Total Land Area in 50 Meter Stream and Lake Buffer

This EnviroAtlas community map portrays the total land area within 50 meters of streams, rivers, and other hydrologically connected waterbodies (e.g., lakes and ponds) within each census block group.

Why are stream buffers important?

Vegetation 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, saturated soils, or associated wetlands. In more developed areas, a riparian buffer represents a vegetated area occurring between a waterbody and adjacent human disturbances. 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 vegetation can prevent sediment, nutrients, harmful bacteria, pesticides, and metals from entering the waterway and degrading 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. Forested riparian buffers provide as much as 40 times the flood water storage of a cropped agricultural field and 15 times that of grass turf because of the ability of tree canopy to capture rainfall on the surface area of the leaves, stems, and branches and to take up water through deep roots.[1] Studies have shown that sediment removal by trees ranges from 60–90%. Toxic substances adhering to sediment particles may be modified by soil microorganisms into less harmful forms and made available to plants.[2] The capacity of riparian vegetation to filter pollutants and store floodwater varies with local climate, buffer width, slope, soil permeability, and depth to water table.[1, ,2]

Vegetation 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 vegetation provides 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.[1] 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.[1] 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).[1,3] Maximizing land area in community riparian buffers provides opportunities for multiple ecosystem services. The total land area and percent land area maps allow comparisons among block groups in total buffer land area available relative to buffer area that is vegetated, developed, or already in conservation status.

How can I use this information?

The map, Total Land Area in 50 Meter Stream and Lake Buffer, is one of six EnviroAtlas maps that illustrate land area, tree cover, and vegetated cover within 50 meters of the banks of community streams and lakes. The related map, Percent Land Area in 50 Meter Stream and Lake Buffer, can be used with this layer to compare riparian buffer land area occurring within and among block groups. Other maps in the

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series provide more specific information on relative amounts of tree cover, vegetated cover, and impervious surfaces within the 50 meter buffers.

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, are also located 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 50 meters on each side. The total land area in square meters within the 50 meter buffer was calculated for each block group. 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 photography. 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.[4] 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.[4] 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.

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Selected Publications

1. 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.

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3. 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.

4. 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.