Stream Length with Impaired Biota

This EnviroAtlas national map displays the length of streams, coasts, canals, and other linear hydrographic features from the 303(d) list of impaired waters within each 12-digit hydrological unit (HUC) with impaired biota, meaning the streams show negative changes in the types and numbers of aquatic life.

Why are streams with impaired biota 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 with the 303(d) categories impaired biota, fish kills, or fish consumption advisories. These impairments can have serious impacts on ecosystems, human health, and the economy. Losing aquatic species can disrupt the food chain, reducing food sources for animals that depend on them, while allowing nuisance species to proliferate in the absense of their predators.

Impaired biota means that aquatic animal populations, including fish, reptiles, amphibians, insects, and other invertebrates are reduced, unhealthy, or absent. Many factors can impair aquatic biota. Excessive algal growth, warmer water temperatures, and reduced water flow can reduce the oxygen levels in aquatic environments and literally smother the plant and animal life in streams and lakes.[1] Algae blooms can occur as a result of eutrophication, the process of fertilization that causes high productivity and biomass in an aquatic ecosystem. Some algal blooms even produce chemicals that are toxic to humans and animals, known as biotoxins or cyanotoxins. Eutrophication can be a natural process, or it can be accelerated by an increase of nutrient loading to a lake by human activity. Invasive species can crowd out native species in riparian areas, change local species composition, affect structural integrity, and reduce the ecosystem's ability to remove pollutants from the environment. Altering the flow of water through activities like dam construction and irrigation can interrupt the overall functionality of water systems by slowing water flow, trapping sediments, changing temperature, and promoting the presence of invasive species. Altered flow may mean increased pollution levels and a harsher living environment, which can result in the loss of fish and other aquatic species.[1]


Photo: Fish kill in Cane Bayou, Louisiana, U.S. Geological Survey

Fish kills reduce fishing opportunities and degrade water quality as the fish decompose. Fish kills also decrease the overall recreational and aesthetic value of an area. They are usually the result of low oxygen, but contaminants and disease can also cause aquatic life to die.

Fish consumption advisories mean that fish or shellfish from a particular stream are no longer safe to eat. Fish advisories are often due to toxic chemicals such as PCBs or mercury. Shellfish can also contain microbes from sewage or manure.

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, due to pollution or other impairments. 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 in order 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 with Impaired Biota, provides information about the length of streams and other waters with impairments in 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 and protect water resources.

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Users can view this information along with other EnviroAtlas layers, such as impervious surface and riparian buffers, to identify possible sources of impairments and remediation needs. The map can be combined with layers on recreation or domestic water consumption to show how impairments relate to water use. This map can be viewed in conjunction with the stream length layer to find out what percent of stream length in a HUC contains impaired biota. Because the total length of streams in a HUC can vary, supplementing information on impairments with information on stream length can give a clearer picture of the extent of the impairments.

How were 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 NHDPlusV2 flowlines and a table listing impaired waters. The impairment causes were summarized into broad categories. For impaired biota, the causes are: Cause Unknown - Impaired Biota, Cause Unknown - Fish Kills, and Fish Consumption Advisory. The flowline features were split where they crossed cross 12-digit HUC boundaries, and the lengths of all waters impaired for biota were summed for each 12-digit HUC.

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 mapped data should be used to inform further investigation. Periodic updates to EnviroAtlas will reflect improvements to nationally available data.

This layer only represents waters on a state's approved 303(d) list; some impaired water bodies are not included in this layer. Additionally, when the biota is impaired due to a known pollutant, the pollutant might be listed as the impairment instead. This is especially true for fish consumption advisories. Therefore, this data may underrepresent the true levels of impaired biota.

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 length of streams in a 12-digit HUC may vary, this information should be considered in conjunction with data on stream density and stream lengths 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 layer list drop down menu on the interactive map. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

Acknowledgements

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Selected Publications

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