USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

Ele-Hydro Meeting

In traditional topographic mapping the features of the landscape were mapped simultaneously and as a result integrated extremely well. In the digital age of mapping and with the advent of geographic information systems many of the landscape characteristics became segregated and put into individual overlays. Each took on its own path and at a later point in time when all of the information was re-assembled, the data themes did not necessarily integrate. This is a particular concern for elevation and hydrography data. On the landscape one forms the other, and on the map each is expected to integrate with the other.

To address this issue, the USGS has sponsored a series of meetings known as "Ele-Hydro." The latest was held December 9th and 10th in Reston, Virginia, and attended by about 60 people in-person and by teleconference. In the meeting it was noted that the integration of elevation and hydrography not only deals with the alignment of the data, but also with modern data modeling techniques, the two forms of topography can integrate in many different ways. For example, elevation features like levees can be linked in the data structure with the river they are designed to contain. That makes it possible to build highly capable information systems, rather than simple mapping data. The age of GIS has created enormous opportunity to better understand the symbiotic relationship between elevation and hydrography. Good examples of exploiting those relationships can be found in StreamStats and NHDPlus.

The meeting consisted of two parts. First, several presentations were made on the state-of-the-art of the technology. Second, six teams were formed to brainstorm the path forward in 2016, 2018, and 2020.

For 2016 there was agreement amongst the teams to implement the findings of the Hydrography Requirements and Benefits (HRBS) study and take another look at the National Enhanced Elevation Assessment (NEEA) as it applies to hydrography. There was also general agreement to aggressively complete the current NHDPlus program. A need was also expressed to developed standards/specifications/best practices for ele-hydro. A fourth major recommendation was to implement breakline practices for hydrography. Other ideas include ramping up web services, develop a focused research agenda, work on pilots to test the technologies, implement generalization, and engage the community.

For 2018 there was a call to more closely integrate the elevation program and the hydrography program. The importance of the HRBS and NEEA were again emphasized. Other important issues included the completion of lidar coverage, automating hydrography extraction, bathymetry, implementing research, a "call to action" to move forward with the HRBS recommendations, using contracting to procure elevation and hydrography data, an integrated ele-hydro budget, 3-dimensional hydrography, get customer feedback on pilots, engage partners for funding, interoperability between data models, a national culvert database to break pooling behind embankments, developing and distributing tools, and acquisition by watersheds.

For 2020 there was general agreement to develop and implement "second generation" data models that account for true 3-dimenstional features such as rivers under bridges, and 4-dimenstional time series such as the high and low stages of water in rivers and lakes. Additionally, a model that handles elevation and hydrography data is needed. Other ideas included better ele-hydro applications, sensor generated products, delivering integrated products, the need for mature tools at this point in time, change detection in the landscape, and next generation products.

Some of the challenges to the ele-hydro initiative expressed by the group include the need for elevation and hydrography to have a consistent message, managing the sometimes conflicting needs of users, automation, limitations in technology, sufficient funding, managing user expectations, and building wide-spread and strong relations amongst the large user community for ele-hydro.

Breakline Investigations to Enhance the NHD and Elevation by Karl Heidemann

The need to reintegrate the USGS elevation and hydrology datasets has been known and discussed by USGS scientists for several years. In December of 2013 experts from both programs attended a multi-day workshop in Reston, Virginia to more formally examine the problem and identify potential solutions. That effort revealed the complexity of the topic, with additional considerations for cartographics, data resolution, hydro modeling trends, elevation surface types, attribution and conflation, automatic extraction of features from point clouds, milestone/completion horizons, human resources, and of course, budgets.

Increasing interest in hydro modeling has led to increasing demand for more detailed NHD and elevation data, as well as multiple types of elevation surfaces. Whereas a standard topographic DEM was once satisfactory, many users now request hydro-enforced (depicting uninterrupted surface water flow), and transportation (including all roadways and bridges) DEMs. The vast majority of the data used for all of these surfaces is identical; the variations can be created largely through the use of selected breaklines. Long established as a topographic surface, the National Elevation Dataset (NED) is now produced primarily from lidar point cloud data. Unlike traditional production methods, lidar does not inherently contain breaklines defining hydro features; the result is a highly irregular and unsatisfactory appearance of waterbody surfaces in the lidar-derived Digital Elevation Models (DEM). Hence, a requirement was added to the National Geospatial Program's (NGP) Lidar Base Specification to collect breaklines for selected waterbodies, so that their surfaces can be flattened.

One of the integration approaches identified during the 2013 workshop is to incorporate NHD requirements into the existing production process for lidar data (this approach is known as "Option 6"). As limited breaklines are already being collected (using any of several methods), expanding the scope of collection is a logical and cost-effective way to acquire additional hydrographic linework. Consistent, coherent hydrographic breaklines, collected during lidar production using an established data structure (attributes and topology) could then be used directly to augment both National Hydrography Dataset (NHD) and Elevation products.

In fiscal year 2015, a team of USGS lidar, hydrography, water, and standards experts compared the NHD's GIS Data Dictionary with the Elevation program's technical requirements for creating different types of surface models. Again, it was found that the vast majority of the hydro breakline features needed for elevation are identical to the NHD, with some expansion of attribution and minor adjustments to topology. From this study, an abbreviated composite data dictionary was developed defining how features common to both programs could be collected as one. Currently in detailed review, this new specification is expected to be included in the upcoming revision to the NGP's Lidar Base Specification. Although the extent to which Option 6 will be implemented remains to be determined, having a standard data structure in which dual purpose data can be stored will benefit all users, regardless of how the data is generated.

NHD Update Process Training by Joel Skalet & Bill Smith

It's not too late to join us for training in January!! The NHD Basics Training will be given via Webex and Teleconference on Thursday, January 7th. The NHD Update Tools Training will be given in two parts on Wednesday, January 13th and Wednesday, January 20th. The link to the Events Calendar on the Hydrographic Data Community is

https://my.usgs.gov/confluence/pages/viewpage.action?pageId=223543429. Principal Stewards in each state (if one exists) should be contacted for approval prior to submitting a request for training. The current training being conducted is using ArcGIS 10.2.2.

NHD Basics is a prerequisite class that all attendees are required to complete prior to moving to NHD Update Training sessions. Training begins at 9:30 Central Time and runs for approximately two and a half hours. This session covers: Basic NHD Background – History of the NHD, NHD Stewardship, Resolutions of the NHD, The NHD Model, Important concepts in the NHD, including: Permanent Identifiers in the NHD Reachcodes in the NHD, Flow Network in the NHD, Important NHD websites, Supporting Software, NHD User Guide, NHD User Account, NHD MYUSGS Hydrographic Data Community, and Checking out data. Please contact your Regional POC to schedule training.
NHD Update Tools Training Part 1 begins at 9:30 Central Time and runs for 5 hours (breaks included). Part 1 will be a review of the entire editing process and a complete discussion of the NHD Update Toolbar, including loading data, Initial QC, Reviewer table, resolving Invalid Geometry, and using the tool to add geometry, modify geometry and attributes, delete geometry, import geometry, and vertical relationships.

NHD Update Tools Training Part 2 begins at 9:30 Central Time and runs for 5 hours (including breaks). Part 2 (follow up to Part 1) will be a review of the Data Reviewer table, a review of Initial QC, Severity 1 versus Severity 3 errors, discussion of the errors one might see in the NHD and how to resolve those errors. We will then discuss Final QC and uploading your edits to *The National Map* hydro layer.
For more information about this training please contact Joel Skalet, jjskalet@usgs.gov (608) 238-9333 x. 152.

The Hydrographic Data Community on MyUSGS by Dave Anderson

The Hydrographic Data Community (HDC) is the one stop shop for partner communications from the USGS Partner Support team. It includes each partner community such as NHD, WBD, HEM and GeoConflation, plus a number of areas of general interest to all partners including a calendar, NHD operations projects, and blog of essential information about infrastructure such as FTP availability. With the hundreds of partners currently working with these projects it is very difficult to manage email lists and groups who want specific information. In this application, the user gets to select what information they would like to see by "watching" a page or pages. If you are not watching a page you will not receive any email notification when something is updated.

Blogs are the communities' way to inform users of USGS happenings within the community. Although partners cannot create blogs or pages, Partner Support invites users to comment on information, whether it be on a blog, technical information, or general content by using the "Comment" section at the bottom of each page. We only ask that you read and follow the USGS Comment policy https://my.usgs.gov/confluence/display/hdc/Hydrographic+Data+Community+Comment+Policy posted on the site.

We also invite users to share their software, workflows, or any other documentation through the "Partner Developed Applications" page. If you have an item you want placed on this page, please send it to Dave Anerson at danderson@usgs.gov or Paul Kimsey pjkimsey@usgs.gov and we will get it posted as quickly as possible.

If you are a new partner and need access to the HDC, send name and email address to Dave Anderson danderson@usgs.gov and I will be happy to help set up your MyUSGS account. If you are a DOI employee, you must log into MyUSGS using your email/password then send an email to any of the site administrators to be added to the members group. If you are a partner who has forgotten your password,

got to https://my.usgs.gov/confluence/forgotuserpassword.action and enter your email for a Reset Password link.

WBD News by Elizabeth Stevens-Klein

Susan Buto from the Nevada Water Science Center and Kimberly Jones from the Utah Water Science Center, are both doing an amazing job picking up where Karen Hanson and Stephen Daw left off this July. Sue will pick up the majority of the Watershed Boundary Dataset Product and Service Lead duties with Kim's support as the Watershed Boundary Dataset National Technical Lead. Kim is also doing a fantastic job helping me get up to speed as the new Watershed Boundary Dataset Point of Contact here at NGTOC. Amidst these changes, we're still charging forward with exciting news. We are working on a 10.3 release of the WBD Editor Tools, which is currently in testing. If not already available, we strongly encourage users to begin scoping out the process of getting ArcGIS 10.3 on their computers.

A new "Names" add-in is also in testing, which will allow users to name Hydrologic Units with confidence. The tool leverages a GNIS layer and NHD layers that intersect the Hydrologic Unit and lists all names from the GNIS and NHD layers in a new window ranked by priority as outlined in the WBD Standards. The user would choose a name for the Hydrologic Unit by selecting the most appropriate high-ranking name in the list and double-clicking on it. If a compounded name is appropriate, the user would select another high-ranked name and double-click on it, which would add a hyphen to the new Hydrologic Unit name. There are also options to add appropriate prefixes to the name, such as Upper, Middle, Lower. This add-in will be available in a final release of the 10.2 tools coming soon, as well as the new release of the 10.3 tools coming shortly thereafter.

NHD Quality Control Errors and How to Resolve Those Errors by Bill Smith

This month's article for the NHD Newsletter will discuss one NHD quality control (QC) error that has appeared in several cooperator's NHD jobs. This will follow the same format as last month's article by noting the errors, discuss the errors, explain why the errors are showing up, and provide guidance on how to resolve these errors.

- Error: Branched or Gapped or Opposing Flow Error – Reachcode
- QC Check: Main Flow Checks (Flow Check Validation):
- NOTES Description: NHDFlowline Flow Check Validation Error (See Status Description) (Flow Check Val)
- REVIEWSTATUS Description: A Branched or Gapped or Opposing Flow Error was found with a Reachcode value = xxxxxxxxxxxxxx (this may be due to an attribute OR geometry error)
- Severity: 1
- Description of Error: The error is indicating there are two or more NHDFlowline features sharing a common Reachcode value where a branch, gap or opposing flow exists.

A branch is defined as a location where a confluencing or diverging NHDFlowline feature is joining or exiting two adjoining NHDFlowline features, and all three features share a common Reachcode value. A gap is defined as a location where there is no connectivity between two NHDFlowline features sharing a common Reachcode value. Opposing flow is defined as two adjoining NHDFlowline features sharing a common Reachcode value, but flowing in opposite directions.

Why are we now seeing this error?

Typically, these are errors made during the editing process. They are typically a blunder. Unlike Branched, Gapped or Opposing flow in GNIS ID or GNIS Names, these reachcode errors cannot be ignored; they must be corrected to allow your edits to be uploaded to the National Geodatabase.

Error Resolution:
The resolution for this error is to initially find the offending branch, gap or opposing flow, determining which error (branch, gap or opposing flow) is present in your dataset. One method is to select one of the offending records in your Reviewer table, open the NHDFlowline feature class table, and complete a query finding all NHDFlowline features that share the offending reachcode. You may copy the reachcode from the one selected feature to set up your query. Now select the "Show selected records" button which will display only the selected features. Zoom to the selected features and see if you can find the gap or branch. Sometime you might have to zoom in fairly tight to find a small gap between features that should be connected, or find a small branch where an Artificial Path (AP) in a double line (2D) StreamRiver feature is downstream from an NHDFlowline, or series of NHDFlowlines, and connects to the main AP for that 2D StreamRiver feature, but has an incorrect reachcode assigned to the feature.

You may also use the ESRI Utility Network Analyst tool. Identify the start with the Start Flag, set Task to Trace Upstream or Trace Downstream (whichever is appropriate), and select the Solve icon. The network trace will stop where there is a disconnect between NHDFlowline features, showing the gap. The above technique will also find opposing flow when the process encounters a feature flowing opposite from others.

You might have to resort to the "caveman" method where you simply select all features that share the common reachcode, and pan upstream or downstream looking for the gap, the branch, or the opposing flow indicated by the arrowheads on all NHDFlowline features.

In some cases you will notice there might be three or four error records in your reviewer table with the same reachcode error. If this is the case, please note that one of the error records will zoom you to the upstream most feature with the offending reachcode, another record will zoom you to the downstream most feature with the offending reachcode, and the remaining two errors will zoom you to the offending features where that gap exists.

Once you have found the error and determined if the error is a gap, a branch or opposing flow, the next step is resolving the error. If the error is a gap, you may sometime be lucky enough to simply have to use the Modify Geometry function to snap the end vertex of the gapped feature to the appropriate end vertex of the other gapped feature. Apply Rule and Save using the Tool.

In some cases you might find a gap where you will need to digitize a new NHDFlowline feature to fill the gap. Use the latest available imagery as a backdrop, and digitize the missing feature using the Add Feature function. Again, Apply Rules and Save your edit using the Tool.

In other cases, you might need to modify the reachcode on the offending feature. If this is the case, the best way to accomplish this is to delete the offending feature and collect a new feature. This process will generate an appropriate reachcode on the newly collected feature(s). There are various methods to recollect existing features in the NHD: (1) Delete Feature and Re-digitize method – the NHD editor would simply delete the offending feature and re-digitize a new feature from some source; (2) Copy/Paste method – the NHD editor may simply copy the offending feature from the appropriate feature class table, then paste that feature into the appropriate Import feature class table (Import_Line or Import_Polygon). Once the feature exists in the appropriate Import table, the offending feature may be deleted, and the feature from the appropriate Import table may be imported; (3) ArcCatalog/Data Loader method – if the offending feature is very large (many vertices), it might be more efficient to create a shapefile containing

the offending feature(s) using ArcMap functionality Data/Export Data, then use the Data Loader function in ArcCatalog to move the feature to the Import_Line feature class. Once you are certain you have the feature(s) in the Import_Line feature class, you must delete the offending feature(s) using the Delete Feature function in the tool. Remember to Apply Rules and Save the delete function. Now you can use the NHD Tool Import function to import the deleted feature back into your edited dataset. This process will generate an appropriate reachcode. After you have verified the import to be correct, remember to Apply Rules and Save the import.

For opposing flow, the resolution is to find the feature flowing in the incorrect direction. Use the Modify Geometry function in the Tool to flip the vector to the appropriate direction. Once you have selected the offending feature, you must display the vertices for the feature. Use the ArcMap Edit Vertices button found in the Esri Editor tool to display vertices, if required. Now hover your cursor over the feature, right mouse click, and select Flip from the dropdown menu. Remember to Apply Rules and Save your edit.

Always remember to go back to your Reviewer table and mark the error records as Resolved . This is good practice, helps you know what error records you have reviewed and in some cases assists with the next QC session.

As you can tell, there are many ways to resolve issues in the NHD. The trick is to find the method that you are comfortable with using, and is the most efficient method of resolving the issue. It is always best to use the functionality of the NHD Update Tool when editing, to appropriately populate associated tables and place your edit into the Edit History file.

NHD Network Improvement Project by Cynthia Ritmiller

Initial Phase Network Improvement

Region 19 (Alaska) is being completed as part of the Hydrographic Image Update project using the 2012 Horizon Systems QA/QC check results.
Initial Network Improvement Regions Completed:
01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, and 22.

Double Check Phase Network Improvement

- Region 01 - Sub-regions 0101-0109 were sent to Horizon systems in August and are being processed in the creation of HiRes NHDPlus. The one remaining sub-region 0110 will be sent to Horizon Systems soon.
- Region 02 - New pre-staged Sub-Regions 0202-0206 and 0208 were received and QA/QC checks were ran edits are being completed. Sub-region 0207 QA/QC edits are complete and will be sent to Horizon Systems for the creation of HiRes NHDPlus soon.
- Region 03 - Three sub-basins need to be reviewed and may needs edits, sub-regions include 0309 and 0311. Will complete these edits working with our partners schedules.
- Region 04 - Several sub-basins in need to be reviewed and may needs edits, sub-regions include 0409, 0414, and 0415. Will complete these edits working with our partners schedules. Edits within sub-basins 0407 were completed.
- Region 05 - New pre-staged Sub-Regions were received, QAQC checks have been run for all HUC4's and are ready to review. POC's have already been contacted.
- Region 06 - The entire region (Sub-regions 0601, 0602, 0603, and 0604) was sent to Horizon Systems in August for the creation of HiRes NHDPlus.
- Region 07 - New pre-staged Sub-Regions were received, QAQC checks have been run for all HUC4's and are ready to review. POC's have already been contacted. Edits are being completed.

- Region 08 - Sub-regions 0801-0807 edits were completed. Sub-regions 0808, and 0809 need QA/QC checks run and edits will be assigned and completed.
- Region 09 - Completed double check phase. As new data become available it will go through QA/QC check process again.
- Region 10 - Completing QA/QC checks within this region. As data is complete it will be sent to Horizon Systems for the creation of HiRes NHDPlus.
- Region 11 - Completed double checks within this region in October.
- Region 12 - New pre-staged data in sub-regions 1210 and 1211 were received, QA/QC checks were run and edits are being completed. Sub-regions 1201-1209 QA/QC edits are complete and will be sent to Horizon Systems for the creation of HiRes NHDPlus soon.
- Region 13 - New pre-staged Sub-Regions were received. QA/QC checks have been run for all HUC4's and are ready to review. POC's have already been contacted. Edits being completed.
- Region 14 - New pre-staged data in sub-region 1401 was received, QA/QC checks were run and edits are being completed. Sub-regions 1402-1408 QA/QC edits are complete and will be sent to Horizon Systems for the creation of HiRes NHDPlus soon.
- Region 15 - New pre-staged data in sub-region 1508 was received, QA/QC checks were run and edits are being completed. Sub-regions 1501-1507 QA/QC edits are complete and will be sent to Horizon Systems for the creation of HiRes NHDPlus soon.
- Region 16 - Completed double checks phase. As new data become available it will go through QA/QC check process.
- Region 17 - Two sub-basins need to be reviewed and may needs edits, sub-regions include 1701, and 1707. Will complete these edits working with our partners schedules.
- Region 18 - Completed double check phase. As new data become available it will go through QA/QC check process.
- Region 19 (Alaska) - Initial Phase Network Improvement in progress see above.
- Region 20 - Completed double check phase.
- Region 21 - Completed double check phase.
- Region 22 (Pacific Islands) - Was given to Horizon Systems in April to produce HiRes NHDPlus.

Note: Regions will be edited as per the NHDPlus contract schedule. Before starting a Region the area POC will be contacted. This status report is current as of December 23, 2015.

Jeff Simley "Retires" After 38 Years

Jeff Simley will retire January 3, 2016. Jeff began his GIS career in 1977 mapping water turbidity samples using SYMAP ftp://nhdftp.usgs.gov/Hydro_Images/NHD/Turbidity.jpg while working for the University of Wisconsin. After graduating from the University he joined the former Defense Mapping Agency in 1978 to develop visual ftp://nhdftp.usgs.gov/Hydro_Images/NHD/Rainier.jpg and radar scope ftp://nhdftp.usgs.gov/Hydro_Images/NHD/Radar.jpg computer graphics for flight simulators. While attached to the Defense Mapping Agency in St. Louis he was detailed to Washington University where he developed medical imaging digital graphics ftp://nhdftp.usgs.gov/Hydro_Images/NHD/Brain.jpg. Jeff finished his career at the Defense Mapping Agency in 1988 where he spent much time developing computer graphics for the Digital Landmass System ftp://nhdftp.usgs.gov/Hydro_Images/NHD/DLMS.jpg. He then moved to his beloved Colorado in 1989 to go to work for the U.S. Geological Survey as program manager for digital geospatial data ftp://nhdftp.usgs.gov/Hydro_Images/NHD/DLG.jpg. In 1994 he received the Department of Interior's Superior Service Award for his work in consolidating map digitizing in the Department of Interior. In 1999 he received the Department of Interior's Meritorious Service Award for his work in implementing the ISO-9000 International Quality Standards applied to mapping.

In 2000 Jeff began work as the assistant lead for the National Hydrography Dataset program ftp://nhdftp.usgs.gov/Hydro_Images/NHD/NHD.jpg. In 2006 he assumed the lead role for the program. Jeff began a NHD seminar program that would lead to teaching over 130 all-day courses in 47 states to over 2,500 students ftp://nhdftp.usgs.gov/Hydro_Images/NHD/Seminar.jpg. He also produced a monthly newsletter for 14 years with a regular readership of 1,000. Jeff has been a regular fixture at the annual Esri International User Conference and the American Water Resources Association's bi-annual GIS Specialty Conference, as well as other conferences, giving many talks about GIS in hydrography and teaching short courses ftp://nhdftp.usgs.gov/Hydro_Images/NHD/Conference.jpg. In 2012 he received the American Water Resources Association's David Maidment Award for contributions to water resources data ftp://nhdftp.usgs.gov/Hydro_Images/NHD/Maidment.jpg.

Jeff is an avid mountain climber ftp://nhdftp.usgs.gov/Hydro_Images/NHD/GrandTrav.jpg, backpacker, hiker, bicyclist, train rider ftp://nhdftp.usgs.gov/Hydro_Images/NHD/Train.jpg, and model railroader. Jeff plans to do more of these things in his retirement along with writing a book about the NHD due out in early 2018.

Jeff considers his greatest accomplishment the pouring water into the Missouri, Arkansas, and Colorado Rivers at the same time atop the triple divide 13,780 foot McNamee Peak ftp://nhdftp.usgs.gov/Hydro_Images/NHD/McNamee.jpg.

The NHD Book

After Jeff Simley retires he plans on writing a book about the NHD, as well as the WBD. The working title of the book is "The NHD Handbook." It should be available in early 2018. You can find a tentative outline for the book at ftp://nhdftp.usgs.gov/NHD_Workshop_Presentations/NHD_Handbook_Outline.pdf. Like the NHD and WBD, the book will be a highly collaborative enterprise. The author welcomes your input and suggestions for the book. In particular, the book will show many examples of how the NHD and WBD are being used in science and management and would like to feature your work. The author can be reached at nhdwbd@gmail.com.

Special Thanks

A special thanks to Ken Wright of Wright Water Engineers for the inspiration to keep this newsletter going for fifteen years. And also a special thanks to all the readers whose feedback made the editor realize that the newsletter was making a difference. And finally a special thanks to the many authors who contributed their knowledge to the water community.

NHD Photo of the Month

This month's photo is the Colorado River about 80 miles downstream from its source. In winter when the river freezes there is usually an open channel of constantly flowing water. This is a good way to visualize what may be the thalweg of the river. The thalweg is the deepest part of the channel and tends to be the part of the river with the greatest velocity and thus has a hard time freezing. The photo was taken by Jeff Simley of the USGS. See ftp://nhdftp.usgs.gov/Hydro_Images/Colorado_Thalweg.jpg.

November Hydrography Quiz / New December Quiz

Elizabeth Smith at the Kansas Department of Health and Environment was the first to correctly guess the November NHD quiz as the Brazos River draining central Texas. See ftp://nhdftp.usgs.gov/Quiz/Hydrography124.jpg.

Elizabeth Smith is an entomologist working as an environmental specialist at Kansas Department of Health and Environment. She manages the Stream Probabilistic Monitoring Program. The Watershed Planning, Monitoring, and Assessment program she works in does surface water monitoring, 303(d) listing, TMDL development, and the Integrated Report for the state of Kansas. Elizabeth notes the quiz "may be a map to you, but it looks like a sample frame to me!"

Elizabeth remembers the Lyle Lovett song – Texas River Song with the lyrics: "We crossed the wild pecos; We forded the nueces; We swum the guadalupe; And we followed the brazos; Red river runs rusty; The wichita clear; But down by the brazos; I courted my dear. Singing li, li, li, le, le, le; Lend me your hand; Li, li, li, le, le, le; Lend me your hand; Li, li, li, le, le, le; Lend me your hand; There's many a river That waters the land…" Read more at http://www.songlyrics.com/lyle-lovett/texas-river-song-lyrics/#XdlWIFjOZf7aVHLB.99.

Others with the correct answer (in order received) were: Becca Conklin, Linda Davis, Carl Zulick, Calvin Meyer, Marc Weber, Jake Kleinknecht, Evan Hammer, Bernie McNamara, Russell Almaraz, Steve Steinberg, Barbara Simpson, Janet Brewster, Al Rea, Jon Becker, Jonathan Labie, Daniel Button, Edwin Abbey, Matt Rehwald, David Straub, Gerald Thornberry, John Kosovich, Jim McDonald, Jill Templeton, Matt Dillon, and Janice Mock.

This month's hydrography quiz can be found at ftp://nhdftp.usgs.gov/Quiz/Hydrography125.jpg. This is an important river in west. The hydrography is from the high resolution national snapshot available from http://nhd.usgs.gov/data.html#natlSnap. What is the river in bright red? Send your guess to jdsimley@usgs.gov.

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The NHD Newsletter is published monthly. Get on the mailing list by contacting Steve Aichele at saichele@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.