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Elevation-Derived Hydrography Specifications Available!

The USGS has released specifications for deriving hydrography from elevation data for use in updating the National Hydrography Dataset.

The 2016 Hydrography Requirements and Benefits Study documented a strong need for improved horizontal and vertical alignment of national hydrography data to elevation data. The National Hydrography Dataset (NHD) is the most up-to-date and geographically inclusive hydrography dataset for the Nation. Deriving NHD features from 3D Elevation Program (3DEP) data greatly enhances the vertical and horizontal spatial integration between the terrain and the stream network and provides the level of accuracy and detail required for local scale water resources applications while also supporting broader scale hydrologic modeling.

In support of this improvement, the USGS has developed new guidance for creating elevation-derived hydrographic features that are appropriate for ingestion into the NHD:

- **Elevation-Derived Hydrography Acquisition Specifications** describe requirements for the capture of hydrographic features from 3DEP products. The specifications provide a consistent data structure,
definition of minimum set of features required, and horizontal and vertical positional assessments for alignment of features to the elevation surface.

- *Elevation-Derived Hydrography Representation, Extraction, Attribution, and Delineation Rules (READ Rules)* describe the parameters for the portrayal of hydrographic features as derived from elevation data, including the attributes, delineation instructions, and representation rules for the NHD.

Elevation-derived hydrography is created using algorithms that identify channels and depressions in elevation data that may carry surface flow. These features are processed into streamlines, lakes, and other hydrographic features, which may then be converted into NHD data. Hydrography developed using these specifications will be horizontally and vertically aligned with the 3DEP high-resolution bare-earth digital elevation model data. Density of delineated features will, at a minimum, match that of the NHD. The EDH will also be suitable for use with digital elevation models, as breaklines for hydro-flattening and for use in hydro-enforcement.

The NHD is a primary input to the *NHDPlus High Resolution (NHDPlus HR)*, a scalable and openly accessible hydrography framework for the inland waters of the Nation. Updating the NHD and NHDPlus HR datasets with elevation-derived hydrographic features will make the data more detailed, accurate, and precise. Deriving hydrography from elevation also helps to advance the future vision of the 3D National Terrain Model (3DNTM), an integrated elevation-hydrography surface from the peaks of the mountains to the depths of the oceans.

_Elevation-Derived Hydrography Specifications online resources_ are available as a part of the Hydrography Standards and Specifications webpages. Information includes links to the specifications, a resource library with a help guide, and proposed solutions for several types of errors.

Figure 1. Elevation-derived hydrography drainage network in the Marshyhope Creek watershed, Maryland. (Public domain.)
New NHDPlus HR Map Service

Contact: Kevin McNinch (klmcninch@usgs.gov), Rob Dollison (rdollison@usgs.gov)

The USGS is pleased to announce the release of the NHDPlus High Resolution (NHDPlus_HR) map service. The NHDPlus_HR map service provides an easy way to browse NHDPlus HR data, including catchments, and access VAAs without having to download datasets. The map service is a national seamless representation of NHDPlus HR vector data and selected NHDPlus HR Value Added Attributes (VAAs) at scales of 1:250K and larger. The NHDPlus_HR service currently includes coverage for most of the conterminous United States (minus parts of the Great Lakes) and select areas of Alaska. The NHDPlus_HR map service will be updated as improved NHDPlus HR staged products are available.

Because the service is only active when zoomed in to a detailed level, it is suggested that it be used in conjunction with either a topographic base map or with the USGS Hydrography Tile Cache (https://basemap.nationalmap.gov/arcgis/rest/services/USGSHydroCached/MapServer) map service.

The NHDPlus_HR map service is accessible as an Esri map service and Open Geospatial Consortium (OGC) Web Map Service (WMS) endpoints. For access to the map service and service endpoints, please visit The National Map Service Endpoints webpage, or the direct map service link: https://hydro.nationalmap.gov/arcgis/rest/services/NHDPlus_HR/MapServer
WBD and NHD Data Model 2.3 Release and Tool Updates

nhd@usgs.gov

USGS is pleased to announce the release of updated data models – National Hydrography Dataset (NHD) 2.3 and Watershed Boundary Dataset (WBD) 2.3. The new data models replace the previous versions, NHD 2.2.1 and WBD 2.2.1. Highlighted changes for each data model are listed below. Full details of the data models, including all changes, can be found on the updated data model posters: NHD 2.3 data model poster and WBD 2.3 data model poster.

Data Model Changes

NHD 2.3 highlighted changes:

- New Drainageway FType (468) and FCode (46800) is added
  - Drainageway definition: A watercourse that conveys, or is likely to convey, water but lacks a clearly defined channel or banks, which differentiates it from an ephemeral stream/river. Drainageways typically convey water for limited periods of time and do not carry perennial flow. Drainageways may follow natural topographic flow paths or constructed or human-made flow paths
  - Drainageway becomes the default FType|FCode for NHDFlowline

- Existing Sink/Rise FCodes are modified, and new values added
  - FCode: 45000 = SinkRise: Flow = Unknown
  - FCode: 45001 = SinkRise: Type = Sink; Flow = Into ground
  - FCode: 45002 = SinkRise: Type = Rise; Flow = Out of ground
  - FCode: 45003 = SinkRise: Type = Estevelle; Flow = Bidirectional

WBD 2.3 highlighted changes:

- ToHUC attribute is added to the WBDHU14 and WBDHU16 feature classes
- GNIS_ID attribute is removed from all WBDHU feature classes and is replaced with the ReferenceGNIS_IDs attribute
- New HUType domain values are added:
  - HUType: U = Urban
  - HUType: D = Indeterminate
- LineSource field length increased from 30 to 75 characters
Tool Updates
USGS has released new hydrography tools to support the new models. With the exception of the HEM Tool, all are available for download on the Hydrographic Data Community (HDC) site.

NHD Update Tool 6.7.3.0 for NHD 2.3 data model and ArcMap 10.5.1
The 6.7.3.0 NHD Update Tool, which is compatible with ArcMap 10.5.1, is now available. This new tool is compliant with the new NHD 2.3 data model, including the four new FCodes mentioned above. Other changes include improvements to how the NHD Update Tool calls National Geospatial Technical Operations Center (NGTOC) Webservices. Users may also attempt to submit an NHD Job until successful, preventing jobs from falling out of sync with NGTOC Workflow Manager. Additional changes include the way the NHD Update Tool assigns Reachcodes during mass imports of new data. These changes should prevent gapped reachcodes. Users performing mass imports of new features may notice a “Reachcode Sync Dialog”. This dialog allows a user to assign reaches the same reachcode. Please contact Ryan Teter (rteter@usgs.gov) with any questions.

NHD Utilities 3.4.4.0 for NHD model 2.3 and ArcMap 10.5.1
NHD Utilities 3.4.4.0, compatible with ArcMap 10.5.1, is now available. This version of the tool works with the NHD 2.3 data model and has improvements for calling the NHD Flow Webservice. Please contact Ryan Teter (rteter@usgs.gov) with any questions.

GeoConflation Tool v3.4.2.0
The GeoConflation Tool v3.4.2.0 has not been effected by the NHD 2.3 data model update, however, in order to use the new feature types and codes in your TARGET data you must download the latest releases on the HDC for the GeoConflation templates. For further information, please email nhd-gct@usgs.gov.

Hydrography Event Management (HEM) Tool 2.12.1.0 for NHD 2.3 data model and ArcMap 10.5.1
Version 2.12.1.0 of the HEM Tool is compatible with ArcMap 10.5.1 and is compliant with the new NHD 2.3 data model, as well as previous the NHD models. Other than compliance with the latest NHD model, there are no new functionalities or changes to the HEM Tool. However, the online User Guide has been updated with a Known Issues section. As always, for questions regarding HEM, email hem@usgs.gov. The latest version of the HEM tool, version 2.12.1.0, is available for download.

WBD Update Tool 2.9.2.0 for WBD model 2.3 and ArcMap 10.5.1
The new WBD 2.3 data model compliant desktop tools, version 2.9.2.0, are now available. This version also includes bug fixes and workflow enhancements. All WBD Tool users must upgrade to this version as soon as possible, as previous tool versions will not function properly after the database model migration is completed. Please reach out to Lily Niknami (lniknami@usgs.gov) with any questions.
Markup Tools Update

The Markup web App has been updated as a result of the recent WBD 2.3 Schema upgrades. You will not be required to change how you use the tool. However, you may notice the following new minor changes to the tool interface:

- You can now add markups for WBDHU14 and WBDHU16 feature classes. Please keep in mind that most U.S. regions contain watershed boundaries only to the WBDHU12 level.
- The Identify tool will identify attributes for WBDHU16 features, if available in your region of interest.
- The WBD map layer includes the WBDHU14 and WBDHU16 map services.
- You may apply the new WBD attributes highlighted above. For example, all WBD features now use the ReferenceGNIS_IDs field instead of GNIS_ID, and the ToHUC attribute exists for WBDHU14 and WBDHU16 features.
ScienceBase Download Links Issue – Resolved!

*Contact: Annalisa Stasey, (astasey@usgs.gov)*

In the April newsletter, we reported an issue with download links for NHDPlus HR Beta raster products found on ScienceBase. Users attempting to download this data receive the error:

“This XML file does not appear to have any style information associated with it. The document tree is shown below.”

We are happy to report this issue has been resolved! If you encounter any further problems, please contact nhd@usgs.gov.

7-Zip Issue with NHD National Products

We have identified an issue with unzipping NHD National products using 7-zip software. NHD National products unzipped using 7-zip software will return a ‘header error’ message shortly after starting the unzipping process. This is a known issue with the 7-zip software and remains unresolved at this time. Please utilize Windows Extract, or any other software of your choosing, to unzip this product. If you have any further issues, please contact nhd@usgs.gov.

NHDPlus High Resolution and WBD Status Updates

**NHDPlus HR Beta Production Status**

*Contact: Karen Adkins (kadkins@usgs.gov), Laurel Casey (lcasey@contractor.usgs.gov)*

The map below provides an overview of NHDPlus HR availability. This status map is updated frequently on the [NHDPlus HR webpage](#). Please contact the National NHD Point of Contact (Joel Skalet, nhd@usgs.gov) or National WBD Point of Contact (Lily Niknami, lniknami@usgs.gov) for more information on the status of NHD and WBD editing.

- Red outline - These areas are currently closed to NHD and WBD editing.
- Blue areas - NHDPlus HR Beta is currently available and Beta QC is either in process or completed for these areas. Please see the [NHDPlus HR Beta QC](#) section of the [NHDPlus HR webpage](#).
- Yellow areas - The NHDPlus HR Beta is in production and the USGS is currently seeking volunteers for the upcoming Beta QC for these areas. Please see the [NHDPlus HR Beta QC](#) section of the [NHDPlus HR webpage](#) for more information.
- Gray areas - NHDPlus HR Beta will be produced at a later date. These areas are currently open for NHD and WBD editing.
- Green areas - The NHDPlus HR Beta was produced using contributing areas in Mexico to improve the NHDPlus HR Beta along the Rio Grande River. Minimal hydrography was included in the Beta build but will be improved when the areas are refreshed. The NHDPlus HR Beta production data with minimal hydrography content is available upon request.
WBD 4-digit Improvement Status

Contact: Kimberly Jones (kjones@usgs.gov), Lily Niknami (lniknami@usgs.gov)

WBD 4-digit Improvement - Work Completed
- Regions - 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21 and 22
- Mexico contributing 4-digit hydrologic units in Region 13
- Region 19 – 19020101, 19020103, 19020104, 19020202, 19020301, 19020302, 19020401, 19020402, 19020501, 19020502, 19020503, 19020504, 19020505, 19020601, and 19020602, 19020800

WBD 4-digit Improvement - Currently in Work
- Region 19 (19020102, 19060102, 19080301, 19070402)

WBD 4-digit Improvement - Future Work
- Region 19 (not listed above)

Photo of the Month

This month’s photo, by Vanessa Baez, is a view of Difficult Run Stream, Section 7 of 10 of the Cross-County Trail in Oakton, Fairfax County, Virginia, (reachcode 02070008000290).

We’d love to see photos of the hydrology near you or from your travels! Please send submissions to Alexander Jonesi (ajonesi@usgs.gov).
Hydrography Quiz

Congratulations to Marc Weber who won the April Hydrography Quiz with the correct answer of Owyhee River. Marc works at US EPA Office of Research and Development at the Pacific Ecological Systems Division in Corvallis, Oregon. Marc uses NHD and NHDPlus extensively in his work developing spatial frameworks for the EPA National Aquatic Resource Surveys and supporting the StreamCat and LakeCat datasets, and is beginning to incorporate NHDPlus HR into these projects. A current project he is working on using the NHDPlus HR is a project linking stream biological condition with multiscale landscape indices in several case study areas in the country including Puget Sound / King County in Washington, Connecticut, New Jersey, and the central Appalachians – the project is linking biological condition classes developed at the stream reach scale with landscape level indices. Marc is a native Oregonian and has spent lots of time over the years exploring eastern Oregon, but has never been to the Owyhee River – it’s definitely on his wish list of places to explore.

Thanks to the others who played along: Roger Barlow, Gary Brimley, Bob Harmon, Katherine Schipke, Evan Hammer, Krysia Chris Sapeta, Nick Weil, and Robert Olive.

This Month’s Quiz

By Jake Schmitz

The headwaters of this river are located in Yellowstone National park. The Shoshone people of the region referred to some parts of the stream as Po-og-way meaning "road river," a reference to the Oregon Trail.

Please email your answer to Becci Anderson (rdanderson@usgs.gov).
Upcoming USGS Hydrography Calls, Trainings, and Meetings

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<tr>
<th>Date</th>
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<th>Event</th>
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<tr>
<td>Aug 12</td>
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<td>WBD Technical Exchange Meeting (TEM)</td>
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<tr>
<td>Aug 25</td>
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<td>USGS Hydrography Advisory Call</td>
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<tr>
<td>Sept 2</td>
<td>12:00 PM ET</td>
<td>NHD Technical Exchange Meeting (TEM)</td>
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To be added to the USGS Hydrography Advisory Call email list, please email nhd@usgs.gov. For information on training, please contact Joel Skalet (nhd@usgs.gov, 608-238-9333 x152). For more information on technical exchange meetings, please see the Hydrographic Data Community (HDC) site. For access to the HDC site, please contact Lily Niknami (lniknami@usgs.gov).

Thank you to this month’s USGS National Hydrography Dataset Newsletter contributors: Annalisa Stasey, Karen Adkins, Laurel Casey, Kim Jones, Lily Niknami, Vanessa Baez, Alexander Jonesi, Joel Skalet, Jake Schmitz, Kevin McNinch, Rob Dollison, Al Rea, Drew Decker, and Becci Anderson.

Join Our Community!

For more information, to sign up for the newsletter, or to contribute, please contact Becci Anderson, Hydrography Management and Planning Lead, at rdanderson@usgs.gov.

Visit us anytime at usgs.gov/NHD and follow us on Twitter @USGSTNM

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