

## 2007 NSDI CAP Category 2 - Project 191830

“Developing a Service-Oriented Architecture (SOA) for the National Hydrography Dataset Plus (NHDPlus) Navigation Tools and consumption of Framework Web Feature Services (WFS) for Geospatial Analysis of the Connecticut River Watershed Atlas and Framework datasets”

### Interim Report - 3.3.2008

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### Project Narrative

This project seeks to make available existing complex NHDPlus network traversals tools coupled with Framework Web Feature Service (WFS) extraction tools in a Service-Oriented Architecture (SOA) to further advanced geospatial analysis with the Connecticut River Watershed and Framework datasets.

This project continues to build upon the Connecticut River Watershed Atlas to support the science priorities of creating data-sharing and geospatial analysis systems. The results of this proposed project would provide useful geospatial analysis tools within desktop GIS applications for the other science priorities associated with Connecticut River Watershed sustainability – water budgets, water quality, and ecological flow determinations. In addition, provide useful training and distribution of software tools to federal, state, local, academia, private sector, and non-profit organizations, such as the USGS, EPA, The Nature Conservancy, through training and presentations at local and national geospatial related events and the Internet.

A Service-Oriented Architecture (SOA) will be implemented as the foundation for the proposed NHDPlus navigation tools and Framework Web Feature Service client desktop GIS toolset (see figure 1). The toolset allows users to view near real-time gaging station information, build watershed boundaries from upstream/downstream reaches identified via network tracing; create attribute reports, and download/extract NHDPlus from a WFS.

### Project management

Overall, the project has stayed reasonably on track and deliverables have been met according to schedule. The project kick-off occurred on 5.27.2007. A Project Charter document, which defines objectives, scope,

stakeholders, project team, schedule, budget, approach, etc., was finalized on 11.20.2007. Much initial scoping effort was expended to investigate means for setting up and serving the NHDPlus WFS between kick-off and finalization of the project charter document. Eventually, it was decided that the team would use ESRI ArcGIS Server 9.3, which is the first release with WFS capabilities, to set-up and serve the NHDPlus as a WFS. One major drawback to this approach is that ArcGIS Server does not currently have transformation capabilities; and thus, serving the NHDPlus by this means will not match the NSDI Framework schema for NHD. GCS is participating in the ArcGIS Server 9.3 beta program and plans to give feedback based on implementation of the WFS for NHDPlus.

To explain the nature of the system from the end-users' point of view, a Functional Design document was created and finalized on 12.10.2007. This document also detailed how the system must support alternative flows through Use Cases to validate and ensure the design supported all system requirements. The Functional Design was reinforced through screen-shots and system diagrams in order to deepen the team's understanding of the functional requirements of the system.

A Technical Design document was finalized on 12.21.2007. This document describes the technical design details needed to implement the system. Developers use this document during the Design phase for the project to document the technical and detailed design specification of the project.

The construction phase of the project occurred from late December through late February 2008. During this time, Horizon Systems developed and hosted the NHDPlus database web service. This service delivers basin geometries based on flowline identification numbers. GCS Research developed a CT River Atlas GIS web service, which consumes the NHDPlus database web service, and delivers other functionality to the systems two client applications: the Connecticut River Watershed Atlas web site (see diagrams 3-7) and an ArcGIS Explorer custom task.

Serving and consuming the NHDPlus WFS requirement is currently delayed until ArcGIS Server 9.3 beta is released, which should be in mid-March. Once GCS Research gets the beta software, they will immediately install and develop this requirement in order to stay on track for a final "Go Live" date of 4.15.2008. Feedback to ESRI during the ArcGIS Server 9.3 beta program will go beyond the systems go live date.

Currently, the team is getting ready to install the system at the USGS in NH this coming Friday, March 17<sup>th</sup>. This milestone will complete the Implementation phase of the project whereby system integration and installation occurs.

A system testing phase will follow the installation at the USGS in NH. This phase will last through 4.14.2008. During this phase, all stakeholders will test and provide feedback on the system. During this time, help and outreach materials will be completed. The system is targeted to "Go Live" on 4.15.2008.

Last week (2.26.2008-2.29.2008), Craig Johnston, USGS, and Cindy McKay, Horizon Systems presented project details during the NHDPlus conference at the Federal Center in Lakewood, Colorado. A brief demonstration of the Connecticut River Atlas web application was presented with good review. Cindy plans to present in-depth coverage of the project at several conferences in the near future: AWRA in March, National Water Quality Monitoring Conference in May, and the EPA GIS User Group in May. Craig and John plan to present at the USGS GIS conference in Colorado in May, the International ESRI User Conference in California in August, and NEARC in Massachusetts in September.

## CT River Atlas Toolset Service-Oriented Architecture (SOA)

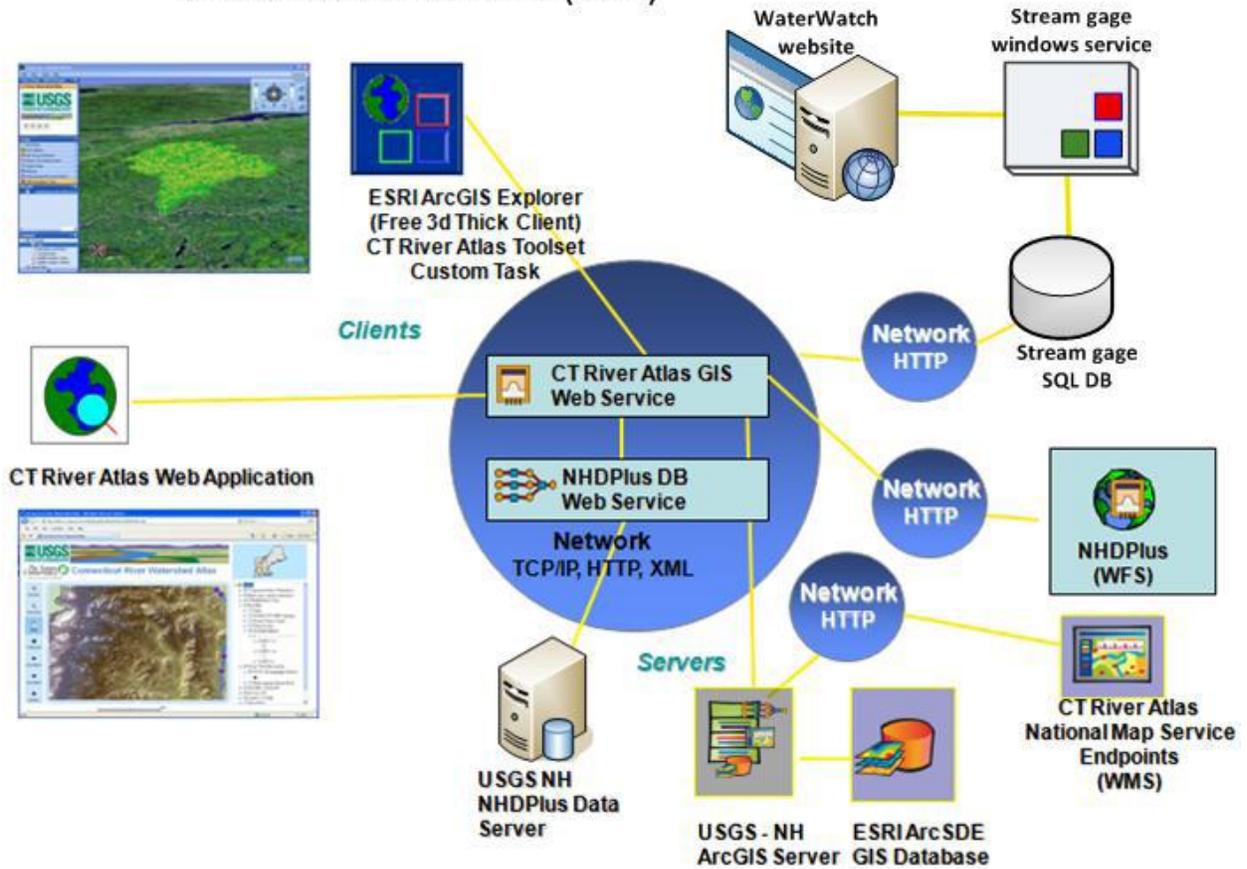


Figure 1: System architecture

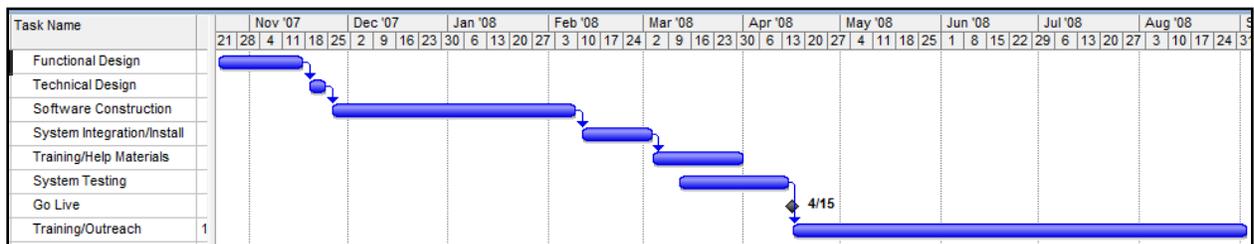


Figure 2: Work plan

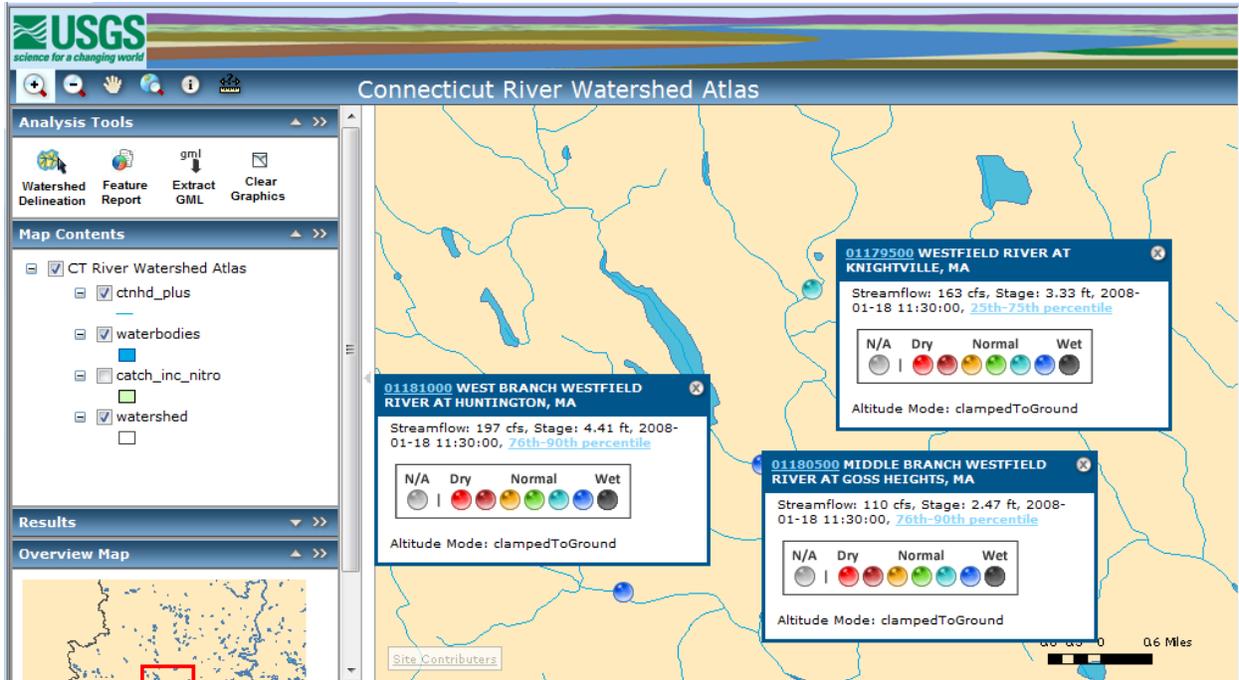


Figure 3: WaterWatch gaging information

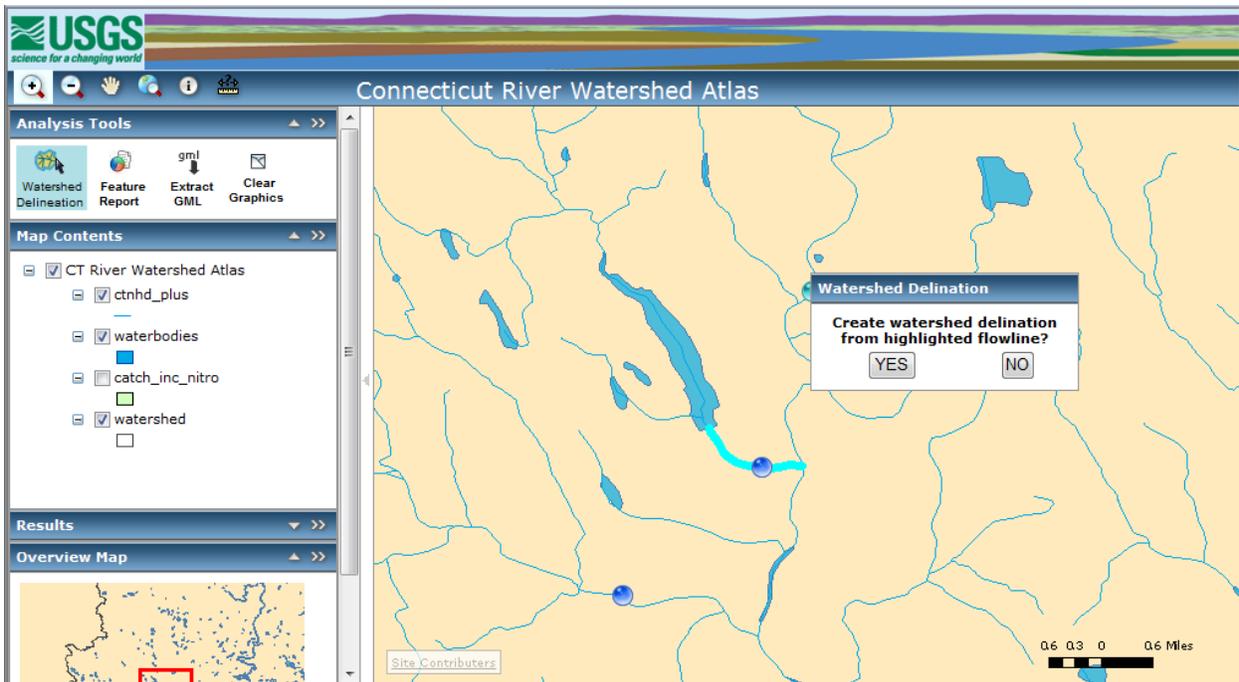


Figure 4: Select a flowline

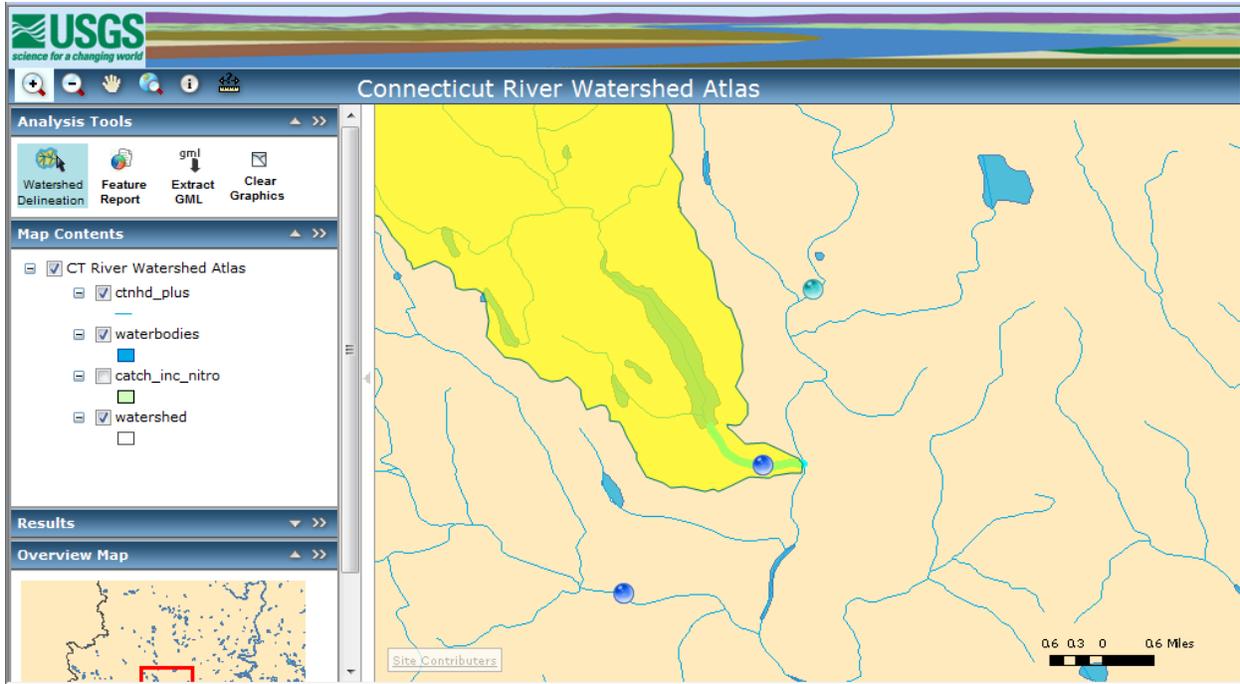


Figure 5: Delineated basin based on selected flowline

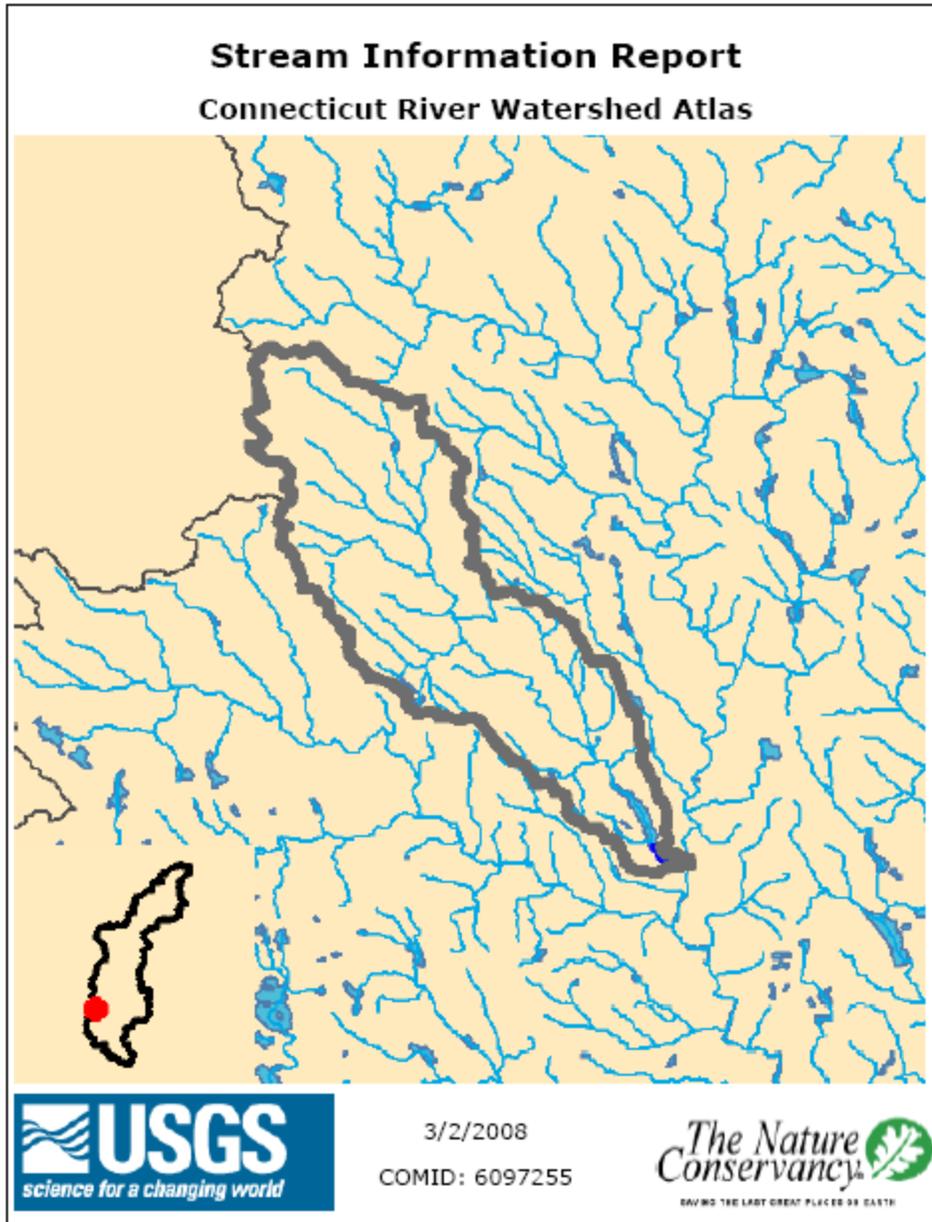


Figure 6: Stream report – beta

### Stream Characteristics

Stream Name: **Middle Branch Westfield River**  
Reach Code: **01080206000059**  
ComID: **6097255**

Slope of the flowline: **0.02251**

Mean annual streamflow is **80.39192** in cubic feet per second. Estimated using the Unit Runoff Method in the NHDPlus.

Mean annual stream velocity is **1.5792** in feet per second. Estimate provided by NHDPlus using the Jobson Method (1996) using mean annual flow from the unit runoff method.

Downstream main path distance (Downstream of this flowline) to the Atlantic Ocean at the mouth of the Connecticut River is **162.093** miles: Source NHDPlus.

### Watershed Characteristics

Drainage Area in square kilometers **136.912**

The watershed has a mean annual temperature of **0** degrees Fahrenheit with a mean annual precipitation of **0** inches per year.  
2000 Census population is **1293**. Estimate from the 2000 Census block data.

Approximate total road length is **108.07226** miles with a road density of **2.04864** miles of road per square mile. Source Census TIGER 2006 Second Edition.

There are approximately **0** toxic release sites as identified in the Toxic Release Inventory (EPA 2005) database.

There are approximately **0** point sources as identified in the EPA National Pollutant Discharge Elimination System (NPDES)

### From the 2001 National Land Cover Dataset

Percent Developed **3.429**  
.....Developed/Open Space **3.280**

Figure 7: Report attributes - beta