

The National Map—Hydrography

The National Hydrography Dataset

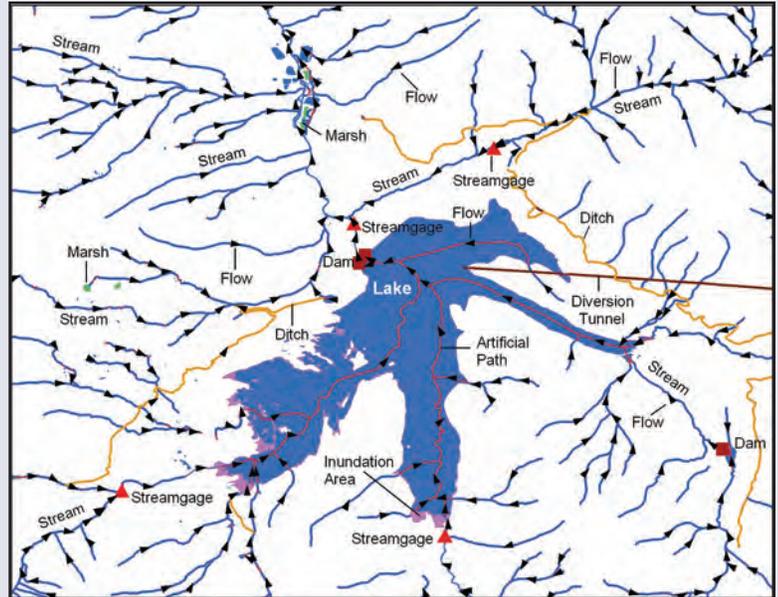
The National Hydrography Dataset (NHD) is the surface-water component of *The National Map*. The NHD is a comprehensive set of digital spatial data that represents the surface water of the United States using common features such as lakes, ponds, streams, rivers, canals, streamgages, and dams. Polygons are used to represent area features such as lakes, ponds, and rivers; lines are used to represent linear features such as streams and smaller rivers; and points are used to represent point features such as streamgages and dams. Lines also are used to show the water flow through area features such as the flow of water through a lake. The combination of lines is used to create a network of water and transported material flow to allow users of the data to trace movement in downstream and upstream directions.

The Watershed Boundary Dataset

The Watershed Boundary Dataset (WBD) is a companion dataset to the NHD. It defines the perimeter of drainage areas formed by the terrain and other landscape characteristics. The drainage areas are nested within each other so that a large drainage area, such as the Upper Mississippi River, will be composed of multiple smaller drainage areas such as the Wisconsin River. Each of these smaller areas can further be subdivided into smaller and smaller drainage areas. The WBD uses six different levels in this hierarchy, with the smallest averaging about 30,000 acres. The WBD is made up of polygons nested into the six levels of data.



Awosting Falls, New York. Photograph courtesy of Allen Karsh.

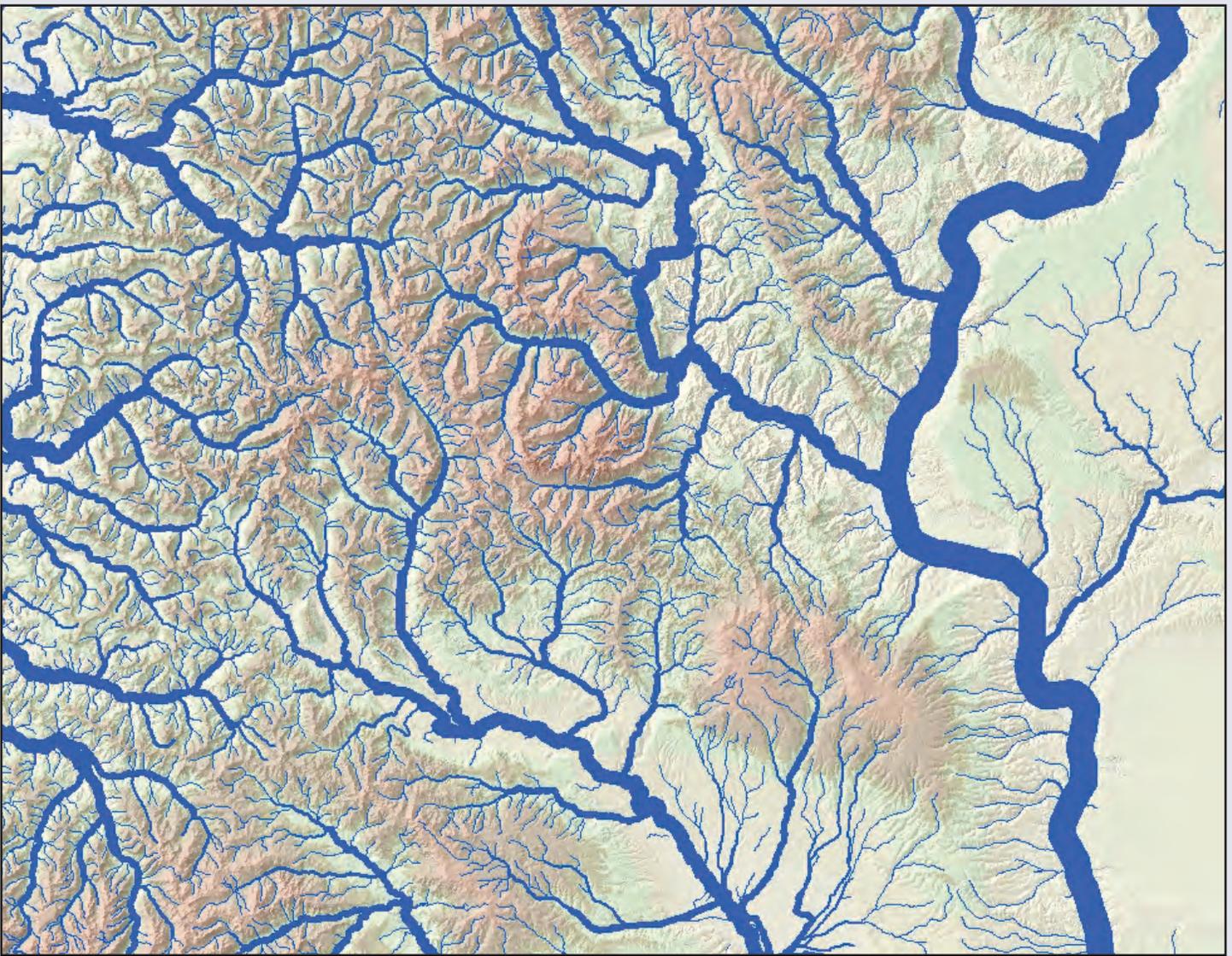


Example of features in the National Hydrography Dataset over Dillon, Colorado.

Using the Data

These data are designed to be used in general mapping and in the analysis of surface-water systems using geographic information system (GIS) technology. In mapping, the NHD is used with other data themes such as elevation, boundaries, and transportation to produce general reference maps. These maps often serve as base maps for special purpose mapping. A geologic map, for example, may show base map information such as hydrography as a reference.

In the analysis of surface water, scientists use the NHD and WBD by applying GIS technology. This takes advantage of a rich set of embedded attributes that can be processed by a computer system to generate specialized information. This information then can be portrayed in customized maps to better understand the results. These analyses of hydrography are possible largely because the NHD contains the flow-direction network, and uses an addressing system to link specific information about the water from other related databases such as water discharge, water quality, and fish population. Using the basic water features, flow network, linked information, and other characteristics, it is possible to study cause and effect relationships, such as how a source of poor water quality upstream might affect a fish population downstream. The WBD plays an important role in this analysis by outlining the area on the landscape that drains into the flow network defined



Using integrated geospatial data and hydrologic modeling to predict streamflow. Line-width is proportional to modeled streamflow.

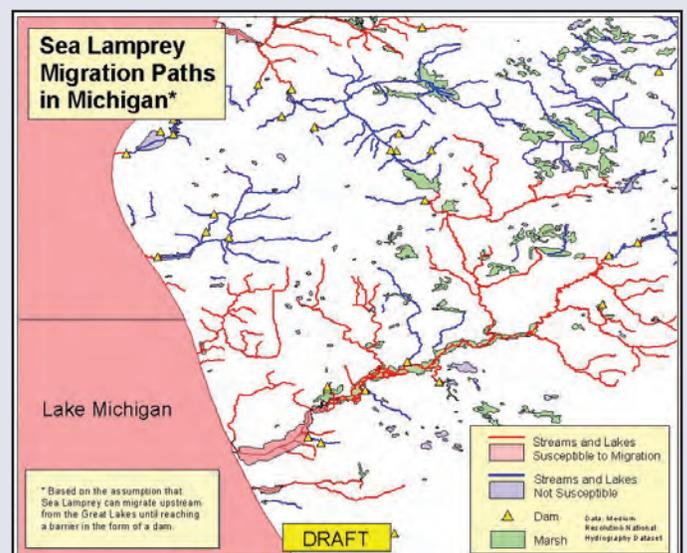
by the NHD. These data also are linked to the Geographic Names Information System to provide accurate hydrography names. The NHD and WBD often are used as a data source to specific applications such as StreamStats, ICWater, or ArcHydro.

Data Availability

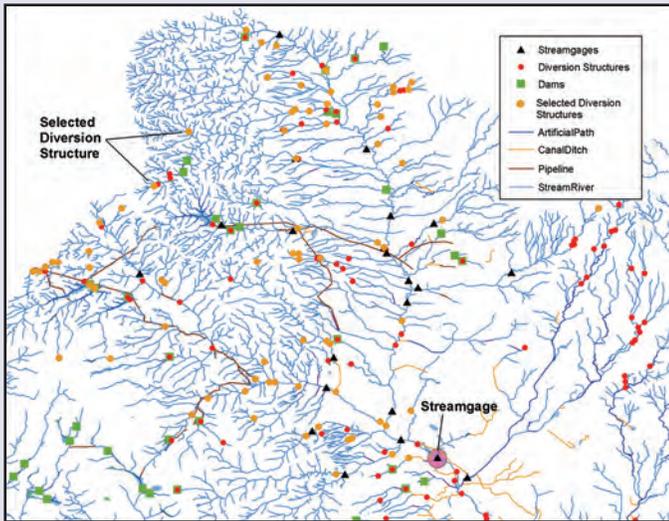
The NHD is available nationwide in two seamless datasets; one based on 1:24,000-scale topographic mapping, known as the high-resolution NHD, and the other based on 1:100,000-scale topographic mapping, known as the medium-resolution NHD. It also is becoming available in select areas based on larger scales such as 1:5,000-scale mapping. The WBD also is available in a nationwide seamless dataset. Typically, users download the WBD polygons using either the fourth or sixth levels of the drainage hierarchy. The NHD and WBD will be available as part of the same database in 2010.

The NHD and WBD can be viewed in *The National Map* (<http://nationalmap.gov/>) and downloaded for use in a GIS. The NHD and WBD also can be downloaded from a specialized hydrography portal to address the specific needs of scientists (<http://nhd.usgs.gov/>). For data management purposes, the NHD is distributed in units defined by the second

or fourth levels of the WBD. The hydrography data also can be downloaded from the Natural Resource Conservation Service (<http://datagateway.nrcs.usda.gov/>).



Using National Hydrography Dataset upstream navigation to predict how dams can act as barriers to invasive species migration.



Integrating dams and water diversions to the National Hydrography Dataset to study effects on streamflow at streamgages.

The Hydrography Partnership

Both the NHD and WBD were created by joining the efforts of many Federal, State, and local agencies. These large and complex databases were built by pooling the funding and resources of many agencies into a single effort. This partnership effort also allowed the many agencies to standardize on a common design to save money and improve data interoperability. Another example of hydrography partnership efforts is the NHDPlus, which was developed by the U.S. Environmental Protection Agency in partnership with the U.S. Geological Survey (USGS) to extend the power of the NHD by integrating a number of geospatial data to calculate streamflow volume and stream velocity for each stream segment. This information assists scientists by simulating the amount of water flowing in a stream and the speed of its movement, and linking to factors such as dissolved or suspended constituents in the water. This is particularly useful when studying the affects of water pollution.



The integrated National Hydrography Dataset and Watershed Boundary Dataset to define streams and watersheds.

The Nation Needs *The National Map*

As one of the cornerstones of the U.S. Geological Survey's (USGS) National Geospatial Program, *The National Map* is a collaborative effort among the USGS and other Federal, State, local, and Tribal partners to improve and deliver topographic information for the Nation. *The National Map* has many uses ranging from recreation to scientific analysis to emergency response. *The National Map* is easily accessible for display on the Web, as products and services, and as downloadable data. The geographic information available from *The National Map* includes orthoimagery (aerial photographs), elevation, geographic names, hydrography, boundaries, transportation, structures, and land cover. Other types of geographic information can be added within the viewer or brought in with *The National Map* data into a Geographic Information System to create specific types of maps or map views.



The National Map is a significant contribution to the National Spatial Data Infrastructure (NSDI) and provides high quality, integrated geospatial data and improved products and services including new generation digital topographic maps. *The National Map* also is foundational to implementation of the Department of the Interior (DOI) Geospatial Modernization Blueprint and meeting the DOI mission. *The National Map* underpins the USGS Science Strategy, which is based on a systems approach to help address multifaceted issues, provide better understanding of earth processes, and evaluate broad causes and consequences of the use and management of natural resources. *The National Map* promotes interdisciplinary science by providing nationally consistent, trusted geospatial data, and establishing a consistent national geographic context.



The Blue River near Kremling, Colorado. Photograph courtesy of Ariel Bates.

Data Stewardship

The NHD and WBD partnership is now turning its attention to a program of data stewardship to improve upon the existing NHD and WBD to keep it continuously up-to-date. This data stewardship activity is based on the input of an even larger partnership of organizations knowledgeable about the hydrography in their local area. They will have the tools and processes necessary to improve the NHD. This will assure that the data are accurate, current, and meet the objectives of users. The NHD and WBD include metadata that will track the history of the data as they are repeatedly updated with time.

Further Information

More information about *The National Map* is available at <http://nationalmap.gov/>.

For information on other USGS products and services, call 1-888-ASK-USGS or visit the general interest publications Web site on maps, imagery and publications at <http://www.usgs.gov/pubprod/>.

For additional information, visit the <http://ask.usgs.gov/> Web site or the USGS home page at <http://www.usgs.gov/>.

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