



Percent Developed Area

This EnviroAtlas national map estimates the percent of developed or urban land within each 12-digit hydrologic unit (HUC). 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 rather than metropolitan area or population density. For the conterminous U.S., the land cover classes come from the EnviroAtlas hybrid 2016 Cropland Data Layer (CDL) – 2016 National Land Cover Dataset (NLCD). Alaska is based on the 2016 NLCD; Hawaii is derived from the 2005–2011 National Oceanic and Atmospheric Administration’s Coastal Change Analysis Program (C-CAP) data, Puerto Rico from 2010 C-CAP, and the U.S. Virgin Islands from 2012 C-CAP data.

Why is percent developed area important?

Developed areas represent urban or suburban areas 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.

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.

Development can create changes in land cover that may have implications for regional ecosystems and the services they provide. This map can be used to identify areas at risk from development; for example, it can be compared to maps showing species richness or protected lands ([PADUS](#), [GAP](#),

or [IUCN](#) data available in EnviroAtlas) to examine where development may be encroaching on sensitive habitat. It can also be compared to EnviroAtlas maps showing recreation demand, historic places, or natural land cover to assess whether urban areas have sufficient access to recreation.

How were the data for this map created?

The percent developed area within each 12-digit HUC was calculated by using an EnviroAtlas hybrid 2016 CDL-NLCD map for the conterminous U.S., 2016 NLCD for Alaska, 2005–2011 C-CAP for Hawaii, 2010 C-CAP for Puerto Rico, and 2012 C-CAP for the U.S. Virgin Islands. The land cover data was used in the landscape assessment tool, Analytical Tools Interface for Landscape Assessments ([ATiLA](#)). ATiLA is an Esri ArcGIS extension created by EPA that calculates many commonly used landscape metrics. The four development categories (classes 21–24 in the NLCD and 2–5 in C-CAP) were aggregated to create percent developed area. As with all the land cover metrics in EnviroAtlas, water was excluded from the total area in the percentage calculation. The landcover data were summarized by 12-digit HUC boundaries taken from the [NHDPlusV2](#) Watershed Boundary Dataset (WBD Snapshot) for the conterminous U.S., Hawaii, Puerto Rico, and the U.S. Virgin Islands. The WBD November 24, 2016 version was used for Alaska. For more information on the calculation, please see the [ATiLA](#) User Guide.

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 and C-CAP estimate 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, C-CAP, and WBD can be found on their respective web sites. Information on ATiLA and its limitations can be found on its website or in the [ATiLA](#) 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 ([NLCD](#)) and the Watershed Boundary Dataset ([WBD](#)) can be downloaded at their respective websites. The EPA [ATiLA](#) 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 references is listed below. The EnviroAtlas website lists several 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 layer list drop down menu on the interactive map. To ask specific questions about this map contact the [EnviroAtlas Team](#).

Acknowledgments

EnviroAtlas is a collaborative effort by EPA, its contractors, and project partners. Timothy Wade, EPA, developed this map for EnviroAtlas. The fact sheet was created by Jean Mayo, Oneida Total Integrated Enterprises (OTIE), and Elena Horvath and Jessica Jahre, EPA Student Services Contractors.

Selected Publications

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