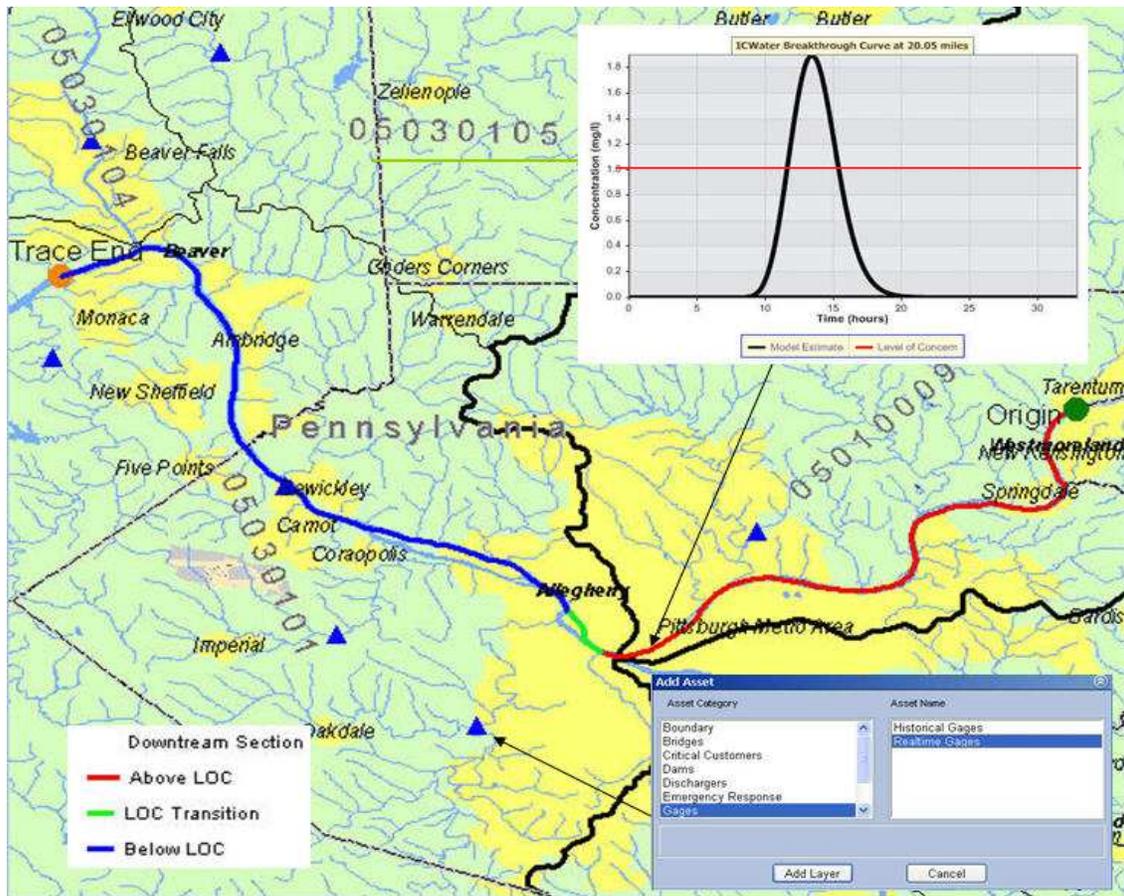


## Incident Command Tool for Drinking Water Protection (ICWater)



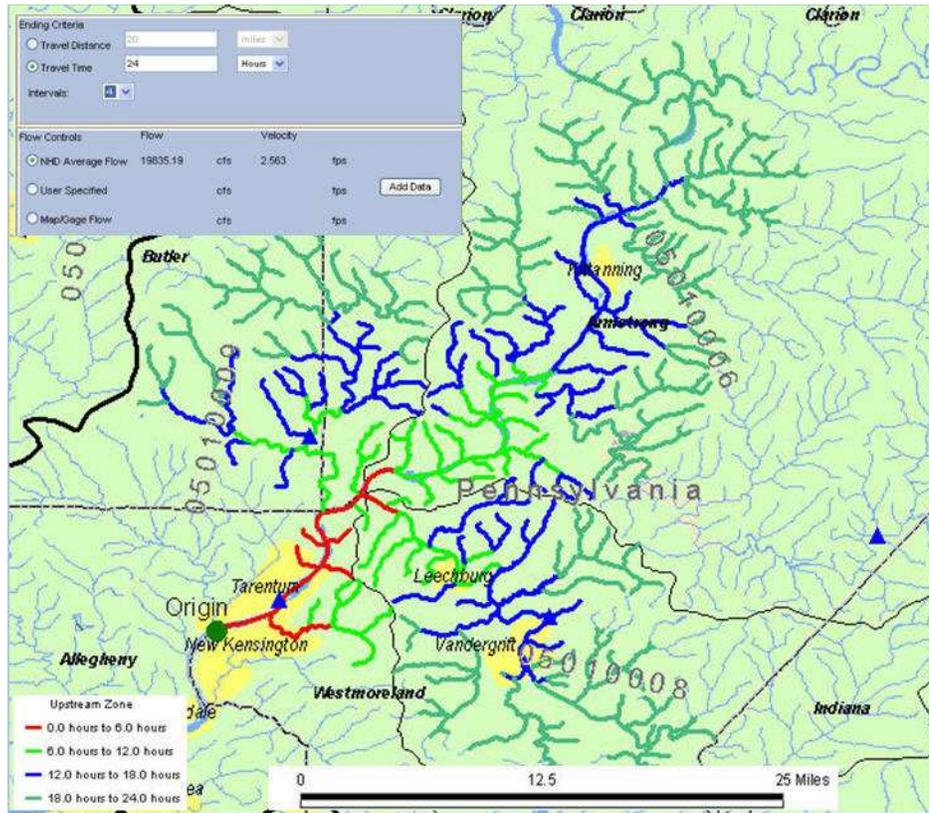
The Incident Command Tool for Drinking Water Protection (ICWater) is structured around the RiverSpill model which has been enhanced to make use of the 1:100,000 scale National Hydrography Dataset Plus (NHDPlus). ICWater is GIS-based tool and includes the NHDPlus, a hydrologically connected river network that contains over 3 million reach segments in the US. This allows for both downstream and upstream network navigation. Mean flow and velocity has been calculated by the USGS and EPA for each reach. RiverSpill provides real-time assessments of the travel and dispersion

of contaminants in streams and rivers. The model deals with human pathogens, toxic chemicals and radioactive substances. Stream and river flows used in ICWater are derived from web accessible real-time gauging stations maintained throughout the country by the USGS. Example databases available within ICWater include: dams, reservoirs, public drinking water intakes, stream gages, municipal and industrial dischargers and transportation networks. A contaminant database is also included which identifies biological, chemical and radiological constituents of concern.



RiverSpill models contaminating substances released, instantaneously or continuously, into surface waters of the U.S. The substances are moved downstream based upon USGS real-time flow information (or alternative flow values provided by the user). The time dependent distribution of contaminant concentrations, simulated by modeled dispersion, dilution and substance decay, is reported for contaminants arriving at drinking water intakes. Mean flows and velocities in the NHD are scaled by the real-time flow and velocity from nearby gages. The dispersion equation used in RiverSpill characterizes one dimensional turbulent diffusion in constant density flow. The concentration is considered to be a function only of time and distance along the longitudinal axis. Reach

velocities, estimated from real-time measurements reported from stream gauging stations, are applied over the uniform cross sections along a reach. Substance decay is model as a first order exponential process.



Example upstream tracing by travel time.

## Background Information

Developing ICWater drew upon the extensive expertise of the U.S. Forest Service in water research as well as models and data sources from other agencies. The U.S. Forest Service has a stake in protecting drinking water because over 3,000 towns and cities draw their drinking water from within National Forests across the nation. The U.S. Forest Service also has an active corps of incident commanders who direct first responders on and off of National Forests during major wildland fires and other emergencies that require coordinated interagency action. With U.S. Forest Service leadership, a cooperating group of agencies contributed financial and technical support to ICWater, including the Technical Support Working Group, United States Environmental Protection Agency, Federal Emergency Management Agency, USGS, and NOAA. Distribution and training for ICWater are being handled by the Defense Threat Reduction Agency (DTRA) under a memorandum of agreement with the U.S. Forest Service. ICWater is being incorporated as a module into DTRA's Consequences Assessment Tool Suite (CATS). ICWater will add a waterborne capability to CATS which already contains several other tools for assessing airborne plumes, earth motion and blast effects to provide incident commanders with critical information in the event of natural and technological emergencies such as earthquakes, hurricanes, and terror attacks. ICWater was produced under government contract by Science Applications International Corporation (SAIC).

ICWater has other potential uses by water resource managers because of its ability to perform rapid analyses of watershed connectivity at multiple scales anywhere in the country. For example, users in the U.S. Forest Service have already adapted the tool for several purposes. The Missoula Fire Lab used ICWater in the summer of 2006 for assessing what on-the-ground assets (including drinking water utilities and HAZMAT sites) were at risk from wildland fires as they were burning. They also used the tool for a wide-ranging planning assessment of what public drinking water systems were potentially vulnerable to disruption by wildland fire at the national scale. Forest Health Protection is using ICWater for planning a nationwide aquatic monitoring program for early detection of waterborne

propagules of Sudden Oak Death, a virulent tree pathogen. ICWater may also have potential non-emergency uses such as performing source water assessments.

### **Using NHDPlus**

The NHD Plus contains more than 3 million stream and river reaches, all hydrologically connected. Dams are included as one of the asset databases and can act as barriers in the network. Long-term average values of velocity and flow (discharge) are attributes of the NHD Plus reported for each reach. The real-time gages report stream and river flow from approximately 7,000 sites located throughout the U.S. ICWater uses relationship between river velocity and river flow to determine the real-time velocity from the measured (gaged) real-time flow. The calculations use the ratio of real-time velocity to long-term average velocity for extrapolation to river reaches not represented by the real-time gage network.

### **Technologies Employed**

ICWater is based on ESRI technology. It is an extension of the ArcMap component of ARCGIS 9.2 (the web-based version uses ARCGIS Server). VB.net software with calls to ArcObjects, links the graphical user interface, RiverSpill hydraulic modeling engine, and the map display. Real-time stream flow data is accessed through the Internet from the National Water Information System (NWIS). Linkage to EPA's Envirofacts warehouse provides up to date information on drinking water systems, and industrial and municipal dischargers.

### **For more information**

<http://eh2o.saic.com/SectionProjects/Transport/Surface/ICWater/ICWater.aspx>

[http://www.stream.fs.fed.us/news/streamnt/pdf/SN\\_01\\_07.pdf](http://www.stream.fs.fed.us/news/streamnt/pdf/SN_01_07.pdf)

<http://www.fs.fed.us/pnw/news/2006/01/ICwater.shtml>

<http://www.aip.org/dbis/stories/2006/15252.html>

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