Pennsylvania StreamStats: A Web-Based Application for Obtaining Water-Resource-Related Information

StreamStats provides streamflow statistics, basin characteristics, and other water-resource-related information for ungaged and gaged stream sites (http://streamstats.usgs.gov)

StreamStats is a national web-based Geographic Information System (GIS) application, developed by the U.S. Geological Survey (USGS), in cooperation with Environmental Systems Research Institute, Inc., to provide a variety of water-resource-related information. Users can easily obtain descriptive information, basin characteristics, and streamflow statistics for USGS streamgages and ungaged stream locations throughout Pennsylvania. StreamStats also allows users to search upstream and (or) downstream from user-selected points to identify locations of and obtain information for water-resource-related activities, such as dams and streamgages.

StreamStats is implemented on a state-by-state basis to allow individual states to customize the data development and underlying data sets to address their specific needs, issues, and objectives. Pennsylvania StreamStats (fig. 1), developed in cooperation with the Pennsylvania Department of Environmental Protection, Federal Emergency Management Agency, Pennsylvania State Association of Township Supervisors, and Susquehanna River Basin Commission, can be accessed through the national StreamStats web-page portal at *http://streamstats.usgs.gov*. Links are provided from this web page to individual state applications, instructions for using StreamStats, definitions of basin characteristics and streamflow statistics, and other supporting information. Currently (2010), the following functions are available on Pennsylvania StreamStats (not inclusive):

- Obtain previously published streamflow statistics for USGS streamgages;

- View a variety of base-map features such as streams, land use, and topography;

- Zoom in or out to a different map scale using standard GIS tools, latitude and longitude coordinates, place names such as streams or landmarks, or National Hydrography Dataset (NHD) reach codes (U.S. Geological Survey, 2010);

- Delineate a watershed from a user-selected point on a stream and edit the watershed boundary, if necessary (fig. 2);

- Compute basin characteristics such as drainage area, percentage of urban area, and mean annual precipitation for the delineated watershed;

- Estimate low-flow, mean-flow, base-flow, and flood-flow statistics using regional regression equations for any user-selected point on a stream;

- Estimate streamflow statistics at user-selected points on the basis of the flow per unit area of streamflow statistics at upstream or downstream streamgages;

- Download a shapefile of a delineated watershed with associated basin-characteristic and streamflow-statistic attributes;

- Obtain plots of stream and land-surface profiles from user-selected points using a digital elevation model; and

- Search upstream and (or) downstream from user-selected points on a stream to identify and obtain information on structures and other water-resource-related activities.

Several of these individual functions may also be requested remotely as web services, which allow other web sites or desktop GIS applications to access this functionality (Ries and others, 2008).

Figure 1. View of the StreamStats user interface for Pennsylvania.
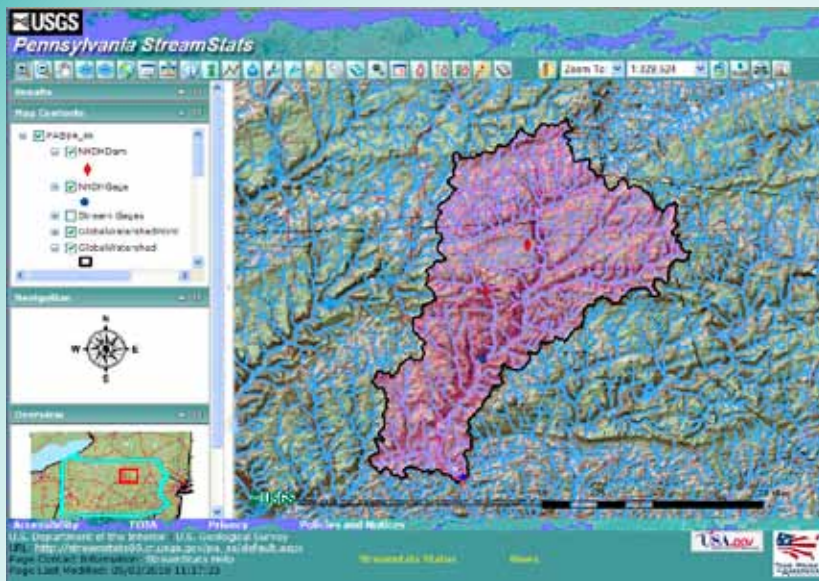
Figure 2. Delineated watershed in Pennsylvania StreamStats. The blue hexagons represent USGS streamgages and the red diamonds represent dams tied to the National Hydrography Dataset.

StreamStats can be used to obtain previously published basin characteristics and streamflow statistics for over 300 USGS streamgages in Pennsylvania. Any regulation to streamflow at the streamgage is noted, and the type of streamgage, such as continuous-record or crest-stage streamgage, and period of record are identified. Currently (2010), 13 basin characteristics and 48 streamflow statistics are available in StreamStats output reports for the streamgages. Time-series data and additional information for these streamgages also can be accessed through links in the output reports to the USGS National Water Information System Web.

Streamflow statistics for an ungaged site are determined through the use of regional regression equations or transferred data from a nearby streamgage. StreamStats uses current regional regression equations developed by the USGS to determine the streamflow statistics for a user-selected point (Stuckey, 2006; Roland and Stuckey, 2008). The user should be familiar with the limitations and accuracy of the regression equations before applying the resulting statistics. The following statistics can be determined from regression equations for Pennsylvania:

- **Low flows** (7-day, 2-year; 30-day, 2-year; 7-day, 10-year; 30-day, 10-year; and 90-day, 10-year low flows),

- **Mean flows** (mean annual and harmonic mean flows)

- **Base flows** (10-year, 25-year, and 50-year base flows), and

- **Flood flows** (50, 20, 10, 2, 1, and 0.2 percent annual exceedance probability, which in the StreamStats application are defined as the maximum instantaneous flows that occur on average every 2, 5, 10, 50, 100, and 500 years).

Streamflow statistics also can be estimated for a user-selected point from a nearby streamgage. StreamStats uses stream-network navigation to search upstream and downstream from a user-selected point to identify possible nearby streamgages that can be used to estimate streamflow statistics. The streamgage closest to the user-selected point with the smallest drainage-area ratio is used to transfer all streamflow statistics associated with the streamgage to the ungaged site using flow per unit area. This functionality works only when the drainage-area ratio between the ungaged site and the streamgage is within a range of 0.5 to 1.5. The user should be cognizant of regulation and other limitations to the streamflow data before using the transferred statistics.

StreamStats uses stream-network navigation to analyze the stream network upstream and downstream from a user-selected point to identify and display information for structures and other water-resource-related activities that are located along the network (fig. 3). This functionality, also known as tracing, can be used to understand how the flow at a particular site may be affected by upstream activities or how downstream flow may be affected by existing or proposed activities at the selected site. The U.S. Environmental Protection Agency and many State and local agencies have worked to associate their water-resource-related data to the NHD, and many similar efforts are underway (Ries and others, 2008). Currently (2010), dams and streamgages are associated with the stream network used in Pennsylvania Stream-Stats, but additional data layers can be added.

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Figure 3. Stream trace report from Pennsylvania StreamStats showing a USGS streamgage (NHDHGAGE) and dams (NHDHDAM) upstream from a user-selected point.

References Cited

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Roland, M.A., and Stuckey, M.H., 2008, Regression equations for estimating flood flows at selected recurrence intervals for ungaged streams in Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2008–5102, 57 p. (Also available at *http://pubs.usgs.gov/sir/2008/5102.*)

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U.S. Geological Survey, 2010, National Hydrography Dataset: accessed June 1, 2010, at *http://nhd.usgs.gov.*