New Stream Dataset for the Susquehanna River Watershed

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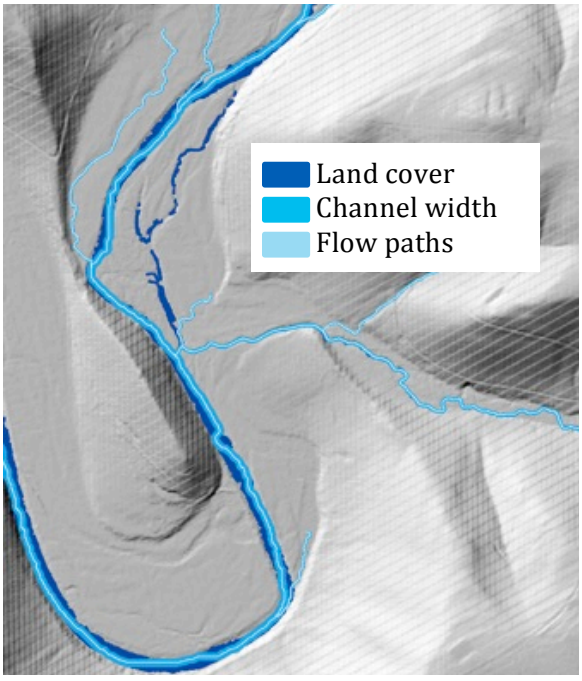
The Chesapeake Conservancy is creating a new high-resolution stream dataset for the Susquehanna River Watershed. [1]



The Conservancy uses a combination of datasets and a Digital Elevation Model to identify:

1. **concentrated flow paths** which identify stream center lines (shown in light blue),
2. an **estimation of channel width** (shown in medium blue) based on the expected flow accumulation at a certain point, and
3. the **pixels identified as water in the new Chesapeake Bay-wide high-resolution land cover dataset**[2] (shown in dark blue).

The methodology begins with the collection of the highest resolution DEM data available. For nearly the entire watershed, 1-meter resolution DEM data were available, and 2-, 5-, and 10-meter DEM data were available in parts of New York. All DEMs were resampled to 1-meter resolution using bilinear interpolation before being used in subsequent analyses.

The 1-meter DEMs were then pre-processed by "breaching" or deepening the drainage routes of flow through depressions. This process allows for a more natural routing of flow across obstructions such as road crossings over stream channels. A second pre-processing step is performed to remove small, isolated pits in the DEM, often a few pixels in size, which are artifacts of the DEM creation procedure.

The pre-processed DEM is then used to calculate the direction of flow across the landscape using an algorithm that routes flow from one pixel to the next based on the direction of steepest descent. The contribution of flow from pixel to pixel across the landscape is accumulated and a threshold is applied such that pixels with a contributing area of 60 acres or greater are considered part of the stream network.

In order to more accurately map channel edges, every reach in the stream network is widened according to regional curves published by the USGS that relate contributing area to channel width. This network of two-dimensional stream channels is then combined with the areas of water identified in the high-resolution land cover dataset to create a composite network of streams, rivers, lakes, and ponds. This mapping will be completed for the entire Susquehanna River Watershed and be available for download on the Chesapeake Conservancy's website in late 2016.

[1] Support provided by the Richard King Mellon Foundation and the Foundation for Pennsylvania Watersheds
[2] Support provided by the Chesapeake Bay Program, through a cooperative agreement between the Chesapeake Conservancy and the National Park Service funded through an interagency agreement with the Environmental Protection Agency.

Overview of stream dataset methodology

1. Concentrated flow path mapping:

-Start with 1m DEM from PAMAP for PA, 1m DEM for MD, highest available resolutions in NY, and 10m NED DEM where higher resolution not available. Mosaic all DEMs and use bilinear interpolation to resample to 1m resolution.

-Breach depressions by deepening drainage routes using SAGA

-Pit fill to remove any pits, usually extremely small, missed by SAGA – not sure why

-D-8 flow direction and flow accumulation to identify channels

-Faster and produces almost identical output as D-inf for areas of concentrated flow

-More tools compatible with D-8 than D-inf

*D-inf flow direction to more accurately map non-channelized overland flow for later analysis?

-Threshold flow accumulation to 60 acres contributing area

-Decided upon by USGS/CBP to replicate stream density of NHD flowlines

-Ensures uniform drainage density across entire watershed

-Would like to improve upon channel initiation methods in the future to improve accuracy

-Assign each stream link a unique ID

-Use unique ID to assign each stream link the maximum flow accumulation value for that link

2. Widen stream channel using regional curves

-Use regional curve with max flow accumulation (converted to drainage area) to get approximate stream width for every reach[3]

-Buffer streamlines by that width to get widened stream network (polygon)

3. Merge with land cover dataset

-Rasterize widened stream network using cell size of land cover and snap to land cover

-Extract water pixels from land cover and mosaic to widened stream network to get composite water network that accurately reflects stream width, especially in large open-water channels

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[3] Krstolic, J.L., and Chaplin, J.J., 2007, Bankfull regional curves for streams in the non-urban, non-tidal Coastal Plain Physiographic Province, Virginia and Maryland: U.S. Geological Survey Scientific Investigations Report 2007–5162, 48 p. (available online at *http://pubs.water.usgs.gov/sir2007–5162*)