EnviroAtlas
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Fact Sheet
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Percent Tree Cover in 15 Meter Stream and Lake Buffer

This EnviroAtlas community map portrays the percent tree cover within 15 meters of streams, rivers, and other hydrologically connected waterbodies (e.g., lakes and ponds) within each census block group. Tree cover includes groups of trees, forests, and woody wetlands. It excludes orchards because of the potential application of pesticides and fertilizer that could pollute waterways.

Why are stream buffers important?

Tree cover adjacent to streams and rivers, also called the riparian area (or riparian buffer), helps protect terrestrial wildlife habitat, aquatic habitat, and water quality. Natural riparian buffers may exist at varying distances from a waterbody depending on the occurrence and width of flood plains, hydric soils, or associated wetlands. In more developed areas, a riparian buffer represents a vegetated area occurring between a waterbody and adjacent human disturbances. To provide community riparian buffers for spatial analysis, EnviroAtlas community maps use two fixed-distance buffer widths, 15 and 50 meters, while national EnviroAtlas stream buffer maps apply a 30 meter buffer. Maintaining vegetated cover in stream buffers benefits water quality at the site as well as downstream. Land management in upstream areas directly affects the water quality in downstream rivers, bays, and estuaries.

By slowing and processing stormwater runoff, riparian tree cover can prevent sediment, nutrients, harmful bacteria, pesticides, and metals from entering waterbodies to degrade water quality. By storing water and securing the stream bank with roots, riparian trees can reduce flood potential, help prevent erosion, and minimize downstream property damage. The ability of riparian vegetation to filter pollutants and store floodwater varies with local climate, buffer width, slope, soil permeability, and depth to water table.[1]

Studies have shown that sediment removal by trees ranges from 60–90% depending on buffer area, slope, and the volume and velocity of runoff.[1] Toxic substances adhering to sediment particles may be modified by soil microorganisms into less harmful forms and made available to plants. A published review of 66 studies covering nutrient removal by mixed buffer vegetation found that 75% and 90% of excess nitrogen was removed from mean buffer widths of 28 and 112 meters (92 and 367 feet), respectively.[2]

Tree cover in stream buffers provides critical wildlife habitat for resident and migratory wildlife species that depend on riparian areas for cover, food, and water. Buffers create corridors for wildlife to safely move between patches of habitat. Riparian trees provide canopy cover for the waterbody, helping to regulate the temperature of the water and protect habitat for fish, amphibians, and aquatic insects. The benefits of aquatic and riparian habitat extend beyond the stream segment to support biodiversity downstream, throughout the watershed, and in the surrounding region.

Although the ecosystem services provided by riparian buffers are well-known, determining the optimum widths necessary for buffers to deliver specific benefits and functions (e.g., flood storage, temperature moderation, nutrient filtering) is more difficult. Streams with adjacent intense disturbances require wider buffers.[3] 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.[3] 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).[3,4]

How can I use this information?

The map, Percent Tree Cover in 15 Meter Buffer, is one of six EnviroAtlas maps that illustrate land area, tree cover, and vegetated cover within 15 meters of the banks of community streams and lakes. The related map, Estimated Tree Cover in 15 Meter Buffer, can be overlaid on this layer to show the

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buffered stream network. An area can be more thoroughly investigated by increasing the transparency on this map and adding layers for streams and waterbodies (NHD) from Supplemental Maps to the aerial imagery base map. Other background layers, like community boundary and high resolution community landcover data, can also be found in Supplemental Maps. Detailed examination shows land cover along streams and reveals where upstream areas may be contributing to problems in downstream communities. Map analysis can help identify disparities in benefits among block groups, for example, flood-prone areas or source areas of heavy metals or nutrients that lack nearby woodland to filter pollutants. Planners and other interested users can explore where riparian restoration would have the greatest return in terms of improving water quality in nearby waterbodies. Many states have developed guidelines for riparian buffer best management practices (BMPs) and may include recommended buffer widths for various functions.

How were the data for this map created?

These data were generated by buffering the stream lines and waterbodies from the high resolution (1:24,000 or higher) National Hydrography Dataset (NHD) by 15 meters on each side. The percent area of tree cover within the 15 meter buffer was calculated for each block group using the EnviroAtlas 1 meter resolution Community Land Cover. Waterbodies that are not hydrologically connected were not included in the analysis.

What are the limitations of these data?

All of the EnviroAtlas community maps that are based on land cover rely on aerial imagery and other remotely-sensed data. These data are estimates that are inherently imperfect. The land cover maps used in the community component of EnviroAtlas typically have an overall accuracy of between 80 and 90%, meaning that there is a probability of at least 80 percent that the land cover reported at any given point corresponds to what appears in the native aerial imagery. The quality of the NHD streamlines varies between regions, and the data may not capture all streams. These data will be updated over time; updates are expected to improve accuracy as data and classification methods improve.

Although fixed-distance buffers are commonly used in spatial analysis, they do have limitations relative to variable-distance buffers. Along a stream network, riparian cover may be narrower or wider than the fixed-distance buffer. Fixed-distance buffers cannot account for differences among buffer areas because of gaps in riparian vegetation, upslope sources of pollutants, or upslope forested areas.[5] They do not reflect upstream-downstream patterns of watershed land cover, differences between forested and unforested stream banks, or flowpaths for runoff influenced by local topography.[5] A full research effort, one that considered variable buffer widths, would be required to get a more accurate estimate of local buffer filtering capabilities.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded.

Where can I get more information?

A selection of resources related to riparian buffers and their benefits is listed below. For additional information on the data creation process, access the metadata for the data layer from the drop down menu on the interactive map table of contents and click again on metadata at the bottom of the metadata summary page for more details. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

Acknowledgments

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Selected Publications

1. Nowak, D.J., J. Wang, and T. Endreny. 2007. Chapter 4: Environmental and economic benefits of preserving forests within urban areas: air and water quality. Pages 28–47 *in* de Brun, C.T.F. (ed.), The economic benefits of land conservation. The Trust for Public Land, San Francisco, California.

2. Mayer, P.M., S.K. Reynolds, M.D. McCutchen, and T.J. Canfield. 2006. Riparian buffer width, vegetative cover, and nitrogen removal effectiveness: A review of current science and regulations. EPA/600/R-05/118. U.S. Environmental Protection Agency, Cincinnati, Ohio.

3. 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.

4. 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.

5. Baker, M.E., D.E. Weller, and T.E. Jordan. 2006. Improved methods for quantifying potential nutrient interception by riparian buffers. *Landscape Ecology* 21 (8): 1327–1345.