



## Residential Population within 300m of Busy Roadway with >25% Tree Buffer

This EnviroAtlas community map estimates for each census block group the number of residents within 300m of busy roads that are bordered by 25% or greater tree cover in a 29m-diameter circular area. Busy roads are defined as interstates, arterial roads, and collector roads.

### 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 300 meters or more from the road edge. Tree cover near busy roadways may act as a buffer from these pollutants, helping to reduce their concentrations.

When compared with the rest of the population, people who live, work, and go to school near roads are at a greater risk for adverse health effects associated with near-road air pollution, such as respiratory and cardiovascular symptoms, asthma, poor birth outcomes, and premature mortality. Low-income and other socially disadvantaged citizens are typically located disproportionately in this near-road zone. Therefore, near-road air pollution is a subject of concern for reasons of environmental justice as well as general public health. Additional research is needed on near-road health effects, cleaner transportation technologies, and roadway and urban design options.

Tree cover adjacent to busy roadways has been shown to alter concentrations of ultrafine particles and other hazardous air pollutants emitted by traffic. This buffering capacity is highly dependent on tree type, height and density, wind speed and direction, and elevation of the roadway in relation to adjacent land. Studies show that the tree canopy is capable of filtering air pollutants and diverting the polluted airstream upwards and laterally, where it can mix with cleaner air and become diluted.

While near-road tree buffers are not a substitute for clean technologies and multi-modal transportation choices, they may represent healthful design solutions for existing roads and nearby buildings and for new projects and expansions.

### How can I use this information?

The map, Residential Population within 300 Meters of Busy Roadway with >25% Tree Buffer, can be used to assess the extent of buffered near-road populations across a community



and find disparities in benefits between neighborhoods. When overlaid with this map, socio-economic layers within EnviroAtlas can highlight specific age groups and other sensitive populations who may be differentially exposed to near-road air pollution and for whom tree buffers could be especially beneficial.

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

This map is based on the [land cover](#) data derived for each EnviroAtlas community, the best available local road layer that included either surface width or number of lanes as an attribute, and the 2010 U.S. Census of the Population. The land cover data were created from one-meter aerial photography through remote-sensing methods.

A moving-window analysis first determined the percent of tree cover within a given distance from every point in the community. Then the roads layer was used to extract only those windows that captured percent tree cover along road edges (Figure 1).

The 25% threshold estimates a 10m buffer depth, which was selected to represent three adjacent rows of trees. On average across all possible roadway orientations within the moving window, a 10m strip of tree cover that is parallel to the road is equivalent to 25% of the area of the moving window.

The population estimate was calculated by creating a 300 meter buffer on each side of the roads and extracting the modeled population values for all areas adjacent to buffered roadways from EPA's [dasymetric](#) population product (mapped to 30m resolution from 2010 Census block-level

data). The buffers were corrected for overlap prior to calculating the population.

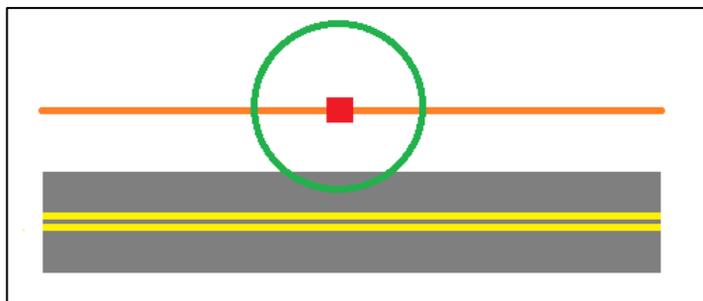


Figure 1. Illustration of Near-Road Tree Buffer Analysis: Each 1m pixel (red square) was attributed with the total number of tree-cover pixels in the surrounding window (green, 29m-diameter circle). By retaining only the pixels along a set distance (orange line) from road edges, the analysis captured tree cover beyond the road shoulder and cleared right-of-way, if present, and avoided tree cover in the median, if present, and on the opposite side of the road (not to scale).

Residents estimated to live within 26 meters of the edge of a buffered road were excluded from the population total because there is uncertainty with the methods used as to where the tree cover is located within the moving window. Therefore, it cannot be determined if people living within the window itself are buffered from traffic pollution.

### What are the limitations of these data?

All of the EnviroAtlas community 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 are inherently imperfect. For more information on the limitations of the underlying land cover data, please see the metadata associated with the land cover map for each relevant community.

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 community hot spots of vehicular pollution, such as busy stoplights along local streets. The 10m threshold for buffer depth was selected based on preliminary field studies; more research is necessary to

### Selected Publications

Baldauf, R.W., L. Jackson, G.S. 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 air quality impacts from traffic emissions](#). *Air & Waste Management Association 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. Accessed October 2020.

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.

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.

validate or refine this estimate. It is not currently known what configurations of tree buffer most improve near-road air quality for a wide variety of local conditions.

EPA's [dasymetric](#) population estimates exclude unpopulated areas such as public land, steep slopes and water, but 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. To find the EnviroAtlas 1-meter land cover grids created for each community, enter *land cover community* in the interactive map search box.

### Where can I get more information?

Numerous resources are available on the relationships among tree cover, ecosystem services, and human health and well-being; a small selection of these is listed below. In-depth information on the relationships between urban tree cover and human health and well-being can be found in EPA's [Eco-Health Relationship Browser](#). For additional information on the data creation process, access the [metadata](#) found in the layer list drop-down menu for map layers in the EnviroAtlas interactive map. To ask specific questions about these data, contact the [EnviroAtlas Team](#).

### Acknowledgments

The analysis for Residential Populations within 300m of Busy Roadway with >25% Tree Buffer was conducted by Alexandra Mackey, EPA Student Services Contractor. The fact sheet was created by Jessica Daniel and Alexandra Mackey, EPA Student Services Contractors, and Laura Jackson, EPA.