National Hydrography Dataset Plus – NHDPlus – Strahler Order Calculation

Metadata also available as

Metadata:

- Identification_Information
- Data_Quality_Information
- Distribution_Information
- Metadata_Reference_Information

Identification_Information:
   Citation:
   Citation_Information:
   Originator:
   U.S. Environmental Protection Agency (USEPA).
   Publication_Date: 2005
   Title: National Hydrography Dataset Plus – NHDPlus – Strahler Order Calculation
   Edition: 1.0
   Geospatial_Data_Presentation_Form: tabular digital data
   Online_Linkage: To be provided at later date
   Description:
   Abstract:
   The NHDPlus Version 1.0 is an integrated suite of application-ready geospatial data sets that incorporate many of the best features of the National Hydrography Dataset (NHD) and the National Elevation Dataset (NED). The NHDPlus includes a stream network (based on the 1:100,000-scale NHD), improved networking, naming, and "value-added attributes" (VAA's). NHDPlus also includes elevation-derived catchments (drainage areas) produced using a drainage enforcement technique first broadly applied in New England, and thus dubbed "The New-England Method". This technique involves "burning-in" the 1:100,000-scale NHD and when available building "walls" using the national Watershed Boundary Dataset (WBD). The resulting modified digital elevation model (HydroDEM) is used to produce hydrologic derivatives that agree with the NHD and WBD. An interdisciplinary team from the U. S. Geological Survey (USGS), U.S. Environmental Protection Agency (USEPA), and contractors, over the last two years has found this method to produce the best quality NHD catchments using an automated process.

   The VAAs include greatly enhanced capabilities for upstream and downstream navigation, analysis and modeling. Examples include: retrieve all flowlines

(predominantly confluence-to-confluence stream segments) and catchments upstream of a given flowline using queries rather than by slower flowline-by-flowline navigation; retrieve flowlines by stream order; subset a stream level path sorted in hydrologic order for stream profile mapping, analysis and plotting; and, calculate cumulative catchment attributes using streamlined VAA hydrologic sequencing routing attributes.

Strahler order follows dendritic networks from headwaters to the river outflow. At headwaters, stream/rivers are assigned a Strahler order of one (1st order). When two 1st order streams flow together, the downstream feature is assigned Strahler order of two (2nd order). Only when two features of the same order flow together does the Strahler order increment to the next larger order.

With NHDPlus, divergences add complexity to the basic dendritic network. The Strahler calculator variable is an additional attribute used to assign Strahler order and to maintain the assigned order when a divergence occurs. When a divergence is reached traversing the stream network - downstream – the main flow path (DIV=1) assigned in NHDPlus is given a Strahler order and Strahler calculator of equal values. The divergence is assigned Strahler order equal to the main path and Strahler calculator = 0. The divergence maintains a Strahler calculator of 0 until it rejoins the main flow path or intersects a different flow path with Strahler calculator greater than 0. Strahler order only increments when Strahler order and Strahler calculator are equal – a divergence will not increase the Strahler order for a different flow path.

Purpose:
The purpose of this dataset is to provide a more accurate assignment of Strahler order in NHDPlus than was achievable by decrementing the Strahler order at divergences in complex dendritic networks.

Strahler order is used in water-related research to represent relative flow and velocity measures. Large river systems with numerous divergences and channels will maintain the same Strahler order for all channels.

Using Strahler order and calculator together, main flow paths assigned in NHDPlus can be easily extracted when selecting features where Strahler order equals Strahler calculator. This selection will show the simplest stream network by removing side channels. Similarly, Strahler order is maintained for all channels across a multi-channel feature – such as braided streams/rivers. By selecting similar Strahler order in a complex channel (where Strahler calculator can be any value), all flow paths associated with the main flow path are visible.

Supplemental_Information: For more information, refer to the NHDPlus Users Guide.
Time_Period_of_Content:
Time_Period_Information:

Single_Date/Time:
Calendar_Date: 2005
Currentness_Reference: publication date
Status:
Progress: Complete
Maintenance_and_Update_Frequency: Irregular
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -160.5
East_Bounding_Coordinate: -66.5
North_Bounding_Coordinate: 49.5
South_Bounding_Coordinate: 18.5
Keywords:
Theme:
Theme_Keyword_Thesaurus: none
Theme_Keyword: Stream / River
Theme_Keyword: Strahler order
Theme_Keyword: Strahler calculator
Theme_Keyword: complex channel
Theme_Keyword: divergence
Theme_Keyword: Artificial Path
Theme_Keyword: Reach
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Theme_Keyword_Thesaurus: ISO 19115 Topic Category
Theme_Keyword: inlandWaters
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Access_Constraints: None.
Use_Constraints:
None.

Acknowledgement of the originating agencies (USEPA and USGS) would be appreciated in products derived from these data.

Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: U.S. Environmental Protection Agency
Contact_Electronic_Mail_Address: waters_support@epa.gov
Native_Data_Set_Environment:
Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 9.0.00

Data_Quality_Information:
   Lineage:
   Source_Information:
   Source_Citation:
   Citation_Information:
   Originator:
   U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (USEPA)
   Publication_Date: none
   Title: National Hydrography Dataset (NHD) Medium Resolution
   Edition: none
   Geospatial_Data_Presentation_Form: vector digital data
   Online_Linkage: <http://nhd.usgs.gov>
   Source_Scale_Denominator: 1:100,000
   Source_Time_Period_of_Content:
   Time_Period_Information:
   Single_Date/Time:
   Calendar_Date: 2005
   Source_Currentness_Reference:
   The source NHD is a snapshot of the dataset accessed on 1/31/2004 and updated throughout 2004 and 2005.
   Source_Citation_Abbreviation: NHD
   Source_Contribution:
   A snapshot of the NHD was used as the baseline framework from which enhancements to the network were built upon. Enhancements include feature names, network connectivity and network flow relationships. This enhanced NHD version was then used in conjunction with the NED, and WBD (where applicable)

to create a HydroDEM, for generation of the catchment Grid/shapefile, and flow direction/accumulation Grids. The enhanced NHD was used to compute and assign flowline Value Added Attributes (VAAs) to this network.

Source_Information:
Source_Citation:
Citation_Information:
Originator: Suzanne M. Pierson, INDUS Corp.; Cindy McKay, Horizon Systems Corp.
Publication_Date: 2006
Title: Augmenting NHDPlus Strahler order values using Strahler calculator.
Geospatial_Data_Presentation_Form: raster digital data
Publication_Information:
Publication_Place: Corvallis, OR
Publisher:
Other_Citation_Details:
Dataset model/algorithm developed by Suzanne M. Pierson, implementation by Cindy McKay.
Calendar_Date: September, 2006
Source_Currentness_Reference: Date data was completed is December 2006.
Source_Citation_Abbreviation: SOSC
Source_Contribution: Update Strahler order values in NHDPlus. The methodology implemented within the NHDPlus framework improves the Strahler order values from the first iteration of NHDPlus. By removing the additive errors caused by decrementing Strahler order at divergences, unlikely Strahler order values (greater than 10) were assigned in highly complex networks. Using Strahler order along with Strahler calculator provides a method for subsetting NHDPlus – such as removing or highlighting side channels in the network.

Distribution_Information:
Distributor:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: U.S. Environmental Protection Agency
Contact_Electronic_Mail_Address: waters_support@epa.gov
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Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:

File_Decompression_Technique: .zip
Digital_Transfer_Option:
Online_Option:
Access_Instructions: Provide website/ftp address to download data here

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    Metadata_Date: 20060119

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