



Fact Sheet:

Watershed Boundaries for the 2002 Impaired Waters Baseline National Geospatial Dataset

Background: the Clean Water Act, impaired waters and TMDLs

The goal of the Clean Water Act (CWA) is “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters”. Under section 303(d) of the CWA, states, territories, and authorized tribes, collectively referred to in the Act and here as “states,” are required to develop lists of impaired waters every two years. A state’s 303(d) impaired waters list is comprised of all waters where required pollution controls are not sufficient to attain or maintain applicable water quality standards. The law requires that states establish a prioritized schedule for waters on the lists and develop Total Maximum Daily Loads (TMDLs). A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of the load reduction needed from various sources of the pollutant. TMDLs are technical documents that summarize the analysis and lay the groundwork for beginning to plan restoration. Over 40,000 TMDLs have been developed, and the number is continually increasing.

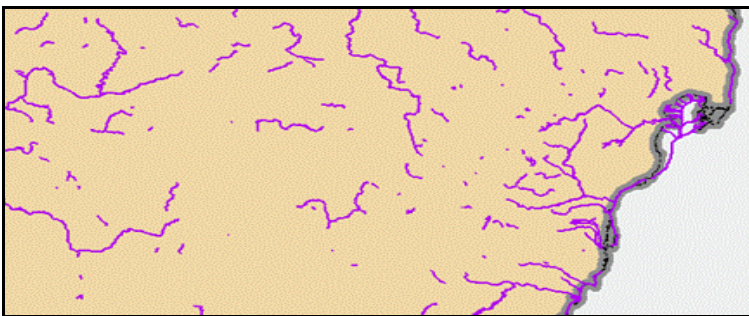


Figure 1: GIS data on impaired waters, available online from EPA

EPA’s Assessment and TMDL Tracking and Implementation System (ATTAINS) is a national compilation of states’ 303(d) listing and TMDL development information, spanning several years of tracking over 40,000 impaired waters. ATTAINS impaired waters data are publicly available online in tabular format (www.epa.gov/waters/ir) and as geographic information systems (GIS) datasets (Figure 1) that are available for download from EPA at <http://epamap32.epa.gov/radims/>.

Geospatial data on impaired waters and their watersheds

National geospatial datasets on impaired waters are produced and periodically updated by EPA using state-reported data. The GIS versions of state 303(d) lists are provided to EPA by states after the lists are approved and finalized. EPA compiles the state datasets, reconciles the differences in format among state data, and indexes the data to the National Hydrography Dataset Plus (NHDPlus) to provide a nationally consistent reference layer. The indexed datasets are based on information taken from the Reach Address Database (RAD) and are housed in EPA’s *Waters Assessment, Tracking, and Environmental Results (WATERS)* environment. They include the **2002 Impaired Waters Baseline National Geospatial Dataset** containing impaired waters as of the 2002 baseline reporting year, and the **303(d) Listed Impaired Waters National Geospatial Dataset** that includes more recent state data (from variable dates) available as of the date of extraction. The RAD also provides dynamic access to individual state or watershed-level data downloads as new data become available.

This fact sheet provides information about the **Watershed Boundaries for the 2002 Impaired Waters Baseline National Geospatial Dataset** that was developed by EPA due to widespread interest in GIS data on impaired waters and their watersheds. Figure 2 is an example from this dataset, which is available for public download through the WATERS website. As a medium-resolution dataset similar to the other national NHDPlus products, these watershed boundaries are appropriate for approximating the land use/land cover, slope, and other general characteristics of numerous impaired watersheds across a state, region, or the nation.

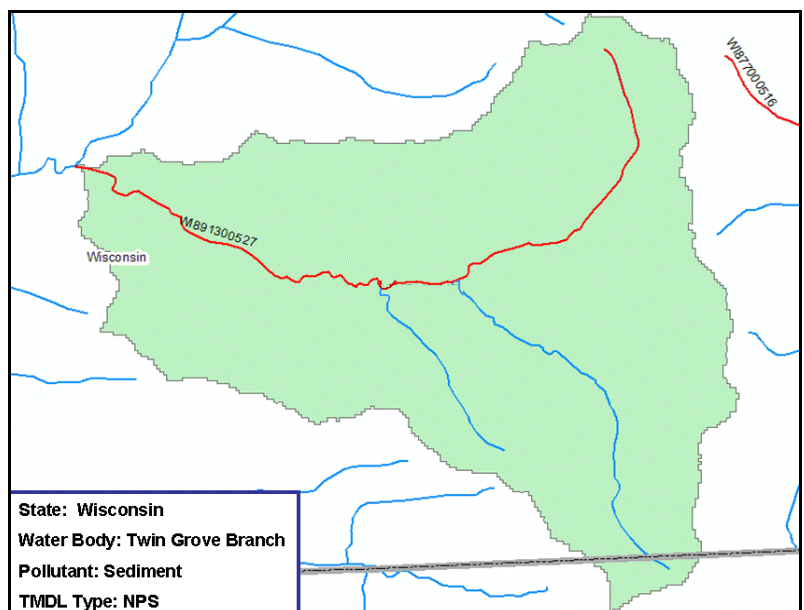


Figure 2: Watershed boundary for a 2002 baseline impaired water

How the impaired watershed boundaries were delineated

Watershed delineation can be extremely labor-intensive when performed manually. Manual creation of a national impaired watersheds boundary dataset would have been cost-prohibitive, but the availability of nationally consistent source datasets and automated basin delineation tools made it feasible. The necessary data included the national 2002 baseline impaired waters geospatial data and the NHDPlus national catchments dataset.

Initially, all the geospatial information on impaired water body segments listed through 2002 was extracted from the RAD to a geospatial data layer. The downstream “pour point” was then identified for each impaired segment based on NHDPlus flow information. The pour point provided the basis for defining the watershed boundary as all up-gradient lands and waters draining to that point. Where larger water bodies such as rivers were listed in segments (i.e., each segment is one impaired water), a separate downstream pour point and watershed boundary were delineated for each segment. Thus, the larger watershed boundaries in this dataset often contain smaller watersheds. For example, a large impaired river’s watershed in this dataset also contains the smaller watersheds of several of its impaired tributary streams.

The NHDPlus catchments national dataset (see figure 3) was used in the next step of automated boundary delineation.

The catchments dataset was produced by integrating elevation data with NHD surface waters data in order to obtain a delineation of a surface drainage unit for every surface water segment in the entire NHD. Some catchments are true watersheds, some are “flow-through” drainage areas with true watersheds farther upstream. These catchments have been further related to one another by flow path information. Thus, starting with any point in the flow network, one can navigate upstream to determine all the catchments that together comprise the watershed for that point. In the case of impaired waters, the multiple catchments upstream of each pour point were then dissolved into single watersheds with a single, outer watershed boundary (figure 4).

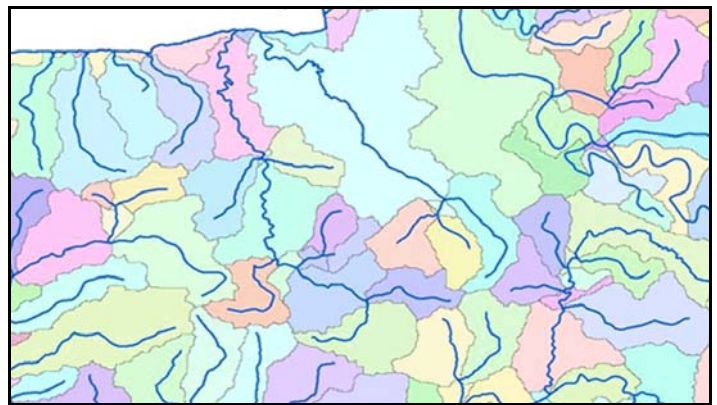


Figure 3: the NHDPlus catchments dataset consists of surface drainage units delineated at each tributary confluence

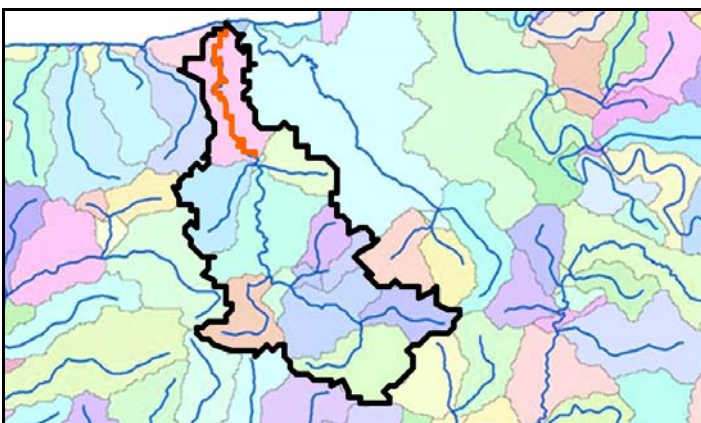


Figure 4: watershed boundary (black) of an impaired water (orange) delineated by aggregating upstream catchments

Once the watersheds for each impaired water in the 2002 baseline were delineated, several attributes about each watershed were compiled in tabular format. The List ID that uniquely identifies each impaired water in the 2002 baseline dataset was used in this attribute table as the Basin ID for its watershed. Other fields included watershed area; whether the impaired water was a linear, areal, or point data feature; and the number of additional impaired waters occurring upstream in the watershed. The presence of the List ID in the watersheds dataset enables users to link to other attributes such as waterbody name, causes of impairment, and whether a TMDL has been completed and made available online.

Limitations of the impaired watershed boundaries dataset

The automated delineation process used to create this national dataset efficiently generated watershed boundaries for most, but not all, impaired waters. The delineation process was attempted on all 39,567 impaired waters (including point, linear and areal features) in the 2002 baseline extracted from the RAD. 32,605 unique pour points were identified relative to these waters. This is a smaller number mainly because two or more impaired waters (such as one impaired tributary and a mainstem segment ending at the confluence) frequently share one pour point. For a variety of reasons, including absence of a downstream pour point or ambiguity of pour point information, the watersheds for many additional waters could not be delineated. In total, 28,350 delineated watersheds were compiled in this national dataset.

For more about TMDLs and impaired waters data, visit:
EPA TMDL home: www.epa.gov/owow/tmdl
WATERS: <http://www.epa.gov/waters/about/index.html>

ATTAINS: www.epa.gov/waters/ir
Data Downloads: <http://epamap32.epa.gov/radims/>
TMDL Results Analysis: www.epa.gov/owow/tmdl/results