EnviroAtlas

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Fact Sheet

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Phoenix, Arizona Land Cover

EnviroAtlas maps for community landcover data depict major landcover classes at a 1-meter resolution for selected communities. The high resolution urban landcover data provides a base layer for the development of metrics and analyses that illustrate the benefits of natural resources to local communities.

Why is community land cover important?

Land cover data represent the surface components of the land that are physically present and visible; the use of land cover data provides a means to examine landscape patterns and characteristics. EnviroAtlas presents landcover information at two major spatial scales: a national scale represented by 30-meter resolution landcover data and a higher 1-meter resolution for selected communities. Existing National Land Cover Data (NLCD) processed at 30-meter spatial resolution are too coarse to measure many urban phenomena. To support community mapping activities, the EnviroAtlas Team developed a high spatial resolution (1-meter scale) urban land cover (ULC) map that quantifies the type and areal extent of the material at earth's surface, such as trees, grass, impervious surfaces, water and barren land. It is a foundational layer for the EnviroAtlas community component that serves as input to approximately 85 sustainability and ecosystem services data layers. These ULC data are derived from one-meter-pixel aerial photos, and they represent the detailed biophysical landscape of urban life and infrastructure. The ULC classes are similar to those in NLCD, but there are approximately 900 ULC pixels inside the footprint of one 30x30 meter NLCD pixel.

Land cover is the ecosystem matrix in which cities are embedded. Land cover data are necessary to sound urban planning and sustainable development. Anticipated users of these data include city and county environmental decision makers, water authorities, wildlife and natural resource managers, citizens, teachers, and students. Some potential applications of this map include stormwater and urban heat island mitigation[1]; habitat, wildlife corridors, and riparian buffers; recreation and access to green space; urban forestry; conservation; and urban landscape ecology.

Created from aerial photography, the EnviroAtlas ULC data present a "birds-eye" view that can help identify important features, patterns, and relationships in the landscape. Each land cover class has characteristic biophysical properties and processes that contribute to a healthy urban environment. The importance of high resolution landcover data is to provide a detailed picture of the urban environment and its ecosystem matrix for analysis of multiple ecosystem services metrics.

How can I use this information?

The ULC data can be used alone or combined visually and analytically with other EnviroAtlas data layers to assess the distribution of natural resources and their benefits to community health and well-being. Approximately 85 EnviroAtlas data layers and metrics incorporate meter-scale urban land cover in their computation, including:

- Total carbon stored in above ground biomass (mt)
- Reduction in annual stormwater runoff (m^3/yr)
- Value of asthma exacerbation cases avoided due to sulfur dioxide removed ($/yr)
- Percent tree cover within 15 m of roadway
- Reduction in median load of nitrites and nitrates, phosphorous, and total suspended solids (kg/yr) from filtration by trees

Urban land cover data show land cover patterns that control or influence human and ecosystem health in the urban landscape and support numerous lines of investigation. Metric information derived from this landcover data is summarized by census block groups. Levels of ecosystem

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services may be compared among different neighborhoods using the census block group reporting framework. Which streets need more trees? What areas are mostly composed of impervious surfaces and subject to urban heat island and stormwater runoff effects? Do urban streams have vegetated buffers? Current landcover data is also useful for analysis of future development scenarios—for example, envisioning planned development alternatives with current policies or more or less stringent policies and development pressures.[2]

Note: The Transparency Slider (found in the i-button drop down menu next to the map layer name) may be used to see through the land cover data and explore how the land cover relates to aerial imagery and other EnviroAtlas layers. Experiment with multiple layer blending using 50–100% transparent land cover overlaid on an imagery basemap.

How were the data for this map created?

These data were generated from digital image processing, air photo interpretation and supervised classification of aerial photography from the United States Department of Agriculture (USDA) National Agricultural Imagery Program (NAIP). NAIP characteristics include three visible and one near-infrared spectral bands, 1-meter spatial resolution, nation-wide availability on a three year update cycle, and low to no cost.

Researchers with the Environmental Remote Sensing and Geoinformatics Lab (ERSG) at Arizona State University (ASU) utilized Object Based Image Analysis (OBIA) techniques and rule sets to classify the land cover for the Central Arizona-Phoenix Long-Term Ecological Research (CAP LTER) project. ASU's classification had additional distinct classes (e.g., swimming pools, seasonal river, etc.) that were collapsed into seven land cover types: Impervious Surface, Soil-Barren, Grass-Herbaceous, Tree-Forest, Shrub, Agriculture, and Water. The CAP LTER project area encompasses the majority of the EnviroAtlas Phoenix study area. EPA utilized a machine learning, automated feature extraction software for the area outside of CAP LTER project. Hand editing was used as needed. Data were organized and manipulated in a GIS. A full description of the remote sensing classification techniques is given in each city's metadata.

What are the limitations of these data?

All land cover maps are, by their nature, imperfect, and the metrics generated from land cover maps cannot be taken as absolute truth, but as the best estimation of that truth based on the best available data. Full accuracy results are reported in the map metadata. Accuracy information for the source data sets can be found on their respective web sites.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. To acquire the imagery data (NAIP), wetland data (NWI), or water data (NHD) used to generate this land cover, please visit the respective web sites for those datasets.

Where can I get more information?

A selection of resources related to landcover and community analyses is listed below. In-depth information on the relationships between urban ecosystems, such as green space 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 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 these data, please contact the EnviroAtlas Team.

Acknowledgments

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Selected Publications

1. Rosenzweig, C., W. Solecki, L. Parshall, S. Gaffin, B. Lynn, R. Goldberg, J. Cox, and S. Hodges. 2006. Mitigating New York City's heat island with urban forestry, living roofs, and light surfaces. National Aeronautics and Space Administration, Washington, D.C.

2. Baker, J.P., D.W. Hulse, S.V. Gregory, D. White, J. Van Sickle, P.A. Berger, D. Dole, and N.H. Schumaker. 2004. Alternative futures for the Willamette River Basin, Oregon. *Ecological Applications* 14(2): 313–324.

Anderson, J.R., E.E. Hardy, J.T. Roach, and R.E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. Geological Survey Professional Paper 964, U. S. Geological Survey, Washington, D.C.

Lockaby, B.G., D. Zhang, J. McDaniel, H. Tian, and S. Pan. 2005. Interdisciplinary research at the urban-rural interface: The WestGA Project. *Urban Ecosystems* 8:7–21.

Myeong, S., D.J. Nowak, P.F. Hopkins, and R.H. Brock. 2001. Urban cover mapping using digital, high-spatial resolution aerial imagery. *Urban Ecosystems* 5: 243–256.