



## Estimated Percent of Tree Cover within 26m of a Road Edge

This EnviroAtlas community map estimates the percent of tree cover in a 29m-diameter circular area adjoining busy roads, defined as interstates, arterial roads, and collector roads, for contiguous points in each travel direction.

### Why are tree buffers near roads important?

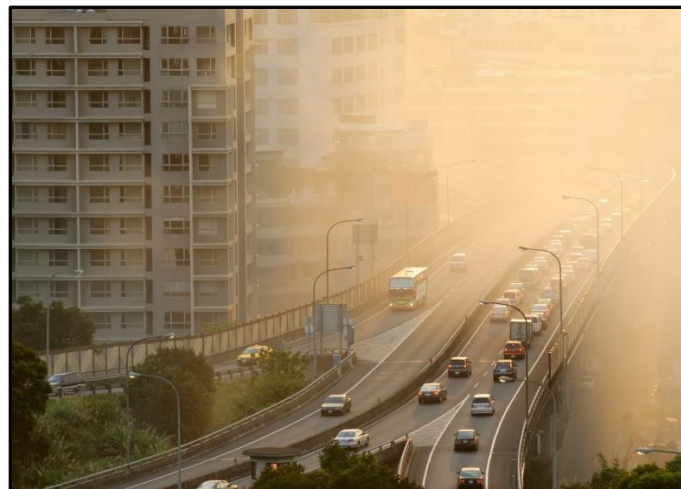
Harmful air pollutants such as airborne particles, nitrogen dioxide, and carbon monoxide are found in high concentrations along busy roadways. Elevated levels of these pollutants, relative to community averages, can persist as much as 300m or more from the road edge. Tree cover near busy roadways may 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, that are associated with near-road air pollution. 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; research on health effects, cleaner transportation technologies, and roadway and urban design options is ongoing.

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, they may represent healthful design solutions for existing roads and nearby buildings and for new projects and expansions.

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



Trees along roads can also serve as wildlife habitat. For example, migratory birds use small patches of trees along roads to rest and refuel during migration.<sup>1</sup> Species such as edge specialists and generalists that do not need core forest habitat may also be found in near-road tree buffers.

### How can I use this information?

The map, Estimated Percent of Tree Cover within 26m of a Road Edge, can be used to identify the locations of near-road areas with varying amounts of tree buffer across the community. When viewed with aerial photography available in EnviroAtlas, users can assess existing land uses that may currently benefit from near-road tree buffers and those where buffering could be enhanced. This map can also be used with local development plans to determine where the siting of high-occupancy buildings and those for especially vulnerable populations can utilize existing tree buffers, and where additional roadway buffering may be advised.

### 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 1-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).

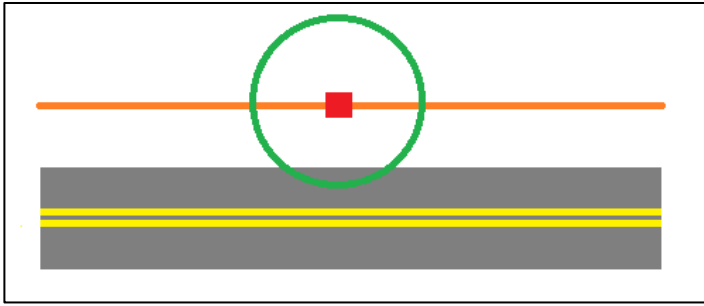


Figure 1. Illustration of Near-Road Tree Buffer Analysis: Each 1m pixel (red) was attributed with the total number of tree-cover pixels in the surrounding window (green, 29m-diameter circle). By retaining only the pixels along a set distance (orange) from road edges, the analysis captured tree cover 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 10m 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.

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 10m threshold for buffer depth was selected based on preliminary field studies; more research is necessary to validate or refine this estimate.

### 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: 96–104.
- Hagler, G.S., M.Y. Lin, A. Khlystov, R.W. Baldauf, V. Isakov, J. Faircloth, and L.E. Jackson. 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.
- 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.
- 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.

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. 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.

### 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

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