



## Stream Length Impaired by Mercury

This EnviroAtlas national map displays the length in kilometers of streams, coasts, canals, and other linear hydrographic features that are impaired by mercury from the 303(d) list of impaired waters within each 12-digit hydrological unit (HUC). Listed streams have high levels of mercury found in water, sediment, or fish.

### Why are streams impaired by mercury important?

Stream impairments can be due to a wide variety of causes, including chemical pollutants, physical conditions such as siltation, or biological contaminants such as bacteria. This map shows waters that are impaired by mercury. Mercury impairments can have serious impacts on ecosystems, human health, and the economy.

Mercury is released into the atmosphere from coal and other fossil fuels, waste incineration, mining, industrial processes, and natural sources such as volcanoes. Atmospheric mercury is deposited in water or soil through atmospheric deposition. Present-day atmospheric mercury levels are three to five times preindustrial levels.<sup>1</sup> Developed countries have decreased their emissions in recent decades, but even small amounts carry health risks, and mercury can continue to cycle through the environment long after it is released. Because it can remain in the atmosphere for up to a year, it can also travel far from its source.<sup>1</sup>

Microorganisms convert mercury to methylmercury, an especially toxic form that can enter the food web. It can become concentrated in certain species by a process called biomagnification. Methylmercury can bioaccumulate in aquatic organisms. As predators eat contaminated prey, mercury becomes increasingly concentrated as it moves up the food web. People or animals that eat fish near the top of the food web can be exposed to high levels of mercury. Methylmercury is the most common form of mercury for human exposure, often through consuming certain types of fish. Methylmercury can cause nervous system damage and can be fatal at very high doses. Even low doses can be harmful.<sup>1,2</sup> It is especially serious for pregnant women and children; in utero exposure can cause mental retardation, cerebral palsy, deafness, and blindness in the affected child.

Exposure to methylmercury can also change fish behavior, interfering with their sense of smell, and altering



reproductive hormones and the timing of spawning.<sup>3,4</sup> These changes make it more difficult for the fish to avoid predators and produce healthy offspring, which can result in reduced populations.<sup>3</sup> It can affect other fish-eating animals as well. Effects on birds include changes to feathers, changes in breeding, parenting, and feeding behavior, and eggs that are less likely to hatch. Mammals that eat fish, like otters, can experience neurological symptoms or die from mercury poisoning.<sup>4</sup>

Section 303(d) of the Clean Water Act requires states to identify water bodies that do not support state designated clean water uses, such as fishing, irrigation, industrial uses, or drinking water supply, because of pollution or other impairments. The states must then establish [Total Maximum Daily Loads](#) (TMDLs), which cap the amount of each pollutant allowed in the water body based on its use. The TMDL sets a load limit for the water body to meet water quality standards and then divides the load into allowable contributions from [point](#) and [nonpoint](#) sources.

### How can I use this information?

The map, Stream Length Impaired by Mercury, provides information about the length of streams and other linear water features with mercury impairments within each 12-digit HUC. Information about the extent and causes of impairments could guide projects for improving water quality or inform decisions about how best to use water resources.

Users can view this information along with supplemental layers, such as impervious surfaces and riparian buffers, to identify possible sources of impairments and remediation needs. It can be combined with layers on recreation or domestic water consumption to show how mercury-related impairments relate to water use.

This map can also be viewed in conjunction with the stream length layer to find out what percent of stream length in a HUC is impaired by mercury. Because the total length of streams in a watershed can vary, supplementing information on impairments with stream length can give a clearer picture of impairment extent. The actual impaired waters lines can also be overlaid on an aerial imagery base map to provide additional detail.

### How was the data for this map created?

The May 1, 2015 303(d) Listed Impaired Waters National Hydrography Dataset (NHD) Indexed Dataset was obtained from the [EPA's WATERS Geospatial Data Downloads web page](#). This dataset includes features based on the [NHDPlus](#) flowlines and a table listing impaired waters. The impairment causes were summarized into broad categories. For this metric, the cause is Mercury. Because some streams cross 12-digit HUC boundaries, the features were split where they crossed the boundaries. The lengths of all waters impaired by mercury were summed for each 12-digit HUC. For detailed information about how the data were generated, see the [metadata](#).

### What are the limitations of these data?

All national data layers, such as the 303(d) Listed Impaired Waters NHD Indexed Dataset, are by their nature inherently imperfect; they are an estimation of the truth based on the best available science. Calculations based on these data are therefore also estimations. The user needs to be aware that the mapped data should be used to inform further investigation. Periodic updates to EnviroAtlas will reflect improvements to nationally available data.

### Selected Publications

1. Selin, N.E. 2009. [Global biogeochemical cycling of mercury: A review](#). *Annual Review of Environment and Resources* 34:43–63.
2. Jarup, L. 2003. [Hazards of heavy metal contamination](#). *British Medical Bulletin* 68(1):167–182.
3. Scott, G.R., and K.A. Sloman. 2004. [The effects of environmental pollutants on complex fish behaviour: Integrating behavioural and physiological indicators of toxicity](#). *Aquatic Toxicology* 68:369–392.
4. Scheuhammer, A. M., M. W. Meyer, M. B. Sandheinrich, and M. W. Murray. 2007. [Effects of environmental methylmercury on the health of wild birds, mammals, and fish](#). *Ambio* 36:12–18
- Mozaffarian, D., and E.B. Rimm. 2006. [Fish intake, contaminants, and human health: Evaluating the risks and the benefits](#). *Journal of the American Medical Association* 296:1885.
- United States Environmental Protection Agency. 2016. [Summaries of Water Pollution Reporting Categories](#). United States Environmental Protection Agency, Office of Water, Watershed Branch. Accessed February 2018.

This layer only represents waters on a state's approved 303(d) list rather than all impaired water bodies. The extent of monitoring and the methods used also vary from state to state. The dataset may include false positives resulting from data that is incorrect or inadequate for determining the exact location, or false negatives resulting from missing information. Because the total lengths of waters in a 12-digit HUC may vary, this information should be considered in conjunction with data on stream density and total lengths of streams and coastlines to better understand the extent of impairment in a 12-digit HUC. Accuracy information for the source data sets can be found on their respective web sites.

### How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. The dataset used to calculate the impairment counts, which provides greater detail on specific water bodies and the causes and sources of impairment, can be found on EPA's [WATERS Geospatial Data Downloads](#) website.

### Where can I get more information?

There are numerous resources on water quality and impairment; a selection of these resources is listed below. The EPA Office of Water provides information on [Section 303\(d\)](#) of the Clean Water Act. For additional information on how the data were created, access the metadata for the data layer from the drop down menu on the interactive map table of contents and click again on metadata at the bottom of the metadata summary page for more details. To ask specific questions about this data layer, please contact the [EnviroAtlas Team](#).

### Acknowledgments

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