



Percent of Stream and Shoreline with 15% or More Impervious Cover within 30 Meters

This EnviroAtlas national map estimates within each 12-digit hydrologic unit (HUC) the percentage length of stream and waterbody shoreline that has 15% or more impervious cover within 30 meters of the bank or shoreline. Impervious surfaces are materials that do not allow the penetration of water, such as buildings, roads, and parking lots.

Why is impervious area important?

[Impervious surfaces](#) prevent rainwater from entering the soil. Pollutants from aerial and terrestrial sources accumulate on impervious surfaces until runoff from a precipitation event carries sediment, nutrients, metals, and pesticides into stormwater drains and directly to local waterbodies. As impervious surfaces increase, stormwater runoff increases in quantity, speed, temperature, and pollutant load. When impervious surfaces reach 10–20% of local watershed area, surface runoff doubles and continues to increase until, at 100% impervious surface coverage, runoff is five times that of a forested watershed.^{1,2} Excessive stormwater runoff also increases the potential for flooding.

These changes to the hydrologic regime from impervious surfaces create conditions that lead to waterbody degradation in developing areas. Multiple studies have shown that stream impairment begins at an impervious level of about 10% of watershed area.³ Runoff carrying excess nitrogen creates algal blooms and abundant aquatic plant growth ([eutrophication](#)). The breakdown of decomposing aquatic plants can create an oxygen deficit that negatively affects the health and productivity of aquatic animal species. Sediment and suspended solids reduce water clarity and light penetration, smother or retard the growth of beneficial aquatic plant life, and bury streambed gravel habitats essential for the sustainability of aquatic insects and fish spawning sites.^{4,6} Poor water quality can also affect aesthetic enjoyment, recreational opportunities, and the potential development of tourism or fishing.

Impervious surfaces affect the quantity, as well as the quality, of water resources. Normally, rainwater entering the soil recharges groundwater aquifers. Water percolates slowly through the soil to enter streams and rivers, contributing to base flows and regulating stream flow after precipitation events. Excessive runoff greatly reduces rainwater percolation and groundwater [recharge](#), thus contributing to



potential shortages in water supply for both surface and ground water.

Trees growing along roadways and in retention basins or [riparian](#) buffers can help mitigate the effects of impervious cover and benefit watersheds and communities by slowing surface water runoff and reducing the influx of pollutants into local waterbodies. Tree cover also helps reduce ambient and waterbody temperatures through evapotranspiration and shading. Trees in riparian buffers are capable of slowing and storing floodwater and filtering significant quantities of sediment, nutrients, and heavy metals from agricultural fields and urban stormwater runoff. Narrow buffer widths of 5–15 meters (16–49 feet) maintain bank stability and provide some temperature moderation, but they are inadequate for sediment and nutrient reduction. Narrow buffer strips are also subject to flood and wind damage. Maintaining breeding habitat for songbirds and wildlife corridors for the movement of large mammals requires wider buffer widths of 30.5–91.4 meters (100–300 feet).^{6,7}

How can I use this information?

This map gives a national and regional perspective of the distribution of HUCs that may contain degraded streams because of the proximity, within 30 meters, of 15% or more impervious cover within the HUC. Users can compare this map to other national EnviroAtlas maps such as Percent Impervious Area, Percent Developed Area, or Percent Forest and Woody Wetlands in Buffer. Within a particular HUC for example, one might compare this map with the metric

Percent Impervious Area to compare the extent of waterbody exposure to impervious surfaces relative to the proportion of impervious surface area in both upland and lowland areas.

By increasing the transparency of this map layer in the interactive map, users can view the landscape in an aerial imagery base map beneath with other EnviroAtlas data layers, such as streams and waterbodies (NHDPlus, found under Boundary Layers), National Wetlands Inventory wetlands, or assessed and impaired waters to identify possible sources of impairments and remediation needs. Comparison with EPA impaired waters data may assist in planning to maximize filtration capabilities when implementing [Total Maximum Daily Loads](#) in streams. Wetlands or riparian areas restored alongside impaired stream segments may help reduce pollutant, sediment, and nutrient loads to streams. Mitigation efforts may help local conditions near developed areas with high concentrations of impervious surfaces.

How were the data for this map created?

These data were generated by using the 2011 National Land Cover Dataset ([NLCD](#)) Percent Developed Impervious Surface Layer. To create this map layer, the impervious cover map was re-classed and split into 5 impervious class-specific maps: 0%, 1% - 4%; 5% - 14%; 15% - 24%; > 25%. The re-classed maps were combined and each pixel re-classified according to rules governing its nearest neighbors' impervious cover classes. This combined map was used with [NHDPlusV2](#) 1:100,000 streams and waterbodies data to determine the percentage of shoreline lengths with impervious cover $\geq 5\%$ within 30 meters and $\geq 15\%$ within 30 meters. Percent shoreline data were summarized by 12-digit HUC boundaries from [NHDPlusV2's WBD Snapshot](#). For details of the reclassification process and area tabulation, see the [metadata](#).

Selected Publications

1. Paul, M.J., and J.L. Meyer. 2001. [Streams in the urban landscape](#). *Annual Reviews of Ecological Systems* 32:333–365.
2. Arnold, C.L., and C.J. Gibbons. 1996. [Impervious surface coverage: the emergence of a key environmental indicator](#). *Journal of the American Planning Association* 62:243–258.
3. May, C.W., R.R. Horner, J.R. Karr, B.W. Mar, and E.B. Welch. 2003. [The cumulative effects of urbanization on small streams in the Puget Sound Lowland ecoregion](#). University of Washington, Seattle, Washington. 26 p.
4. Aponte Clark, G.P., P.H. Lehner, D.M. Cameron, and A.G. Frank. 1999. [Stormwater strategies: Community responses to runoff pollution](#). Pages 179-189 in Sixth Biennial Stormwater Research & Watershed Management Conference Proceedings, September 14-17, 1999, Tampa, Florida.
5. Schueler, T.R. 2003. [Impacts of impervious cover on aquatic systems](#). Watershed Protection Research Monograph No. 1. Center for Watershed Protection, Ellicott City, Maryland.
6. Palone, R.S., and A.H. Todd (eds.). 1997. [Chesapeake Bay riparian handbook: A guide for establishing and maintaining riparian forest buffers](#). NA-TP-02-97, U.S. Forest Service, Radnor, Pennsylvania.
7. Bentrup, G. 2008. [Conservation buffers: Design guidelines for buffers, corridors, and greenways](#). General Technical Report SRS-109. U.S. Forest Service, Southern Research Station, Asheville, North Carolina. 110 p.

What are the limitations of these data?

Though EnviroAtlas uses the best data available, there are limitations associated with the data. The landcover classes found in NLCD are created through the classification of satellite imagery. Human classification of landcover types that have a similar spectral signature can result in classification errors. As a result, NLCD is a best estimate of actual landcover. NHDPlus is also regularly updated. Updates may improve accuracy as data and classification methods improve. Periodic updates to EnviroAtlas will reflect improvements to nationally available data.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. The 2011 NLCD Percent Developed Impervious Surface Layer is available at the [MRLC](#) website. HUC boundaries are available for download (as the WBD Snapshot) from the [NHDPlusV2](#) website.

Where can I get more information?

A selection of resources on impervious cover and water quality is listed below. Information on the Clean Water Act, impaired waters, and Total Maximum Daily Loads can be found at the EPA Office of Wetlands, Oceans, and Watersheds [website](#). To ask specific questions about these data, please contact the [EnviroAtlas Team](#).

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