N-Sink: A decision support tool under development with EPA

Kenneth J. Forshay[1], C. Arnold[2], Q. Kellogg[3], and A. Gold[3]

1. United States Environmental Protection Agency, Office of Research and Development, 2. University of Connecticut, Center for Landuse Education and Research, 3. University of Rhode Island

Ken Forshay | forshay.ken@epa.gov | 580-436-8912

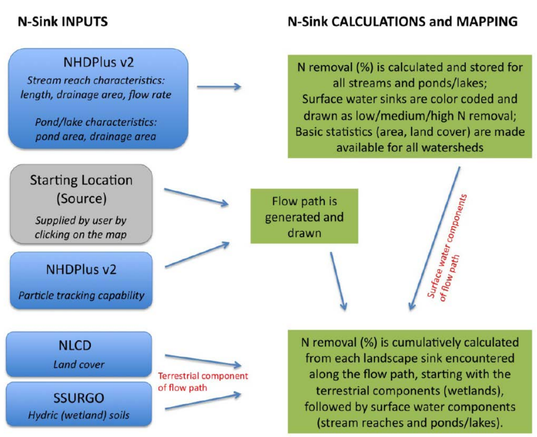
N-Sink shows where N can be retained or transported

N-Sink is a web based decision support tool for land use planners and managers that shows locations sensitive to nitrogen pollution within a watershed to help individuals explore the relationship between land use and nitrogen pollution in their waters. N-Sink uses the best available science on land use & nitrogen interactions, plus widely available basic datasets for hydrography, soils and land use, to highlight major sources and sinks of nitrogen within a watershed context. In contrast to complex loading models that focus on nitrogen generation, N-Sink focuses on watershed landscape elements that serve as nitrogen sinks, and thus it highlights the importance of wetlands, ponds, riparian buffers and other areas that may be priorities for protection. N-Sink is a partnership between the University of Rhode Island and the University of Connecticut, and currently exists as a web-based beta version focused on 19 twelve-digit Hydrologic Unit Code (HUC-12) watersheds draining to the coasts of southeast Connecticut and southern Rhode Island. Development of N-Sink into a nationally available tool is underway with EPA.

N-Sink uses nationally available data layers and best available biogeochemistry data to estimate retention along a flowpath.

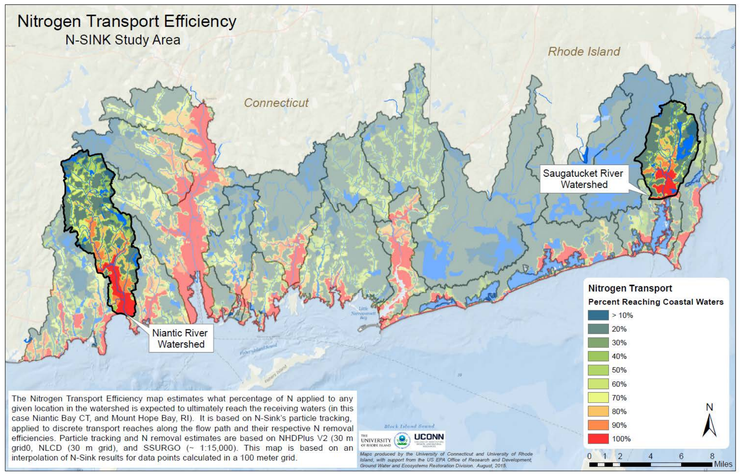
N-Sink currently uses the following data layers for input.

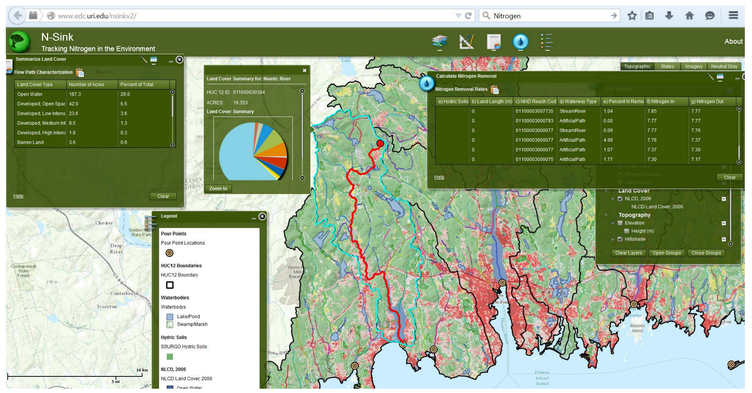
- Topography in the form of a Digital Elevation Model (DEM) from the National Elevation Dataset (NED)
- Soils from Natural Resources Conservation Service (NRCS) Soil Survey GeographicDatabase (SSURGO)
- Hydrography from the National Hydrography Dataset (NHD)
- Land cover from the National Land Cover Dataset (NLCD)



N-Sink conceptual diagram. Arnold et. al. 2013.

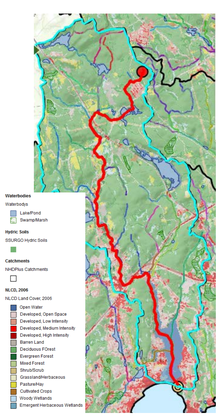
N-Sink identifies N "leaky" areas and N "sinks"



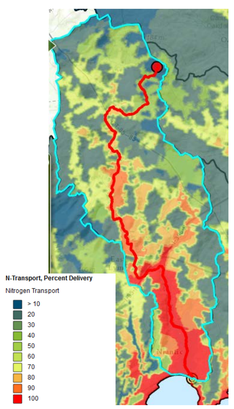


Screen capture of a N-Sink desktop.

1) Hydrologic flowpath



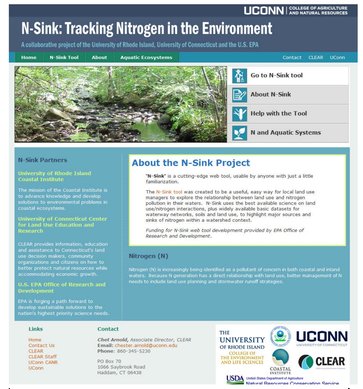
2) Water and N flow over landscape units

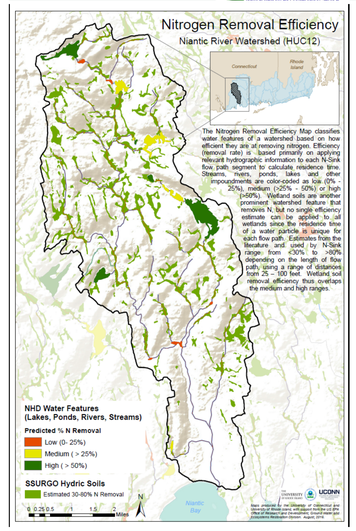


3) Repeat every grid cell to generate a "heat map".

Hydrologic flow paths are linked to biogeochemcical retention functions in a landscape unit to create a retention efficiency for any location in a watershed. These calculations are dependent on residence time, land cover, and biogeochemical retention rate as pictured here in the Niantic River Watershed.

N-Sink is a web based tool for planning & prioritization under development with EPA





- N-Sink is a planning & prioritization tool, not a rigorous loading model.
- N-Sink is designed to use widely available national datasets
- N-Sink focuses on retention and removal rather than sources/loadings
- Currently maintained by URI and UConn. EPA is working to make it national.
- N-Sink is under development i.e. It is not done yet, but it is useful and available now!
- Available on the web at http://http://clear.uconn.edu/projects/nsink

Community planners working with land cover maps. Photo courtesy of C. Arnold.

EPA is working with university partners and community stakeholders to improve N-Sink functionality for communities.

The goal is to show N-Sinks in your watershed

Efforts are underway to expand coverage to the nation at the same HUC 12 resolution. EPA ORD is working with R1 and university collaborators to bring the tool online. Today you can access the tool at:

http://clear.uconn.edu/projects/nsink/

Acknowledgements

David Burden, Rebecca Foster, and Dan Pope assisted with multiple components of this poster.
The US Environmental Protection Agency through its Office of Research and Development funded and managed portions of this work described here. It has not been subjected to Agency review and therefore does not necessarily reflect the views of the Agency, and no official endorsement should be inferred.

Citations

Arnold, C., D. Kellogg, K. Forshay, C. Damon, E. Wilson, A. Gold, E. Wentz, AND M. Shimizu. Tracking the fate of watershed nitrogen: The "N-Sink" Web Tool and Two Case Studies. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-13/230, 2013.

Kellogg, D. Q., Arthur J. Gold, Suzanne Cox, Kelly Addy and Peter V. August. 2010. A geospatial approach for assessing denitrification sinks within lower order catchments. Ecological Engineering (36): 1596-1606.