



Population near Major Roadway with Little to No Tree Buffer

This EnviroAtlas national map estimates the number of residents within 90 meters of busy roads (defined as interstates, arterial roads, and collector roads) that are bordered by little or no tree cover. The data are summarized by 12-digit hydrological unit ([HUC](#)).

Why are tree buffers near roads important?

Harmful air pollutants such as airborne particles, nitrogen dioxide, and carbon monoxide are found in high concentrations along busy roadways. Elevated levels of these pollutants, relative to community averages, can persist as much as 300m or more from the road edge. Tree cover near busy roadways may act as a buffer from these pollutants, helping to reduce their concentrations.

Worldwide, people who live, work, and go to school near roads are at a greater risk than the rest of the population for adverse health effects such as respiratory and cardiovascular symptoms, poor birth outcomes, and premature mortality, all of which have been associated with vehicular air pollution. Low-income and other socially disadvantaged citizens are typically located disproportionately in this near-road zone.¹ A research study on cancer risk from inhalation exposure to 29 air toxics in the state of Maryland found that census tracts in the lowest quartiles of median household income were 15 to 100 times more likely to be at high risk than those in the highest quartile of income. Results also indicated that near-road sources made the highest contribution to cancer risk.¹ Therefore, near-road air pollution is a subject of concern for reasons of [environmental justice](#) as well as general public health.

Studies have shown that tree cover adjacent to busy roadways can reduce concentrations of ultrafine particles and other gaseous air pollutants emitted by traffic. This buffering capacity is dependent on tree type, height, and density, wind speed and direction, and elevation of the roadway in relation to adjacent land. Pollution removal amounts vary regionally among cities depending on pollutant concentrations, amount of tree cover, length of in-leaf season, and amount of precipitation. Trees intercept fine particulates both day and night on leaves and bark, but trees filter gaseous pollutants most efficiently when in-leaf and during the daytime when they are transpiring water.² The tree canopy diverts the polluted airstream upwards and laterally, where it can mix with cleaner air and become diluted.³ Annual air pollution



removal of five major pollutants across the US by urban trees has been estimated at over 700,000 metric tons with an annual value of \$3.8 billion.² While near-road tree buffers are not a substitute for clean technologies and multi-modal transportation, they may represent healthful design solutions for existing roads, nearby buildings, and new projects.

How can I use this information?

The national map, Population near Major Roadway with Little to No Tree Buffer, can be used to regionally assess for each 12-digit HUC the number of persons living within 90 meters of busy roads that do not have tree buffers. Other national layers, such as percent impervious area, percent forested cover, or the atmospheric deposition layers for major pollutants such as nitrogen and sulfur dioxide may be overlaid with this human exposure layer to compare impacts among 12-digit HUCs. One may also take a more detailed view of population near roadways in the EnviroAtlas community maps section.

How were the data for this map created?

This map is based on the tree cover class from the 2011 National Land Cover Dataset ([NLCD](#)) percent tree canopy layer, the 2011 NAVTEQ road layer, and the EnviroAtlas dasymetric population dataset, which is based on the 2010 U.S. Census of the Population and the 2011 NLCD.

The roads layer was buffered by 90 m distance on either side from the edge (Figure 1). If there was at least one 30 meter pixel with tree cover within a 90 meter square window the area was considered to have tree cover. Those areas with tree cover

were then extracted from the dasymetric population grid. The remaining population count in the 90-m zone on each side of the roads was then summarized by 12-digit HUC using zonal statistics.

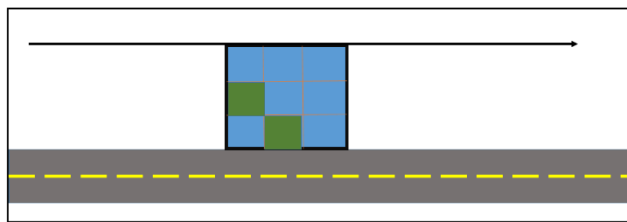


Figure 1. Illustration of Near-Road Tree Buffer Analysis: Each 3x3 window was assessed for three cover (green) and population (blue).

What are the limitations of these data?

All of the EnviroAtlas national maps that are based on land cover use remotely-sensed data. Remotely-sensed data in EnviroAtlas have been derived from imagery and have not been verified. These data are estimates and thus are inherently imperfect. For more information on the limitations of the underlying land cover data, please see the [NLCD](#) metadata.

The roads underlying this map were selected to capture heavy diesel, commuting, and other through-traffic across the area. However, they do not account for all hot spots of vehicular pollution. The threshold for buffer depth was selected based on preliminary field studies; more research is necessary to validate or refine this estimate. Optimal tree buffer configurations to consistently improve near-road air quality under variable local conditions are not currently known.

Selected Publications

1. Apelberg, B.J., T.J. Buckley, and R.H. White. 2005. [Socioeconomic and racial disparities in cancer risk from air toxics in Maryland](#). *Environmental Health Perspectives* 113: 693–699.
 2. Nowak D.J., D.E. Crane, and J.C. Stevens. 2006. [Air pollution removal by urban trees and shrubs in the United States](#). *Urban Forestry and Urban Greening* 4: 115–123.
 3. Baldauf, R.W., L. Jackson, G.S.W. Hagler, V. Isakov, G. McPherson, D. Nowak, T.A. Cahill, K.M. Zhang, C.R. Bailey, J.R. Cook, and P. Wood. 2011. [The role of vegetation in mitigating near-road air quality impacts from traffic emissions](#). *Air & Waste Manage Assoc. Environmental Manager (EM)* January edition.
- Health Effects Institute. 2010. [Traffic-related air pollution: A critical review of the literature on emissions, exposure, and health effects](#). Special Report 17, Health Effects Institute, Boston, Massachusetts.
- Houston, D., P. Ong, J. Wu, and A. Winer. 2006. [Proximity of licensed child care facilities to near-roadway vehicle pollution](#). *American Journal of Public Health* 96(9): 1611–1617.
- Karner A.A., D.S. Eisinger, and D.A. Niemeier. 2010. [Near-roadway air quality: Synthesizing the findings from real-world data](#). *Environmental Science and Technology* 44 (14): 5334–5344.

EPA’s dasymetric population estimates exclude unpopulated areas such as public land, steep slopes, and water, but they may allocate population incorrectly within pixels, including within private parcels of undeveloped land. This map is not meant to be used for inferring numbers or types of residents that are at risk for developing specific health conditions. For more information on the limitations of the underlying population data, please see the metadata associated with the EnviroAtlas national dasymetric population map.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. Land cover ([NLCD](#)) and 2010 [census data](#) are available on their respective websites.

Where can I get more information?

A selection of resources on the relationship of urban tree cover, ecosystem services, and human health and well-being is listed below. For additional information on data creation, access the [metadata](#) for the data layer from the drop down menu and click again on metadata at the bottom of the metadata summary page. To ask specific questions about these data, please contact the [EnviroAtlas Team](#).

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