



Percent of Busy Roadway Bordered by >25% Tree Buffer

This EnviroAtlas community map estimates the percent of road length in each travel direction along busy roads bordered by >25% tree cover for each census block group. 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, poor birth outcomes, and premature mortality. Low-income and other socially disadvantaged populations 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 focused on 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.

Near-roadway tree cover provides additional benefits that can improve quality of life in the surrounding area. It may reduce traffic noise, increase the aesthetic enjoyment and value of homes and other buildings, and lower [ambient](#) air temperatures. Trees along roads may serve as wildlife habitat. For example, migratory birds use small patches of trees along roads to rest and refuel during migration.¹ Species that do not need core forest habitats, such as edge specialists and generalists, may also be found in these tree



buffers. The benefits that trees provide may encourage people who live in these areas to spend more time outdoors than they might otherwise.

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 and nearby buildings, and for new projects and expansions.

How can I use this information?

The map, Percent of Busy Roadway Bordered by Tree Buffer, can be used to assess the extent of buffered roadways 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 populations who are 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, and the best available local road layer that included either surface width or number of lanes as an attribute. 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).

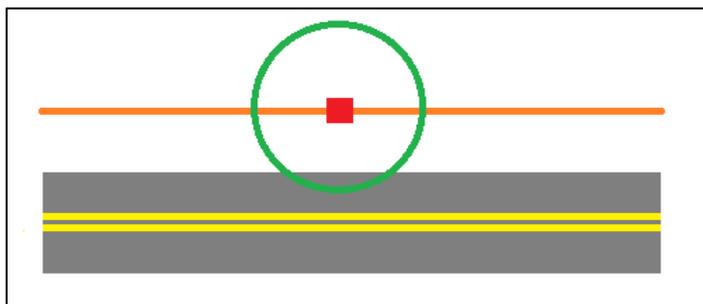


Figure 1. Illustration of Near-Road Tree Buffer Analysis: Each 1m pixel (red square) was attributed with the total number of tree-cover pixels in the surrounding window (green, 29m-diameter circle). By retaining only the pixels along a set distance (orange) from road edges, the analysis captured tree 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).

The 25% threshold estimates a 10 m buffer depth, which was selected to represent three adjacent rows of trees. On average across all possible orientations of the roadway 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.

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 school bus and carpool lanes and busy stoplights along local streets. The

Selected Publications

1. Matthews, S.N., and P.G. Rodewald. 2010. [Urban forest patches and stopover duration of migratory Swainson's thrushes](#). *The Condor* 112(1): 96–104.
- Hagler, G.S., M.Y. Lin, A. Khlystov, and R.W. Baldauf. 2012. [Field investigation of roadside vegetative and structural barrier impact on near-road ultrafine particle concentrations under a variety of wind conditions](#). *Science of the Total Environment* 419: 7–15.
- 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.
- Shin, W.S. 2007. [The influence of forest view through a window on job satisfaction and job stress](#). *Scandinavian Journal of Forest Research* 22:3: 248–253.

10m threshold for buffer depth was selected based on preliminary field studies; more research is necessary to 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. This map is not meant to be used for inferring numbers or types of residents that are at risk for developing specific health conditions.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. EnviroAtlas land cover maps created for each community are available under the Supplemental Maps tab in the interactive map table of contents.

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 publications 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 data creation, access the metadata found in the drop-down menu for each map layer listed in the EnviroAtlas table of contents and click again on metadata at the bottom of the metadata summary page for more details. To ask specific questions about these data, contact the [EnviroAtlas Team](#).

Acknowledgments

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