Obtaining NHDPlus Data

You can access NHDPlus data by going to the U.S. Environmental Protection Agency WATERS web site at http://www.epa.gov/waters/ and clicking on NHDPlus on the right side of the page under Quick Links. This takes you to the Horizon Systems Corporation NHDPlus webpage. Here you will find the NHDPlus User Guide. Be sure to read through this first. Then you will find a "downloaded" hot link to take you to the data itself. The data is divided into 13 "Major Drainage Areas of the United States." Note that the Mississippi area is composed of six hydrologic Regions. After identifying your area of interest you will find a list of files to be downloaded. This data consists of ESRI shapefiles, ESRI grids and a dbf file. The NHDPlus shapefile of immediate interest is the NHD vector data itself name with "_NHD" such as "NHDPlus17V01_NHD." This file contains improved medium-resolution NHD data organized into the standard seven NHD feature classes. It also contains several standard NHD object classes in the form of .dbf files. Of significant interest is the NHDFlowlineVAA.dbf table. This table contains a rich set of attributes used to code the flow network that allow the user to perform powerful analytical queries. Another shapefile of particular interest is the "_Catshape" which provides drainage catchments for each individual flowline. Related to it is the "_Cat_flowline_attr" which provides three .dbf files of important characteristics of each catchment including landuse/landcover categories, temperature and precipitation. In the grid category you will find grids for elevation data and flow direction/flow accumulation. These grids may be divided between processing areas to keep file sizes manageable. These data bring the NHD to a new level of analysis capability. You are encouraged to download and work with the data.

NHD Stewardship in Minnesota

In Minnesota, the stewardship of the National Hydrography Dataset (NHD) is seen as just one component of an overall program for the exchange of environmental information. The information is structured around data needed by the U.S. Environmental Protection Agency (EPA) to support aspects of the Clean Water Act. Familiar forms of this data include "assessed" waters known as 305(b), "impaired" waters known as 303(d), or Total Maximum Daily Load (TMDL). The EPA geospatially references this information using the NHD. It obtains environmental information from designated agencies in each state, which officially report the information to the EPA. In Minnesota, the Minnesota Pollution Control Authority (MPCA) reports many types of data to the EPA. The EPA also sends data back to the MPCA. To maintain the integrity of the data that travels back and forth, the EPA has a secure system known as Central Data Exchange (CDX) with state agencies and EPA offices placed as nodes on the system. Minnesota will take advantage of this communication system for not only the scientific data, but also the NHD upon which the data is referenced. In the exchange of NHD updates, the USGS will be added as a node to participate in the CDX system. Minnesota and the USGS will use a special CDX client designed to input NHD into the exchange system.

The Land Management Information Center (LMIC), in partnership with the Minnesota Pollution Control Authority is establishing the NHD stewardship environment for Minnesota. Just as the USGS stores the NHD in a main "production" database, and then distributes it from a secondary "distribution" database, the State of Minnesota will have its own copy of the same data, but limited to the hydrologic footprint of the state. The two similar Minnesota databases will be called the MnRAD, for Minnesota Reach Address Database. These databases are SDE databases implemented in Oracle. Typically a NHD user in the state will download a personal geodatabase from the MnRAD distribution database. If a qualified editor in the state needs to modify the NHD, they will apply the NHD Geo Edit tool to the data and make the necessary changes. The NHD Geo Edit tool enforces a number of NHD rules and the editor must also

observe that the edits reflect the concepts of the NHD. At this point the editor is building quality into the product based on the training they have received from the USGS. The USGS will not necessarily re-inspect the data at a later time. They will trust the relationship established with the steward doing the editing and the principal steward that oversees all hydrography updating in the state. The changed flowlines themselves, not the entire dataset, are then packaged to be sent back to the USGS as a transaction. This packaging process puts the transaction into a universal web exchange markup language known as XML. This is done so that all systems that have to interface using the NHD only have to exchange one system independent format. Once in XML, the transaction is input into validation software operated by the principal Minnesota steward. The principal steward will note the edits made and may check them so that they conform to the needs of the state hydrography community and to the needs of the USGS. At this point the valid data is fed to the USGS where additional validation and loading software places it in the USGS production database, which is in the form of SDE. The transaction is processed to receive final NHD codes such as final ComID's. With all coding up-to-date, the transaction has now become just a "regular" piece of NHD data, except that its change management coding has tagged it as recently updated data.

The transaction is then "pulled" out of the USGS production database by the Minnesota principal steward using a software routine that packages it as an XML file and then uses another software routine that loads it in the MnRAD production SDE database to make it up-to-date and mirror the Minnesota footprint in the USGS production database. The Minnesota principal steward then uses a software routine to generate a new MnRAD distribution database. The distribution database is tagged with a version identifier that makes it possible to distinguish later data from earlier data. From this database, which is now the new baseline, users in Minnesota can download the NHD as a personal geodatabase, a shapefile, or coverage. When they do this, the geometric network, the logical network flow table, and the routes populated with M-values for linear referencing are created. These processes are run as needed, usually shortly after edits have been completed. Meanwhile over at the USGS, much the same thing happens to generate a new nationwide distribution database. The USGS will do this about twice a week. Whether users download data from the USGS or MnRAD distribution databases, they should get the same thing.

Normally anybody who wants to edit the NHD in Minnesota will work through the Minnesota principal steward and use the above process. There are three exceptions. One would be if the USGS generates a new attribute or makes a model change that needs to be propagated to the MnRAD. The second would be if a surrounding state makes an edit that affected the Minnesota footprint. For example if Wisconsin edited its Mississippi River shoreline. The third would be if the USGS edits Minnesota data on behalf of the state. This later example will occur shortly as new stream courses digitized by the Minnesota Department of Natural Resources are updated into the NHD by the USGS under an arrangement between the state and the USGS.

The Governor's Council on Geographic Information, through its Hydrography Committee, will provide input and advice to the NHD stewardship process. The Hydrography Committee has been actively involved in coordinating and promoting the development of consistent surface water GIS databases for Minnesota that are consistent with national products.

As mentioned above this is just one component of data exchange in Minnesota. Another component is the building, exchanging, and editing of events. In addition to indexing the water quality assessment units to the NHD as events, Minnesota agencies will ultimately link other databases to the NHD, such as permitted discharges, fish habitat, impaired waters, streamgages, and water chemistry to name a few. If the NHD is edited, it is important to note if events linked to this data are also changed. If this is true, then the events need to be migrated to a new address. Another process will then be launched to update events.

Answer to May Hydrography Quiz / New June Quiz

Keith McFadden was the first to correctly guess last month's hydrography quiz as Lake Texoma on the Texas-Oklahoma border directly north of Dallas. Keith works for the USGS Georgia Water Science Office in Atlanta, Georgia, where he is the GIS manager for the statewide office. He is an information technology specialist by title and a geographer by training. Keith worked several years ago on creating flowpath centerlines in hydrography data. Although a long way from Lake Texoma, Keith was able to narrow down the quiz location as "somewhere in the mid-west, lower or central plains" by noting "all the intermittent streams combined with the dendritic drainage sloping to the east." Then with a bit of luck he came across Lake Texoma. Other correct answers came from Chris Curlis, and Thomas Denslinger who notes "Lake Texoma is formed by the Denison Dam built by the U. S. Army Corps of Engineers. This 89,000 acre lake on the Red River is shared by Texas and Oklahoma. It is widely recognized as a top fishing lake, and is one of the most popular recreation destinations in the Southwest. Lake Texoma was built by the Corps of Engineers in the 1940's, and was stocked with black bass and crappie along with the native white bass in the Red and Washita Rivers. http://www.laketexoma.com/."

For the May quiz look at ftp://nhdftp.usgs.gov/Quiz/Hydrography13.pdf . Can you identify where this is? We are back on the subject of Lakes. These are some very famous lakes. Note one lake has an "X" in it. Do you know what this is? The bigger lake is one of the most studied lakes in the world. Send your guess to jdsimley@usgs.gov.

Current USGS NHD Data Stewardship Contacts

Maine, New Hampshire, Vermont, New York, Massachusetts, Connecticut, Rhode Island, Pennsylvania, New Jersey, West Virginia, Maryland, Delaware, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Puerto Rico, and Virgin Islands – Carl Nelson cwnelson@usgs.gov

Michigan, Indiana, Ohio, Kentucky Tennessee, Minnesota, North Dakota, South Dakota, Nebraska, Wyoming, Montana, Idaho, Washington, Oregon, Alaska – Paul Kimsey pjkimsey@usgs.gov

Wisconsin, Illinois, Iowa, Missouri, Arkansas, Kansas – Tim Hines thines@usgs.gov

Louisiana, Texas, Oklahoma, New Mexico, Colorado, Utah, Arizona Nevada, California, Hawaii, Guam, American Samoa – Bill Smith wjsmith@usgs.gov

Upcoming NHD Application Workshops
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 – August 23 &24, 2006. Contact Frank Roberts at fmroberts@cdatribe-nsn.gov.
New Mexico – September 12, 2006. Contact Gary Kress at gekress@usgs.gov.
St. Cloud, Minnesota – October 4, 2006.
Salem and Portland, Oregon –Fall, 2006. Contact Nancy Tubbs at ntubbs@usgs.gov.
Olympia, Washington – Fall, 2006. Contact Sam Bardelson at stbardelson@usgs.gov.
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