



Maryland's Approach to the 2010 Network Assessment and Plans for 2015

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National Ambient Air Monitoring Conference – Atlanta

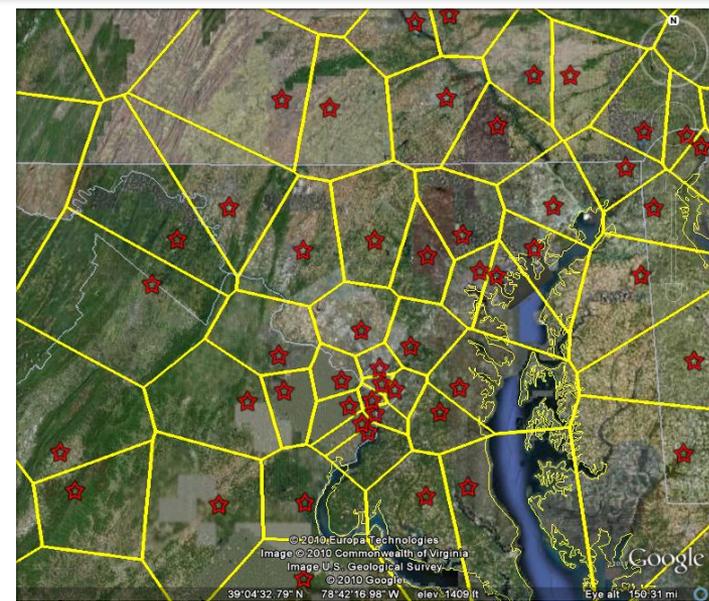
August 11, 2014

Overview

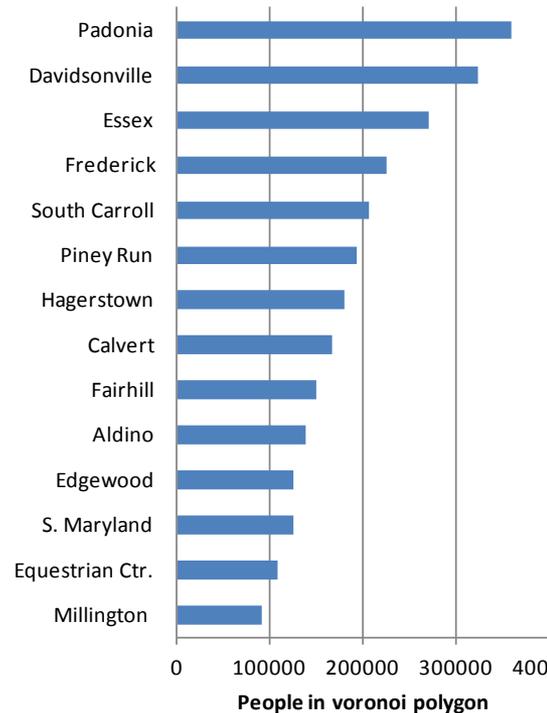
- Using EPA tools to apply to a decision matrix.
- Development of new tools for the 2015 assessment.
- Summary of approach for assessing how well sensitive populations are served by the network.
- Comments and suggestions for improvement are very welcome.

Population Served

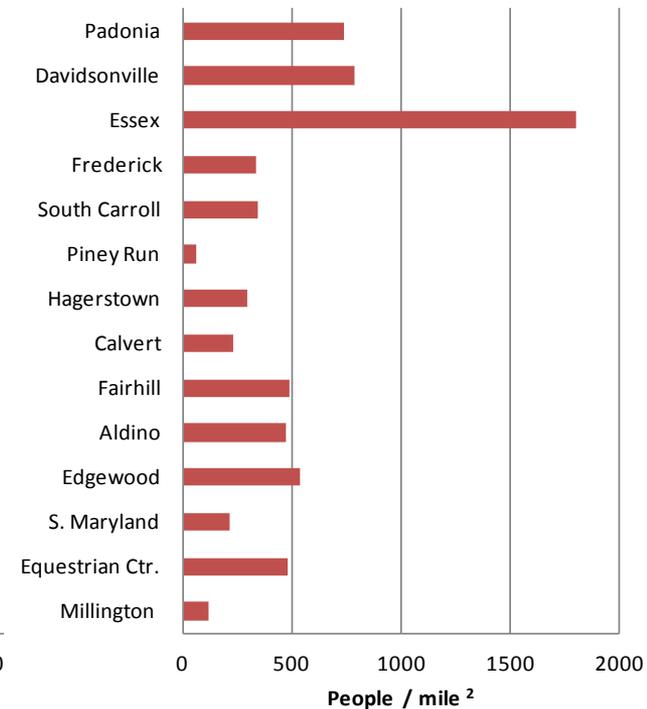
- For the 2010 Network Assessment EPA developed a tool using Voronoi polygons to provide information on the population served by a particular monitoring site.
- We used the population and the population density in our decision matrix to quantify the value of each site.



2008 Population

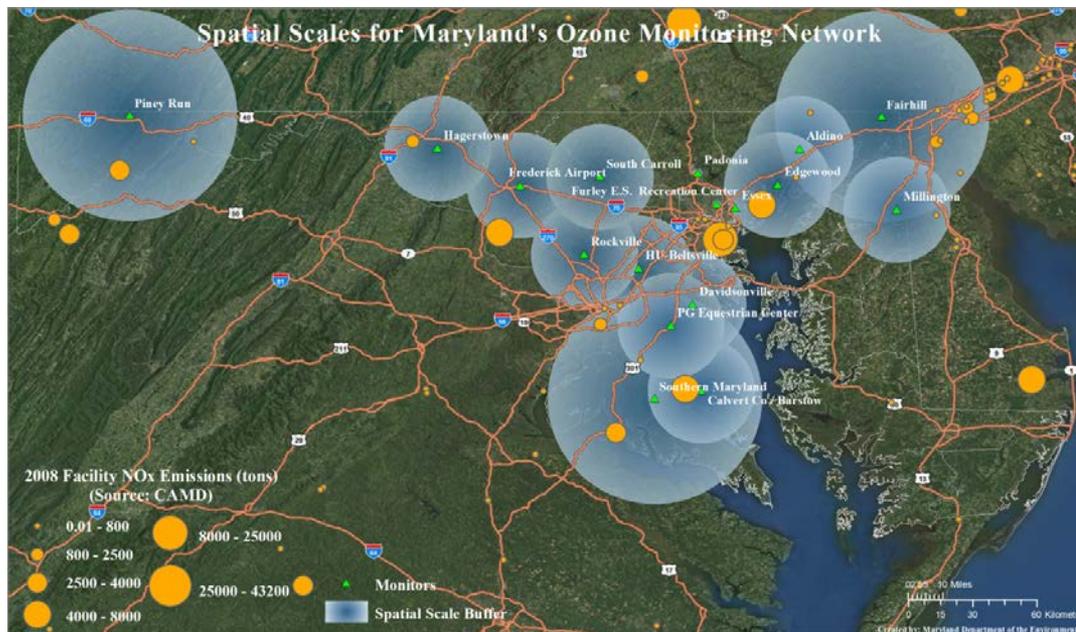


2008 Population Density



Another Way to Show Population Served

- We worked with an engineering student from UMD (Hannah Shockley) developing an R script to determine population served from scales of representativeness and census tract data.

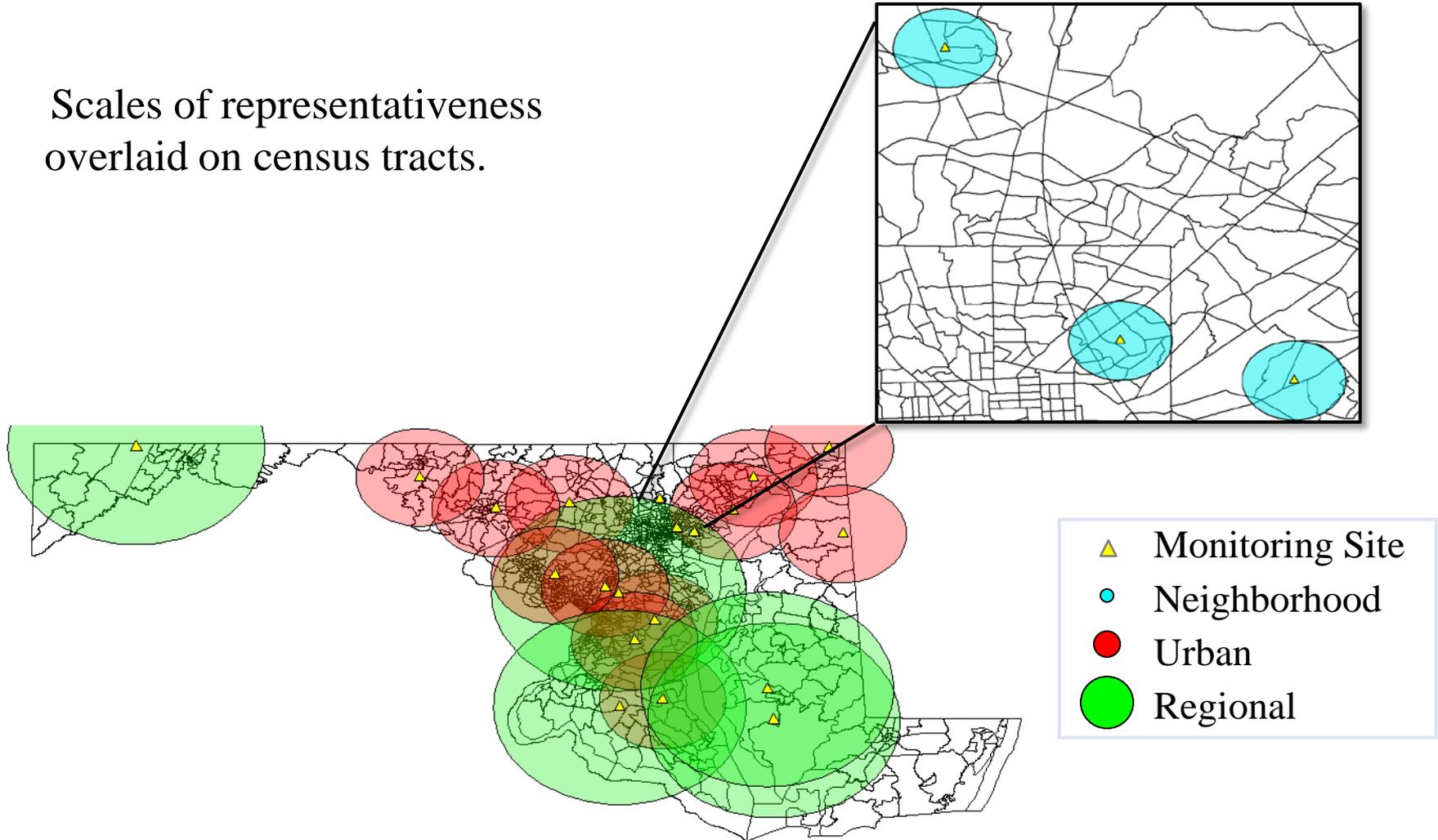


Part 58 Appendix D Section 1.2 Spatial Scales (b)

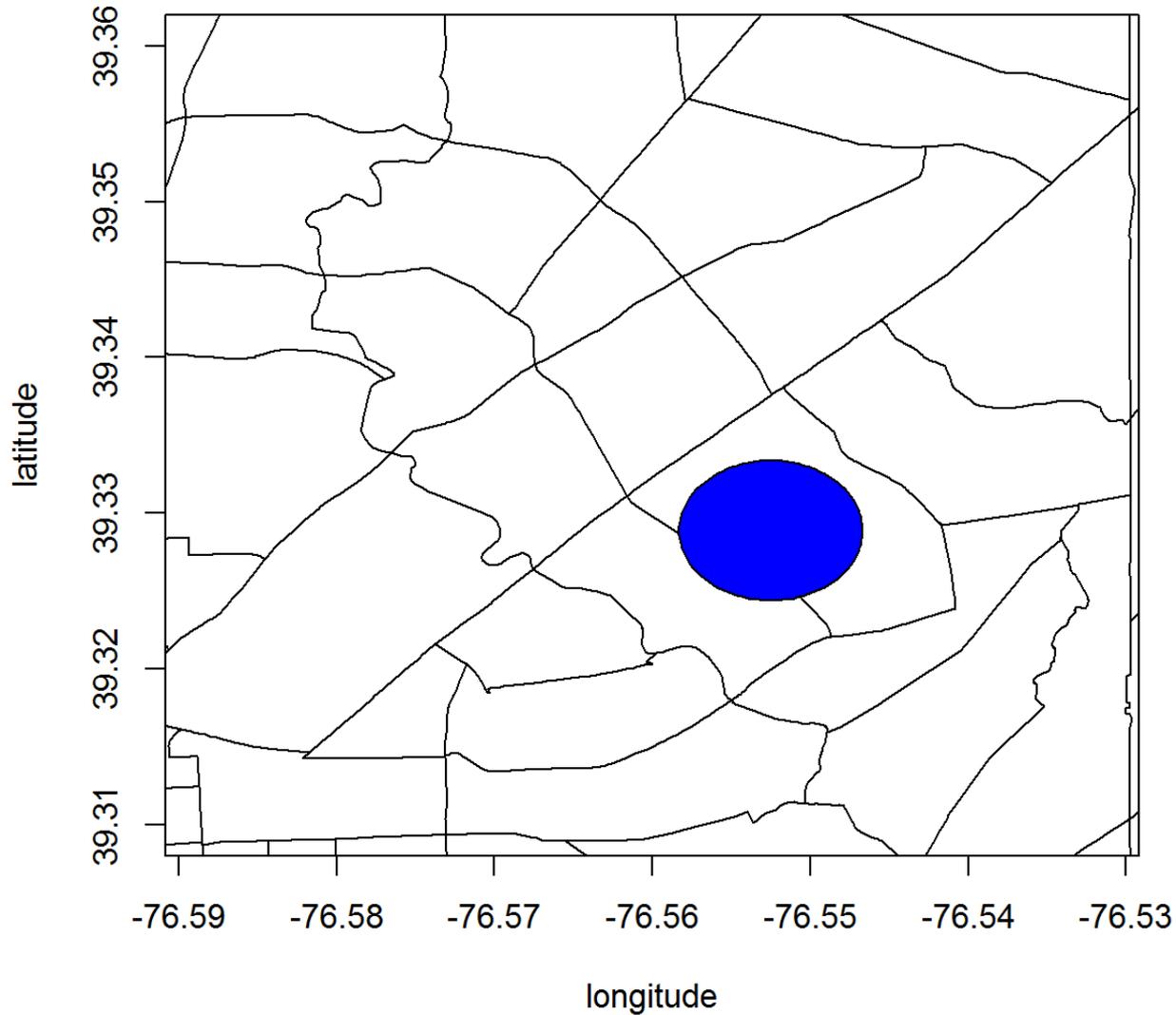
Scale of representativeness	
Micro	several m - 100 m
Middle	100 m - 0.5 km
Neighborhood	0.5 km - 4 km
Urban	4 km - 50 km
Regional	50 km - 100 km

O₃ Monitoring Sites and Census Tracts

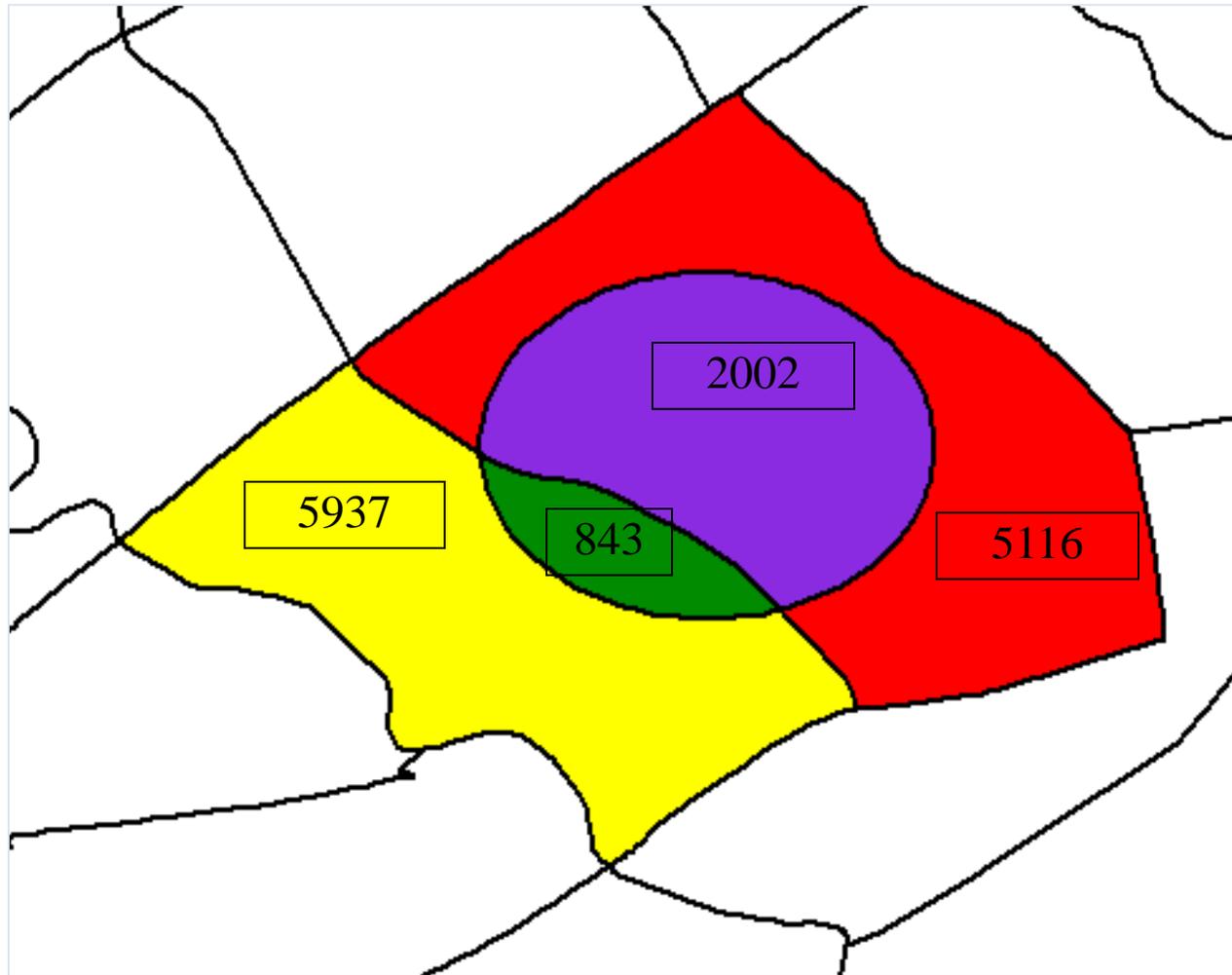
Scales of representativeness overlaid on census tracts.



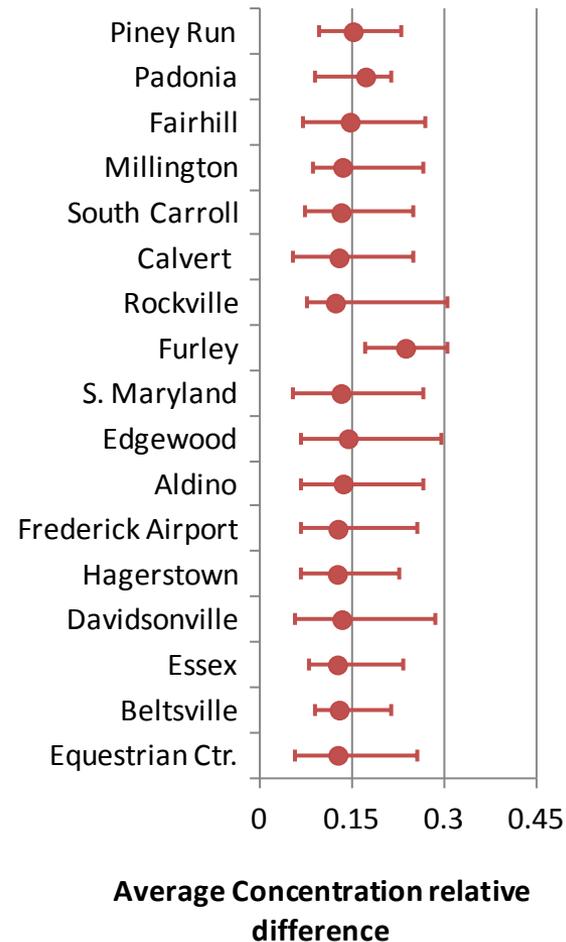
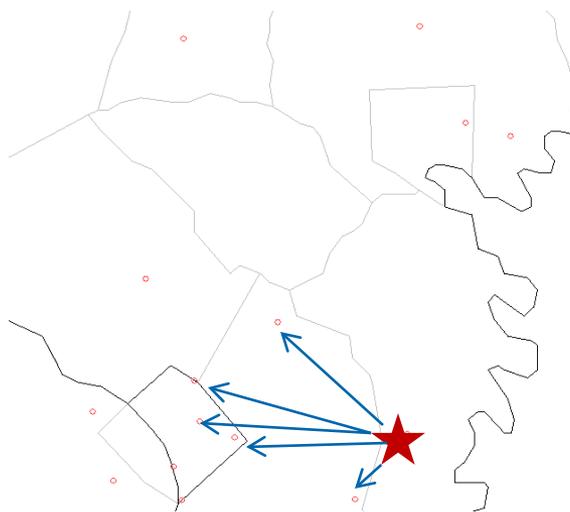
Zoom-in on Baltimore City Site



Population in Baltimore City Site



Cormat tool



- The cormat tool provided correlations and concentration relative differences for all site pairs.
- We averaged the correlations and relative differences among all site pairs. These averages were used in the decision matrix.
- We developed an R script to calculate the correlations and relative differences.

Decision Matrix

- A decision matrix was used to determine the relative value of each site in the ozone and PM2.5 network.
- The decision matrix ranks the sites according to a weighted score and a normalization process:
 - The score for each criterion was calculated with the following equation [Cavender, 2009]:

$$\text{Score} = 100 * \text{weight} * (V_i - V_{\min}) / (V_{\max} - V_{\min})$$

where V_i , V_{\min} and V_{\max} represent the value of the given criteria and the minimum and maximum values of criteria for all sites.

- For correlation with other sites, the score is calculated differently so that smaller correlations receive more weight:

$$\text{Score} = 100 * \text{weight} * (V_{\max} - V_i) / (V_{\max} - V_{\min})$$

Decision Matrix Criteria

- 2008 estimated population within Voronoi polygons associated with each site— important relative to the population oriented monitoring requirement but not highly weighted because of the reliability of the 2008 population estimates.
- 2008 population density within Voronoi polygons.
- The number of parameters measured at the site.
- The uniqueness of the concentrations measured at one site relative to other sites
 - The site-average squared correlation coefficient.
 - The site-average relative percent concentration difference.
- The site-specific 2008 design value (DV_{2008}) represented as a percentage of the NAAQS.



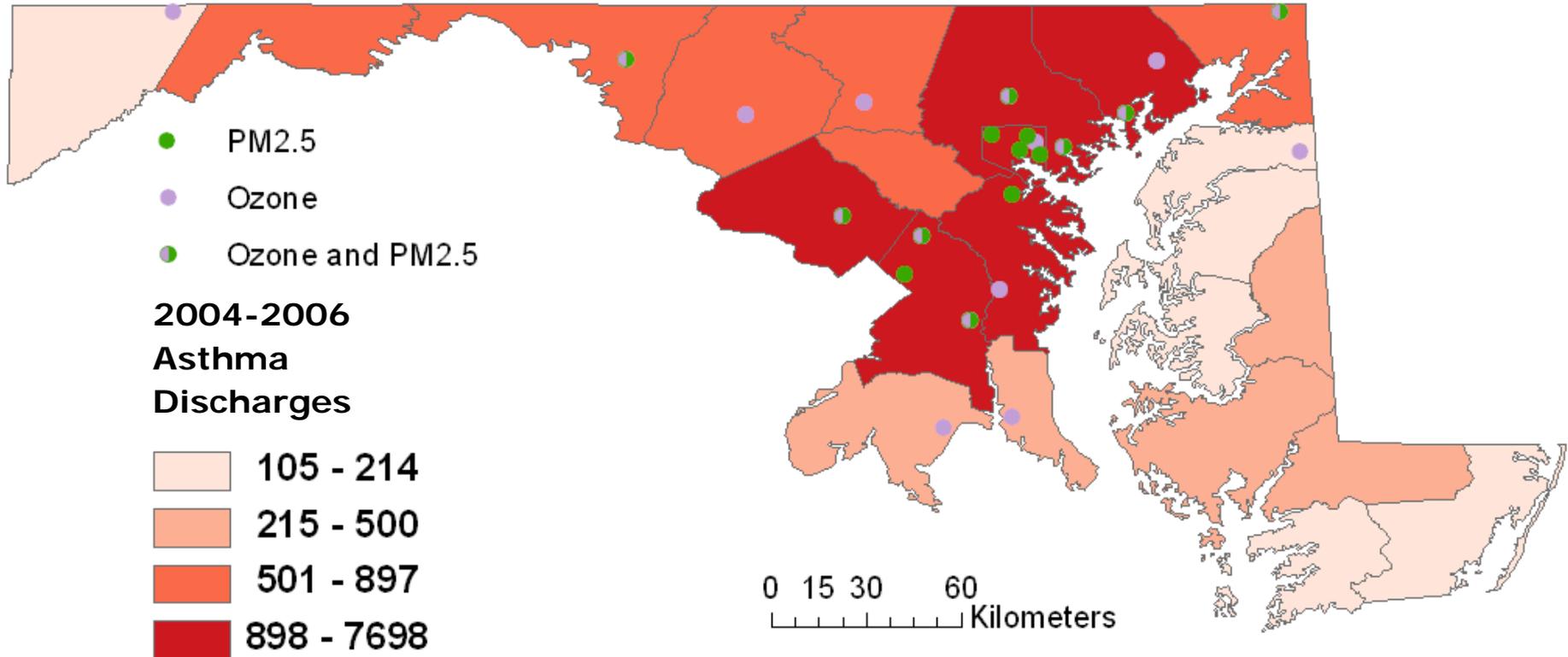
Scoring results for ozone

Site	2008 Design Values	Population 2008		Population density 2008		Number of parameters		Correlation with other sites		Relative concentration difference		Ozone DV %NAAQS		SCORE
		weight:	0.33	weight:	0.50	weight:	0.50	weight:	1.00	weight:	1.00	weight:	1.00	
		raw	points	raw	points	raw	points	raw	points	raw	points	raw	points	
Davidsonville	0.087	322819	8	784	7	2	4	0.69	9	0.14	9	1.160	83	121
Padonia	0.08	358215	10	759	7	3	7	0.59	67	0.18	43	1.067	54	187
Essex	0.085	270208	7	1804	17	12	39	0.70	8	0.13	3	1.133	75	148
Calvert	0.079	166991	3	225	2	1	0	0.66	30	0.13	5	1.053	50	89
S. Carroll	0.083	205345	4	340	3	1	0	0.65	34	0.14	8	1.107	67	116
Fairhill	0.09	150178	2	488	4	4	11	0.62	51	0.15	21	1.200	96	185
S. MD	0.082	125376	1	212	1	1	0	0.67	22	0.14	8	1.093	63	95
Frederick	0.082	224018	5	337	3	1	0	0.68	19	0.13	4	1.093	63	92
Piney Run	0.073	192030	4	64	0	13	43	0.53	100	0.16	25	0.973	25	197
Edgewood	0.091	125822	1	535	4	3	7	0.67	21	0.15	18	1.213	100	153
Aldino	0.089	137441	2	469	4	5	14	0.67	21	0.14	11	1.187	92	144
Millington	0.083	92039	0	117	1	4	11	0.64	37	0.14	10	1.107	67	125
Rockville	0.084	577350	18	2011	19	4	11	0.66	29	0.13	0	1.120	71	147
Beltsville	0.083	541105	17	1847	17	15	50	0.70	6	0.13	5	1.107	67	161
PG Equestrian Center	0.087	108724	1	479	4	3	7	0.71	0	0.13	4	1.160	83	99
Hagerstown	0.078	178897	3	290	2	3	7	0.68	18	0.13	3	1.040	46	80
Furley	0.067	988285	33	5305	50	1	0	0.66	26	0.24	100	0.893	0	209

Limitations

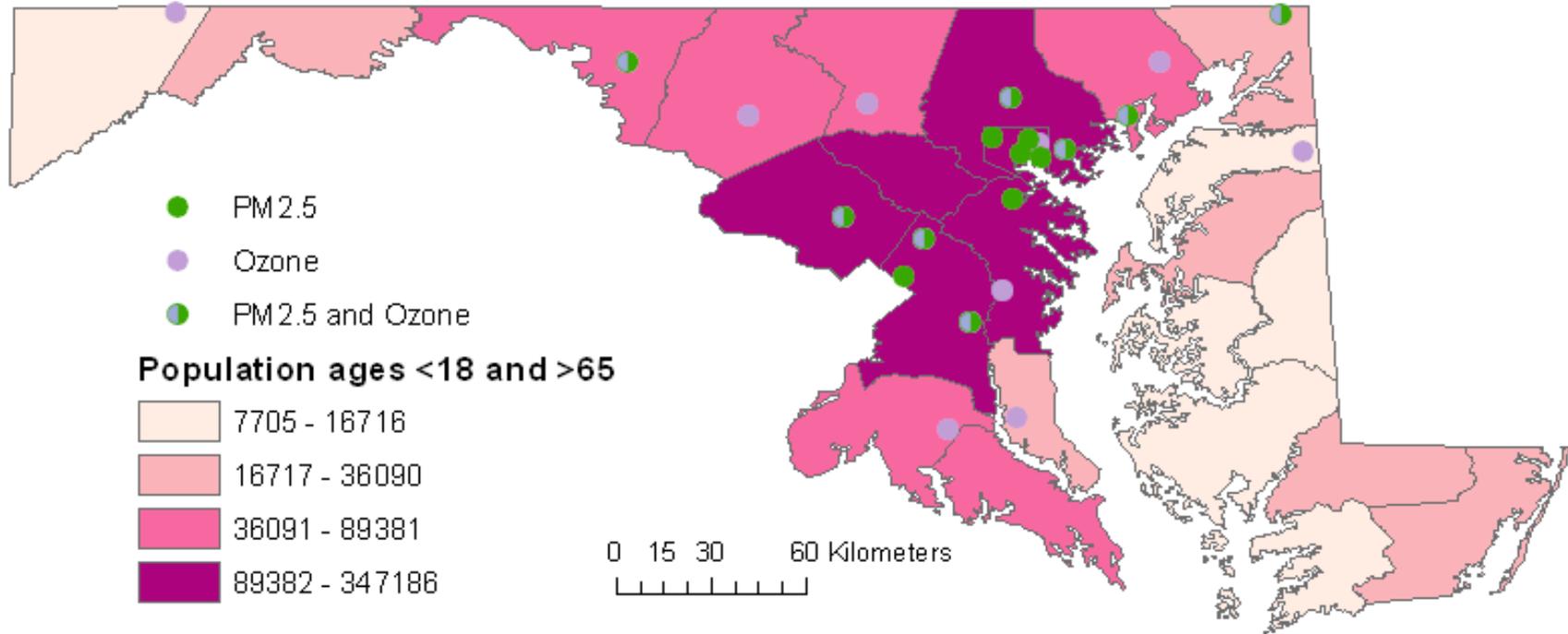
- The decision matrix does not help us determine if new sites are needed and where these sites should be located.
- Suggestions are very welcome.

Sensitive populations: Asthma Hospital Discharges



- Counties with the largest sensitive populations have monitors.
- More detailed sensitive population distributions are needed to fully assess whether monitors serve these populations.

Sensitive Populations: Children and the Elderly



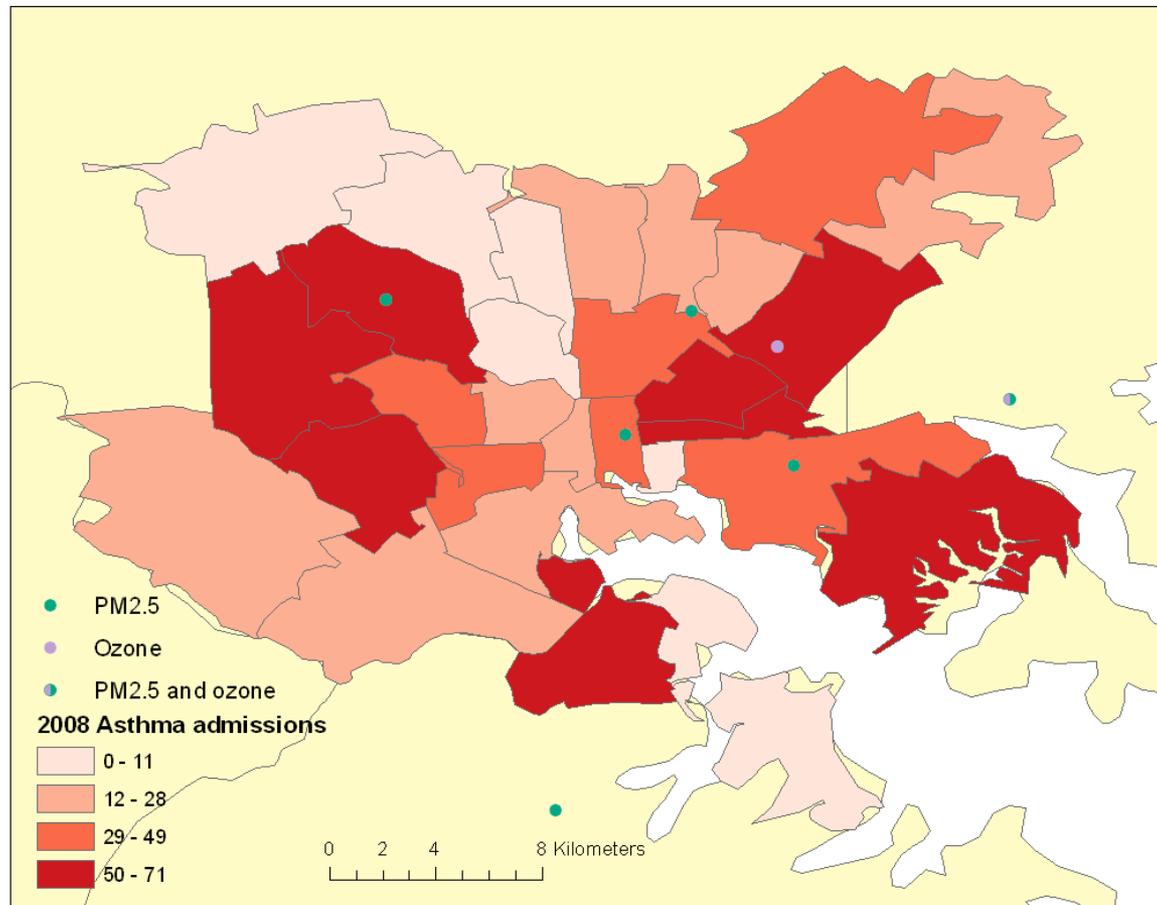
- Another set of sensitive populations was defined as children (younger than 18) and the elderly (older than 65).
- Ozone and PM2.5 monitors are located in all of the counties with the largest sensitive population except Howard County.

Scales of Representativeness

COUNTY	SITE	PARAMETER	SCALE
Montgomery County	Rockville	Ozone	Urban
		PM2.5	Neighborhood
Prince George's County	HU-Beltsville	Ozone	Urban
		PM2.5	Urban
	PG Equestrian Center	Ozone	Urban
		PM2.5	Neighborhood
Baltimore City	Bladensburg	PM2.5	Neighborhood
	NE Police	PM2.5	Neighborhood
	NW Police	PM2.5	Neighborhood
	SE Police	PM2.5	Neighborhood
	Oldtown	PM2.5	Middle
Baltimore County	Furley	Ozone	Neighborhood
		PM2.5	Neighborhood
	Essex	Ozone	Neighborhood
		PM2.5	Neighborhood
Harford County	Padonia	Ozone	Neighborhood
		PM2.5	Neighborhood
	Aldino	Ozone	Urban
Anne Arundel	Edgewood	Ozone	Urban
		PM2.5	Neighborhood
Anne Arundel	Glen Burnie	PM2.5	Neighborhood
	Davidsonville	Ozone	Urban

- Most counties have at least one urban scale monitor (4-50 km).
- Urban scale monitors cover most of the county and likely overlap Howard County which does not have a PM2.5 or ozone monitor.

Baltimore City: Child Asthma Admissions by Zip Code



- Some PM2.5 monitors are located within zip codes with large asthma hospitalizations.
- PM2.5 is well correlated throughout the city suggesting that distributions are similar throughout the city.



Suggestions and comments are very welcome!

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