Percent Developed Area

This EnviroAtlas national map estimates the percent of developed or urban land within each 12-digit hydrologic unit (HUC) in the contiguous United States. For this map development includes parks, golf courses, single family homes, multifamily housing units, retail, commercial, industrial sites, and associated infrastructure. This definition is based on developed land cover classes in the EnviroAtlas hybrid 2011 Cropland Data Layer (CDL) - 2011 National Land Cover Dataset (NLCD) rather than metropolitan area or population density.

Why is percent developed area important?

Developed areas represent urban or suburban areas are where people live, work, and play. These activities demand infrastructure such as roads, sewers, storm drains, pipelines, houses, stores, office buildings, and other constructed amenities. The building of towns and cities, and the networks that connect them changes the landscape and the land cover of an area. There is an increasing recognition of the impacts urban land has on surrounding ecosystems and the benefits ecosystems provide.

Development of an area can greatly affect surrounding ecosystems by increasing the volume and rate of air and water pollution, which may reduce air quality and water quality in these areas. Natural vegetation, especially forests, helps mitigate air pollutants by storing carbon, which helps maintain a balance between carbon storage and carbon emissions. The loss of natural vegetation, combined with pollution associated with urbanized areas can reduce air quality. Additionally, increases in impervious surfaces, such as roads and rooftops, can raise the temperatures in these areas. Higher temperatures may contribute to the chemical reactions that produce ground-level ozone and smog, which can affect human health and well-being.

In terms of water quality, the daily activities in urban areas create sediment, nutrients, harmful bacteria, pesticides, and other pollutants. Most storm drains located in parking lots and streets flush directly into streams and rivers with no filtration or treatment. Historically, they have been designed to remove water quickly downstream to prevent flooding. The unintended side effects of this type of construction result in altered stream flow and velocity, which lead to greater erosion and sedimentation. To minimize the impacts of stormwater on downstream areas, development has begun to focus on detaining and filtering stormwater runoff on-site. These efforts help provide better flood control, improved water quality, and groundwater replenishment.


Photo: : *Lynn Betts, NRCS*

Increased urbanization can also impact both terrestrial and aquatic wildlife. Development can break up large areas of natural vegetation into smaller lower-quality habitat. It can also force animals to cross large roadways in order to migrate or find shelter. Additionally, the loss of vegetation from urban development can expose waterways to the sun and increase stormwater runoff. Both these impacts may increase water temperatures. Heightened temperatures in streams and rivers decrease the dissolved oxygen, making it difficult for fish and other aquatic animals to survive.

How can I use this information?

This map, Percent Developed Area, provides an estimate of development within a region. Used in conjunction with other land cover maps, such as Percent Forest or Percent Wetlands, these data can be used to evaluate the balance of land cover types within a 12-digit HUC.

The processes through which these data were generated could be applied to other land cover data, such as the 2001 NLCD data. Using data from different time periods may help determine if an area has experienced significant change in development over this time period. Significant change in land cover over a period of time may suggest implications for regional ecosystems and the services they provide. NLCD maintained the same mapping methods among versions after 2001, allowing for direct comparison of map

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layers and the production of change detection maps to identify changes in land cover and urban development.[1] However, the updated 2011 Editions of NLCD 2001 and NLCD 2006 must be used in any comparison of NLCD 2001 and NLCD 2006.

How were the data for this map created?

For this map, the percent developed area within each 12-digit HUC was calculated by putting an EnviroAtlas hybrid 2011 Cropland Data Layer (CDL) - 2011 National Land Cover Dataset (NLCD) and the March 2011 Watershed Boundary Dataset (WBD) into EPA's landscape assessment tool, Analytical Tools Interface for Landscape Assessments (ATtILA). The four "developed" categories (classes 21-24) in the NLCD were aggregated, resulting in percent developed area. As with all the land cover metrics in EnviroAtlas, water was excluded from the total area in the percentage calculation. For more information on the calculation, please see the ATtILA User Guide. For more detailed information on the processes through which this data was generated, see the layer's metadata.

What are the limitations of these data?

All national data layers, such as the NLCD and WBD, are inherently imperfect; they are an estimation of the truth based on the best available science. Calculations based on these data are, therefore, also estimations. The NLCD estimates land cover based on a classification of satellite imagery; the process of classifying imagery into land cover types is not 100% accurate. Accuracy information for the NLCD and the WBD can be found on their respective web sites. Information on ATtILA and its limitations can be found on its website or in the ATtILA User Guide.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. The National Land Cover Database and the Watershed Boundary Dataset can be downloaded at their respective websites. The EPA ATtILA tool is accessible through the EnviroAtlas website.

Where can I get more information?

There are numerous resources on the impacts of urbanization and development on ecosystems and the services they provide; a small selection of these resources is listed below. The EnviroAtlas website lists a number of related websites and resources on its related links page. EnviroAtlas also provides resources on the relationships between urban ecosystems, public health, and well-being in the Eco-Health Relationship Browser. For additional information on how the data were created, 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 map contact the EnviroAtlas Team.

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Selected Publications

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