

Definition

**Greenspace** = Open space and natural habitat. Split into three categories: natural habitat, semi-natural habitat, and unnatural open space.

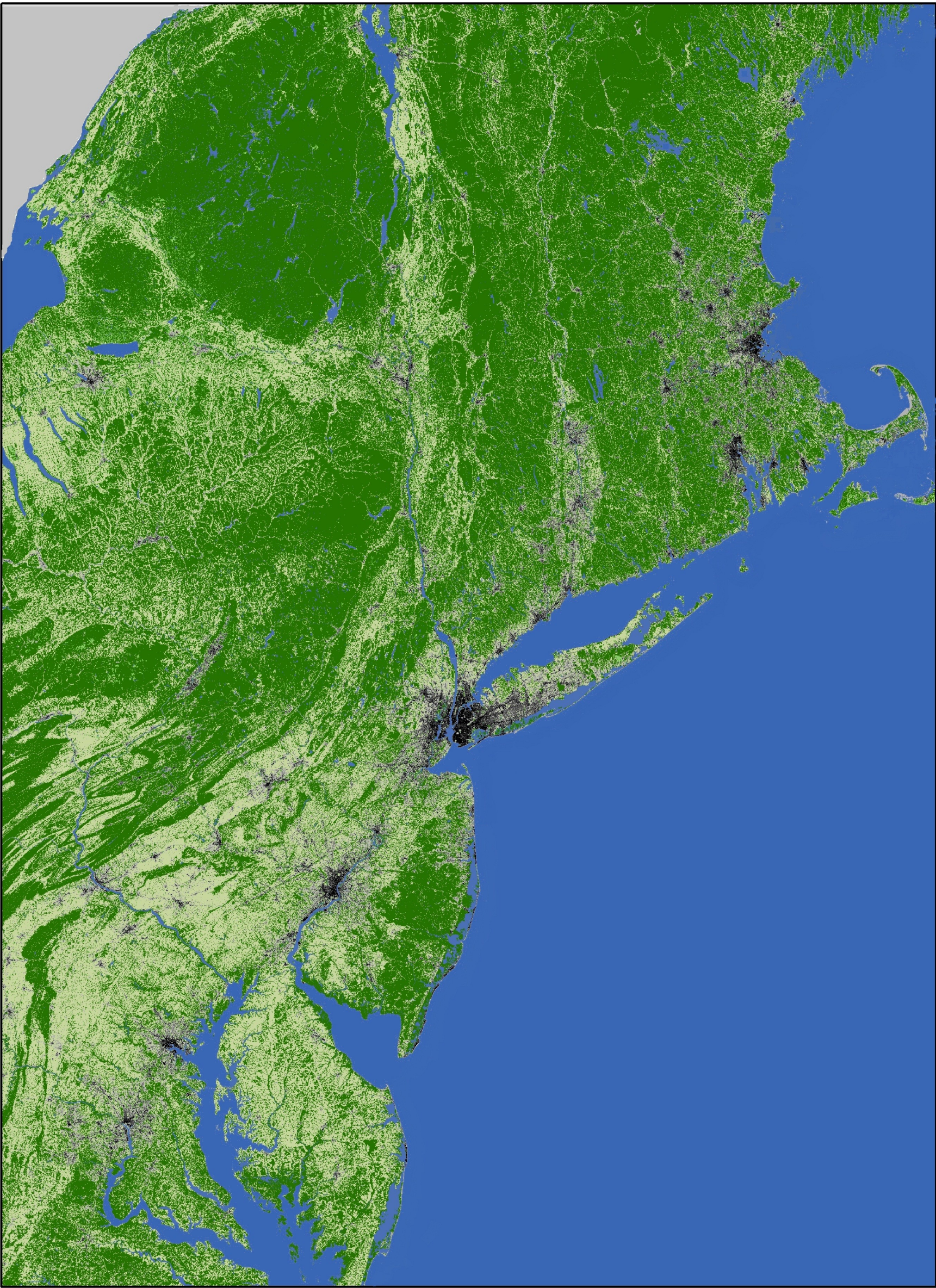
**Blackspace** = Impervious surface. Split into three categories based on the intensity of development (which affects permeability of the land surface).

Methodology

- Creating the Map
1. Grouped the 21 land cover types from the National Land Cover Data Set (NLCD) into eight categories. Six of these will be used in this analysis. All are categorized in the Gs/Bs Map Guide to the bottom right.
  2. Assigned each new land cover category a color, also shown in Guide.
  3. Added the Core Based Statistical Area (CBSA) layer, which creates regions around major cities. See Boston example below.

- Analyzing a Metropolitan Area
1. Clipped the land cover layer into polygons based on the CBSA regions.
  2. Within a polygon, counted the number of raster cells in each of the three greenspace categories and each of the three blackspace categories.
  3. Assigned a value to each land cover category, as shown in the Guide.
  4. Found the total value of each category in the polygon by multiplying category value by # of raster cells of that category.
  5. Added the values for all six categories within one polygon (a combination of three positive and three negative numbers).
  6. Divided this number by the area in square kilometers, resulting in the **Greenspace/Blackspace Rating**.

The Greenspace/Blackspace Rating



**What Is It?**

The Greenspace/Blackspace Rating was born out of the desire to create a mechanism that would be useful in analyzing the quality of land cover in a given city or region. This Gs/Bs analysis creates a score that serves as an indicator of the sustainability of development patterns in a given metropolitan area.

The Gs/Bs Rating is based on the concept of the greenspace/blackspace ratio, but it takes into account more information than a simple comparison of two land cover types. This process splits both greenspace and blackspace into subcategories based on how much biodiversity the greenspace supports and how intensely developed the blackspace is. It then compiles this information and outputs a rating that incorporates the benefits rendered by green space and the negative impacts of development.

**Rationale**

Urban greenspace supports wildlife, mitigates runoff by increasing infiltration, protects waterways, provides natural space for recreation, reduces urban temperatures, fixates atmospheric carbon, and improves the psychological health of the urban population. A good Greenspace/Blackspace Rating indicates that a city has integrated green space into its development and has implemented forms of development that have a smaller footprint.

A Regional Application:

**The Northeast USA**

In the map below you will find ten metropolitan areas outlined in red. These are the ten most populous CBSA regions in the Northeast. The Gs/Bs Ratings for all of them have been compiled along with other relevant data in the table below the map. Rochester has the best Rating and New York City has the worst. Notice the negative correlation between Gs/Bs Rating and both population size and population density. Also notice that the positive relationship between Gs/Bs Rating and % Greenspace is not perfect. Considering how much the Gs/Bs Rating depends on the presence of greenspace, where does this variance come from?

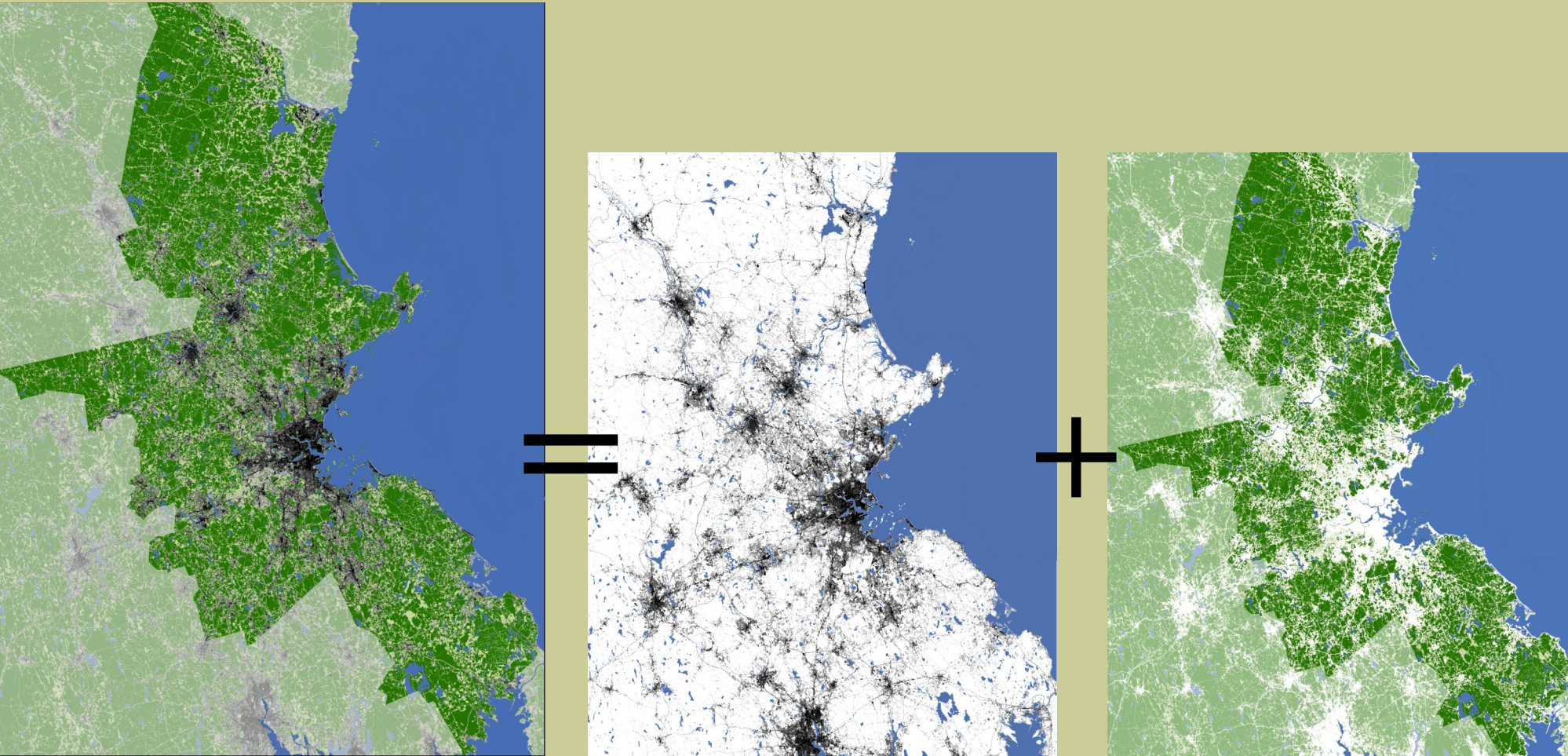
Let's look at Boston as an example. It rates higher than two cities that have committed significantly higher portions of their land area to greenspace. Remember, though, that the Gs/Bs analysis considers the quality of the land. Boston probably has higher quality greenspace and less intense development than Baltimore and Philadelphia.



Boston Metro Area: A Case Study

The maps below show the CBSA region called “Boston-Cambridge-Quincy, MA-NH”. You can see from the boundary of the non-shaded area that this does not show what could intuitively be called the Boston metro area. The region goes up to the NH-ME border, and just barely excludes two of New Hampshire’s largest cities, Manchester and Nashua. This is because CBSA is based on where people in a community commute to get to work, instead of relying on political boundaries or other criteria.

Boston has a Greenspace/Blackspace Rating of 1.63, which ranks it sevenths among. This means that the positive value of its green space plus the negative value of its black space, divided by its area in km<sup>2</sup>, equals 1.63. You can see these greenspace and blackspace values illustrated below. The darker the green, the more this area adds to the green space value. The darker the gray or black, the more this area adds to the black space value.



Gs/Bs Map Guide

|  |  |
|--|--|
| <b>Natural Habitat</b><br><b>Dark Green</b><br>Value = 3<br>Deciduous Forest<br>Evergreen Forest<br>Mixed Forest<br>Woody Wetlands<br>Forested Wetland<br>Other Wetland* | <b>Zero Permeability Surface</b><br><b>Black</b><br>Value = -3<br>Developed, High Intensity              |
| <b>Semi-Natural Habitat</b><br><b>Medium Green</b><br>Value = 2<br>Shrub<br>Grassland/Herbaceous   | <b>Low Permeability</b><br><b>Dark Gray</b><br>Value = -2<br>Developed, Medium Intensity                 |
| <b>Unnatural Open Space</b><br><b>Light Green</b><br>Value = 1<br>Pasture/Hay<br>Cultivated Crops<br>Developed, Open Space   | <b>Medium Permeability</b><br><b>Light Gray</b><br>Value = -1<br>Developed, Low Intensity<br>Barren Land |
|  | <b>Other</b><br>Value = 0<br>Open Water - Blue<br>Unconsolidated Shore - Tan                             |
| *Includes five other types of wetland  |  |

Study Limitations

The main fault with this study was the use of the CBSA boundaries to define metropolitan areas. The results it yields are essentially intuitive. We might find a more interesting comparison of cities if smaller boundaries were drawn around just urbanized areas. Also, an ideal study would control for population density. A city that has the same population density as another city but has a better Greenspace/Blackspace Rating can accurately be called more sustainable. In contrast, the information here mostly reaffirms the obvious trend that larger populations and higher population densities lead to less green space. I believe this methodology and the Gs/Bs Rating can find a useful application, however.

Adrian Dahlin  
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| City Name           | Gs/Bs Rating | % Greenspace | Population | Pop Density |
|---------------------|--------------|--------------|------------|-------------|
| 1. Rochester, NY    | 2.64         | 94           | 1,058,006  | 356.4       |
| 2. Buffalo, NY      | 2.28         | 86           | 1,168,416  | 742.8       |
| 3. Hartford, CT     | 2.02         | 82           | 1,184,283  | 762.9       |
| 4. Providence, RI   | 1.84         | 74           | 1,184,823  | 202.8       |
| 5. Washington, DC   | 1.78         | 83           | 5,284,007  | 892.1       |
| 6. Bridgeport, CT   | 1.67         | 75           | 910,228    | 1411.6      |
| 7. Boston, MA       | 1.63         | 73           | 4,471,495  | 1235.9      |
| 8. Baltimore, MD    | 1.52         | 87           | 2,665,073  | 1012.2      |
| 9. Philadelphia, PA | 1.48         | 82           | 5,848,871  | 1229.2      |
| 10. New York, NY    | 1.38         | 72           | 18,880,671 | 2730.0      |