ESRI User Conference - NHD User's Group Meeting

Attendees interested in the National Hydrography Dataset (NHD) met at the recent Environmental Systems Research Institute (ESRI) User Conference for a formal User's Group meeting on August 12. About 40 people attended including many key figures in the NHD partnership. The meeting was structured around ten topics: (1) Feedback on the NHDinGEO – This data structure enhancement has been important to the NHD user community, particularly the opportunity for better GIS reliability with ArcGIS. A few minor details need attention according to the group; such as a subbasin name in the downloaded filename for easier file management, a verification list of which subbasins are being downloaded, the Fcode ID number, an editing suite - particularly on canals, and documentation on projections. (2) Interest in the NHDGEOinARC format still exist for many users although many struggle with the complicated data structure. (3) The comments on the quality of the NHD indicated general satisfaction, but some problems were noted, including navigation failures, missing M-values, incorrect subbasin boundaries, and poor flow geometry in Florida. (4) Stewardship, as always, is eagerly sought by many users and is considered a key characteristic of the NHD partnership. Users would like to see this implemented very soon. (5) Also, as can be expected, the completion of the high-resolution NHD program ranks high in interest among the user community. A brief review of strategy was presented. (6) Interest in the medium-resolution program remains critical to the Environmental Protection Agency. It also provides the only current option to generalization for studies at smaller scales. (7) Reach indexing is important to users as it provides an outstanding solution to linear analysis. (8) Navigation is, of course, a critical characteristic of the NHD for the same reason. (9) The issue of user needs brought about a number of comments, including needs for direct and concise documentation on Fcodes and Ftypes, simplified documentation in general, and bi-directional flow. (10) This led to a discussion on the future of the program, which included the need for a strong partnership with FEMA and a review of how the NHD can serve FEMA, urban drainage incorporated into the NHD, responsiveness from the USGS on editing of the NHD, and the need for distributed, but synchronized copies of the NHD geodatabase. Overall, the attendees were enthusiastic about the NHD and are loyal supporters, but they also recognize that the full potential of the NHD cannot be achieved unless the USGS remains steadfast in providing high-resolution coverage, making technical enhancements, weeding out quality problems, and implementing a maintenance strategy through stewardship.

ESRI User Conference – Networking

ESRI held a number of sessions at its annual User Conference to announce more advanced networking capability in its ArcGIS 9.02 release. This is designed primarily to serve the transportation industry and the benefit to hydrography or the NHD is not certain. It is oriented toward solving navigation decisions rather than establishing a network. The big news is that ESRI will come out with a new network model known as the Network Dataset, which will work with a new extension known as Network Analyst. The Network Dataset is different from the geometric network used in NHDinGEO in that it does not use connectivity to establish the network, but rather uses new attributes to help define the network. Editing the network will, therefore, also be quite different. More attributes will become standard to help define costs, restrictions, and hierarchies. The Network Dataset will allow multi-modal navigation, with each mode using different navigation rules. For example, a train and a truck will operate on the same network dataset, but each will follow their own rules for traversing the network. One mode can follow rail track, but the other cannot. A new feature will be a Turn, which records various rules for traversing a junction. The Network Dataset can be built on top of a shapefile. Geometric Networks will not go away, and will also receive some enhancement, which can't hurt the NHD.

ESRI User Conference – Linear Referencing

ESRI held a session on linear referencing at the annual User Conference. Nothing radically new was announced, but the sessions provided a valuable review of linear referencing and how it works in ArcGIS 9, including some new tools. Here is a synopsis of the session: Linear referencing is based on measures along the Line feature class. When a line feature has a unique identifier and a measurement system, it is known as a Route. A collection of these routes is stored in a single Feature Class with geometry type Polyline, storing x, y, and m (measure) values. Multiple Feature Classes can be stored in a single Feature Dataset. A Route Location (what ESRI used to call events) is a discrete location along a route or portion of a route. It is possible then to have point and line "events." They are stored in Route Event Tables, consisting of a Route Identifier and a Measure. To create linear referenced features you (1) go to ArcCatalog and create a new feature class in geodatabase with measure values, or you can create a route feature class from an existing line feature dataset by adding measure using a similar process, (2) then you create routes from the lines using Create Routes under Linear Referencing in ArcToolbox. You can calibrate the measures on routes with known reference markers using Calibrate Routes in ArcToolbox. You can also migrate a route from another data format using a feature class to feature class transformation to a new geodatabase feature class using Export in ArcCatalog. Then (3) go to ArcMap to take a point table of from/to measures and (4) use Add Route Event in ArcMap to do Dynamic Segmentation to create route events. In applications, it is possible to (1) convert from/to measures to a route, (2) create routes of a series of segments defined by from/to measures, (3) define offsets to the side of a route, (4) calibrate the route to adjust to known references, such as mile-markers, (5) edit the route, (6) query the route, (7) overlay route hatching symbology for reference, and (8) add new route locations. ArcGIS 9 ArcToolbox Linear Referencing tools include: (1) Calibrate Route, (2) Create Route, (3) Dissolve Route Events, (4) Locate Features Along Routes, (5) Make Route Event Layer, (6) Overlay Route Events, and (7) Transform Route Events. An outstanding resource for NHD users can be found in the ESRI book ArcGIS9: Linear Referencing in ArcGIS. Even if you are running ArcGIS 8.3 (the version used by NHDinGEO) you will find the book fully applicable.

ESRI User Conference – ArcHydro

ESRI held a session specifically on ArcHydro. Here is a synopsis: ArcHydro is a template data model and is not a project data model. For that you need to modify the basic template. ArcHydro is an extension of Geodatabase and it is built upon ArcGIS. The field of water resources is concerned with (1) layers of data, and (2) behavior of water. ArcHydro works in water resources by attempting to combine the two. The basic concept behind ArcHydro is that it uses (1) core feature classes, (2) relationships, and (3) a geometric network. The ArcHydro schema is an interrelationship between (1) drainage, (2) network, (3) hydrography, and (4) channels, plus a (5) time series. The ArcHydro framework has five feature classes (1) HydroJunction, (2) HydroEdge, (3) line, (4) point, and (5) area. The key field is the HydroID. It is a unique identifier for each feature. You will also find a (1) NextDownID, (2) DrainID, (3) JunctionID, (4) FeatureID, and (5) HydroCode. Relationships exist between all aspects of the schema and of the feature classes. Characteristics of the geometric network include (1) connectivity between feature classes, (2) employing HydroEdges and HydroJunctions to form the network, (3) the feature classes are connected to junctions, and (4) upstream and downstream tracing. In addition to demonstrations of tracing/selection and the use of time series using tables, an extensive groundwater application was provided.

Updated Subbasins

To improve the NHD, separate subbasins have been created for each of the five Great Lakes. The subbasin perimeter is based on the NHD coastline, where available. The only features in each of these

subbasins will be those of the various islands plus sea/ocean and lake/pond for the Great Lakes themselves. For the time being, those features may still have reaches referenced to the original subbasins. The NHD viewer now displays the new subbasins and users can extract data accordingly. The new subbasins are: 04020300 - Lake Superior, 04060200 - Lake Michigan, 04080300 - Lake Huron, 04120200 - Lake Erie, and 04150200 - Lake Ontario. In addition, a new subbasin has been created for part of the Aleutian Islands in Alaska, 19030103, but since no source mapping exists in order to make the NHD, it will not be produced. Also, a very small missing subbasin has been added in the area of Marysville, California, 18020107. A number of watersheds and subwatersheds have also been added to the NHD viewer as they become available from the Watershed Boundary Dataset. These are also known as fifth and sixth level hydrologic units.

Hydrologic Regions Nearing Completion

Most production of the high resolution NHD is in response to covering political boundaries, such as States, or National Forests. But to hydrologists, coverage is needed to allow modeling throughout a complete hydrologic unit. That's tough when virtually no political boundaries in the United States correspond to any level of hydrologic unit, except perhaps Hawaii. The highest level of hydrologic unit is the Region, of which there are 21 in the U.S. Five of these are well on their way to completion. The Upper Colorado Region will be 100% complete in about a month. The Mid-Atlantic, Texas-Gulf, Rio Grande, and California Regions will soon be over 95% complete, with just a handful of subbasins in need of funding for completion. Other hydrologic region completions on the horizon include New England, Ohio, Tennessee, South Atlantic-Gulf, and Lower Mississippi. Overall, of 2,259 subbasins in the high-resolution program, 1,654 are complete or funded for completion. Over 50 government agencies are participating in the funding of this work.