USGS National Hydrography Dataset Newsletter
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Underground Streams

The National Hydrography Dataset is implementing new features for underground water systems including underground streams, also known as underground conduits, or subsurface conduits. Here is a primer on underground streams:

In specific geologic settings, such as volcanic terrains and karst topography, groundwater can flow in stream-like conduits or collect in underground pools. The term "underground stream" is a proper descriptor when it refers to these special conditions. Karst is a term applied to areas where extensive dissolution of rock has led to the development of subterranean channels through which groundwater flows in conduits (enclosed or semi-enclosed channels). These conduits can vary in size from slightly enlarged cracks to tunnels many meters in diameter and many kilometers in length. The evolution of karst topography differs significantly from more typical landscapes where erosion and deposition by running water sculpt the land surface. In karst topography, the underlying soluble rocks are removed by being dissolved instead of being eroded. Groundwater percolating through cracks removes the soluble rock while leaving an enlarged channel for further (and progressively more efficient) flow of water. If there is a thick cover of soil above the soluble rock, surface streams may flow above the subterranean karst drainage system. But more commonly, dissolution features occur at the surface, and hence there are few continuous surface streams because runoff encounters sinkholes or is otherwise routed underground. In some cases, the flow of a surface stream may be diverted underground when subterranean caves collapse and break through beneath the streambed in a process known as stream piracy. Usually this is a gradual process, with only part of the surface stream being diverted through small cracks in the rock just below the soil cover. The amount of surface water diverted grows larger with time, and the cave also grows with time until the entire surface stream disappears into the ground. Underground stream systems present special problems for people interested in water supplies and water contamination. Two notable features of karst hydrology are the often-unknown flow paths and the wide variability in flow rates. Some underground flow systems may mimic the behavior of surface streams as one or more underground streams join into a single large stream. But generally, underground systems are quite different than surface systems. Underground streams are not visible from the ground surface and may go in unexpected directions, and may change direction some of the time. Although they must flow downhill, underground streams can follow paths quite different from what one might expect from the surface topography. In order to understand these underground stream systems, karst hydrologists attempt to determine the sources of springs by water tracing. Water tracing usually involves injecting a tracer chemical, most commonly a harmless fluorescent dye, into a disappearing stream. Springs are then sampled and the water samples are tested for the presence of the dye. The springs where underground streams reemerge to the surface get their water from two main sources: disappearing streams and the diffuse (spread out) infiltration of water percolating through numerous tiny cracks. The presence of a disappearing stream almost always means a large spring somewhere in the downhill direction, and large underground channels carrying the water to the spring. But the actual pathway of the water is hidden from view, and where there are many disappearing streams and springs it is difficult to know which spring is fed by which disappearing stream. From http://www.waterencyclopedia.com/Hy-La/Karst-Hydrology.html

Comparing High Resolution and Medium Resolution NHD

Have you ever wondered how much larger high-resolution NHD files are compared to medium-resolution data? Here is a sample from nine subbasins around the country. The bold numbers tell you how many times larger the high-resolution is from the medium-resolution by measuring the difference for the zipped file (megabytes), unzipped file (megabytes), total number of flowlines, total number of waterbodies, and the density of flowlines per square mile. For example, the Rio Chama subbasin has 11 times more flowlines in the high-resolution than in the medium-resolution. A flowline is a confluence-to-confluence section of a water feature or segments differentiated by feature type. You can see from this sample that there is a lot of variance. The number of flowlines varies from a difference of 2.7 times for the South Skunk to a high of 16.1 for the Austin-Travis Lakes. The number of waterbodies sees the most dramatic change, ranging from 5.0 times for the Snoqualmie to 56.3 times for the Lower Verde.

Subbasin	Subbasin Name	ST	Area	Res	Zipped	Unzip	Flowlines	Waterbodies	Flowline/Mi2
02050305	Lower Susquehanna-Swatra	PA	1,870	Med	2.2	15.6	1,951	140	1.04
				Hi	8.3	30.6	8,401	3,248	4.49
				x	**3.8**	**2.0**	**4.3**	**23.2**	
03020201	Upper Neuse	NC	2,401	Med	4.5	13.5	4,501	880	1.87
				Hi	33.5	101.3	27,007	10,870	11.25
				x	**7.4**	**7.5**	**6.0**	**12.4**	
07080105	South Skunk	IA	1,864	Med	2.6	14.9	1,991	237	1.07
				Hi	11.7	37.0	5,443	2,700	2.92
				x	**4.5**	**2.5**	**2.7**	**11.4**	
07010202	Sauk	MN	1,030	Med	2.4	13.8	1,124	400	1.09
				Hi	5.6	22.7	3,667	2,793	3.56
				x	**2.3**	**1.6**	**3.3**	**7.0**	
10190001	South Platte Headwaters	CO	1,608	Med	1.6	13.4	1,029	91	0.64
				Hi	11.6	39.9	12,270	1,915	7.63
				x	**7.3**	**3.0**	**11.9**	**21.0**	
12090205	Austin-Travis Lakes	TX	1,238	Med	1.9	18.8	593	98	0.48
				Hi	9.4	38.1	9,544	4,082	7.71
				x	**4.9**	**2.0**	**16.1**	**41.7**	
13020102	Rio Chama	NM	3,160	Med	3.4	19.6	2,576	96	0.82
				Hi	25.0	84.4	28,240	2,910	8.94
				x	**7.4**	**4.3**	**11.0**	**30.3**	
15060203	Lower Verde	AZ	1,956	Med	2.6	13.5	2,072	15	1.06
				Hi	13.0	38.5	9,629	845	4.92
				x	**5.0**	**2.9**	**4.6**	**56.3**	
17110010	Snoqualmie	WA	690	Med	1.0	6.7	994	301	1.44
				Hi	3.9	14.4	5,850	1,514	8.48
				x	**3.9**	**2.1**	**5.9**	**5.0**	

Summary of Subbasin Statistics

Need a brief summary of subbasin statistics? Try: http://www.esg.montana.edu/gl/huc/statehuc.html. Here you will find subbasin statistics on area of a subbasin, elevations found in the subbasin, the total length of streams, stream density (both based on TIGER/LINE data), and place names found in the subbasin. The subbasin-based data was compiled by the Environmental Statistics Group at Montana State University for the National Wild Fish Health Survey. Most of the base data for this project came from the U.S. Geological Survey. This project was funded by the U.S. Fish and Wildlife Service.

2007 National Spatial Data Infrastructure (NSDI) Cooperative Agreements Program (CAP)

The U.S. Geological Survey and the Federal Geographic Data Committee (FGDC) formally announced their request for proposals to support the 2007 National Spatial Data Infrastructure (NSDI) Cooperative Agreements Program (CAP). With a total of $1.2 million spread across five categories, the 2007 NSDI CAP will fund an estimated 26 innovative projects in the geospatial data community. Each project aims to build new and improve existing infrastructure necessary to effectively discover, access, share, manage and use digital geographic data. To date the NSDI CAP awards have created collaborations at all levels of government, provided seed money to enable geospatial organizations to participate in national efforts to implement the NSDI, promoted the development of standardized metadata in hundreds of organizations, and funded numerous implementations of OpenGIS Web Mapping Services and Web Feature Services. The twelve years of CAP awards have played a substantial role in promoting and disseminating the tenets of the NSDI to thousands of practitioners. The program is organized into five categories: (1) FGDC-Endorsed Standards Implementation Assistance and Outreach - provides funding to organizations to assist in the implementation of FGDC-endorsed standards; (2) Framework Client Development - to support general access to Framework data vector themes; (3) Fifty States Initiative - in support of the NSDI and the objectives of the Fifty States Initiative Action Plan; (4) Geo-Enabled Federal Businesses Initiative - incorporating geospatial approaches into business processes; and (5) Geographic Information Integration - to develop sustainable partnerships to integrate, maintain and provide access to current geospatial data and to develop the infrastructure needed to integrate these data. The full 2007 announcement and further information are available at: http://www.fgdc.gov/grants/2007CAP/2007CAPschedule.

NHD Program Loses Two Long-Time Supervisors

Ellen Finelli, the USGS supervisor for NHD operations in Denver, Colorado, and Gladys Conaway, the USGS supervisor for NHD operations in Rolla, Missouri, have both left the program for career advancements. Ellen and Gladys have each supervised a team of 30-40 people responsible for producing the high-resolution NHD through in-house, workshare, or contract operations. Each has been with the program for many years, starting with the medium-resolution NHD, and through their experience has been able to contribute a great deal to the success of the program. They have dealt with a wide range of issues from personnel management, to data scheduling, to gaps in flowlines, and have done an outstanding job making the NHD a premier dataset for the nation. Ellen and Gladys will be missed.

Answer to November Hydrography Quiz / New December Quiz

Kevin Sweeney, a GIS Manager for FMSM Engineers, was the first to correctly guess last month's hydrography quiz ftp://nhdftp.usgs.gov/Quiz/Hydrography18.pdf as the "D" River on the Pacific coast of Oregon just north of Lincoln City, Oregon. The "D" River links Devil's Lake with the Pacific Ocean and is reputed to be the shortest river in the world at 120 feet. Kevin notes "The site in the quiz just looked like the Oregon coast to me (as a former resident of Portland) and a zoom to the specific area in Google identified it as Lincoln City. Having been across the bridge over this short reach many times it was easy to identify as the D River. There's a sign on the Coast Hwy 101 that identifies it as the worlds shortest. Because it empties across the beach right into the Pacific, the length actually varies with the tides. This is also big kite flying territory and you can see an interesting one nearby in the imagery served up by Google Map". According to other sources, including the Guinness Book of World Records, the world's shortest river is the Roe River, which flows between Giant Springs and the Missouri River near Great Falls, Montana. It is generally described as being 200 feet long. The Roe River is a pretty solid 200 feet, while the D River as a bit of "play" in where you start and end your measurement. Also, the Roe River's notoriety in the Guinness Book of World Records has a bit to do with a well organized letter writing campaign. Kevin works as the GIS Manager with FMSM Engineers, administering GIS staff and operations for the Columbus, Ohio office. In addition to engineering services (focused on water resource engineering here in this office) they also provide a range of GIS consultation and services, including database design and development, data conversion, enterprise implementation services, application programming, Web GIS, H&H modeling and floodplain mapping (they are a FEMA Map Modernization contractor), stream restoration and GIS training. Others with the correct answer were: Nancy Tubbs, Tom Potter, Melvin Landry, Gail Jackson, Dan Wickwire, Ed Carter, Joe Buckwalter, David Asbury, Dan Saul, Barbara Rosenbaum, Ken Koch, Calvin Meyer, Martyn Smith, Tom Shindler, and Dave Stewart. Dave Stewart notes: "This was easily found using GoogleEarth's new Geographic Web layer option, which does a Wikipedia on the D River."

For the December quiz look at ftp://nhdftp.usgs.gov/Quiz/Hydrography19.pdf. Can you identify where this is? This is one hydrologic sub-region dominated by a central feature. What is that feature? Send your guess to jdsimley@usgs.gov.

Upcoming NHD Geo Edit Tool Training

Lincoln, NE - January 9-11, 2007. Contact Bill Smith wjsmith@usgs.gov or Ray Fox rfox@usgs.gov
St. Paul, MN – January 9-11, 2007. Contact Paul Kimsey pjkimsey@usgs.gov or Ron Wencl rwencl@usgs.gov
Bozeman, MT – January 23 - 25, 2007. Contact Paul Kimsey or Lance Clampitt lsclampitt@usgs.gov
Arkansas – February, 2007 (Possibility). Contact Tim Hines thines@usgs.gov or Bill Sneed wsneed@usgs.gov
Anchorage, AK - March or April, 2007 (Possibility). Contact Paul Kimsey or Carl Markon markon@usgs.gov

Upcoming One-Day NHD Application Workshops

San Diego, CA – January 29 & 30, 2007. Contact Carol Ostergren at costergren@usgs.gov
Redlands, CA –January 31, 2007. Manager's Overview. Contact Carol Ostergren.
Redlands, CA – February 1, 2007. Contact Carol Ostergren
Las Vegas, NV – February 27 & 28, 2007. Contact Tom Sturm at tsturm@usgs.gov
Indiana – March 13 2007. Contact Dave Nail at dnail@usgs.gov.
Idaho – April 2 and 3, 2007. Contact Frank Roberts at fmroberts@cdatribe-nsn.gov.
Michigan – May 7, 2007. Contact Steve Aichele at saichele@usgs.gov.
Illinois – Winter, 2007. Contact Shelley Silch at ssilch@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.