USGS National Hydrography Dataset Newsletter
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The Move to Geodatabase

The move of the National Hydrography Dataset (NHD) database, known as the Feature Operational Database (FOD), to the NHD geodatabase will be happening sometime in the next six months. The conversion will take about three to five weeks to process, depending on the total number of features to process at the time of the conversion, and the actual processing speeds. At the moment, the number of features stands at 18-million and grows week by week. Before this conversion process can start, software must be written, tested, fixed, and retested until all processes are verified. Also, sufficient servers and licenses must be in place to handle the processing loads and access requirements of the geodatabase once it is in place. Everything could be ready as early as mid-July, but could also be delayed to December depending on problems encountered. The conversion will take a snapshot of the FOD and run a series of functions. Any new data ready to be loaded to the main database after the snapshot is taken must wait until the new geodatabase becomes available and any data updates must be loaded into the FOD prior to the conversion. This means that there will be a three to five week moratorium on new data loads. This can have an adverse affect on the NHD program for the simple reason that new data will not be available, but also because the test loading of data is an integral part of the production process. This might mean that a big part of the production program would have to be suspended during the conversion window. However, proper planning for using the workforce during time could minimize the interruption of work. A reasonable plan is to conduct only basic NHD production functions during the window by most if not all employees. At the completion of the conversion, the deferred loads will be processed by a few trained production employees. Some amount of geodatabase training would also occur during the conversion window. When the geodatabase becomes operational, the Framework Tools Interface (FTI) and NHD Create production systems will continue to operate as in the FOD days. When the new geodatabase edit systems are capable of supporting full NHD production and maintenance, these older systems will be phased out. In the NHD geodatabase era, users will be able to download data in the new geodatabase format, FCP, the traditional Arc format and a few other formats.

Perennial and Intermittent Streams

Scientists are often concerned with the perennial and intermittent classification of a stream. The National Hydrography Dataset (NHD) records this classification in the Fcode field in the Drain table, with 46004 for perennial streams and 46001 for intermittent streams. These codes are based on the stream symbolization on the 7.5-minute series topographic map that was digitized as the source for the NHD, and in some cases may have been revised based on the updates of local data producers such as the U.S. Forest Service. The accuracy of the stream classification is based primarily on photointerpretation and field checking at the time the map was compiled or revised. The USGS and its partner agencies made a considerable effort to correctly classify the stream within the observation methods available when the original maps were made. Another type of stream called an ephemeral drain is shown on maps in the Southwest to represent drains that channel water only from flash thunderstorms and these may also be found in the NHD coded as a wash. As scientists and regulators study water issues, the importance of the perennial and intermittent stream classification in the NHD becomes a larger issue. Accurate classifications affect scientific, regulatory, and legal analysis. Although hydrologists have methods that rigorously classify streams, these can only be used in special cases and are not a normal part of mapmaking. Now new methods are being developed to use spatial data in models to predict the proper classification of perennial and intermittent streams. A recent USGS Water-Resources Investigations Report 02-4043 by Bent and Archfield explores this issue in Massachusetts, http://water.usgs.gov/pubs/wri/wri024043. More recently, a follow-up study was done to improve the

equation to estimate the probability of a stream flowing perennially in Massachusetts that was developed in the previous study. This follow-up study involved a greater number of field observation data and the testing of additional basin characteristics. The follow-up study logistic regression analysis determined that the basin characteristics (1) drainage area, (2) drainage density, (3) areal percentage of stratified-drift deposits, (4) mean basin elevation, and (5) areal percentage of forestland are explanatory variables for the equation. The improved equation can correctly predict the transition point from an intermittent to perennial stream 75 percent of the time within a certain probability cutpoint range. The intermittent to perennial stream transition point represented would be for periods of low stream flow and low ground water levels during the summer and early fall (July - October). Although it has not yet been tested, it is estimated that the transition point will be within several hundred feet of the actual point. The biggest variable affecting the accuracy of the model is most likely the accuracy of the input data layers. Interestingly, in a Massachusetts field study, a point on a stream that has a drainage area greater than two square miles will almost always be perennial and appear on the topographic map as such. For points with less than this drainage area, the stream is correctly classified in a range of about 53% to 63% of the time. So as one might expect in a State with relatively few intermittent streams, as you reach the originating point of the stream, the intermittent classification becomes more tenuous. The research is very promising and will certainly lead to more study. Look for upcoming publications on the improved logistic regression equation and new automated procedures. As maintenance is conducted on the NHD, users may be using such methods to help fine-tune the feature classifications. Additionally, scientist can utilize these methods and other watershed tools in a GIS to do time of travel applications, cold/warm water fish habitat studies, and water quality trends

Watershed Tools

The NHD Watershed Tool is currently available at http://nhd.usgs.gov/applications.html#nhdwatershed. This tool is an ArcView (3.x) extension that enables users to delineate a watershed from any point on any NHD reach in a fast, accurate, and reliable manner. Now, a number of new tools are in final stages of development for future release on the NHD website. The first is the NHD Watershed Characteristics tool. This allows users to summarize watershed characteristics of choice within a newly delineated watershed. Users will get on-the-fly summaries on any number of watershed characteristics such as percent forested landcover, basin slope, population, mean elevation, or any other characteristic that could be summarized within a newly delineated watershed. To use the tool, users will need to follow on-line instructions on how to set up their “watershed characteristics” workspace, and populate it with data layers of interest. Users will also need to make an easy modification to the code for the data layers of interest. A second tool is the NHD Watershed Batch tool, which will actually be a new feature of the NHD Watershed tool. It will allow users to delineate multiple watersheds with one click of the button. The watersheds will be initiated using a point event table supplied by the user. The NHD Watershed tool and NHD Watershed Characteristic tool have been used for several hydrologic applications in New England including the Massachusetts perennial/intermittent study (above). In this case, a program loops up and down headwater reaches to determine the intermittent/perennial cut-off point. If the entire headwater reach is determined to be intermittent, the program then jumps into the next downstream reach and loops again. This continues until the cut-off point is found. For each-iteration the program delineates a watershed (using the NHD Watershed tool), summarizes relevant watershed characteristics (using the NHD Watershed Characteristics tool) and runs a logistic regression equation to find the cutoff point. For more information, contact Pete Steeves psteeves@usgs.gov.

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