

An interactive, GIS-based application to estimate continuous, unimpacted daily streamflow at ungaged locations in the Connecticut River Basin

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Grant Number: 2007-06

Northeast Regional Conservation
Needs Workshop

June 14-16, 2011

Albany, New York

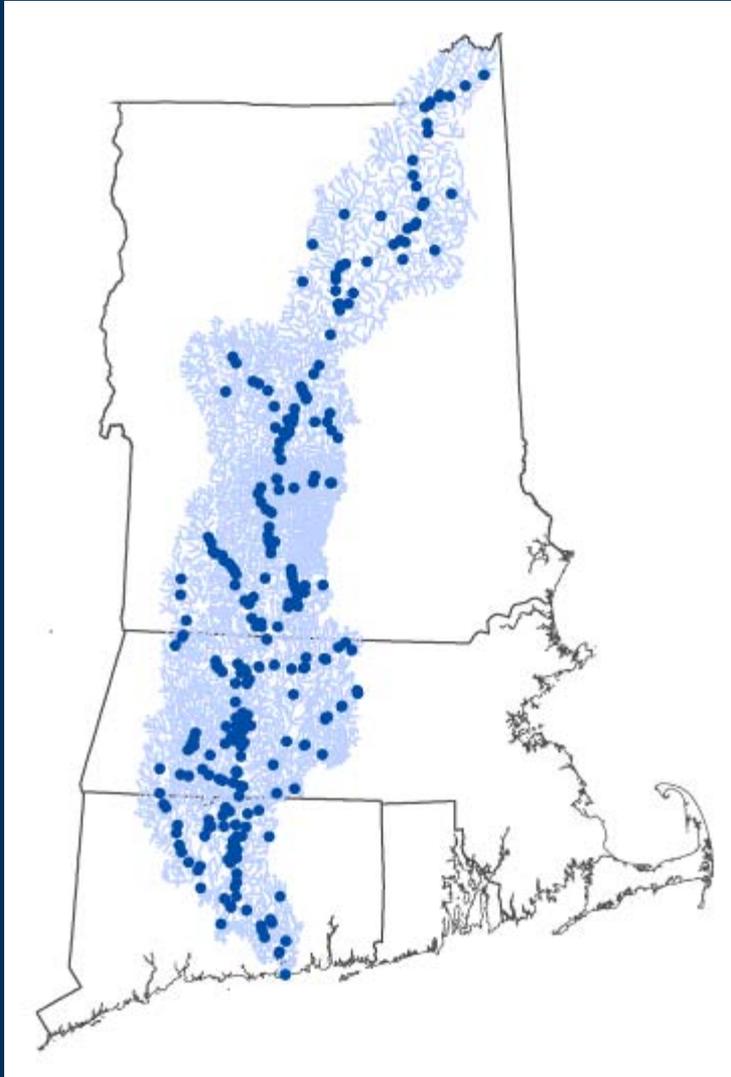
U.S. Department of the Interior
U.S. Geological Survey

With support from:



The Connecticut River looking north in the early evening, from the French King Bridge at the Erving-Gill town line in Western Massachusetts.

Motivations for the study in the Connecticut River Basin



- The Connecticut River watershed contains a number of flood-control and hydropower dams; there has been increased attention on how these dams can be managed to support ecological services
- Daily unregulated streamflow has been estimated for approximately 350 stream locations (*shown at left*) to:
 - Route through reservoir simulation and optimization models that will help to determine how dam operation can be modified to meet ecological services
 - Determine flow prescriptions



Reservoir modeling and optimization being done as a separate (non-RCN) project by:



US Army Corps of Engineers

Objectives

- Develop an **easy-to-use screening-level** tool to estimate continuous unimpacted streamflow at ungaged locations in the Connecticut River basin (excluding the mainstem of the Connecticut River)

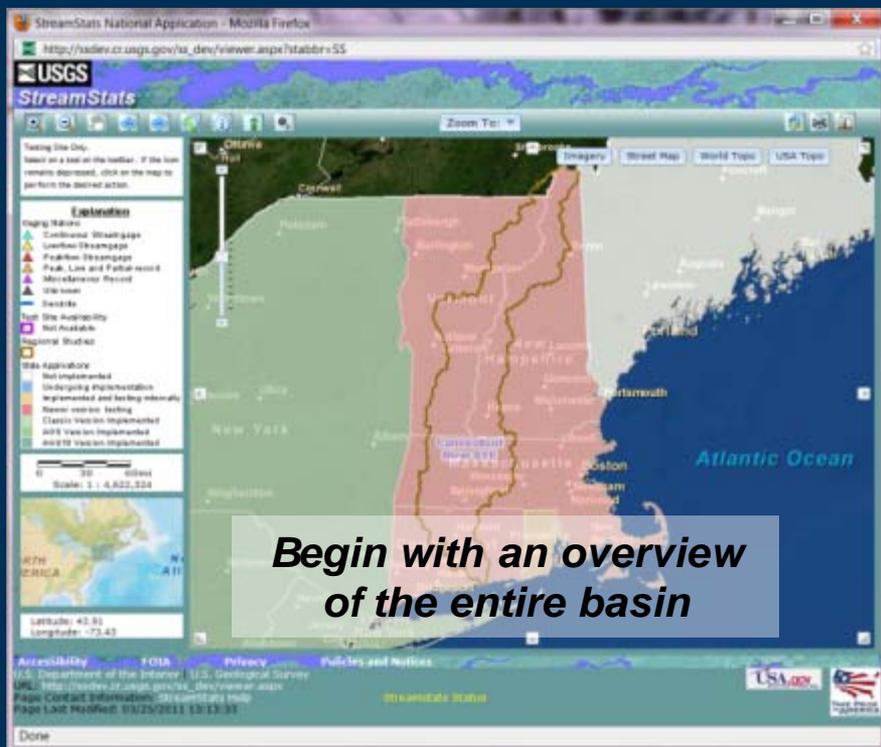
POINT-AND-CLICK GIS USER-
INTERFACE COUPLED WITH
MICROSOFT EXCEL
SPREADSHEET

APPROACH REQUIRES
SIMPLIFYING ASSUMPTIONS AND
FEW PARAMETERS

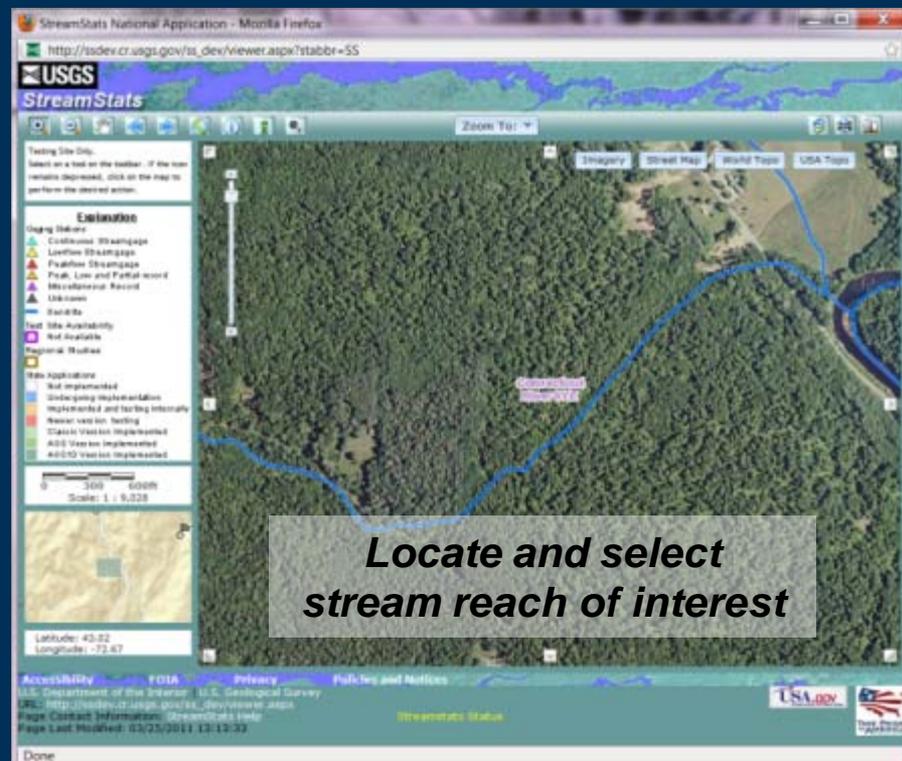
Leveraging existing methods

- Existing tools to estimate daily, unregulated streamflow in southern New England had already been developed [*Archfield et al.*, 2010 and *Archfield and Vogel*, 2010]
- This RCN grant leveraged these existing methods and tools to provide estimates of daily, unregulated streamflow across the entire Connecticut River Basin

The Connecticut River Basin Unimpacted Flows Tool



Begin with an overview of the entire basin



Locate and select stream reach of interest



The Connecticut River Basin Unimpacted Flows Tool

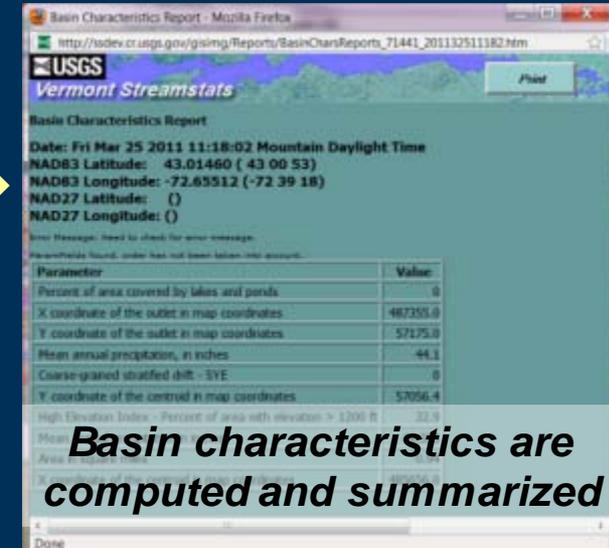


Basin is delineated

The user can export a shapefile of the delineated basin and obtain the basin characteristics needed to calculate daily streamflow

The screenshot shows the StreamStats web application interface. A map displays a delineated basin in red. The interface includes a legend on the left with categories like 'Engage Stations', 'Dam Status', and 'Area Application'. A text box is overlaid on the map with the text 'Basin is delineated'. Another text box at the bottom of the map area states: 'The user can export a shapefile of the delineated basin and obtain the basin characteristics needed to calculate daily streamflow'. The browser address bar shows 'http://sdev.cr.usgs.gov/ss_dev/viewer.aspx?stabbr=SS'.

- Publication of the methods and tool is planned as a journal article
- This tool will be available through a publically-accessible webpage and is currently in beta testing

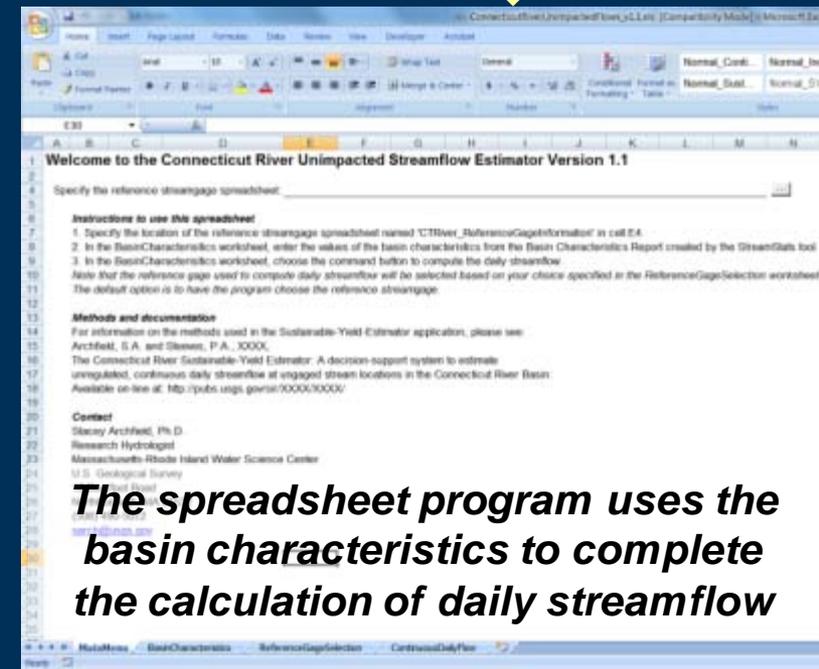


Basin characteristics are computed and summarized

The screenshot shows the 'Basin Characteristics Report' page from the USGS StreamStats application. The report includes the following information:
Date: Fri Mar 25 2011 11:18:02 Mountain Daylight Time
NAD83 Latitude: 43.01460 (43 00 53)
NAD83 Longitude: -72.65512 (-72 39 18)
NAD27 Latitude: ()
NAD27 Longitude: ()
A table of parameters and values is shown below:

| Parameter | Value |
|---|----------|
| Percent of area covered by lakes and ponds | 0 |
| X coordinate of the outlet in map coordinates | 487355.0 |
| Y coordinate of the outlet in map coordinates | 57175.0 |
| Mean annual precipitation, in inches | 44.1 |
| Coarse-grained stratified drift - SYE | 0 |
| Y coordinate of the centroid in map coordinates | 57056.4 |
| High Elevation Index - Percent of area with elevation > 1200 ft | 32.3 |
| Mean Annual Precipitation | 44.1 |
| Area of the basin | 6824.2 |

A text box is overlaid on the report with the text: 'Basin characteristics are computed and summarized'. The browser address bar shows 'http://sdev.cr.usgs.gov/gis/mg/Reports/BasinCharsReports_71441_201132511182.htm'.



The spreadsheet program uses the basin characteristics to complete the calculation of daily streamflow

The screenshot shows a Microsoft Excel spreadsheet titled 'ConnecticutRiverUnimpactedFlow_v1.xls'. The spreadsheet contains instructions for using the 'Connecticut River Unimpacted Streamflow Estimator Version 1.1'. The instructions include:
1. Specify the location of the reference streamgage spreadsheet named 'CTRiver_ReferenceGageInformation' in cell E4.
2. In the BasinCharacteristics worksheet, enter the values of the basin characteristics from the Basin Characteristics Report created by the StreamStats tool.
3. In the BasinCharacteristics worksheet, choose the command button to compute the daily streamflow.
Note that the reference gage used to compute daily streamflow will be selected based on your choice specified in the ReferenceGageSelection worksheet. The default option is to have the program choose the reference streamgage.
Methods and documentation
For information on the methods used in the Sustainable-Yield Estimator application, please see: Archfield, S.A. and Stevens, P.A., XXXX, The Connecticut River Sustainable-Yield Estimator: A decision-support system to estimate unregulated, continuous daily streamflow at engaged stream locations in the Connecticut River Basin. Available on-line at: <http://pubs.usgs.gov/xxxx/XXXX/>
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A text box is overlaid on the spreadsheet with the text: 'The spreadsheet program uses the basin characteristics to complete the calculation of daily streamflow'. The spreadsheet title bar shows 'ConnecticutRiverUnimpactedFlow_v1.xls [Compatibility Mode] - Microsoft Excel'.