



StreamStats

Delivering Streamflow Information to the Public

By Kara Watson, USGS



In Cooperation with the New Jersey Department of Environmental Protection
And the U.S. Army Corps of Engineers



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Objectives

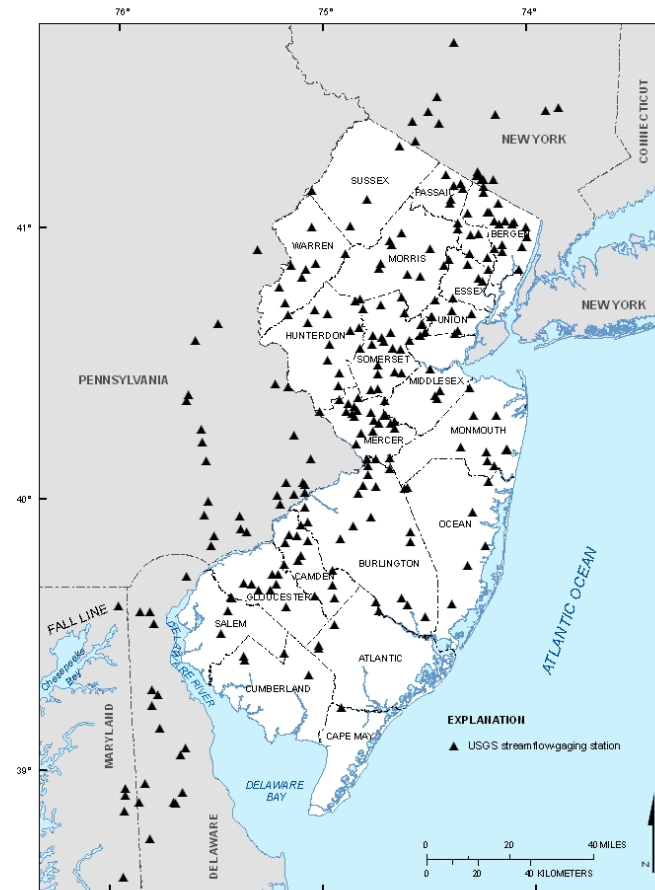
- Update Special Report 38, by Stankowski, published in 1974
- StreamStats web application is available for the public to determine flood magnitude and frequency and basin characteristics for existing gaged sites and at ungaged sites

Need for Streamflow Statistics

- Water resources planning, management, and permitting
- Flood-plain mapping
- Engineering design of structures such as roads, bridges, dams, culverts, locks, and levees
- Streamflow statistics are not available everywhere they are needed

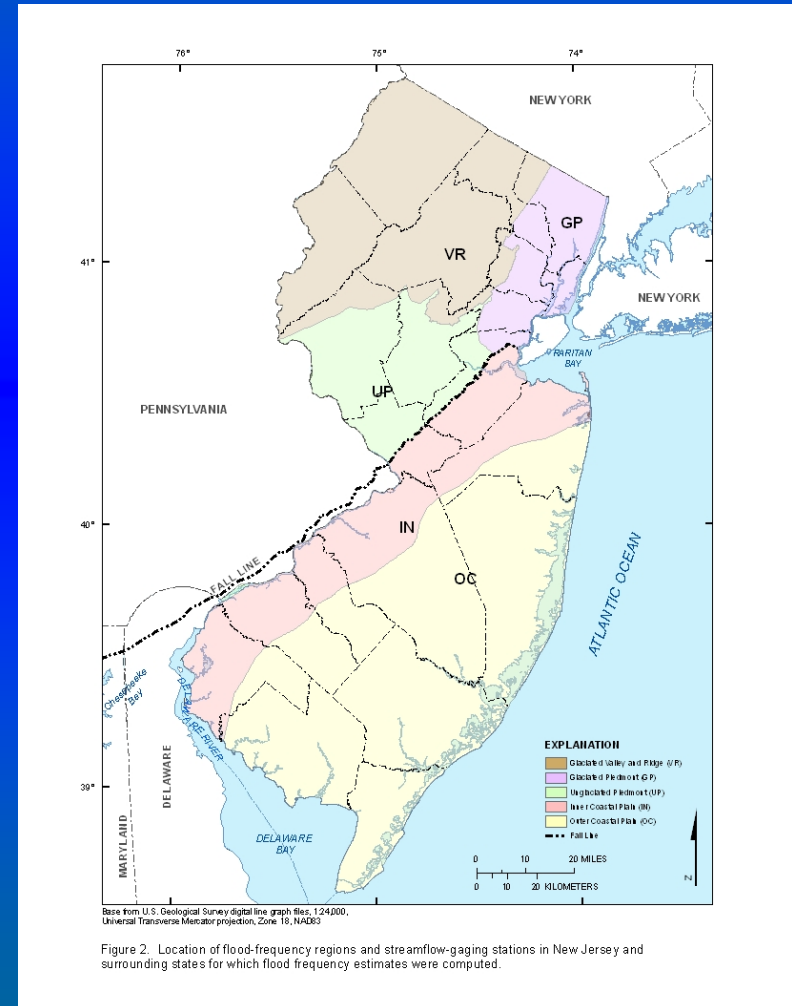
Flood Frequency

- 254 streamflow-gaging stations in New Jersey and surrounding states were used in the study
- Peak-flow data collected through the 2007 water year for most gages



Flood Frequency Regions

- Divided the State into five geographic regions for the regression analysis
- The regions follow physiographic province boundaries and take into account glaciated extent and coastal geology



Final Regional Regression Equations

- Equations estimate peak flow for 2-, 5-, 10-, 25-, 50-, 100-, and 500-year floods
- All equations use the same basin characteristics
 - Drainage area, percent storage, 10-85 slope, and 1990 population density
- Varies by flood-frequency region

Flood Frequency Equations

Estimation at Ungaged Sites

- Use regional regression equation
- Weighted by the percentage of the drainage basin within each region

USGS StreamStats

- Currently used to estimate peak flows and basin characteristics

The screenshot shows the USGS StreamStats website. At the top left is the USGS logo with the tagline "science for a changing world". To the right, there are links for "USGS Home", "Contact USGS", and "Search USGS". Below the logo is a green banner with "Welcome to StreamStats" and a note: "Best viewed in Internet Explorer 5 or above. Screen resolution of 1152x864 or greater, with pop-up blocker disabled".

The main content area is titled "State Applications" and includes a "Choose a State" dropdown menu. Below this is a paragraph of text: "Efforts are underway to make StreamStats operational for many states, with a long-term goal of national coverage. Work needed to implement StreamStats is generally done by the USGS in cooperation with various state and local agencies. The map below indicates states where StreamStats has been implemented, and where work on implementation is currently underway. Green states have fully implemented StreamStats applications, orange states have been completed and are in testing internally, and blue states are undergoing implementation. Users may access the implemented state applications by selecting the state of interest on the map below, or by selecting the name of the state from the list above."

Below the text is a map of the United States with a legend:

- Green: Fully implemented (Clickable)
- Orange: Delineation and basin characteristics implemented (Clickable)
- Blue: Implemented and testing internally
- Light Blue: Undergoing implementation

A left-hand navigation menu contains the following links: Home, News, StreamStats Description, Unnamed Sites, Data Collection Stations, StreamStats Limitations, State Applications, USGS Station Statistics, User Instructions, Definitions, Basin Characteristics, Streamflow Statistics, StreamStats Fact Sheet, Frequently Asked Questions, Available Web Services, Talks and Other Info, Internal Links, Contact StreamStats Team, and Current Streamflow Conditions.



StreamStats New Jersey

- StreamStats is an interactive map-based USGS web application available for public use
- Users can access flood-frequency statistics and basin characteristics
- Utilizes the updated regional regression equations to obtain flood-frequency estimates for ungaged sites in New Jersey

StreamStats Benefits

- Published statistics are readily available
- Consistent information delivery
- Little or no additional error is introduced
- Estimates for ungaged sites takes <1 minute

GIS Database Includes

- Datasets used to delineate accurate basin boundaries-10 meter Digital Elevation Model (DEM), National Hydrography Dataset (NHD)
- Datasets used to determine basin characteristics (2002 NJDEP Landuse/Landcover, DEM, census block data)
- USGS data-collection station locations

Using StreamStats

http://water.usgs.gov/osw/streamstats/new_jersey.html

New Jersey

StreamStats for New Jersey can be used to estimate instantaneous flood discharges with exceedance probabilities of 0.5, 0.2, 0.1, 0.04, 0.02, 0.01, and 0.002 for ungaged, unregulated or slightly regulated, non-tidal streams in New Jersey. These exceedance probabilities correspond to recurrence intervals of 2-, 5-, 10-, 25-, 50-, 100-, and 500-years, respectively. The report below presents the regression equations used to estimate the peak-flow statistics, describes the errors associated with the estimates, and describes the methods used to develop the equations and to measure the basin characteristics used in the equations. Users should familiarize themselves with the report before using StreamStats to obtain estimates of streamflow statistics for gaged and ungaged sites.

- [Watson, K.M., and Schopp, R.D., 2009, Methodology for estimation of flood magnitude and frequency for New Jersey streams: U.S. Geological Survey Scientific Investigations Report 2009-5167](#)

NOTE: Scientific Investigations Report 2009-5167 "Methodology for Estimation of Flood Magnitude and Frequency for New Jersey Streams" has been revised, May 2010. The flood-frequency regression equations, regional constant coefficients, and average standard errors have been updated for this report. The updates are reflected in the current New Jersey StreamStats application.

[Interactive Map](#)

[Footnote for New Jersey StreamStats:](#) Although 1990 population density was used for the development of the regression equations in SIR 2009-5167, the New Jersey StreamStats application will offer the more current 2000 population-density data.

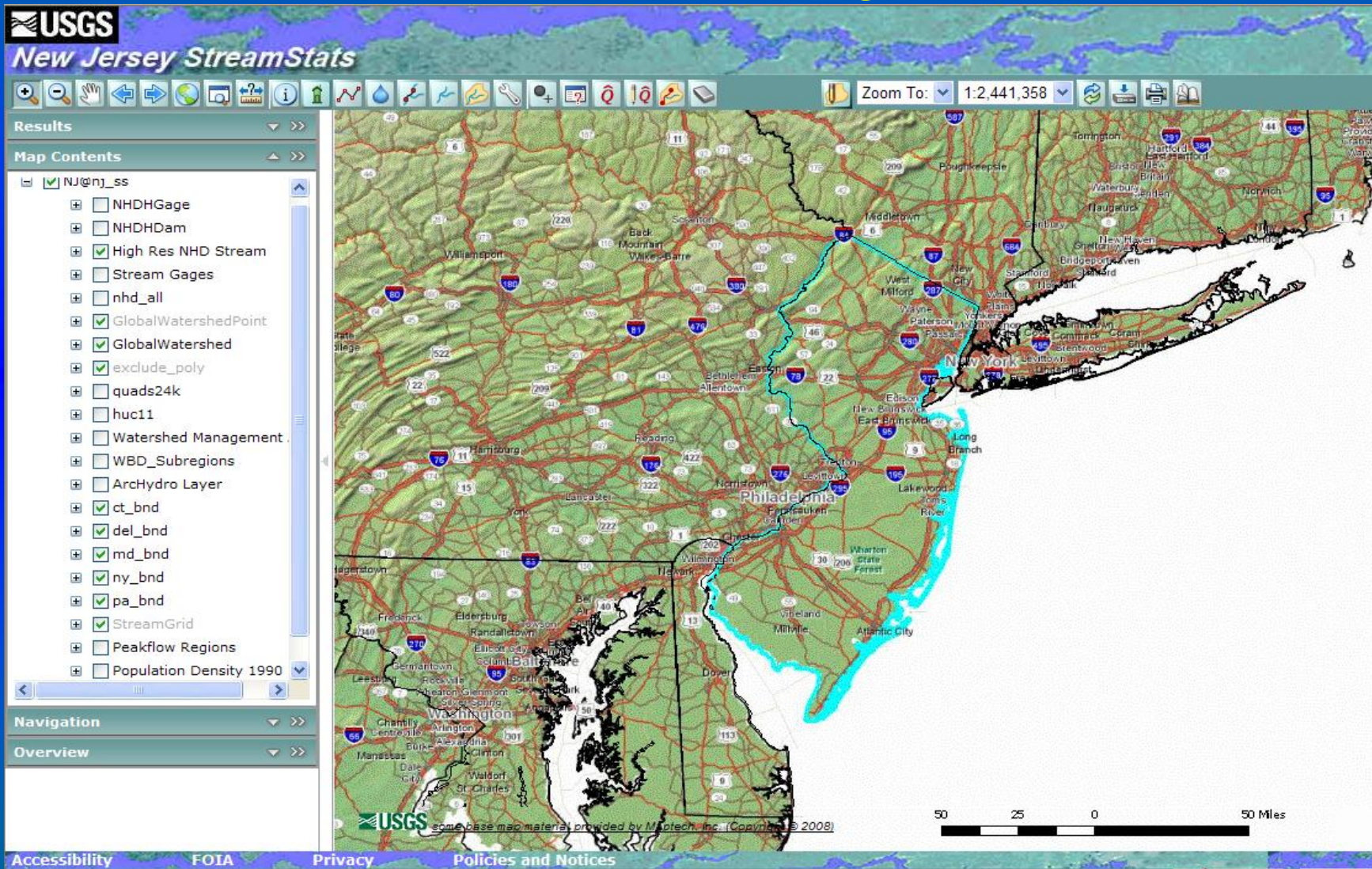
StreamStats for New Jersey was developed in cooperation the New Jersey Department of Environmental Protection and the U.S. Army Corps of Engineers.



User Interface

- Displays maps and enables site selection
- Displays default data layers for selected scale ranges and allows adding/subtracting map layers
- Zoom to named geographic location or stream
- Print maps and download data shown in the map frame

StreamStats New Jersey



Drainage Boundaries

- User selects any point on a stream
- Drainage basin boundary is calculated within the application using GIS datasets
- Creates a basin polygon used to calculate basin characteristics and statistics
- Basin polygons can be downloaded

Using StreamStats

USGS
New Jersey StreamStats

Zoom To: 1:7,898

Results

Map Contents

- NJ@nj_ss
 - NHDHGage
 - NHDHDam
 - High Res NHD Stream
 - Stream Gages
 - nhd_all
 - GlobalWatershedPoint
 - GlobalWatershed
 - exclude_poly
 - quads24k
 - huc11
 - Watershed Management
 - WBD_Subregions
 - ArcHydro Layer
 - ct_bnd
 - del_bnd
 - md_bnd
 - ny_bnd
 - pa_bnd
 - StreamGrid
 - Peakflow Regions
 - Population Density 1990

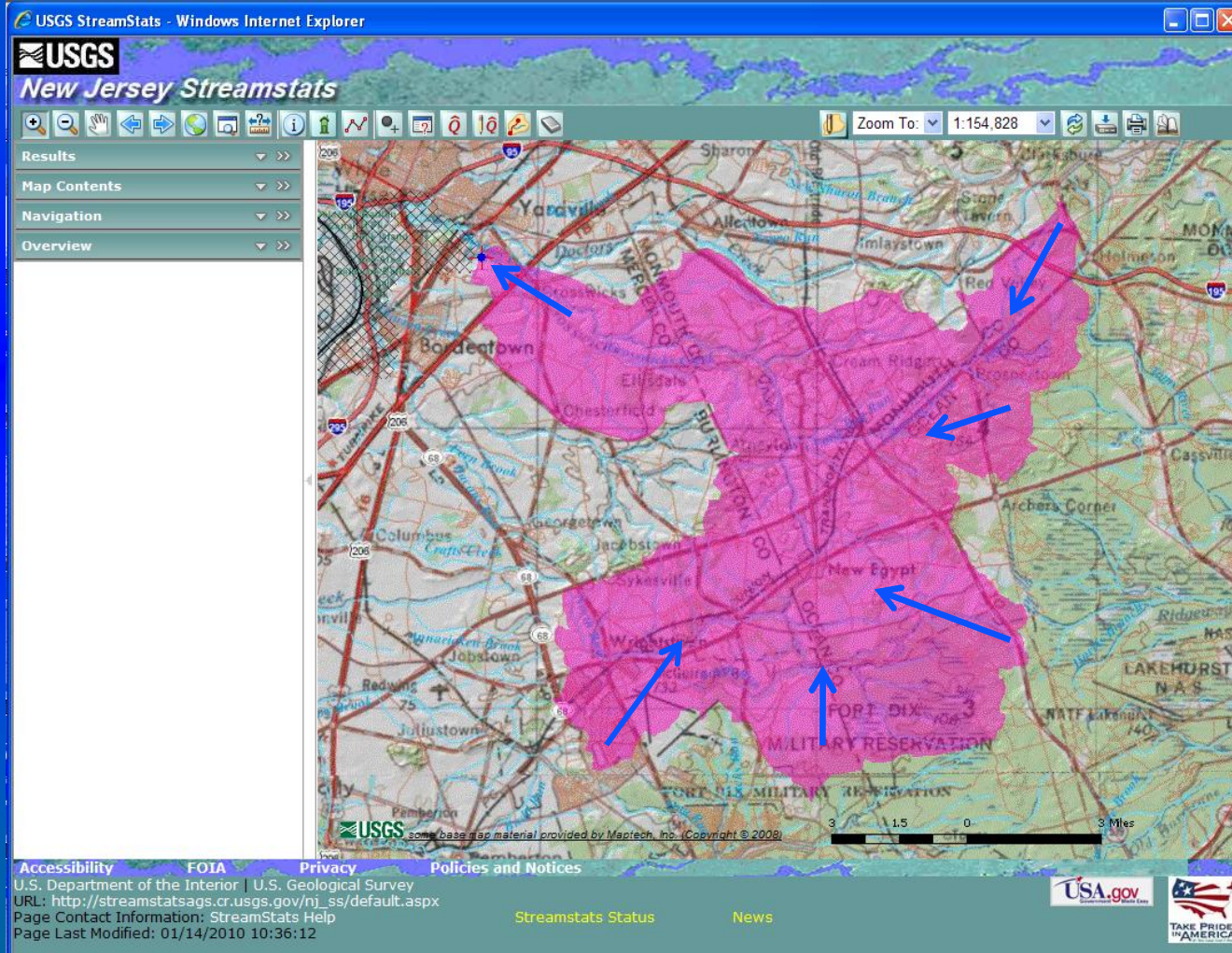
Navigation

Overview

USGS some base map material provided by Maptech, Inc. (Copyright © 2008)

0.1 0.05 0 0.1 Miles

Example Drainage Boundary



StreamStats Basin Characteristics



New Jersey StreamStats

<input checked="" type="checkbox"/> All	Parameters
<input checked="" type="checkbox"/>	Drainage area in square miles
<input checked="" type="checkbox"/>	Percent of area covered by water and wetland.
<input checked="" type="checkbox"/>	Mean population density, people per square mile, 2000 census block data.
<input checked="" type="checkbox"/>	10-85 slope in feet per mile based on preprocessed data
<input checked="" type="checkbox"/>	Total stream length in miles
<input checked="" type="checkbox"/>	Percent of area covered by forest
<input checked="" type="checkbox"/>	Percent of area covered by urban land use
<input checked="" type="checkbox"/>	Percent of area covered by wetland land use
<input checked="" type="checkbox"/>	Average basin elevation in feet

Compute Parameters

Close



New Jersey StreamStats

Basin Characteristics Report

Date: Wed Jun 30 2010 11:13:32 Mountain Daylight Time

NAD27 Latitude: 41.1470 (41 08 49)

NAD27 Longitude: -74.8834 (-74 53 00)

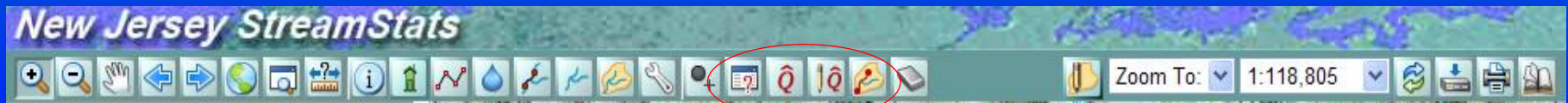
NAD83 Latitude: 41.1471 (41 08 50)

NAD83 Longitude: -74.8830 (-74 52 59)

Parameter	Value
Drainage area in square miles	57.8
Percent of area covered by water and wetland.	4.3
Mean population density, people per square mile, 2000 census block data.	42.4
10-85 slope in feet per mile based on preprocessed data	46.8
Total stream length in miles	108
Percent of area covered by forest	86.9
Percent of area covered by urban land use	1.24
Percent of area covered by wetland land use	3.24
Average basin elevation in feet	913



StreamStats Statistics



- Estimate flows using regression equations
- Change parameters to re-compute flows

StreamStats Statistics

Peak Flows Region Basin Characteristics

100% Peak Valley and Ridge Region 2009 5167 (57.8 mi²)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	57.8	0.87	763
Percent Storage (percent)	4.3	2.36	30.1
Stream Slope 10 and 85 Method (feet per mi)	46.8	2.56	268
Basin Population Density (persons per square mile)	42.4	35	1493

Peak Flows Region Streamflow Statistics

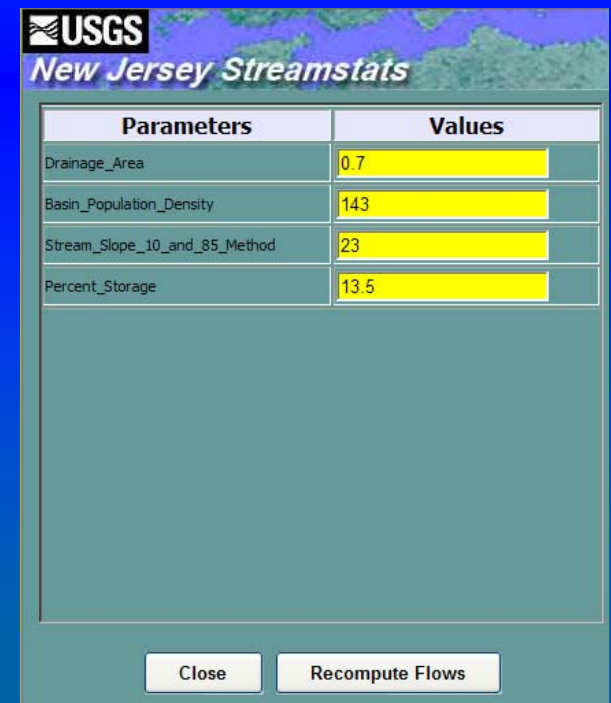
Statistic	Flow (ft ³ /s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	1130	50	1		
PK5	1970	51	2		
PK10	2670	52	3		
PK25	3710	55	4		
PK50	4580	57	5		
PK100	5590	60	5		
PK500	8330	66	6		

Additional Applications



- Valuable tool to compute flows or check flows found using other methods
- Predict the effect of changes in land use or population

*Edit Parameters and
Recompute Flows
Feature*



The dialog box displays a table with parameters and their values, along with 'Close' and 'Recompute Flows' buttons.

Parameters	Values
Drainage_Area	0.7
Basin_Population_Density	143
Stream_Slope_10_and_85_Method	23
Percent_Storage	13.5

Buttons: Close, Recompute Flows

Summary

■ StreamStats

- ◆ Is a Web application that provides estimates of streamflow statistics, basin characteristics, and other information for gaged and ungaged sites
- ◆ Uses updated flood-frequency regional regression equations for peak-flow estimates

USGS Products

- Methodology for Estimation of Flood Magnitude and Frequency for New Jersey Streams, By Kara M. Watson and Robert D. Schopp, published <http://pubs.usgs.gov/sir/2009/5167/>
- StreamStats web application <http://water.usgs.gov/osw/streamstats/>