

USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

Stewardship Success in Alabama

The population in Alabama, including the governor and legislature, take the state's water issues very seriously. The Alabama Office of Water Resources (OWR) plays an important role by administering programs for: river basin management, river assessment, water supply, water conservation, flood mapping, the National Flood Insurance Program, water resources development, instream flow needs, recommending policies and legislation, conducting technical studies, and representing Alabama's intra and interstate water resource interests. The NHD is a vital resource that will be used as a tool to achieve many of OWR's objectives because it is the foundation of the hydrologic network.

To make sure the NHD will be fully functional, the state is taking a step-by-step approach to review and improve the dataset. The first steps are to make sure the dataset works in GIS and modeling applications. In order to accomplish this, a fully functioning network is required. Although the NHD was very good to begin with, modeling has little tolerance for error. So the initial step is to go through each subbasin and verify that every single flowline is flowing properly. OWR is excited about NHD Stewardship and is dedicated to its improvement because it is crucial to so many of its programs. This year OWR was the beneficiary of a USGS grant that initiated the first step of correcting the geometric network. Jared Bostic, a GIS specialist, has completed 33 of 53 subbasins having started the effort in January, 2008, with an expected completion date of Spring, 2009. Jared successfully uses the NHDGeoEdit tool and believes the tool is an excellent resource for getting the job done. But it hasn't been easy - the tool, data, and process are complicated. Jared took an initial one-week training course, began applying his training to real data immediately, and took an additional one-week follow-up. It took him one month to become proficient and three months to be at a point where he can really fly through the data. Making that all possible was the work of Carl Nelson at the USGS who provided the training and made himself available for any follow-up assistance that was necessary. Over a period of time Carl and Jared, with the help of Tim Hines and George Heleine of the USGS, worked-out the problems to the point where Phillip Henderson, GIS Manager, is seeing outstanding productivity in the stewardship process.

There are five key points to this stewardship success story: (1) Water issues are a major focus in the state, (2) The state is in the process of utilizing and putting the NHD to work, (3) A step-by-step process of tackling one quality issue at a time, (4) A resource was dedicated to mastering the NHD and the NHDGeoEdit tool, and (5) The USGS provided the tool, process, training, and follow-up assistance to make it all work. When asked what the key element to the process was, Phillip explained that the support received from the USGS made all of the state's stewardship goals become an outstanding success.

The NHD in the USFS Enterprise System by Brian Sanborn

The US Forest Service (USFS) recently completed installation of the NHD into the USFS enterprise to support national applications. This is used for the management of water related data including: Fish Populations and Habitat, Aquatic Organism Passage, Hydrologic Classification, Stream Condition Inventory, and Watershed Improvement data. The NHD data installed covers all Subbasins that contain USFS lands in the United States and Puerto Rico. The NHD is also available for all USFS personnel to use in custom applications, map creation, and analysis. The data resides on the agency's enterprise Corporate Data Warehouse at the US Department of Agriculture National Information Technology Center in Kansas City, Missouri.

This project took several months from initiation to completion. Many technological difficulties were encountered. Requirements for the NHD data included: (1) implementation in SDE in an Oracle 10G

database using the SDO_Geometry type; (2) a geometric network with properly set flow direction; (3) public access to all features; and (4) the ability to support periodic one way transactional updates from the USGS NHD database. The initial objective was to manage all of the NHD data in a single database schema. However this couldn't be done because it was not possible to create a geometric network on a dataset this large (over 20 million NHDFlowline features). The task therefore separated the data into 9 subsets representing each of the USFS Administrative Regions and limited the data to Subbasins that contain lands owned or managed by USFS, reducing the number of NHDFlowlines in each dataset to less than 3 million features.

A number of lessons were learned in the process. A bug was found in ESRI Geometric Network creation using complex edges on SDO_Geometry, and one bug in the upgrade of Oracle 10g release 3. Some other notable items are:

- Use Simple Edges in the network if at all possible. Networks with simple edges are much less complex than those with complex edges, require less time to create, and have a greater success rate in creating the network.
- Use Direct Connections to SDE whenever possible. Direct connections by-pass the mid-tier SDE service and are more stable, and operations are faster. Issues were encountered with SDE Service connections being dropped during long processes.
- There are limits to the amount of data that can be included in a geometric network. The limit is a combination of using complex edges, the number of features, and the complexity of features.
- There are many NHDFlowline features in the high resolution NHD data that are very small and produce zero-length features when creating a geometric network using snapping of .04 meters.
- Database tuning is essential. Using ESRI recommended block size (8k) and tuning database buffer size while loading large amounts of data vastly improves performance.
- SDO_Geometry provides the ability to perform spatial queries and analysis using SQL directly against the database. This provides needed functionality for our reporting and analysis. However using SDO_Geometry also has its drawbacks because it is not really fully supported in ESRI software.
 - Spatial Reference metadata is stored twice for SDO_Geometry, once by Oracle and once by ESRI. Since oracle is not aware of feature datasets, and ESRI sets spatial reference metadata on feature datasets it takes extra effort to keep these in sync.
 - There are limits to the number of vertices supported on a feature in SDO_Geometry. Although the limit is large (approximately 454,000), one NHDArea feature (Kodiak Island in Alaska) was encountered that exceeds this number of vertices.

If you have any questions about USFS experiences, please contact Brian Sanborn (bsanborn@fs.fed.us) 541-750-7151.

The NHD Surface Water Maintenance Tool* (SWaMT) by Mike Brouillette

In support of the United States Geological Survey (USGS) stewardship program, the Vermont Center for Geographic Information, Inc. (VCGI) has created a map centric feedback website to improve, maintain and enrich the positional and attribute accuracy of the National Hydrography Dataset (NHD). With participation from the Vermont Regional Planning Commissions, the Vermont Agency of Natural Resources, the USFS Green Mountain National Forest, USFWS and a number of state NHD stewards across the country, VCGI has composed this pilot website as a first step towards creating a sustainable state NHD stewardship foundation.

As the NHD steward for Vermont, VCGI's approach to accomplishing the goal of stewardship is to provide stakeholders with a clear, readily accessible and easy-to-use web interface that provides users with a gateway to facilitate feedback. By creating a controlled environment with base map services, navigation tools and a simple feedback form, users can readily convey updates. This form, or "maintenance ticket", will also allow user created shapefiles and maps to be submitted. Review of these

forms will be conducted by VCGI on a periodic basis with all of the accepted changes to be made by a trained operator using sanctioned USGS procedures. VCGI has employed "best of breed" technology for developing the tool and has made the code available to other parties interested in customizing it for their own purposes, e.g., USGS, states and others.

Having developed and implemented a local resolution NHD (1:5k) dataset, commonly referred to as the Vermont Hydrography Dataset (VHD), five years ago, the foundation for buy-in by numerous stakeholders has firmly established the VHD as the primary organizational spatial dataset for hydrology based efforts in Vermont. With two attribute-enrichment efforts recently completed, it is of growing importance to support the development side of the program with greater update and maintenance efforts. These are core tenets of the Stewardship program. To see the tool, go to <http://maps.vcgi.org/SWaMT/>.

Hydrography Stewardship Conference

A national conference will be held April 15-17, 2009 in Denver, Colorado to discuss hydrography data stewardship composed of the NHD and WBD components. Because other themes of data such as transportation, boundaries, and structures are also interested in the data stewardship concept they will also be invited to participate to learn from the NHD example. The goal of the conference is to better develop data stewardship by exchanging ideas amongst a broad group of participants to find out what works, what doesn't work, and how to fix what doesn't work. The last NHD stewardship conference was held in April, 2007 and drew over 150 people from 43 states, six federal agencies, and six private firms.

USEPA Funding Sources Web Site

The Catalog of Federal Funding Sources for Watershed Protection Web site is a searchable database of financial assistance sources (grants, loans, and cost-sharing) available to fund a variety of watershed protection projects. Go to <http://cfpub.epa.gov/fedfund/>.

July Hydrography Quiz / New August Quiz

Rich Stein, with the Bureau of Indian Affairs was the first to correctly guess last month's hydrography quiz <ftp://nhdftp.usgs.gov/Quiz/Hydrography37.pdf> as Lake Oahe (pronounced "oh-WAH-he"), a portion of the Missouri River in South Dakota. The dam is Oahe Dam just north of Pierre, the capitol of South Dakota. The impounded water forms Lake Oahe, whose tailwaters extend into North Dakota just south of Bismarck, the capitol of North Dakota. The large stream flowing from the west is the Cheyenne River. The Missouri River/Lake Oahe forms the eastern boundary of two Indian reservations - Cheyenne River and Standing Rock. The Lakota word "Oahe." roughly translated means "a foundation" or "a place to stand on." Rich works in the Division of Irrigation, Power and Safety of Dams in Lakewood, CO. Although based in Denver, Rich and his crew are currently working at Standing Rock in support of the BIA's Safety of Dams program.

Others with the correct answer were (in order received): Al Rea, Joseph Kerski, Jim Sherwood, Barbara Rosenbaum, Richard Patton, Joe Gross, Roger Barlow, Jim McDonald, David Straub, Angela Redmond, David Asbury, Thom DeGriselles, Deborah Naslund, Ken Koch, Tom Christy, Dave Greenlee, Roger Anzzolin, Calvin Meyer, Matt Rehwald, Ariel Bates, John Lynam, Steve Shivers, Gita Urban-Mathieux, and Linda Kelly.

This month's hydrography quiz can be found at <ftp://nhdftp.usgs.gov/Quiz/Hydrography38.pdf>. The olive color represents the ground while the white represents a hydrography feature. What is this feature, and where is this? The blue area is Sea/Ocean and the brown in Foreshore (inter-tidal zone). Everyday during the tourist season dozens of Beavers can be seen flying over this big white feature. Send your guess to jdsimley@usgs.gov.

Upcoming NHD Geo Edit Tool Training

September 16 - 18, Albuquerque, New Mexico, contact Gary Kress at gekress@usgs.gov or Bill (BJ) Smith at wjsmith@usgs.gov

Upcoming NHD Applications Training

Sept. 16-17, Portland, Oregon, contact Sheri Schneider at sschneid@usgs.gov

Sept. 18, Lacey, Washington, contact Allyson Jason at ajason@usgs.gov

Oct. 7 and 8, Boise, Idaho, contact Scott Van Hoff at svanhoff@usgs.gov

Oct. 21, Laramie, Wyoming, ESRI SWUG, contact Paul Caffrey at Caffrey@uwyo.edu

November 3-7, additional California workshops in planning stages, contact Carol Ostergren at costergren@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.