Area Served – Population Served Analysis

To assist states with their network assessments, EPA developed several tools, including area and population served. This tool provides a Google Earth map showing spatial area (in terms of a polygon) and associated population represented by individual monitoring sites. Static results and interactive tools for these analyses are available at: http://www.epa.gov/ttn/amtic/network-assessment.html A summary report of the analyses and tools was prepared by EPA – see "Network Assessment Analyses and Tools Documentation", March 1, 2010. The purpose of this memo is review the area and population served analysis.

Discussion: Area Served – Population Served Analysis (taken from EPA's March 1, 2010, document)

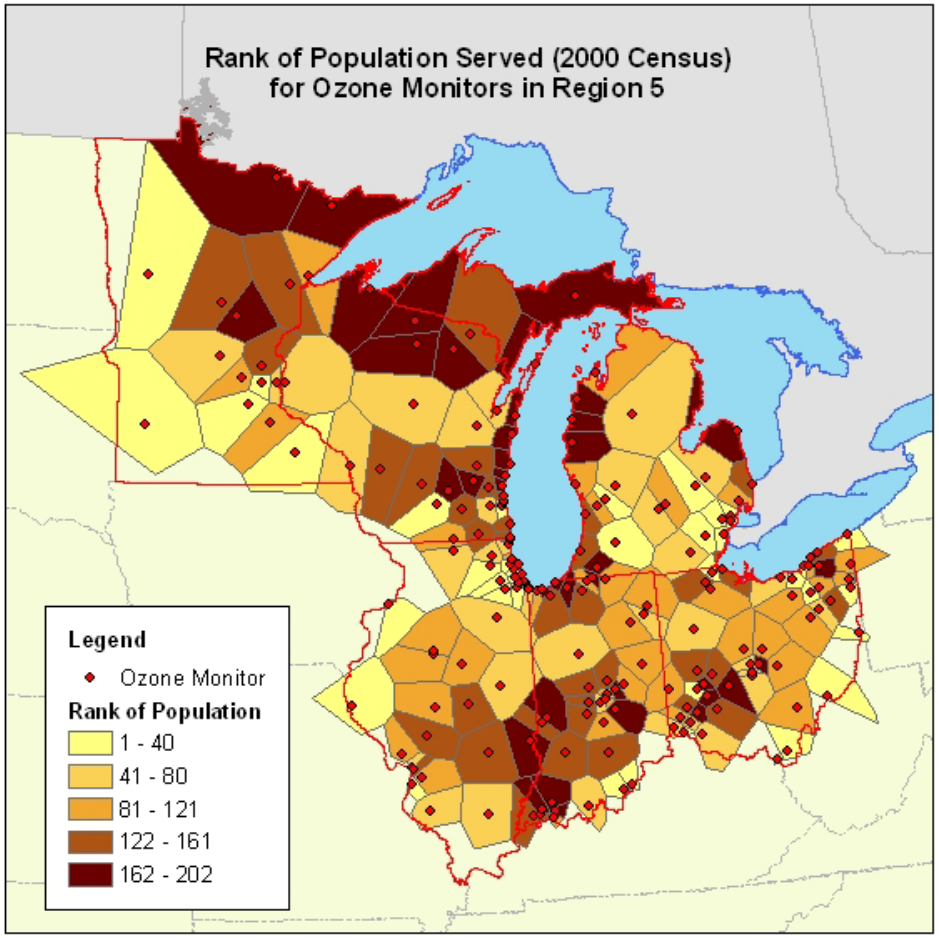
The area served tool uses a spatial analysis technique known as Voronoi or Thiessen polygons to show the area represented by a monitoring site. The shape and size of each polygon is dependent on the proximity of the nearest neighbors to a particular site. Data from the 2000 Decennial Census were used to determine which census tract centroids were within each polygon. The total tract area represented by the polygon was calculated as well as the total population and population density. These statistics were tabulated for each year for 2005 through 2008. An individual population estimate was created for each tract and for each year by using the 2000 census' individual tract composition within a county. This composition was assumed to remain constant and the census county level estimates for 2005 through 2008 were used to estimate the tract populations. The static tool displays each polygon along with the location of the monitor within it. In Google Earth, the user can click on the site or within the polygon containing the site and get the total area served, the total population and population densities for 2000 and the year represented by the network as well as the individual census tract IDs so that the user can refer to the census data to determine the sensitive populations served by the monitor. Those census data can be accessed at http://factfinder.census.gov/.

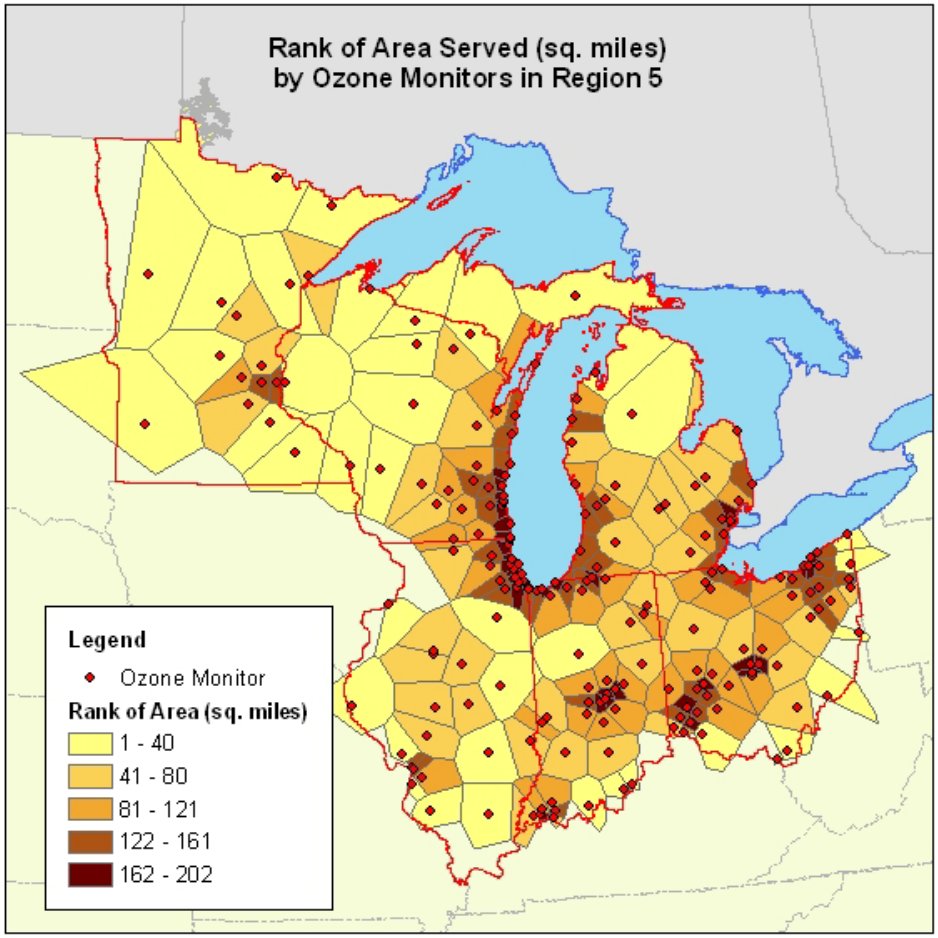
Because census tract centroids were used to assign whole tracts to a particular Voronoi polygon, some polygons which do not have a tract centroid within them will not have population information. In these cases, information will have to be gleaned from the statistics of surrounding sites.

The interactive tool allows for the input of existing sites and possible new sites to determine the populations served. Different possible networks could then be created to see how different populations would be covered. It does need to be noted for both the static and interactive tools that because the Voronoi polygons represent a purely mathematical construct based on the proximity of sites to each other, important factors which would aid in determining the area and population served by a monitor such as emissions, meteorology and topography are not being accounted.

Results

The attached maps were prepared by U.S. EPA, Region V using data from EPA's national analysis for ozone, PM2.5 (FRM), and PM2.5 (continuous) data. The area and population values for each monitor were ranked and then displayed with different color shading for each 20th percentile. Not surprisingly, monitors in urban areas tend to rank high for population and low for area (given the higher density of urban monitoring), and monitors in rural areas tend to rank low for population and high for area (given the lower density of rural monitoring).


Rank of Population Served (2000 Census)
for Ozone Monitors in Region 5
Legend
Ozone Monitor
Rank of Population
1 - 40
41 - 80
81 - 121
122 - 161
162 - 202


Rank of Area Served (sq. miles)
by Ozone Monitors in Region 5
Legend
Ozone Monitor
Rank of Area (sq. miles)
1 - 40
41 - 80
81 - 121
122 - 161
162 - 202

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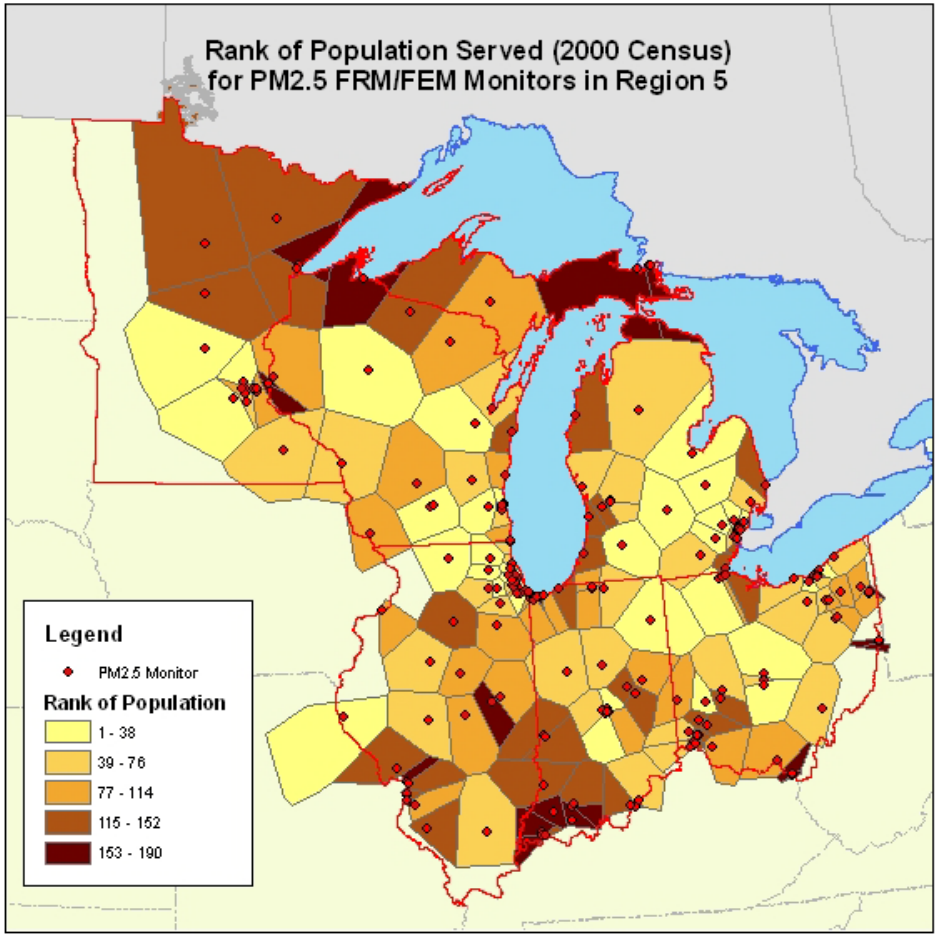

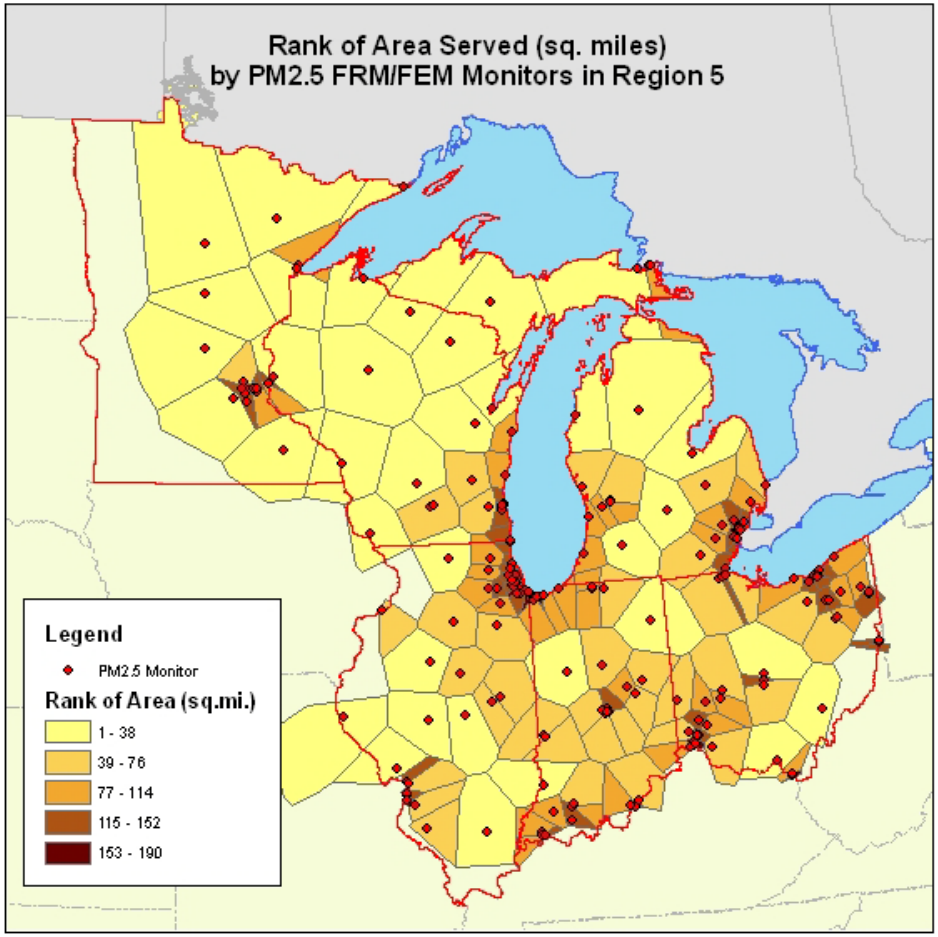

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