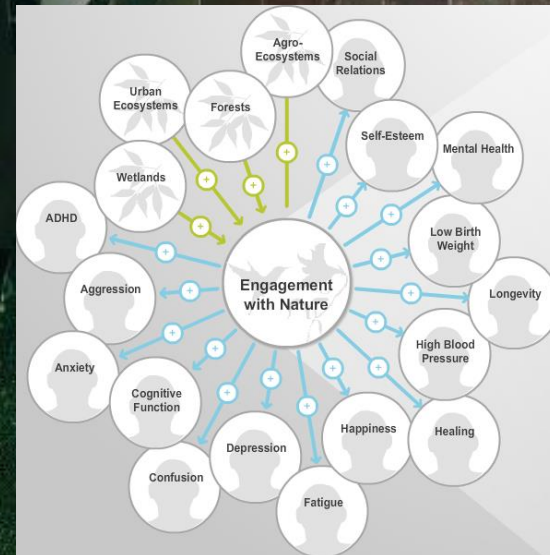


Online Decision Tools for Identifying Nature's Benefits, Deficits, and Opportunities for Equitable Distribution

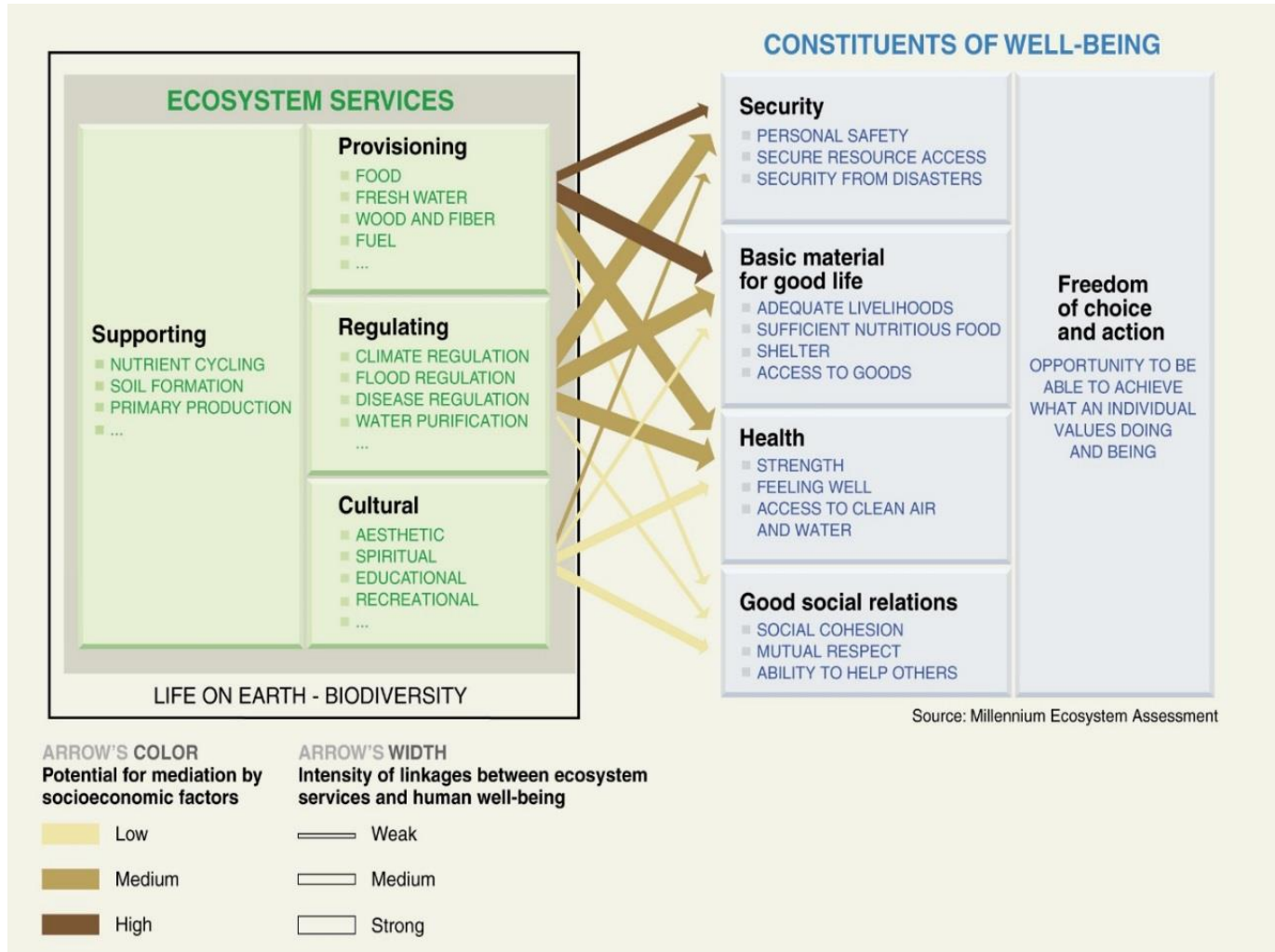


Laura Jackson, Ph.D.

New Partners for Smart Growth

January 30, 2015

International “Ecosystem Services” Framework



Related concepts:

*“benefits from nature,” “green infrastructure,” “our life-support system,”
“positive environmental exposures”*

Ecosystem Services and Health & Well-Being: Unrealized Assets = Unintended Consequences

Approach: Demonstrate Multiple Benefits of Green Infrastructure,

- Clean air
- Clean & plentiful water
- Natural hazard mitigation
- Climate stabilization
- Recreation, culture & aesthetics
- Food, fiber & materials
- Biodiversity conservation

...and How They Relate to Human Health & Well-Being

- *Air and water pollutants removed by neighborhood tree cover*
- *Homes and schools near busy roadways*
- *Extreme heat events*
- *Opportunities for physical exercise, social engagement, outdoor experience, and play*

Boiling it down: Hazard Buffering and Health Promotion

How Does *Green Space* Affect Health?

Prevailing Mechanistic Theories behind Engagement with Nature

*

Stress Reduction

Ulrich 1993

Decreased cortisol and blood pressure

(Hartig et al. 2003; Lee et al. 2011; Park et al. 2008; Thompson Coon et al. 2011)

*

Attention Restoration

Kaplan and Kaplan 1989

Improved attention and cognitive function

(Hartig 2008; Kuo and Taylor 2004; Pretty et al. 2005; Taylor and Kuo 2009)

Nature Appreciation

Bratman et al. 2012

Improved mood and mental health

(Barton and Pretty 2010; van den Berg et al. 2010)

Social Interaction

Maas et al. 2008;
Barton and Pretty 2010

Increased social cohesion

(Coley et al. 1997; Kuo et al. 1998; Seeland et al. 2009)

EnviroAtlas is ...

An online decision support tool for viewing, analysing, and downloading geospatial data related to **ecosystem services**

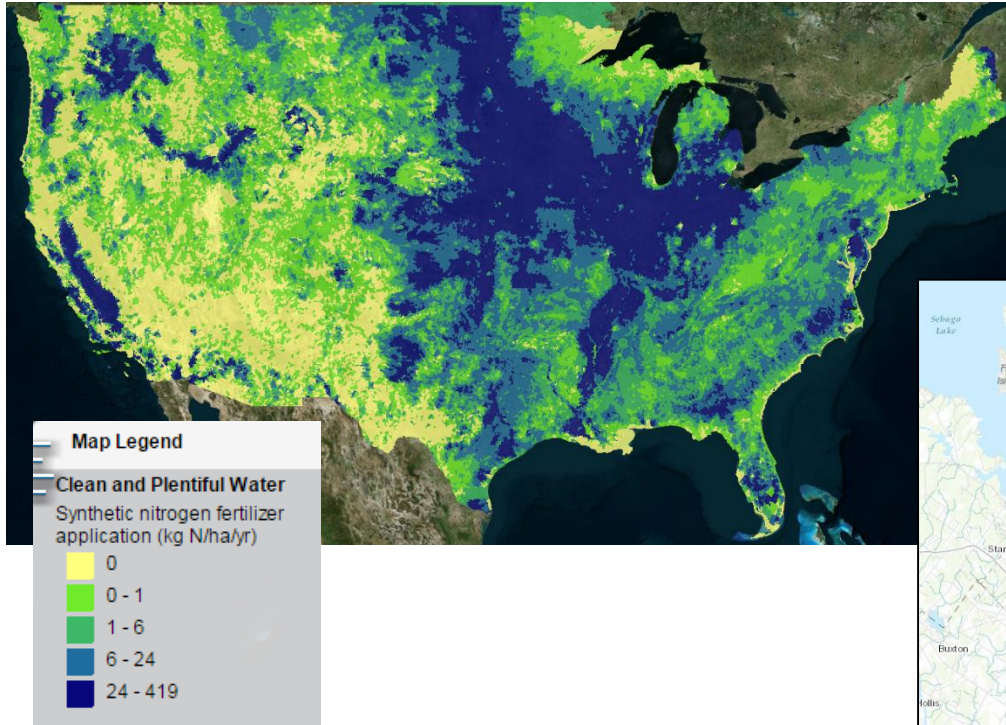
- Maps, data, tools and info. on the supply, demand, and benefits of ecosystem services
- Population and climate scenarios
- Reference data (e.g., boundaries, land cover, soils, hydrography, impaired water bodies, wetlands, demographics)
- Analytic and interpretive tools
- Free & open access



*Developed through cooperative effort
among multiple Federal agencies, universities, and other organizations*

EnviroAtlas is Multi-Scaled

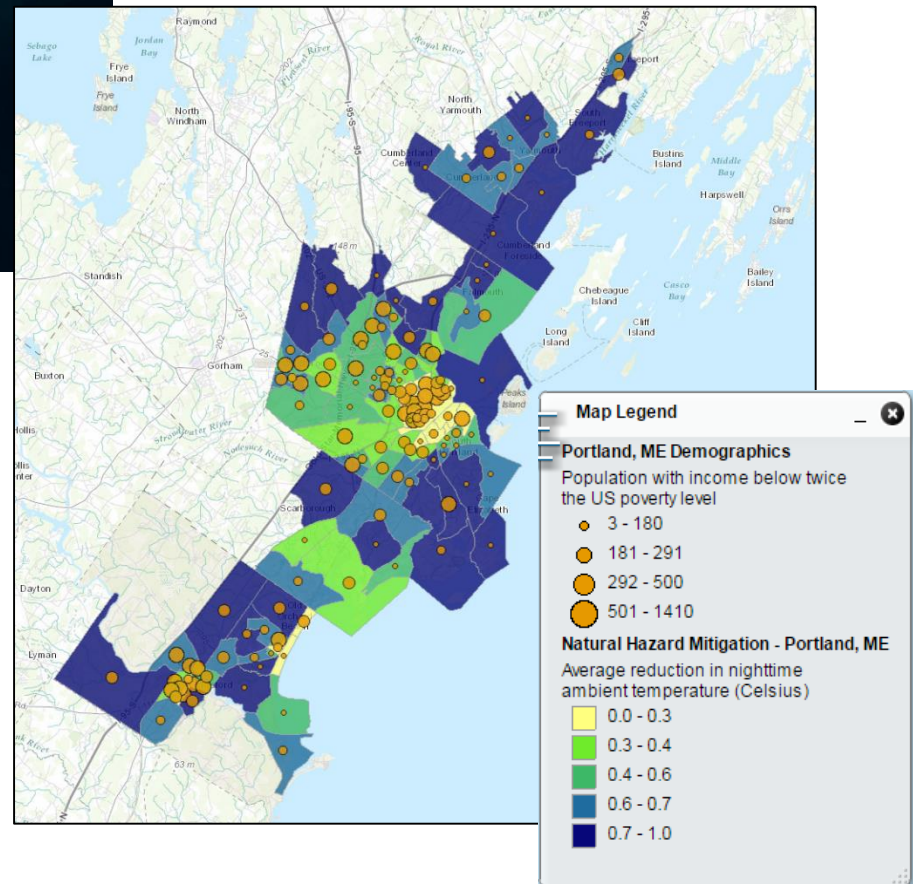
300+ map layers available online



National: Wall-to-wall coverage for coterminous US; summarized by ~90,000 drainage basins (12-digit HUCs). 160+ data layers

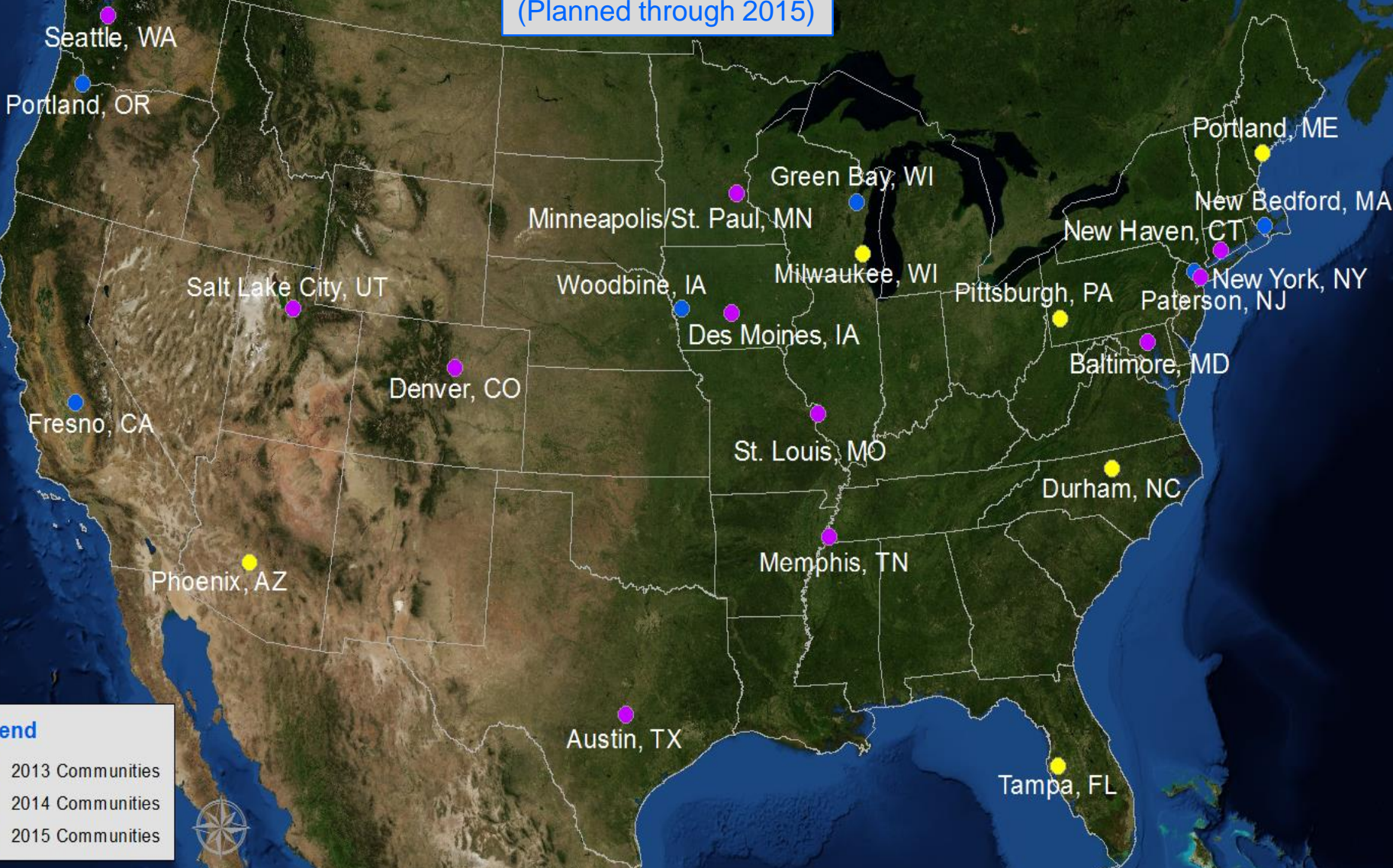
Community: High resolution component for 50 populated places; summarized by US census block group. 100+ data layers

Pictured: Greater Portland, ME



EnviroAtlas Communities

(Planned through 2015)



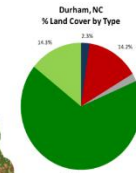
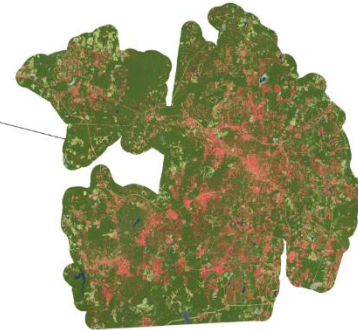
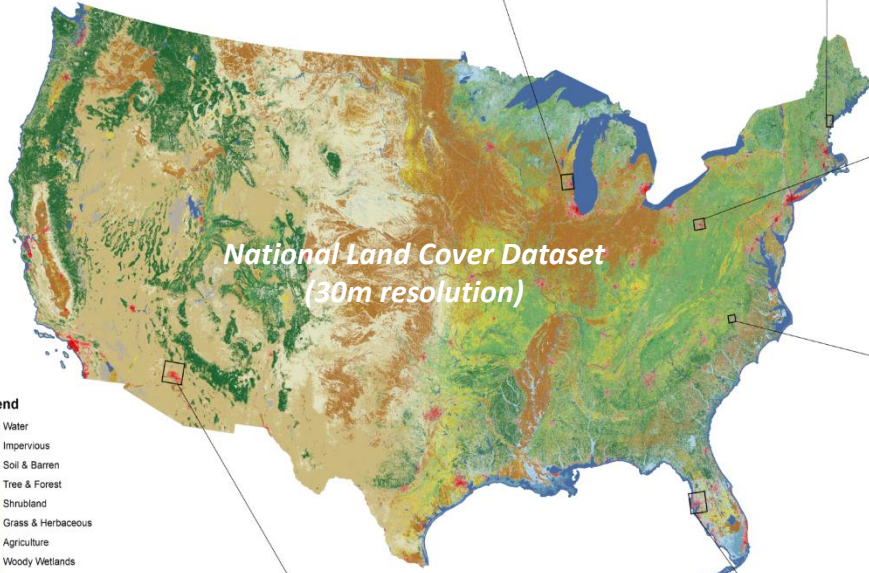
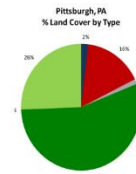
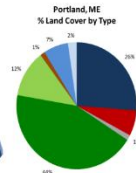
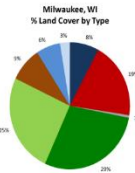
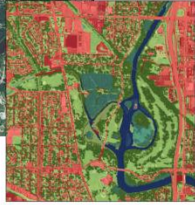
Legend

- 2013 Communities
- 2014 Communities
- 2015 Communities

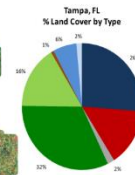
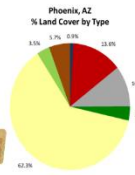
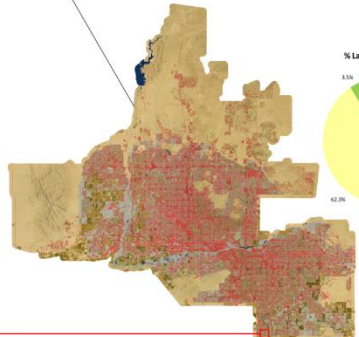


Graphics used by permission. Copyright © 2013 Esri. All rights reserved. State boundaries and City points from NavTeq 2011. Sources: Esri, DigitalGlobe, GeoEye, Earthstar, USDA, USGS, AeroX, @marming, Aergrid, IGN, IGP, swisstopo, and the GIS User Community



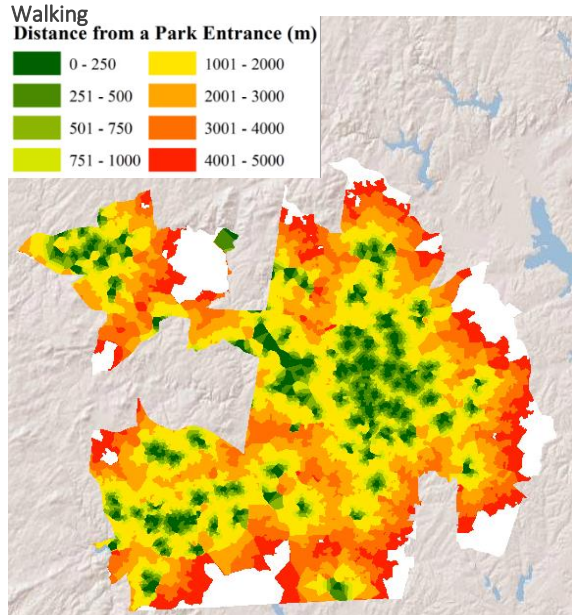


- Legend**
- Water
 - Impervious
 - Soil & Barren
 - Tree & Forest
 - Shrubland
 - Grass & Herbaceous
 - Agriculture
 - Woody Wetlands
 - Emergent Wetlands

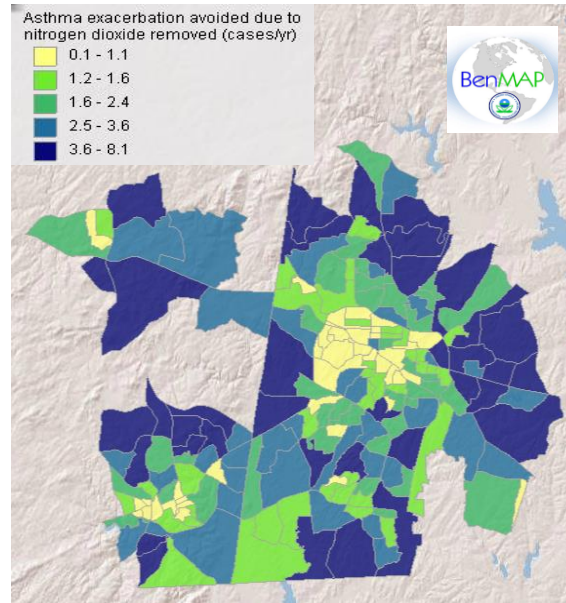


Information to Assist Decision-Making

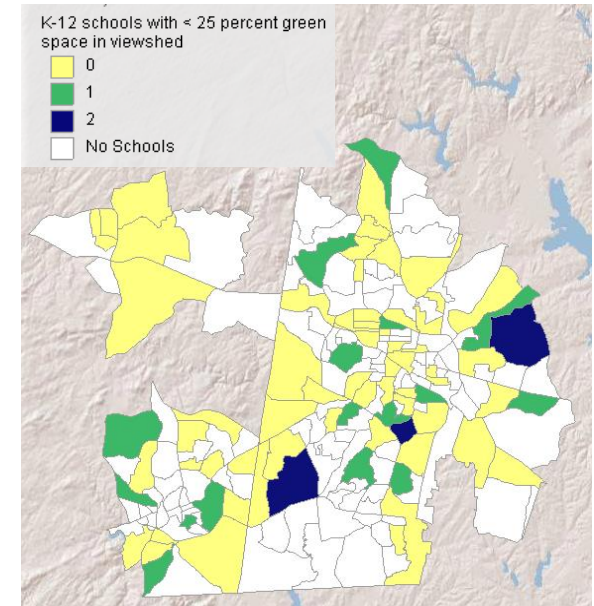
e.g., health interventions, public infrastructure, social equity



Opportunities for physical activity, engagement with nature, & social interaction



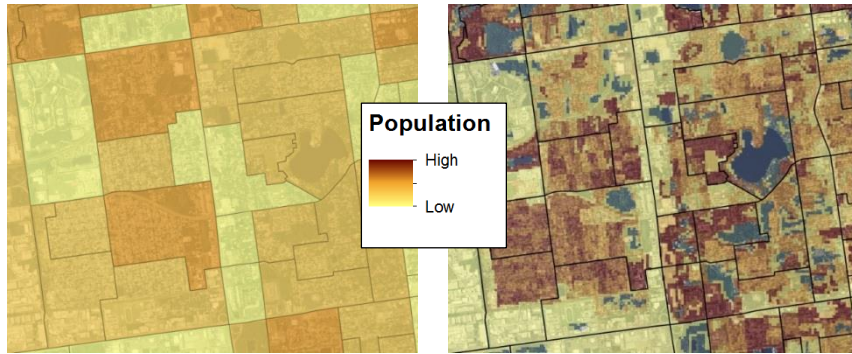
Estimated reductions in adverse respiratory health events due to ambient air filtration by trees



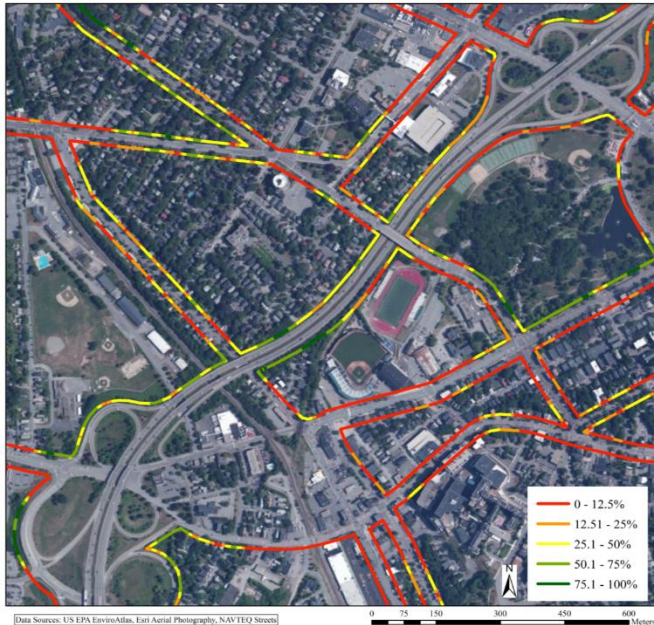
Potential to improve school performance through cognitive restoration & stress reduction

Pictured: Greater Durham-Chapel Hill, NC

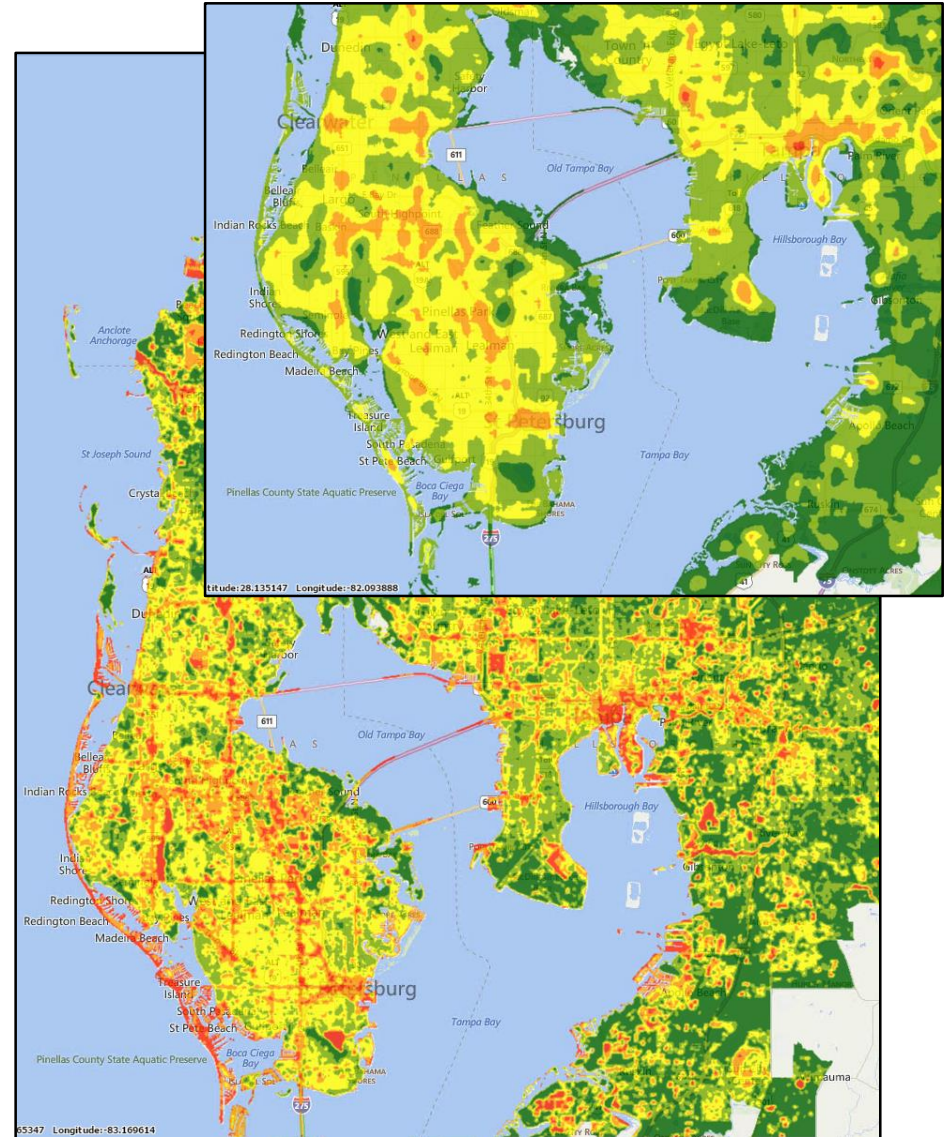
All Data are Downloadable & Accessible via Web Services (incl. fact sheets for general users and technical metadata)



Downscaled (30-meter) U.S. Census population grid



Precise maps of tree cover along local roads & streams

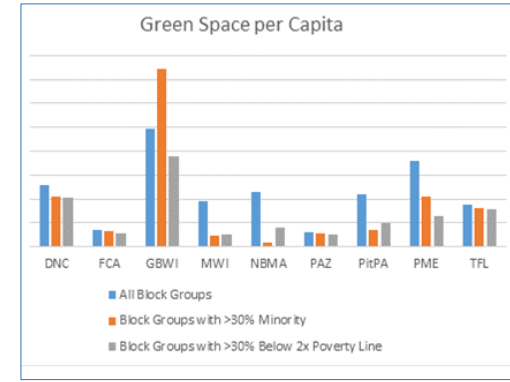


Heat maps

Plus: Analysis Tools, Guides, and Information

- Eco-Health Browser
- Mapping and analysis tools
- User added data
- Ecosystem Services Analyzer
- Downloadable GIS toolboxes
- Use stories, guides for classroom and HIAs
- Interpretive fact sheets for every data layer

Click HERE to open the Relation Browser in a new window, or HERE for a copy of all the Relation Browser data.



EnviroAtlas

Ecosystem Services and Biodiversity | People and Built Spaces | Supplemental Maps | Analysis Tools | Mapping Tools | Future Scenarios

Navigate HUC 12 Cat. [?]

Filter and Search

Select Up or Down Stream
 UP DOWN

Distance of Time
 DIST TIME

Value Stop (Km)
 1 250

Count Stop
 1 100

Select to Save HUC Shapefile

Polymers Plotted

Select a Search Point [Clear]

EnviroAtlas

Ecosystem Services and Biodiversity | People and Built Spaces | Supplemental Maps | Analysis Tools | Mapping Tools | Clear Layers | Data Layers Matrix | Full Screen | Basic Map

Analyze Ecosystem Services (Experiment)

Food, Fuel, and Fibers | Clean Air | Recreation, Cultural, and Aesthetic | Natural Hazard Mitigation | Climate Stabilization | Clean and Pervasive

Elevation Profile

Map Legend

Data

Draw a Point with the tools below to open the elevation in that area.

Draw a Profile Line

EPA EnviroAtlas

Percent Stream Buffer Zone as Natural Land Cover

Why are naturally vegetated stream buffers important?

Stream buffers are naturally vegetated areas adjacent to streams and rivers. They provide a variety of benefits, including filtering sediment, nutrients, and other pollutants from runoff before they reach the water. Stream buffers also help regulate the flow of water into a waterbody by acting as a sponge, absorbing and storing water during heavy rain events. This helps reduce the risk of flooding and erosion. Stream buffers also help prevent erosion, and minimize downstream property damage.

Stream buffers also help filter sediment and runoff by trapping and absorbing pollutants, preventing sediment, nutrients, and other pollutants from entering the water. Stream buffers also help regulate the flow of water into a waterbody by acting as a sponge, absorbing and storing water during heavy rain events. This helps reduce the risk of flooding and erosion. Stream buffers also help prevent erosion, and minimize downstream property damage.

Natural vegetation in stream buffers provides a natural wildlife habitat for resident and migratory species that depend on riparian areas for cover, food, and water. Stream buffers also provide a variety of benefits to the surrounding landscape, including providing shade and reducing the temperature of the water entering the habitat for fish and other riparian species. The benefits of stream buffers are also realized by the surrounding community, including providing shade and reducing the temperature of the water entering the habitat for fish and other riparian species. The benefits of stream buffers are also realized by the surrounding community, including providing shade and reducing the temperature of the water entering the habitat for fish and other riparian species.

EPA EnviroAtlas

How was this map created?

The data for this map was compiled by updating the 2006 National Land Cover Database (NLCD) and the National Wetlands Inventory (NWI) to reflect the most current data available. The NLCD and NWI are the primary data sources for the map. The NLCD is a 30-meter resolution map of the conterminous United States, and the NWI is a 30-meter resolution map of the conterminous United States. The NLCD and NWI are the primary data sources for the map. The NLCD is a 30-meter resolution map of the conterminous United States, and the NWI is a 30-meter resolution map of the conterminous United States.

For more technical details about the limitations of these data, see the map's metadata or contact the data provider.

How can I get more information?

Additional information on stream buffers and their benefits are listed in the selected publications below. These are only a small selection of resources available on this topic. For information on how the data was created or the methodology used, please contact the data provider. For more information on the NLCD or NWI datasets, visit their respective websites.

Who created this map?

EnviroAtlas is a collaborative effort by the US EPA, as well as other federal, state, and local agencies. The map was created by the EPA's Landscape Ecology Branch, and the data was provided by the US EPA's National Wetlands Inventory and the US EPA's National Land Cover Database. The map was created by the EPA's Landscape Ecology Branch, and the data was provided by the US EPA's National Wetlands Inventory and the US EPA's National Land Cover Database.

The Eco-Health Relationship Browser

4 ecosystems:

- Forests
- Urban Ecosystems
- Wetlands
- Agro-Ecosystems

6 Ecosystem Services:

Health promotional services

- Aesthetics & Engagement with Nature
- Recreation & Physical Activity

Buffering services

- Clean Air
- Clean Water
- Heat Hazard Mitigation
- Water Hazard Mitigation

Incl. extensive bibliography (n ~ 300)



30+ health outcomes:

- Asthma
- ADHD
- Cancers
- **Cardiovascular diseases**
- **Heat stroke**
- Healing
- **Low birth weight**
- Obesity
- **Social relations**
- Stress
- ... many more

Click a topic bubble or choose a topic from the
 Hover over linkages (+) to view the relation



Details

Description: U

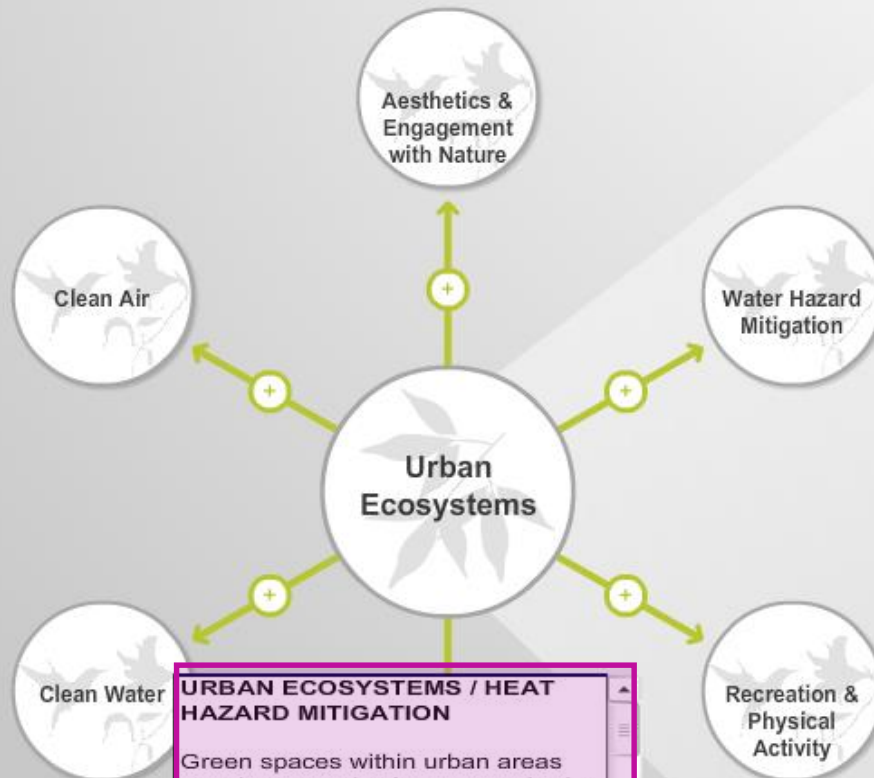
An urban ecosystem that contains natural elements and built infrastructure in large proportions and/or people. These systems include blue spaces within the area, such as parks, cemeteries, lakes and streams, along with human components. Urban ecosystems can mimic the function of natural ecosystems and thus provide their own important ecosystem services that contribute to human well-being in those urban areas. Various green environments such as shade trees, urban green spaces and urban forests, can exist within a single urban region. The services provided by urban ecosystems include filtering water runoff, providing areas for physical activity and recreation such as hunting and bird watching, and mitigating the Urban Heat Island effect by replacing heat-absorbing impervious surfaces and increased shading from shade trees. Additionally, urban green spaces such as private gardens provide opportunities for

Citations/ Sources

Pickett et al., 2001; Guidotti, 2010; Hancock, 2002; Freeman et al., 2012

You are here: **Urban Ecosystems**

Click a topic bubble or choose a topic from the dropdown list above.
Hover over linkages (+) to view the relationship between elements.



URBAN ECOSYSTEMS / HEAT HAZARD MITIGATION

Green spaces within urban areas can decrease daytime atmospheric temperatures through shading and evapotranspiration, thus decreasing the Urban Heat Island effect (UHI). Increasing vegetative cover and adding higher reflective surface materials in urban areas can reduce temperatures within the area and

Details

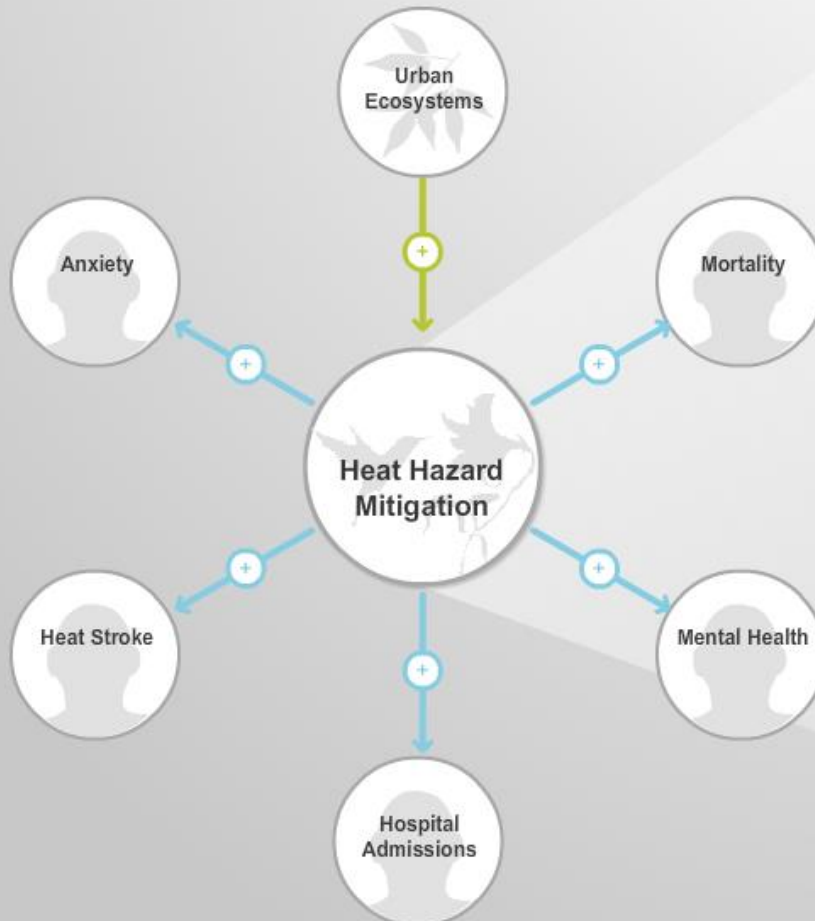
Description: Urban Ecosystems

An urban ecosystem is a dynamic system that contains both built and natural elements. In urban ecosystems, built infrastructure typically covers a large proportion of the land surface and/or people live in high densities. These systems include all green and blue spaces within the area, such as parks, cemeteries, lakes and streams, along with human components. Urban ecosystems can mimic the function of natural ecosystems and thus provide their own important ecosystem services that contribute to human well-being in those urban areas. Various green environments such as shade trees, urban green spaces and urban forests, can exist within a single urban region. The services provided by urban ecosystems include filtering water runoff, providing areas for physical activity and recreation such as hunting and bird watching, and mitigating the Urban Heat Island effect by replacing heat-absorbing impervious surfaces and increased shading from shade trees. Additionally, urban green spaces such as private gardens provide opportunities for

Citations / Sources

Pickett et al., 2001; Guidotti, 2010; Hancock, 2002; Freeman et al., 2012

Click a topic bubble or choose a topic from the dropdown list above.
Hover over linkages (+) to view the relationship between elements.



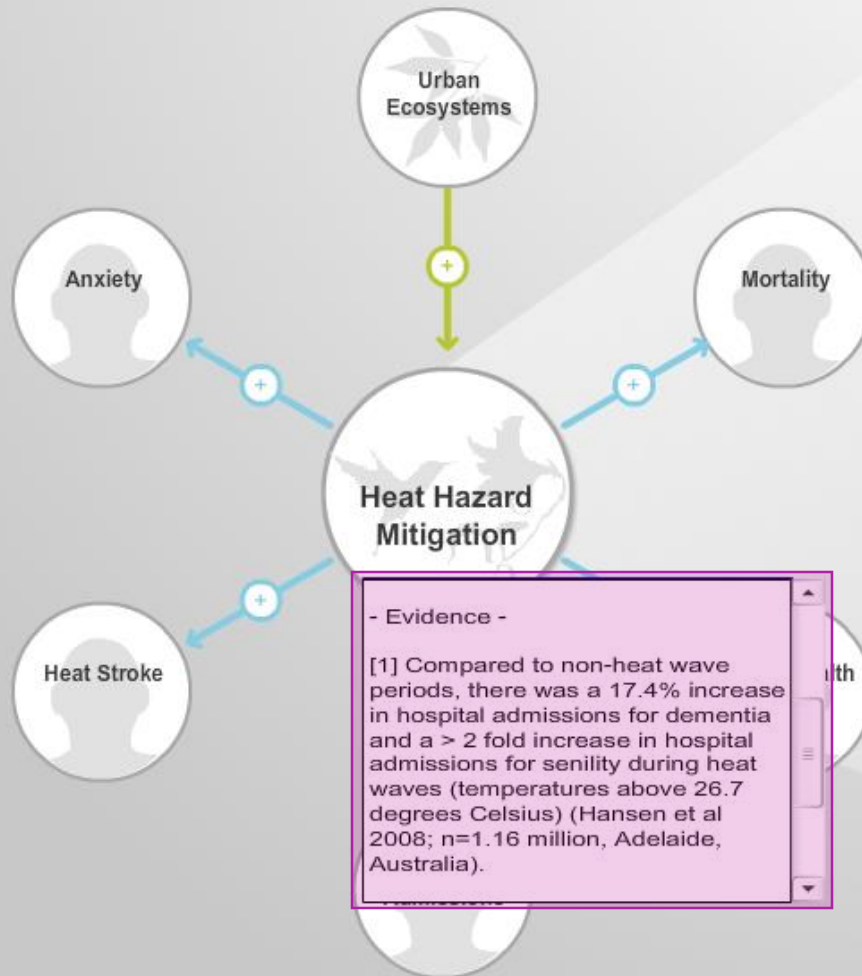
Details

Description: Heat Hazard Mitigation

The Urban Heat Island (UHI) effect is a heating phenomenon that occurs in urban centers and their surrounding suburban areas. With the UHI effect, metropolitan areas do not cool down at night due to the release of heat from dark surfaces that absorb heat throughout the day. In UHIs, temperatures can be 6 to 8 degrees higher in urban centers than in nearby woodlands. This fact is especially important during heat wave events, where those who reside in urban areas are often most effected due to exposure to higher maximum temperatures and less nighttime reprieve from heat. In urban systems, green spaces such as parks, urban forests and green roofs, can reduce urban temperatures and mitigate the effects of heat wave events through evapotranspiration and shading. The cooling effects of these green spaces may be especially important during heat waves, where temperatures directly outside the homes in which people are confined (elderly, infirm) have an effect on mortality.

You are here: [Urban Ecosystems](#) / [Heat Hazard Mitigation](#)

Click a topic bubble or choose a topic from the dropdown list above.
Hover over linkages (+) to view the relationship between elements.



Details

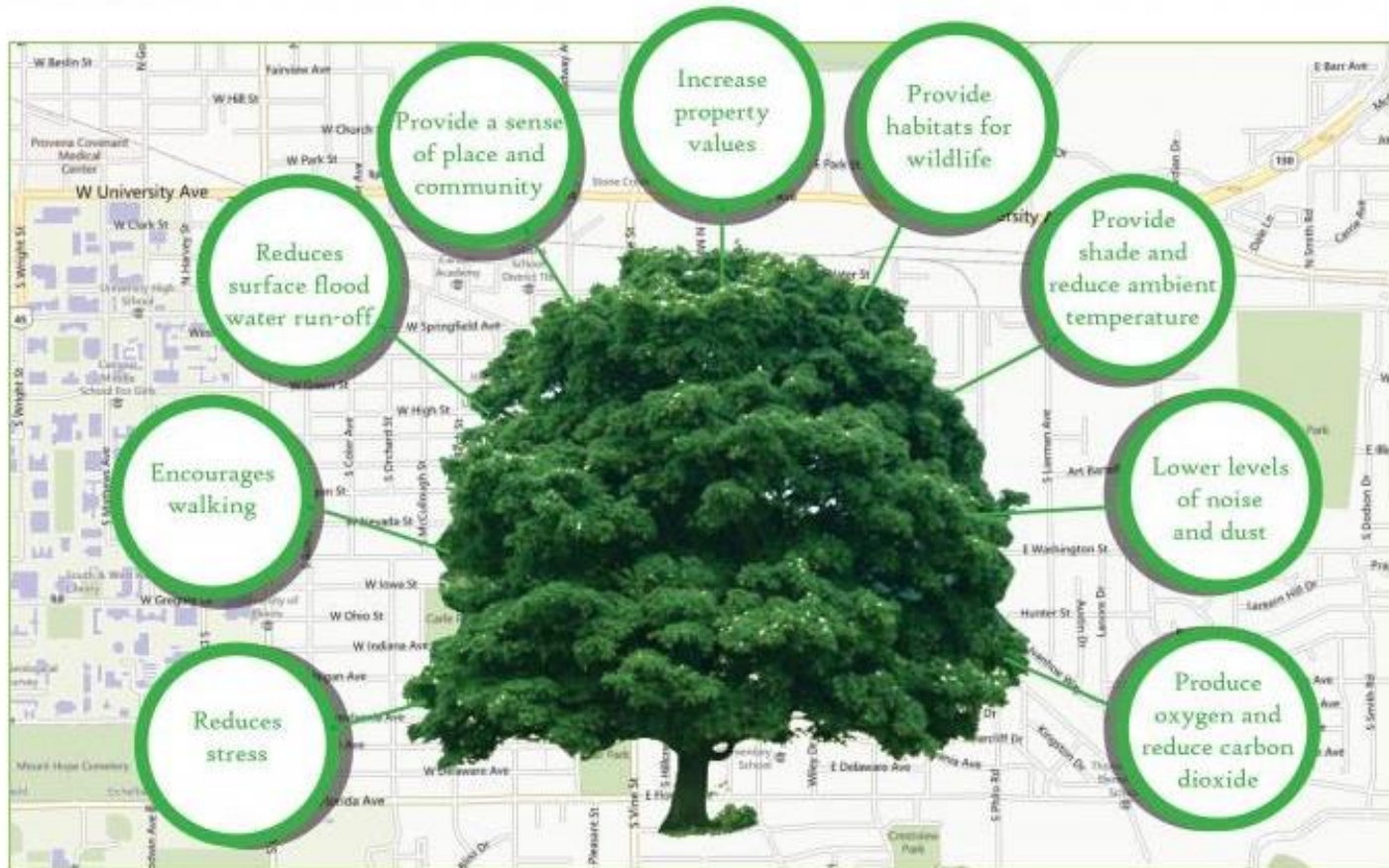
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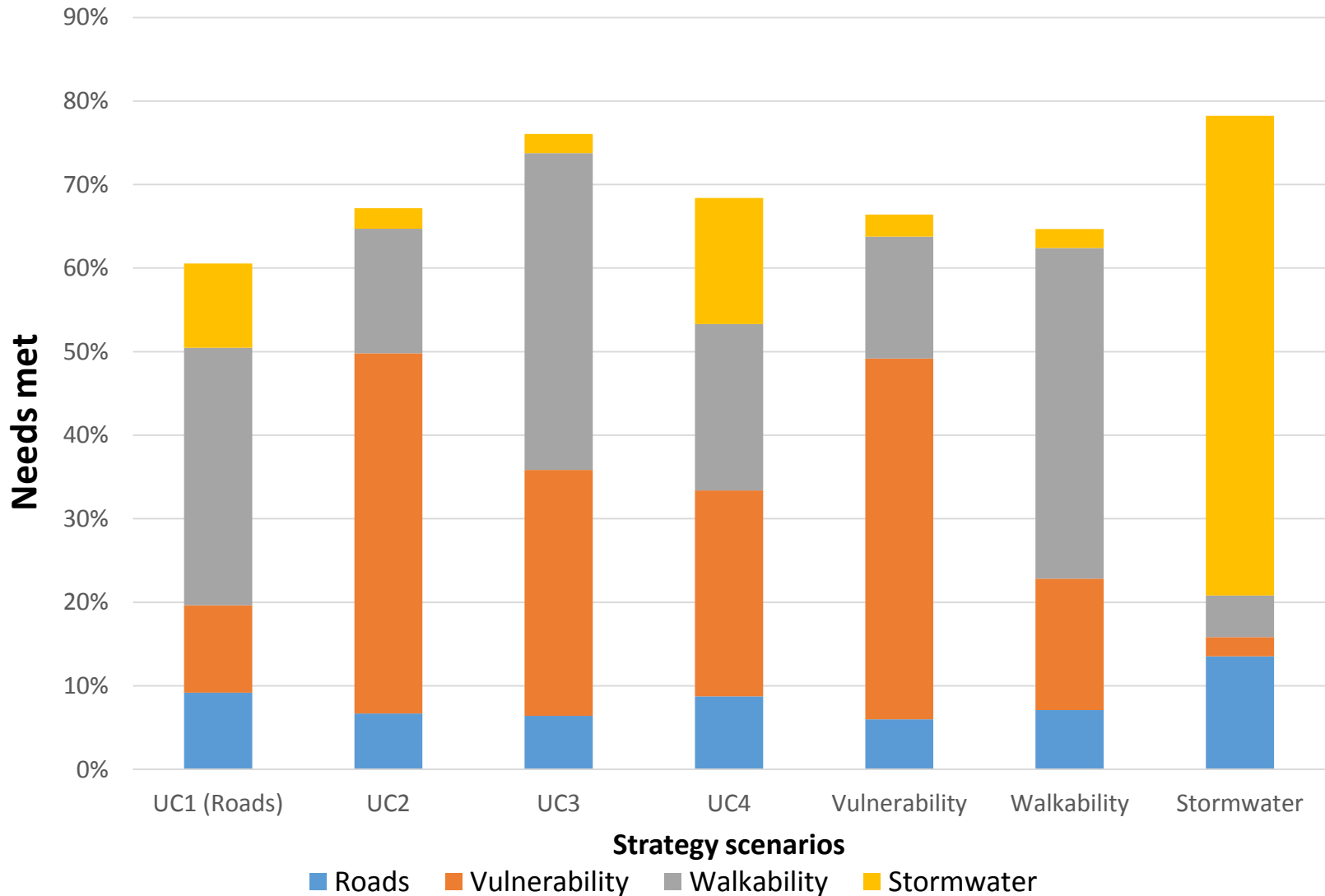
Ecosystem Services Deliver “Co-Benefits,” Facilitate Systems-Level Solutions



Urban Tree Benefits



Assessing Community Benefits under Alternate Decision Scenarios





Access EnviroAtlas at:

<http://enviroatlas.epa.gov>

Or

<http://ecosystems.data.gov>