

Notes on tribal data analysis

A post-hoc attempt to include tribal data was made after the network analyses had been completed, in order to incorporate data that had not been available earlier. Five PM sites had new data entered into AQS: 3 sites operated by the Intertribal Council of Michigan (260330901, 260330902, and 260330903, all in the vicinity of Sault Ste. Marie), 1 site operated by Leech Lake Band of Minnesota Chippewa Tribe (270210001) and 1 site operated by Mille Lacs Band of Minnesota Chippewa Tribe (270953051). However, all 5 sites failed to meet EPA completeness criteria for calculating a valid NAAQS comparison. Consequently, the revised ranking analysis did not include these sites. An ozone site operated by the Grand Traverse Band of Ottawa and Chippewa, 260890001, was not included in some analyses performed previously because the site information (latitude, longitude, parameters, address, sampling start date, etc.) was not complete in AQS although the measurement data were. New ozone data from the Mille Lacs site caused that site to meet the completeness criteria. These sites were included where appropriate in the revised figures and table below.

The ozone correlation analysis and the particulate correlation and cluster analyses were rerun with the incomplete tribal data. Missing PM_{2.5} values replaced by the daily regional average concentration to avoid biasing the results (simply removing the days without data does not leave enough data for analysis). During this analysis, an inspection of the data revealed many days with recorded concentrations of zero at the three Sault Ste. Marie sites. These values were also replaced with daily average concentrations. The resulting new correlations and cluster analyses are presented below. The Leech Lake and Mille Lacs results are probably reliable since the amount of missing data was not extreme. However, the data from Sault Ste Marie were highly compromised and the resulting correlations were unrealistically low for PM_{2.5} sites in such close proximity to each other. As a result, we recommend that the tribes implement measures to improve their data capture, validation, and documentation.

Monitor ID	County	O3 Corr.	PM Corr.	O3 DV	PM25 Daily DV	PM25 Annual DV	O3 Pop.	O3 Area	PM2.5 Pop.	PM2.5 Area	Years	Parms.	Overall Rank	O3 Rank	PM Rank	DV-wted O3 Rank
170190004	Champaign	0.384	-0.102	-1.557	-0.277	-0.330	-0.052	0.545	-0.076	0.236	1.651	0.230	0.059	0.163	0.239	-0.123
170191001	Champaign		0.105		-0.817	-0.330			-0.928	-0.092	-0.531	-0.643	-0.462		-0.557	
170310001	Cook	-1.220		0.558			0.707	-0.582			1.432	1.103	0.333	0.644		0.630
170310022	Cook		-0.470		0.263	0.764			-1.050	-0.694	1.542	1.103	0.208		0.321	
170310032	Cook	-0.847		0.174			-0.373	-0.649			0.669	-0.643	-0.278	-0.165		-0.108
170310050	Cook		-0.430		-0.277	0.399			0.441	-0.682	1.323	0.230	0.144		0.239	
170310052	Cook		-0.229		0.802	0.921			2.653	-0.675	1.214	0.230	0.703		0.858	
170310057	Cook		-0.229		0.263	0.660			2.403	-0.682	-0.640	0.230	0.286		0.372	
170310064	Cook	-0.847		-0.595			-0.053	-0.647			0.451	-0.643	-0.389	-0.298		-0.347
170310072	Cook	0.228		-1.172			-0.134	-0.652			-0.203	0.230	-0.284	-0.386		-0.517
170310076	Cook	-1.220	-0.527	-0.019	0.533	0.452	0.436	-0.633	1.585	-0.677	-0.640	3.723	0.274	0.574	0.829	0.475
170311003	Cook	-0.597		-0.019			1.047	-0.625			1.651	-0.643	0.136	0.282		0.232
170311016	Cook		-0.156		1.342	1.234			0.022	-0.663	-0.094	0.230	0.274		0.345	
170311601	Cook	-0.233		0.366			0.423	-0.434			1.323	0.230	0.279	0.382		0.379
170312001	Cook		-0.311		0.263	0.504			1.662	-0.601	0.887	0.230	0.376		0.491	
170313103	Cook		0.087		0.802	1.181			0.884	-0.646	-0.421	1.977	0.552		0.630	
170313301	Cook		-0.527		0.263	0.608			-0.517	-0.673	1.542	1.103	0.257		0.388	
170314002	Cook	-0.638		-2.134			1.403	-0.625			1.214	1.977	0.200	0.367		-0.050
170314007	Cook	-0.597	0.049	-1.365	-0.277	-0.278	0.523	-0.607	1.140	-0.651	-0.749	0.230	-0.235	-0.393	-0.098	-0.555
170314201	Cook	-0.391	-0.282	-0.788	-0.007	-0.330	-0.332	-0.622	0.076	-0.642	-0.421	5.470	0.157	0.661	0.691	0.420
170314201	Cook	0.909	-0.282	-0.788	-0.007	-0.330	-0.332	-0.622	0.076	-0.642	-0.421	5.470	0.276	0.661	0.691	0.420
170317002	Cook	0.569		-0.595			-0.009	-0.646			1.760	-0.643	0.073	-0.027		-0.122
170434002	DuPage		-0.358		0.533	0.139			1.456	-0.604	-0.531	0.230	0.124		0.204	
170436001	DuPage	-0.233		-1.941			1.577	-0.497			1.105	-0.643	-0.105	-0.080		-0.390
170491001	Effingham	2.148		-0.788			-0.448	0.570			1.323	-0.643	0.361	0.003		-0.129
170650002	Hamilton	1.351	1.575	-0.788	-0.817	-0.018	0.101	1.383	0.135	1.390	-1.294	0.230	0.295	-0.074	-0.062	-0.193
170831001	Jersey	0.516	0.467	-0.019	-0.817	-0.383	-0.325	0.578	-0.796	0.594	0.560	0.230	0.055	0.205	-0.102	0.168
170890003	Kane		-0.347		0.802	-0.226			1.182	-0.494	-0.640	-0.643	-0.052		-0.003	
170890005	Kane	-0.114		-1.365			0.637	-0.336			1.432	-0.643	-0.065	-0.055		-0.273
170890007	Kane		0.085		-0.277	0.087			0.415	-0.327	-1.294	-0.643	-0.279		-0.340	
170971002	Lake	-1.052		-0.403			-0.034	-0.592			1.869	-0.643	-0.143	0.039		-0.035
170971007	Lake	-1.059	-0.282	-0.211	-0.817	-0.904	-0.761	-0.643	0.038	-0.623	-0.094	0.230	-0.466	-0.296	-0.362	-0.282
170990007	La Salle		0.236		-1.087	-0.487			-0.569	0.315	-0.094	1.103	-0.083		-0.136	
171110001	McHenry	-0.047	-0.347	-1.557	-0.547	-0.591	0.119	-0.475	1.103	-0.296	1.432	0.230	-0.089	-0.050	0.222	-0.301

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171132003	McLean	0.259	-0.155	-0.403	-0.817	-0.435	-0.380	0.071	-0.431	0.169	-0.858	0.230	-0.250	-0.268	-0.357	-0.290
171150013	Macon	0.259	-0.104	-0.403	-0.277	0.191	-0.422	0.066	-0.169	0.691	1.214	1.103	0.195	0.312	0.459	0.193
171170002	Macoupin	0.873		-0.595			-0.583	-0.024			1.432	1.977	0.513	0.441		0.269
171190008	Madison	-1.012		0.558			-0.041	-0.527			1.105	0.230	0.052	0.265		0.314
171191007	Madison		1.428		1.342	1.703			-0.903	-0.663	-0.531	0.230	0.372		0.196	
171191009	Madison	0.379		0.943			-0.313	-0.197			1.214	-0.643	0.230	0.201		0.325
171192009	Madison		-0.127		0.263	0.608			-1.018	-0.575	-0.640	-0.643	-0.305		-0.334	
171193007	Madison	-1.012	-0.215	0.558	-0.277	0.452	-0.593	-0.553	-0.707	-0.252	2.087	2.850	0.212	0.870	0.692	0.818
171430024	Peoria	-0.098		-1.172			-0.200	0.015			2.196	0.230	0.162	0.214		-0.017
171430037	Peoria		-0.155		-0.007	-0.122			0.622	0.613	0.778	1.103	0.405		0.498	
171431001	Peoria	-0.098		-0.211			-0.309	0.213			1.542	-0.643	0.082	0.118		0.063
171570001	Randolph	1.587	0.653	-0.211	-1.087	-0.174	0.126	2.537	-0.858	0.024	0.560	1.103	0.387	0.823	-0.072	0.651
171613002	Rock Island	1.023	1.674	-1.365	-1.087	-0.591	3.607	5.309	-0.118	-0.034	-0.749	0.230	0.718	1.407	-0.391	0.945
171630010	Saint Clair	0.383	0.441	-0.211	-0.277	0.973	4.433	3.111	-0.927	-0.674	2.087	4.596	1.267	2.803	0.963	2.301
171634001	Saint Clair		0.851		-0.277	0.399			-0.224	-0.130	-0.640	-0.643	-0.095		-0.252	
171670010	Sangamon	0.809		-1.557			-0.200	0.282			1.432	-0.643	0.021	-0.137		-0.374
171670012	Sangamon		0.221		-0.277	-0.226			0.244	0.928	-0.531	-0.643	-0.041		-0.084	
171971002	Will		-0.358		0.533	0.243			0.278	-0.407	1.105	0.230	0.232		0.330	
171971011	Will	2.326	0.320	-1.365	-1.087	-0.852	-0.076	0.533	-0.420	0.237	-0.203	0.230	-0.032	-0.176	-0.349	-0.374
172010013	Winnebago		-0.072		-0.277	-0.278			1.544	0.657	-1.294	-0.643	-0.052		-0.049	
172012001	Winnebago	-1.346		-1.557			0.239	0.310			1.542	-0.643	-0.243	-0.022		-0.278
180030002	Allen	0.508		-0.211			-0.279	0.054			0.778	-0.643	0.034	-0.060		-0.085
180030004	Allen	0.508	-0.040	-0.019	-0.007	-0.018	-0.071	-0.371	2.580	1.476	1.542	0.230	0.528	0.262	0.967	0.215
180150002	Carroll	0.541		-0.211			0.184	0.595			-0.858	-0.643	-0.065	-0.186		-0.191
180190006	Clark		-0.189		1.342	1.546			-0.975	-0.682	-1.076	1.103	0.153		0.210	
180350006	Delaware		-0.544		-0.547	-0.018			-0.290	0.015	-0.640	-0.643	-0.381		-0.354	
180350010	Delaware	-0.504		-0.403			-0.231	-0.029			-0.858	-0.643	-0.445	-0.433		-0.428
180390007	Elkhart	-0.765		-0.211			-0.181	-0.169			-0.967	-0.643	-0.489	-0.434		-0.397
180431004	Floyd	0.626	-0.189	0.751	-0.007	0.660	1.653	1.313	-0.737	-0.380	1.869	1.103	0.606	1.338	0.418	1.240
180670003	Howard		-0.491		-0.007	0.035			0.009	0.370	-0.640	-0.643	-0.195		-0.146	
180690002	Huntington	0.604		-0.595			-0.371	-0.033			-0.749	-0.643	-0.298	-0.478		-0.498
180830004	Knox		0.353		-0.007	0.295			-0.570	0.716	-0.640	-0.643	-0.071		-0.142	
180890006	Lake		-0.449		0.263	0.452			-1.198	-0.691	0.669	0.230	-0.104		-0.046	
180890022	Lake	1.410	0.496	-0.019	0.263	0.712	-0.289	-0.560	-1.113	-0.675	-0.203	3.723	0.340	0.530	0.451	0.439

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180890026	Lake		-0.444		0.802	1.338			-1.231	-0.695	-0.749	-0.643	-0.232		-0.196	
180890027	Lake		-0.573		-0.277	0.035			-0.105	-0.292	-0.749	-0.643	-0.372		-0.339	
180890030	Lake	1.410		0.751			-0.737	-0.648			-1.185	-0.643	-0.175	-0.492		-0.285
180890031	Lake		-0.410		0.263	0.504			-1.092	-0.693	-1.294	0.230	-0.356		-0.347	
180892004	Lake		-0.573		-0.007	0.191			-0.259	-0.665	-0.640	0.230	-0.246		-0.192	
180892008	Lake	0.520		-0.019			0.223	-0.542			1.978	0.230	0.398	0.374		0.309
180892010	Lake		-0.470		-0.007	0.295			-1.203	-0.694	0.669	0.230	-0.169		-0.118	
180910005	LaPorte	0.805		-0.788			-0.714	-0.618			1.869	0.230	0.131	-0.004		-0.135
180910011	LaPorte		-0.399		-0.277	-0.383			-0.653	-0.332	-0.640	-0.643	-0.475		-0.488	
180950009	Madison		-0.544		-0.277	0.139			-0.579	-0.459	0.451	0.230	-0.149		-0.083	
180950010	Madison	-0.580		-0.403			-0.396	-0.369			0.015	-0.643	-0.396	-0.359		-0.367
180970043	Marion		-0.483		1.342	1.911			0.890	-0.101	0.778	0.230	0.652		0.842	
180970073	Marion	-0.788		-0.211			-0.328	-0.620			0.342	2.850	0.207	0.407		0.304
180970078	Marion		-0.672		0.802	1.025			1.085	-0.509	-0.749	1.103	0.298		0.460	
181230009	Perry	0.984		0.751			-0.046	1.095			-1.185	-0.643	0.159	-0.006		0.120
181270024	Porter	-0.146	-0.411	0.174	-0.277	-0.070	-0.691	-0.632	-0.523	-0.412	1.105	1.103	-0.071	0.212	0.155	0.206
181270026	Porter	0.288		-0.595			-0.444	-0.165			-0.531	-0.643	-0.348	-0.476		-0.496
181290003	Posey	2.310		-0.788			-0.562	0.257			-0.312	-0.643	0.044	-0.410		-0.473
181410010	St. Joseph	-0.587		-0.788			-0.583	-0.278			0.233	-0.643	-0.441	-0.412		-0.474
181410014	St. Joseph		-0.615		-0.277	-0.122			-0.476	-0.302	-0.640	-0.643	-0.439		-0.410	
181410015	St. Joseph	2.614	-0.615	-1.941			-0.250	-0.555	-0.395	-0.475	-1.403	1.103	-0.213	-0.609		-0.831
181411007	St. Joseph	-0.900		-0.019			-0.630	-0.605			-0.312	-0.643	-0.518	-0.442		-0.371
181470009	Spencer		-0.154		-0.817	0.347					-0.749	-0.643	-0.403		-0.465	
181570008	Tippecanoe		-0.491		-0.277	-0.018			0.192	0.874	-0.967	-0.643	-0.190		-0.140	
181630013	Vanderburgh	-0.993		1.327			-0.757	-0.417			1.432	-0.643	-0.008	0.189		0.378
181630016	Vanderburgh		-0.176		-0.277	0.660			-0.893	-0.638	-0.640	-0.643	-0.372		-0.405	
181670018	Vigo	0.702	-0.452	-1.557	-0.277	0.452	-0.590	-0.424	-0.622	0.315	1.105	1.977	0.057	0.102	0.492	-0.174
181670023	Vigo		-0.452		-0.007	0.139			-0.529	0.016	-0.640	-0.643	-0.302		-0.277	
181670024	Vigo	0.546		-0.595			-0.602	-0.064			-0.858	-0.643	-0.369	-0.552		-0.560
181730008	Warrick	-0.924		0.751			-0.797	-0.552			0.233	-0.643	-0.322	-0.202		-0.043
181730009	Warrick	-0.993		-0.403			-0.672	-0.301			0.233	-0.643	-0.463	-0.357		-0.365
181730011	Warrick	0.074		-0.403			-0.157	0.479			-1.294	-0.643	-0.324	-0.404		-0.404
260050003	Allegan	-0.987	0.050	2.481	-0.007	-0.747	-0.486	-0.491	-0.676	-0.495	0.124	0.230	-0.091	0.372	-0.262	0.723
260170014	Bay		0.132		-1.087	-1.373			1.512	1.270	-0.749	-0.643	-0.134		-0.178	

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260190003	Benzie	-0.538		0.558			-0.734	-0.350			0.124	-0.643	-0.264	-0.209		-0.081
260210014	Berrien	-0.038	0.188	0.943	-0.277	-0.800	-0.473	-0.434	-0.541	-0.389	0.124	0.230	-0.133	0.078	-0.275	0.222
260270003	Cass	-0.765		0.366			-0.738	-0.498			-1.294	-0.643	-0.595	-0.561		-0.407
260370001	Clinton	-1.149		-0.019			-0.337	-0.073			1.542	-0.643	-0.113	0.094		0.075
260490021	Genesee	-0.343	0.132	0.174	-1.087	-0.904	1.058	-0.061	1.900	0.210	0.124	0.230	0.130	0.305	0.079	0.283
260492001	Genesee	-0.279		0.558			-0.138	0.025			1.432	-0.643	0.159	0.247		0.299
260630007	Huron	1.474		0.174			-0.619	0.025			-0.094	-0.643	0.053	-0.231		-0.164
260650012	Ingham	-1.149	-0.012	-0.019	-0.817	-0.747	0.251	-0.030	1.655	0.692	1.432	1.103	0.215	0.548	0.553	0.453
260770008	Kalamazoo	0.154	0.129	-0.019	-0.547	-0.174	0.408	0.174	1.265	0.445	-0.421	0.230	0.150	0.075	0.133	0.059
260810020	Kent	-1.223	-0.443	0.751	-0.277	-0.278	0.344	-0.430	0.322	0.079	1.432	3.723	0.364	1.164	0.833	1.095
260810022	Kent	-0.654		0.943			-0.116	0.207			-0.640	-0.643	-0.150	-0.050		0.116
260890001	Leelanau	-0.538		-0.403			-0.321	0.526			-1.076	-0.643	-0.409	-0.384		-0.387
260910007	Lenawee	-0.117		0.366			-0.103	0.053	0.174	0.288	0.015	1.103	0.222	0.287		0.300
260990009	Macomb	-0.774	-0.216	1.520	0.263	-0.539	-0.283	-0.428	0.475	-0.351	1.432	0.230	0.121	0.494	0.252	0.665
260991003	Macomb	-1.411		1.327			0.854	-0.582			1.869	-0.643	0.236	0.565		0.692
261010922	Manistee	-0.520	1.091	0.751			-0.798	-0.477	-0.566	0.521	-1.403	0.230	-0.130	-0.339		-0.158
261050007	Mason	-0.113		0.366			-0.692	-0.064			-0.531	-0.643	-0.280	-0.313		-0.200
261130001	Missaukee	0.503	1.506	-0.403	-2.166	-2.572	-0.056	2.129	0.666	3.412	-0.531	1.977	0.406	0.623	0.131	0.452
261150005	Monroe		-0.057		0.263	0.035			-0.776	-0.580	-0.640	0.230	-0.218		-0.245	
261210039	Muskegon	0.178		1.712			-0.279	-0.325			0.233	-0.643	0.146	0.140		0.402
261210040	Muskegon		-0.155		-0.547	-0.956			0.048	0.066	-0.531	-0.643	-0.388		-0.427	
261250001	Oakland	-0.899	-0.306	0.751	0.802	-0.122	2.945	-0.465	3.763	-0.555	1.323	0.230	0.679	0.957	0.907	0.922
261390005	Ottawa	-1.223	-0.443	1.135	-0.547	-0.435	-0.393	-0.443	-0.562	-0.462	0.451	0.230	-0.245	0.196	-0.221	0.353
261470005	St. Clair	-0.008	-0.108	0.943	1.342	-0.226	-0.537	-0.446	-0.596	-0.211	1.323	1.103	0.235	0.477	0.456	0.555
261530001	Schoolcraft	0.919		0.366			-0.628	1.458			-0.967	-0.643	0.084	-0.083		-0.008
261610008	Washtenaw	-0.117	-0.639	0.174	0.263	-0.070	0.788	-0.320	0.748	-0.385	-0.640	0.230	0.003	0.047	0.024	0.068
261630001	Wayne	0.195	-0.306	-0.403	0.533	0.139	1.037	-0.540	0.218	-0.637	0.669	4.596	0.500	1.072	0.920	0.826
261630015	Wayne	-0.812	-0.194		1.342	0.869			-1.222	-0.696	0.669	1.977	0.242		0.490	
261630016	Wayne	-0.812	-0.349		1.072	0.295			-0.323	-0.687	-0.640	-0.643	-0.261		-0.154	
261630019	Wayne	-1.411	0.297	1.712	0.802	-0.018	0.687	-0.622	2.572	-0.633	-0.749	1.103	0.340	0.426	0.513	0.641
261630025	Wayne		-0.639		0.263	-0.226			2.773	-0.418	-0.640	-0.643	0.067		0.185	
261630033	Wayne		0.237		1.882	1.599			-0.178	-0.679	0.342	1.977	0.740		0.824	
261630036	Wayne		-0.042		-0.277	0.035			-0.745	-0.654	-0.640	-0.643	-0.424		-0.487	
261630039	Wayne		-0.300		0.802	0.399			-1.090	-0.695	-1.294	-0.643	-0.403		-0.420	

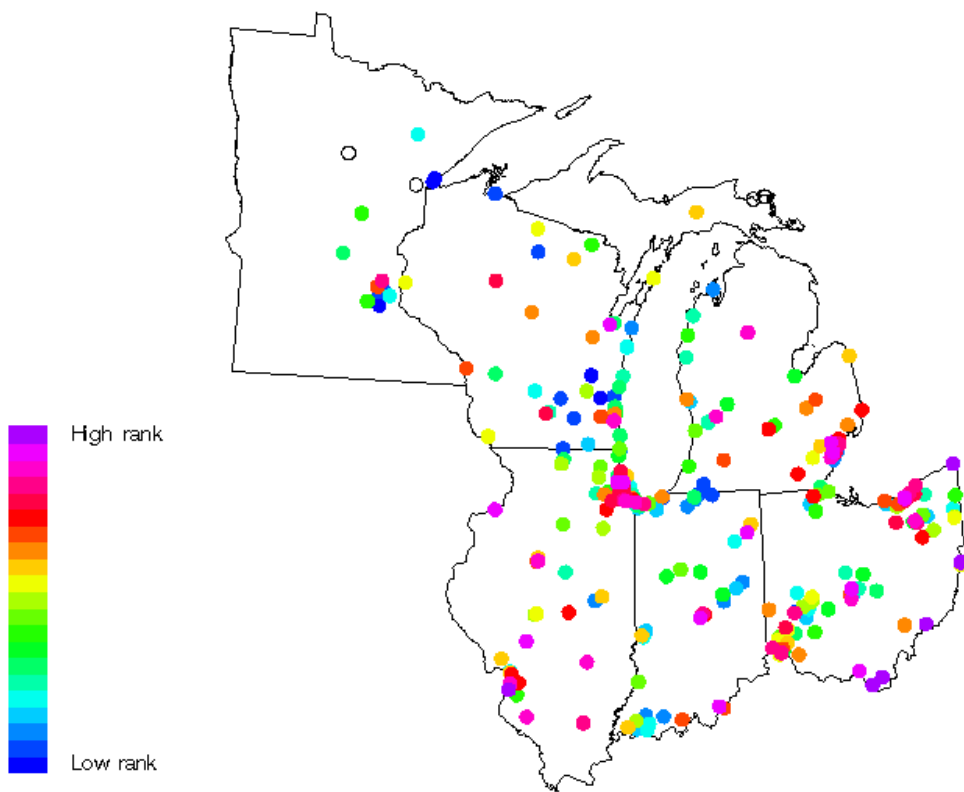
Monitor ID	County	O3 Corr.	PM Corr.	O3 DV	PM25 Daily DV	PM25 Annual DV	O3 Pop.	O3 Area	PM2.5 Pop.	PM2.5 Area	Years	Parms.	Overall Rank	O3 Rank	PM Rank	DV-wted O3 Rank
270031002	Anoka	0.137		-1.557			2.267	-0.493			1.542	0.230	0.354	0.398		0.072
270370470	Dakota		-0.607		-1.896	-1.582					-0.749	-0.643	-1.095		-1.217	
270530961	Hennepin		-0.682		-1.896	-1.738			0.675	-0.567	-0.640	-0.643	-0.784		-0.801	
270530963	Hennepin		-0.506		-1.896	-1.425			-0.098	-0.684	-0.749	1.103	-0.608		-0.625	
270531007	Hennepin		-0.599		-1.357	-1.269			2.623	-0.212	0.996	1.103	0.184		0.314	
270953051	Mille Lacs	-0.132	0.341	-1.557			-0.740	0.254	-0.617	1.759	-0.640	0.230	-0.122	-0.490		-0.668
271230866	Ramsey		-0.563		-1.087	-0.695			-0.207	-0.357	-0.312	1.103	-0.303		-0.259	
271230868	Ramsey		-0.529		-0.817	-0.852			-0.159	-0.676	-0.640	0.230	-0.492		-0.485	
271377001	Saint Louis		0.213		-3.515	-3.302			-0.813	3.349	0.887	1.103	-0.297		-0.382	
271377550	Saint Louis	1.677	-0.380		-2.706	-3.146			-0.998	-0.496	-0.640	0.230	-0.807		-1.293	
271377551	Saint Louis		-0.380		-1.896	-2.468			-0.635	1.067	-0.640	0.230	-0.674		-0.724	
271390505	Scott	0.677	-0.607		-1.896	-1.686			1.324	1.591	-0.640	0.230	-0.126		-0.180	
271453052	Stearns	-0.038	0.067		-2.706	-2.051			0.784	2.540	-0.640	0.230	-0.227		-0.307	
390071001	Ashtabula	1.171		2.097			3.702	1.510			1.869	0.230	1.763	1.882		1.917
390090003	Athens		1.188		0.533	-0.278			0.022	0.632	-0.640	-0.643	0.116		-0.062	
390170003	Butler		-0.451		0.263	1.077			-0.619	-0.575	0.124	0.230	0.007		0.083	
390170004	Butler	-0.418		1.327			-0.256	-0.546			0.124	-0.643	-0.069	0.001		0.222
390170016	Butler		-0.462		1.072	0.973			0.092	-0.282	-0.749	-0.643	0.000		0.077	
390171004	Butler	-0.428		1.712			-0.425	-0.568			0.124	1.103	0.253	0.389		0.610
390230001	Clark	-0.676		0.558			-0.453	-0.429			1.760	-0.643	0.019	0.159		0.225
390230003	Clark	-0.452		0.366			-0.657	-0.586			0.996	0.230	-0.017	0.070		0.119
390230005	Clark		-0.688		0.533	0.608			0.413	0.364	-0.749	-0.643	-0.023		0.088	
390250022	Clermont	0.208	-0.161	0.943	-0.007	0.243	0.109	0.641	-0.062	0.219	-0.858	0.230	0.137	0.213	-0.039	0.335
390271002	Clinton	-0.552		1.135			-0.578	-0.137			0.015	-0.643	-0.127	-0.042		0.155
390350034	Cuyahoga	0.065	-0.410	0.943	0.533	-0.174	0.555	-0.620	0.804	-0.619	2.305	0.230	0.328	0.682	0.513	0.726
390350038	Cuyahoga		-0.334		2.152	1.442			-1.320	-0.698	1.978	2.850	0.867		1.067	
390350045	Cuyahoga		-0.410		0.802	1.025			-0.688	-0.691	0.996	1.103	0.306		0.425	
390350060	Cuyahoga		-0.548		1.612	1.338			-1.130	-0.695	-0.749	2.850	0.383		0.538	
390350064	Cuyahoga	0.098		0.174			0.812	-0.552			-0.094	-0.643	-0.034	-0.061		-0.022
390350065	Cuyahoga		-0.208		0.802	1.129			0.236	-0.631	-0.421	1.103	0.287		0.370	
390351002	Cuyahoga		-0.201		0.263	-0.018			0.807	-0.602	0.560	0.230	0.149		0.207	
390355002	Cuyahoga	0.719		1.520			-0.270	-0.600			0.996	-0.643	0.287	0.200		0.420
390410002	Delaware	-0.623		0.558			-0.325	-0.070			-0.421	-0.643	-0.254	-0.180		-0.057
390490024	Franklin		-0.728		0.533	0.712			0.425	-0.591	0.778	0.230	0.194		0.348	

Monitor ID	County	O3 Corr.	PM Corr.	O3 DV	PM25 Daily DV	PM25 Annual DV	O3 Pop.	O3 Area	PM2.5 Pop.	PM2.5 Area	Years	Parms.	Overall Rank	O3 Rank	PM Rank	DV-wted O3 Rank
390490025	Franklin		-0.728		0.533	0.660			1.895	0.180	0.015	0.230	0.398		0.585	
390490029	Franklin	-0.851		2.097			-0.626	-0.579			-0.858	-0.643	-0.243	-0.122		0.248
390490037	Franklin	-0.778		0.558			0.157	-0.613			-0.858	-0.643	-0.363	-0.280		-0.140
390490081	Franklin	-0.089	-0.496	0.174			0.205	-0.588	2.695	0.928	2.305	1.103	0.693	0.640		0.562
390550004	Geauga	0.719		-0.019			-0.636	-0.518			-0.421	-0.643	-0.253	-0.447		-0.376
390570005	Greene		-0.688		-0.277	-0.018			-0.658	-0.379	-0.421	0.230	-0.316		-0.254	
390570006	Greene	-0.827		0.751			-0.636	-0.546			-0.421	-0.643	-0.387	-0.299		-0.124
390610006	Hamilton	-0.316	-0.728	2.289	0.533	0.608	-0.144	-0.588	-0.590	-0.644	0.124	0.230	0.070	0.382	0.043	0.700
390610010	Hamilton	0.197		1.520			-0.119	-0.094			0.124	0.230	0.310	0.332		0.530
390610014	Hamilton		-0.523		1.342	1.755			-0.906	-0.687	0.124	0.230	0.191		0.310	
390610040	Hamilton	0.041	-0.607	1.520	0.263	0.764	1.203	-0.249	-0.833	-0.691	-0.640	2.850	0.329	0.937	0.286	1.034
390610042	Hamilton		-0.353		0.802	1.442			0.039	-0.298	-0.749	-0.643	0.034		0.099	
390617001	Hamilton		-0.523		0.802	1.077			-0.580	-0.678	-0.640	-0.643	-0.169		-0.110	
390618001	Hamilton		-0.470		1.072	1.651			-0.803	-0.684	-0.640	-0.643	-0.074		-0.008	
390810017	Jefferson	1.366	0.002	0.751	1.882		6.325	2.554	-1.144	-0.584	-1.076	1.977	1.205	2.106		1.880
390811001	Jefferson		0.049		1.072	1.286			-1.201	-0.618	-0.640	0.230	0.025		0.022	
390830002	Knox	-0.851		0.558			-0.288	-0.187			0.560	-0.643	-0.142	0.000		0.093
390850003	Lake	0.766		0.943			-0.561	-0.636			0.996	0.230	0.290	0.194		0.319
390870006	Lawrence	1.188		0.558			3.046	5.892			0.342	0.230	1.876	2.014		1.771
390870011	Lawrence	1.188		0.174			3.035	3.828			-0.203	-0.643	1.230	1.238		1.061
390890005	Licking	-0.803		0.174			-0.190	-0.085			0.233	-0.643	-0.219	-0.102		-0.056
390930018	Lorain	0.065		0.174			0.074	-0.366			-1.294	-0.643	-0.332	-0.411		-0.314
390933002	Lorain		-0.297		0.263	-0.226			0.561	-0.307	0.233	1.103	0.190		0.271	
390950024	Lucas	0.649	-0.666	0.366	-0.007	0.399	0.330	-0.535	-0.313	-0.544	-0.531	0.230	-0.057	-0.028	-0.128	0.038
390950026	Lucas		-0.345		0.263	0.399			1.128	0.350	-0.640	0.230	0.198		0.288	
390950027	Lucas	0.011		-0.211			-0.461	-0.287			-0.640	-0.643	-0.372	-0.448		-0.409
390950034	Lucas	0.484		0.366			-0.469	-0.452			0.233	-0.643	-0.080	-0.193		-0.100
390970007	Madison	-0.216		0.558			-0.619	-0.302			0.015	-0.643	-0.201	-0.198		-0.072
390990005	Mahoning		-0.338		0.263	0.608			-0.983	-0.659	0.560	0.230	-0.046		0.003	
390990013	Mahoning	-0.807		0.366			0.799	0.242			-0.640	0.230	0.032	0.200		0.227
390990014	Mahoning		0.157		0.533	0.660			-0.096	-0.504	-0.967	0.230	0.002		-0.024	
391030003	Medina	3.163	-0.361	-0.211	-0.277	-0.122	-0.267	-0.209	0.646	0.165	0.015	0.230	0.252	-0.088	0.109	-0.109
391090005	Miami	-0.324		-0.211			-0.403	-0.235			0.015	-0.643	-0.300	-0.295		-0.281
391130032	Montgomery		-0.480		0.533	0.973			2.072	-0.363	-0.858	0.230	0.301		0.431	

Monitor ID	County	O3 Corr.	PM Corr.	O3 DV	PM25 Daily DV	PM25 Annual DV	O3 Pop.	O3 Area	PM2.5 Pop.	PM2.5 Area	Years	Parms.	Overall Rank	O3 Rank	PM Rank	DV-wted O3 Rank
391130037	Montgomery	-0.676		0.174			0.430	-0.550			-1.621	-0.643	-0.481	-0.442		-0.340
391330002	Portage		-0.597		-0.007	0.139			-0.356	-0.429	-0.640	-0.643	-0.362		-0.323	
391331001	Portage	-0.810		0.174			-0.329	-0.510			1.651	-0.643	-0.078	0.068		0.086
391351001	Preble	0.237	-0.237	-0.403	-0.277	0.191	-0.366	-0.096	-0.236	0.126	1.978	0.230	0.104	0.269	0.335	0.157
391450013	Scioto		1.659		0.263	0.608			-0.283	0.407	0.560	1.103	0.617		0.443	
391510016	Stark	0.016		1.135			-0.047	-0.485			1.323	-0.643	0.217	0.257		0.403
391514005	Stark	-0.046		1.135			-0.526	-0.423			0.233	-0.643	-0.045	-0.045		0.152
391530017	Summit		-0.690		1.072	0.869			-0.267	-0.632	1.651	0.230	0.319		0.487	
391530020	Summit	-0.810		1.712			0.275	-0.537			1.432	0.230	0.384	0.623		0.804
391530023	Summit		-0.690		-0.007	0.399			0.115	-0.582	-0.531	0.230	-0.152		-0.063	
391550009	Trumbull	-1.065		0.558			-0.248	0.483			0.124	-0.643	-0.132	0.055		0.139
391550011	Trumbull	-1.065		1.520			-0.253	-0.470			-0.967	-0.643	-0.313	-0.163		0.118
391650007	Warren	-0.827		2.289			-0.653	-0.550	-0.794	-0.417	-1.076	0.230	-0.225	0.048		0.422
391670004	Washington	1.490		1.520			0.669	3.550			0.342	-0.643	1.155	1.088		1.160
391730003	Wood	0.460		0.366			-0.317	-0.098			-0.421	-0.643	-0.109	-0.223		-0.125
550030010	Ashland	1.090	0.478	-2.134	-2.976	-3.146	-0.693	0.842	-1.047	1.582	-0.967	0.230	-0.613	-0.544	-1.054	-0.809
550090005	Brown		0.953		1.342	-0.226			0.405	0.447	1.432	0.230	0.655		0.605	
550090026	Brown	0.323		-0.595			-0.157	-0.140			-0.094	-0.643	-0.218	-0.326		-0.371
550210015	Columbia	-1.179		-0.788			-0.709	-0.324			0.560	-0.643	-0.514	-0.381		-0.449
550250041	Dane	-0.722		-0.788			0.288	0.068			0.124	-0.643	-0.279	-0.190		-0.290
550250047	Dane		-0.293		1.072	0.139			1.126	0.243	-0.640	0.230	0.268		0.362	
550270007	Dodge	-1.111	0.458	-0.980	-0.817	-0.643	-0.702	-0.438	0.054	0.268	-0.094	3.723	-0.026	0.302	0.415	0.088
550290004	Door	-0.361		1.327			-0.649	-0.155			0.451	-0.643	-0.005	0.066		0.276
550370001	Florence	-0.298		-1.557			-0.516	1.584			0.669	-0.643	-0.127	-0.093		-0.337
550390006	Fond du Lac	-1.111		-1.172			-0.491	-0.221			-0.094	-0.643	-0.622	-0.524		-0.632
550410007	Forest	-0.298	1.672	-0.980	-2.436	-2.729	-0.731	0.422	-0.104	3.843	-0.967	2.850	0.049	0.119	0.076	-0.064
550430009	Grant		0.006		1.072	-0.018			-0.411	0.729	-0.640	-0.643	0.014		0.015	
550550002	Jefferson	-1.179		-0.595			-0.553	-0.405			0.560	-0.643	-0.469	-0.327		-0.372
550590019	Kenosha	-1.101	-0.078	0.943	0.263	0.191	-0.554	-0.584	-0.241	-0.565	0.669	0.230	-0.075	0.141	0.091	0.275
550610002	Kewaunee	-0.958		0.366			-0.765	-0.491			-0.094	-0.643	-0.431	-0.325		-0.210
550630012	La Crosse	0.011	0.260		0.533	-0.122			0.159	1.749	-1.294	0.230	0.191		0.209	
550710007	Manitowoc	-0.958	-0.265	0.366	-0.547	-0.852	-0.656	-0.465	-0.881	-0.380	-0.094	1.103	-0.330	0.051	-0.275	0.103
550730012	Marathon	0.758		-1.172			0.059	1.377			0.233	-0.643	0.102	-0.029		-0.220
550790010	Milwaukee	0.328		-1.941	1.612	0.556	0.349	-0.609	-0.347	-0.686	-0.531	1.103	-0.017	-0.326	0.285	-0.595

Monitor ID	County	O3 Corr.	PM Corr.	O3 DV	PM25 Daily DV	PM25 Annual DV	O3 Pop.	O3 Area	PM2.5 Pop.	PM2.5 Area	Years	Parms.	Overall Rank	O3 Rank	PM Rank	DV-wted O3 Rank
550790026	Milwaukee	-0.831	0.025	-0.980	1.882	0.608	-0.133	-0.643	0.853	-0.638	-0.531	1.977	0.144	-0.062	0.692	-0.215
550790041	Milwaukee	-0.889		-0.211			-0.683	-0.652			2.196	-0.643	-0.147	0.001		-0.034
550790043	Milwaukee		0.066		1.612	0.817			-1.266	-0.698	-0.640	-0.643	-0.107		-0.136	
550790059	Milwaukee				0.533	1.129			0.289	-0.561	0.560	0.230	0.363		0.363	
550790085	Milwaukee	-0.989		0.366			-0.495	-0.621			0.996	-0.643	-0.231	-0.079		-0.005
550790099	Milwaukee		0.077		1.612	0.869			-0.948	-0.695	-0.640	-0.643	-0.053		-0.074	
550850004	Oneida	-0.754		-1.365			-0.660	0.526			-0.094	-0.643	-0.498	-0.447		-0.600
550870009	Outagamie	-0.558	0.354	-0.980	0.533	-0.487	0.184	0.273	1.171	0.949	-0.203	0.230	0.133	-0.099	0.365	-0.246
550890008	Ozaukee	-0.827		-0.211			-0.743	-0.624			0.233	-0.643	-0.469	-0.398		-0.366
550890009	Ozaukee	-0.989	-0.265	0.174	-0.007	-0.226	-0.795	-0.599	-0.449	-0.379	-0.094	1.103	-0.230	-0.042	-0.009	-0.006
551010017	Racine	-1.101		-0.403			-0.404	-0.572			1.760	-0.643	-0.227	-0.052		-0.111
551050024	Rock	-1.006		-0.788			-0.323	-0.135			-0.094	-0.643	-0.498	-0.397		-0.462
551091002	St. Croix	-0.467	0.446	-0.980	-1.357	-1.060	0.055	1.195	-0.130	1.273	0.996	0.230	0.018	0.299	-0.008	0.086
551110007	Sauk	-0.282	-0.293	-1.557	-1.087	-0.956	-0.514	0.249	-0.195	1.301	-0.203	0.230	-0.301	-0.359	-0.152	-0.559
551170006	Sheboygan	-0.949		1.712			-0.606	-0.559			-0.421	-0.643	-0.244	-0.103		0.199
551198001	Taylor		0.836		-0.277	-1.738			0.697	3.114	-0.858	0.230	0.286		0.195	
551230008	Vernon	-0.202		-1.172			-0.501	0.881			0.342	-0.643	-0.216	-0.219		-0.378
551250001	Vilas	-0.754	1.162	-1.172	-0.277	-2.833	-0.679	0.922	-0.765	2.519	0.124	1.977	0.020	0.234	0.124	0.000
551270005	Walworth	-0.616		-0.595			-0.518	-0.378			0.669	-0.643	-0.347	-0.293		-0.343
551310009	Washington	-0.793		-1.557			-0.579	-0.539			0.233	-0.643	-0.646	-0.617		-0.774
551330027	Waukesha	-0.793		-1.365	0.263	0.817	0.009	-0.450	0.928	-0.161	0.451	1.977	0.167	0.124	0.712	-0.124

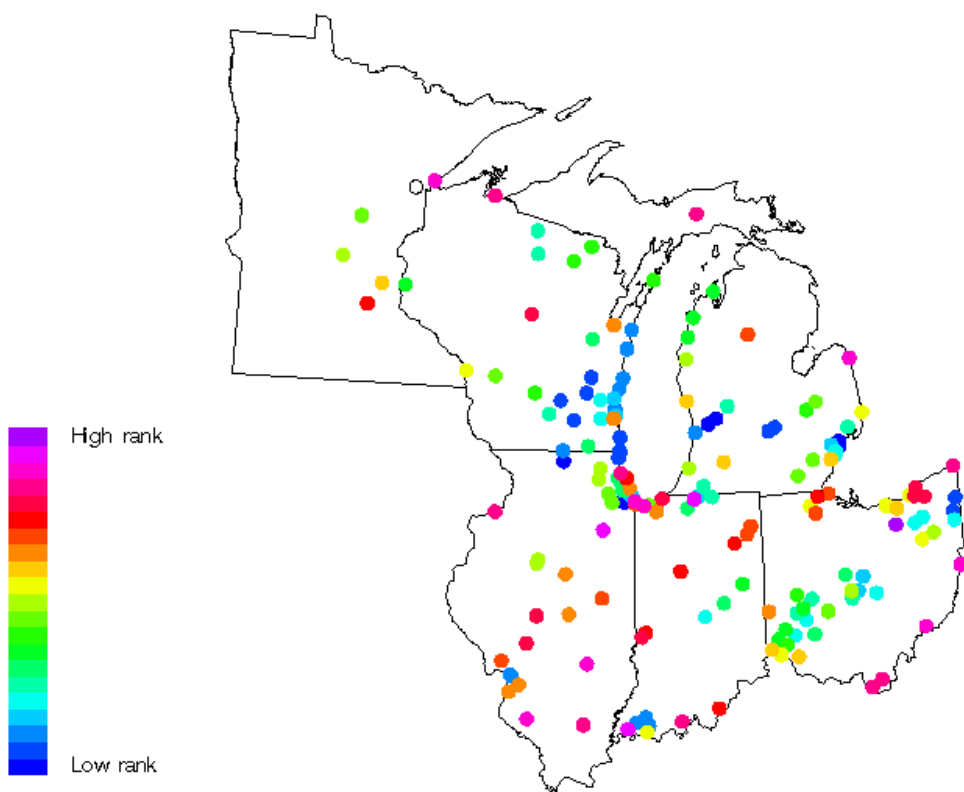
Monitor Rankings



Open circles are unranked monitors with incomplete data

Fig. 1. Overall monitor rankings

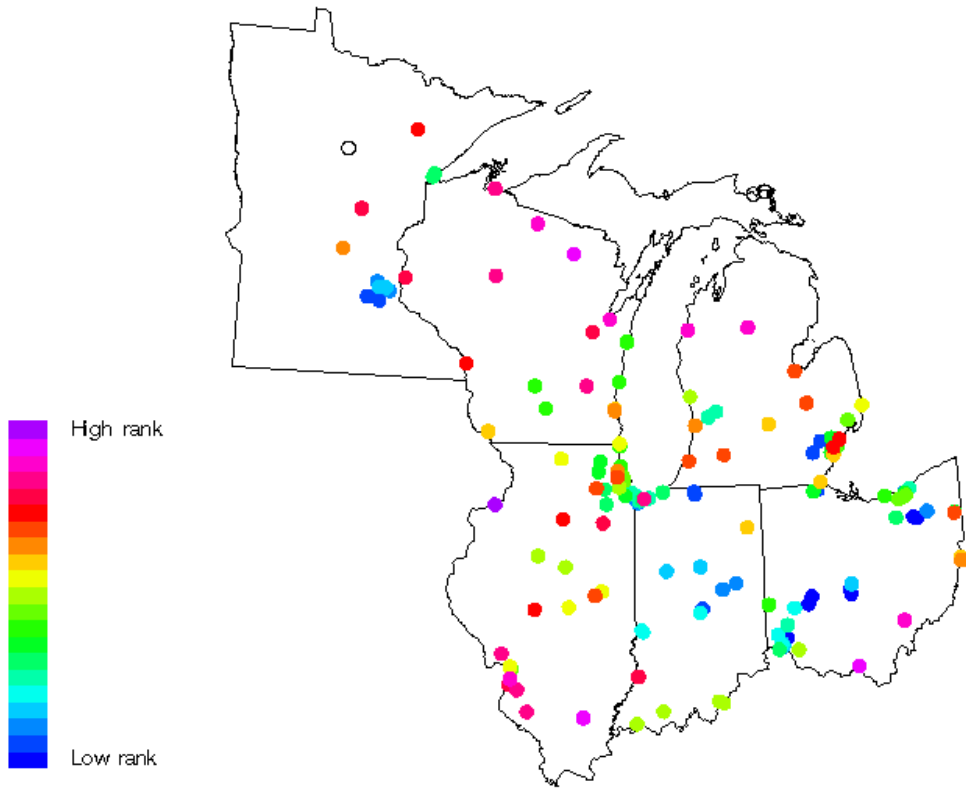
Ozone Monitors Ranked by Monitor Correlation



Open circles are unranked monitors with incomplete data

Fig. 2. Ozone monitors ranked by monitor correlation (lower correlation = higher rank)

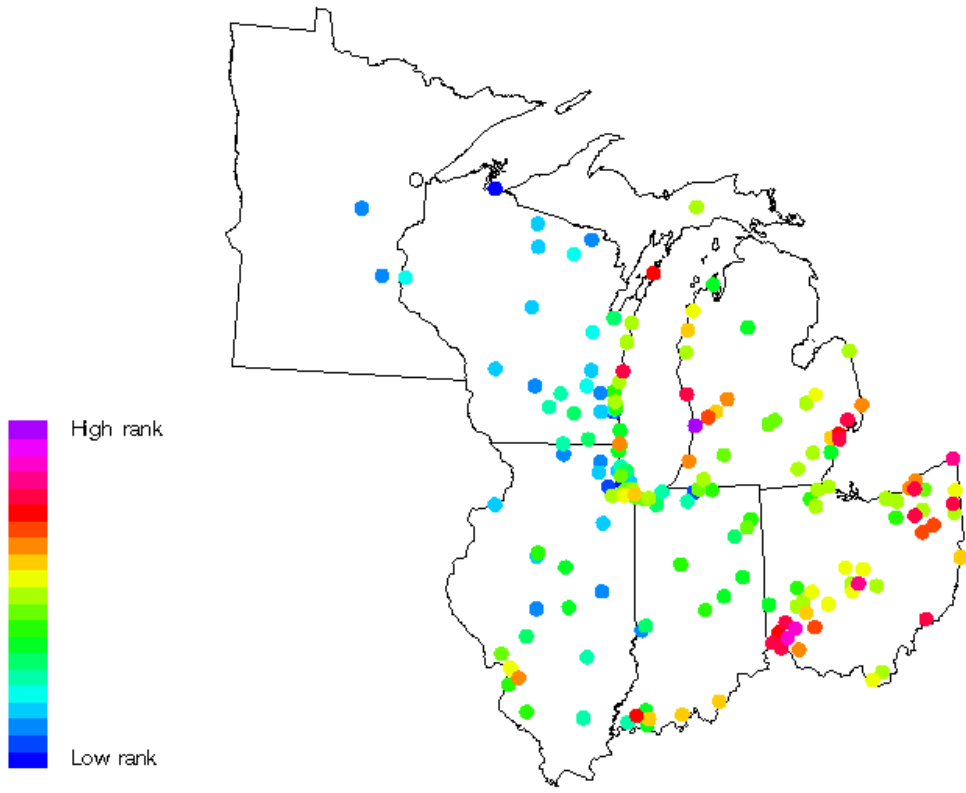
PM2.5 Monitors Ranked by Monitor Correlation



Open circles are unranked monitors with incomplete data

Fig. 3. PM2.5 monitors ranked by monitor correlation (lower correlation = higher rank)

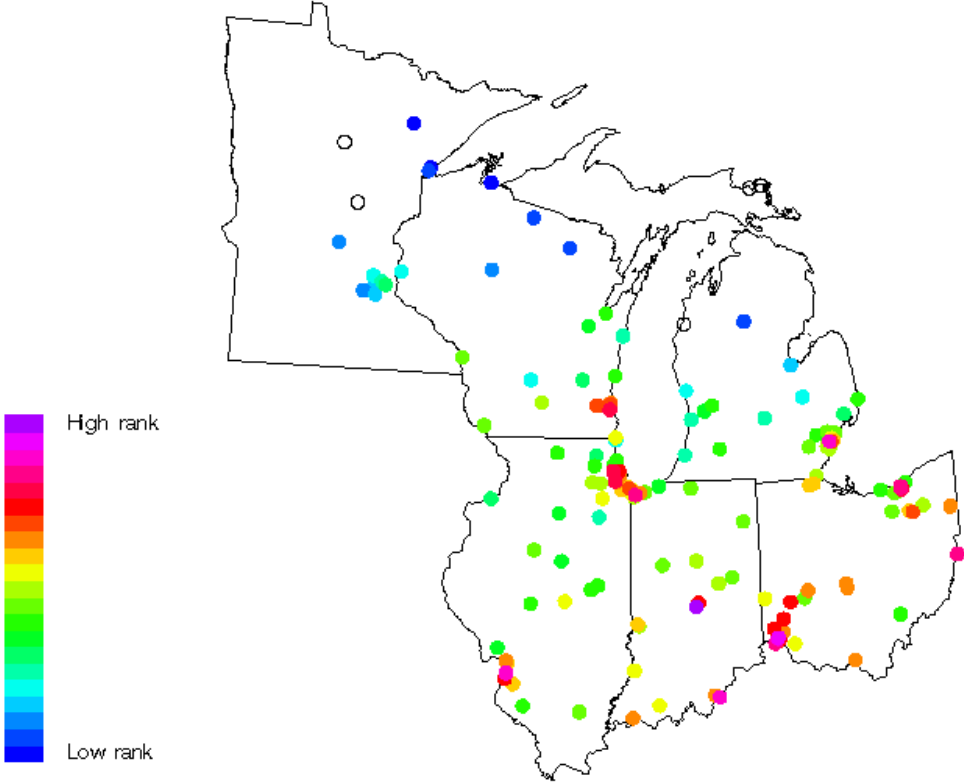
Ozone Monitors Ranked by Design Value, 06—08



Open circles are unranked monitors with incomplete data

Fig. 4. Ozone monitors ranked by design value

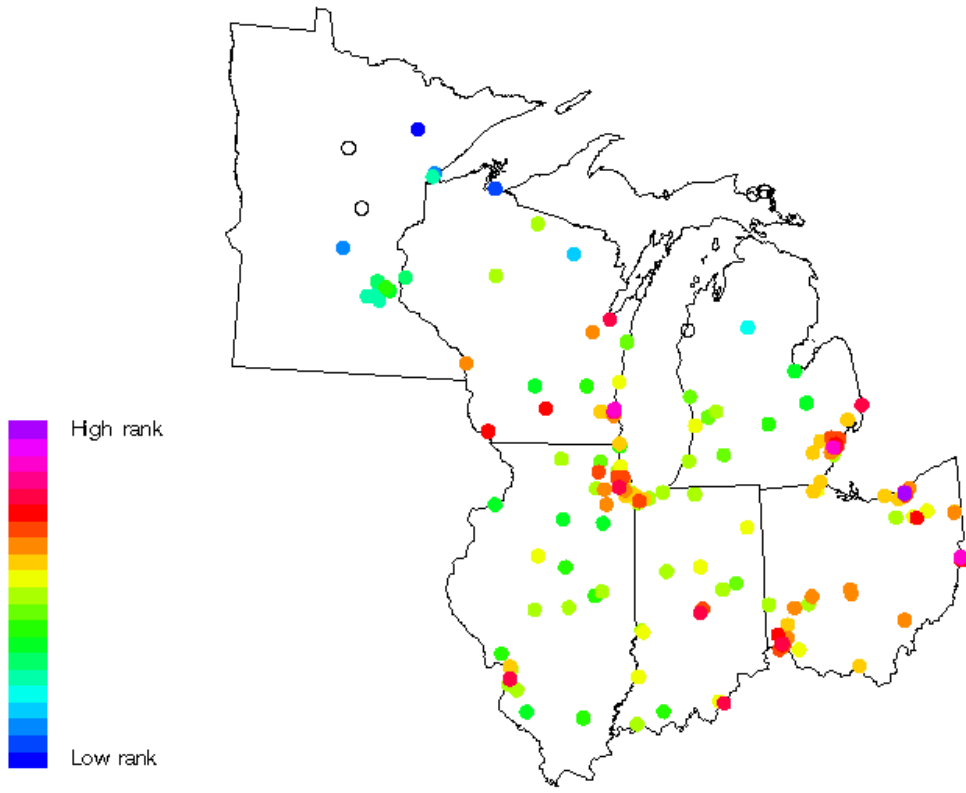
PM2.5 Monitors Ranked by Annual Design Value, 06—08



Open circles are unranked monitors with incomplete data

Fig. 5. PM2.5 monitors ranked by annual design value

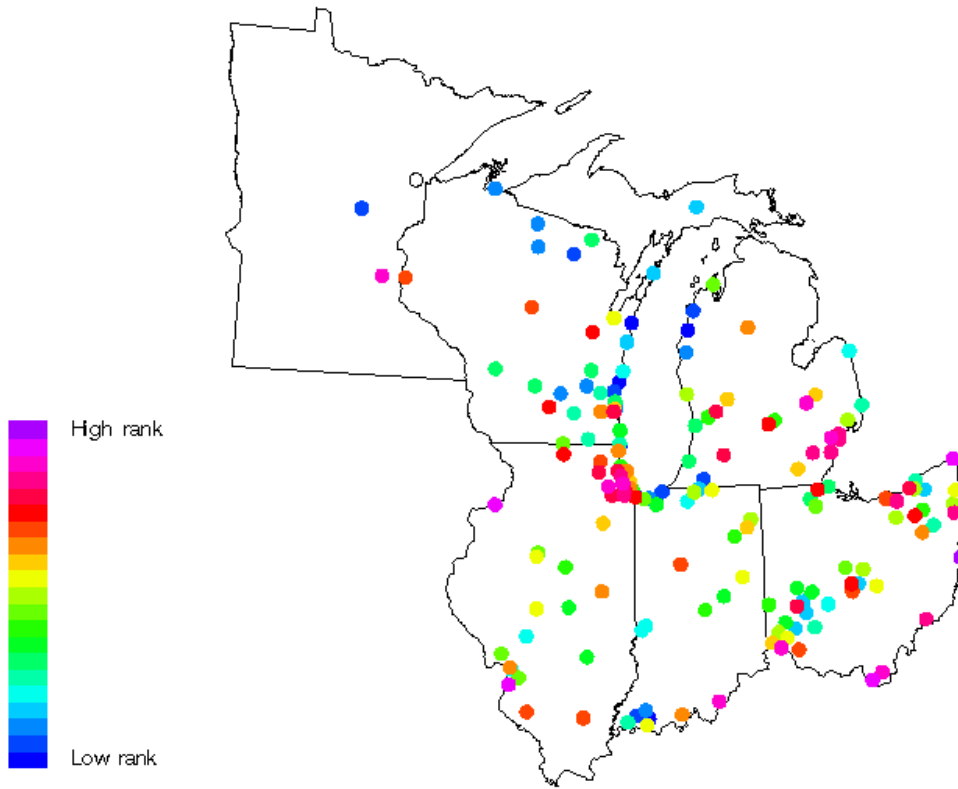
PM2.5 Monitors Ranked by Daily Design Value, 06—08



Open circles are unranked monitors with incomplete data

Fig. 6. PM2.5 monitors ranked by daily design value

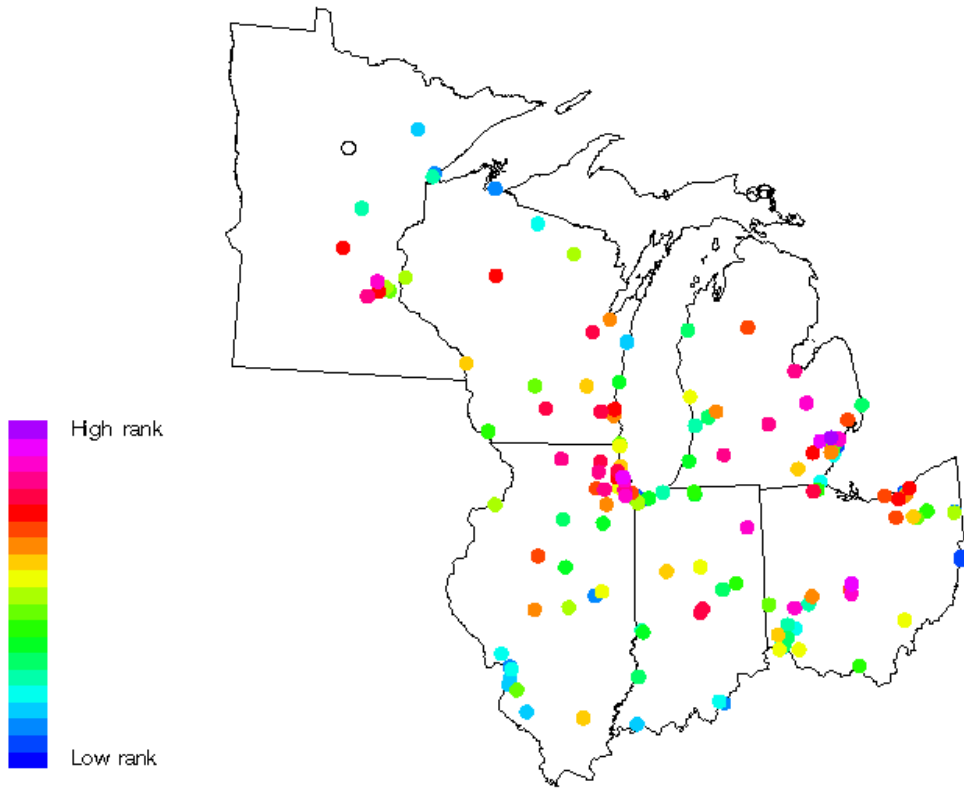
Ozone Monitors Ranked by Population Served



Open circles are unranked monitors with incomplete data

Fig. 7. Ozone monitors ranked by population served

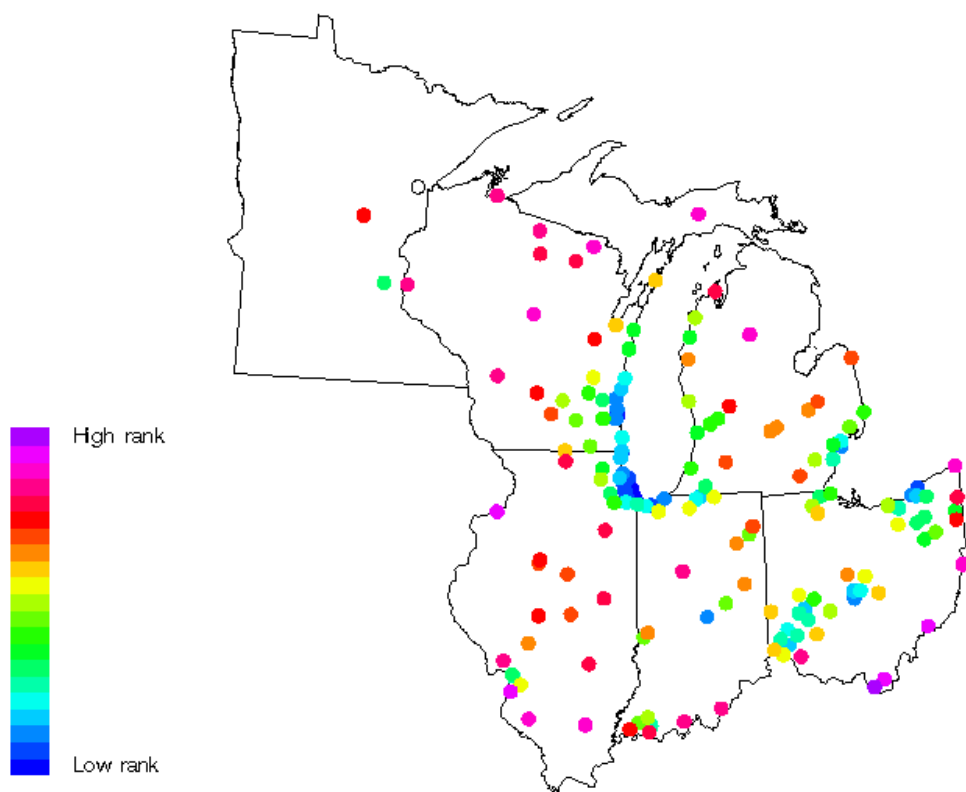
PM2.5 Monitors Ranked by Population Served



Open circles are unranked monitors with incomplete data

Fig. 8. PM2.5 monitors ranked by population served

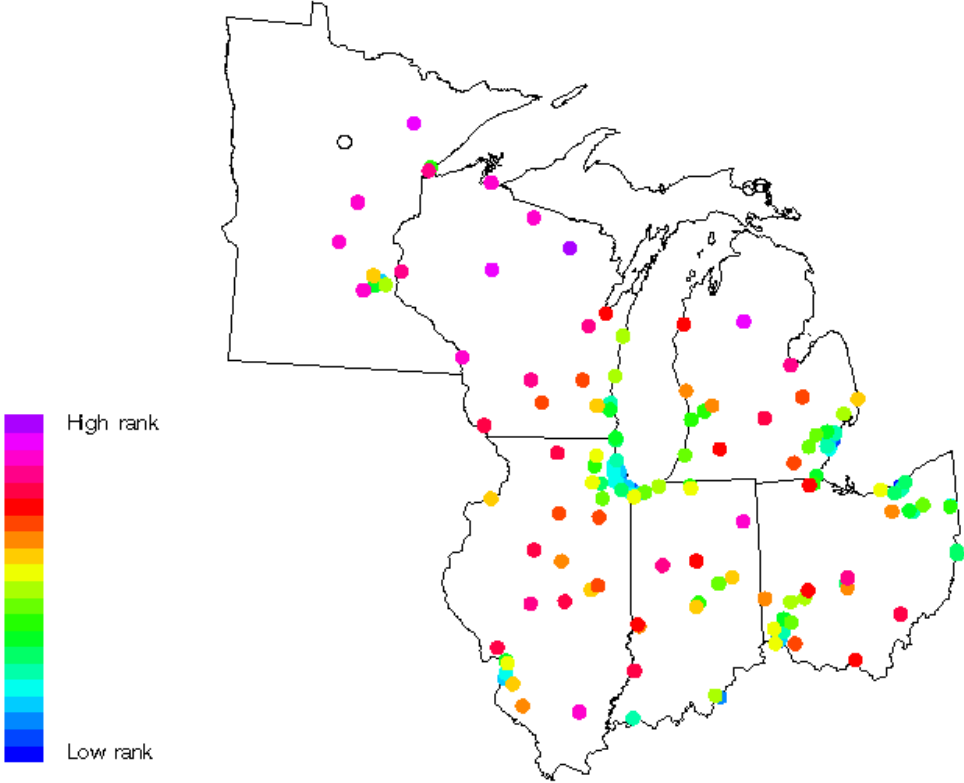
Ozone Monitors Ranked by Area Served



Open circles are unranked monitors with incomplete data

Fig. 9. Ozone monitors ranked by area served

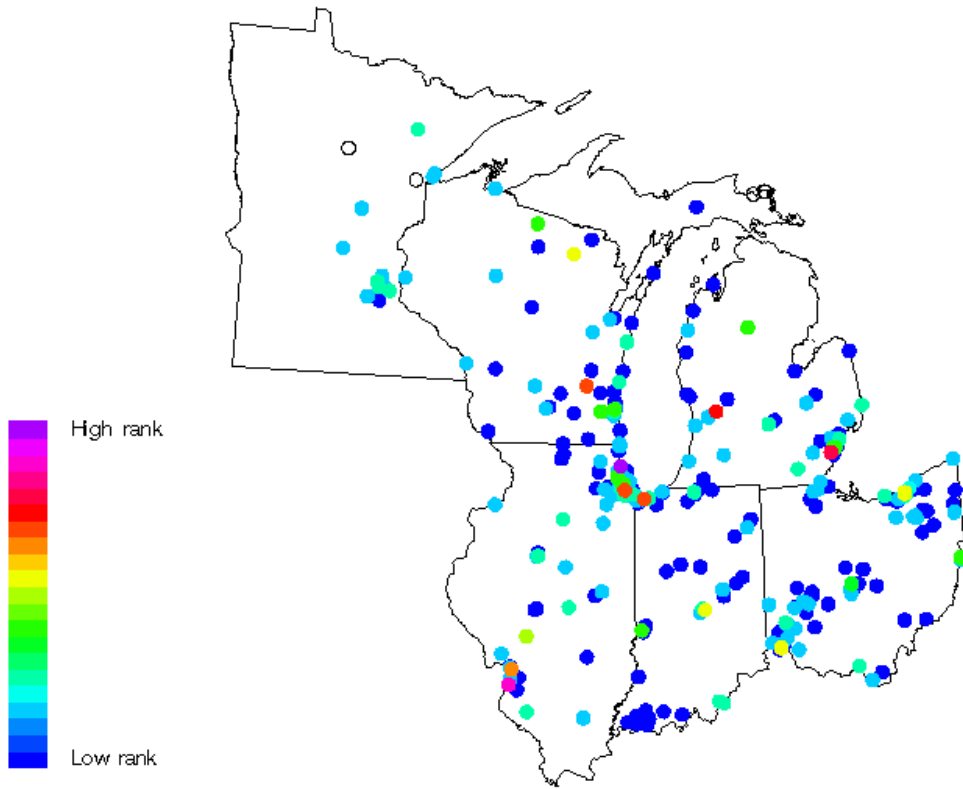
PM2.5 Monitors Ranked by Area Served



Open circles are unranked monitors with incomplete data

Fig. 10. PM2.5 monitors ranked by area served

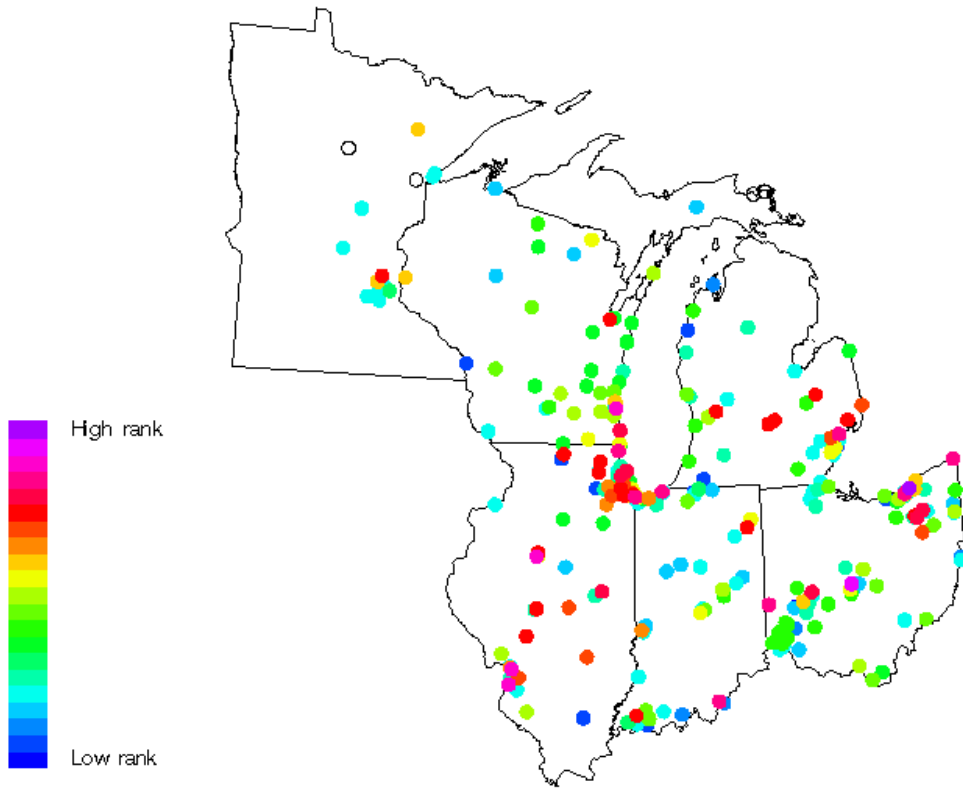
All Monitors Ranked by Number of Parameters



Open circles are unranked monitors with incomplete data

Fig. 11. All monitors ranked by number of parameters

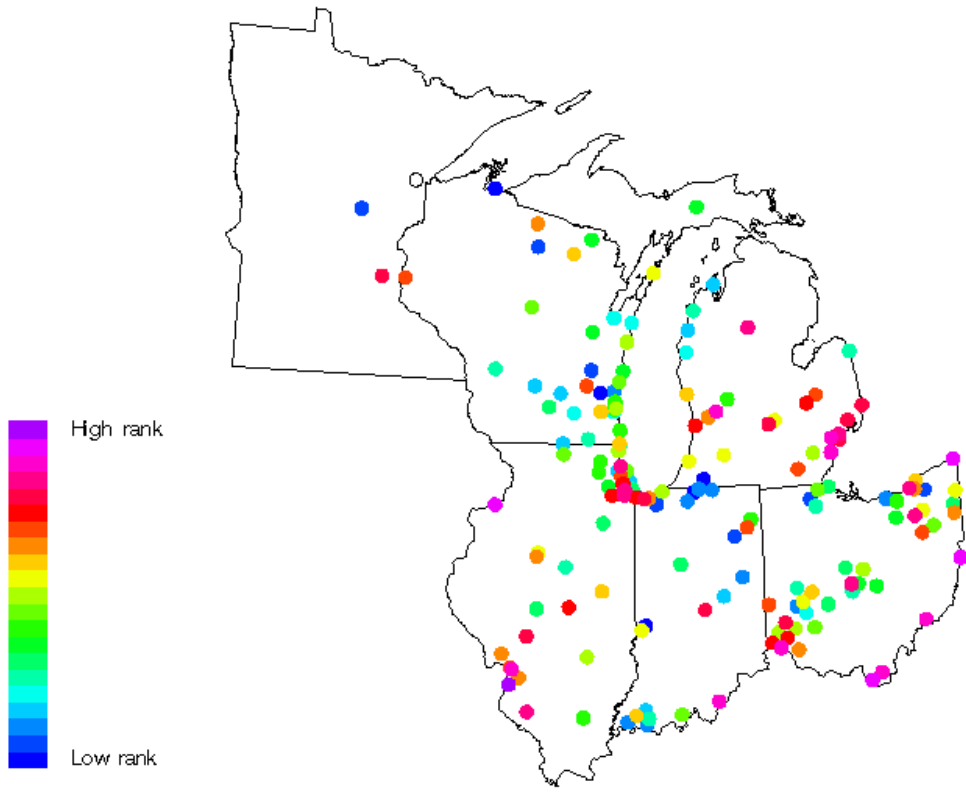
All Monitors Ranked by Years in Operation



Open circles are unranked monitors with incomplete data

Fig. 12. All monitors ranked by number of years site has operated

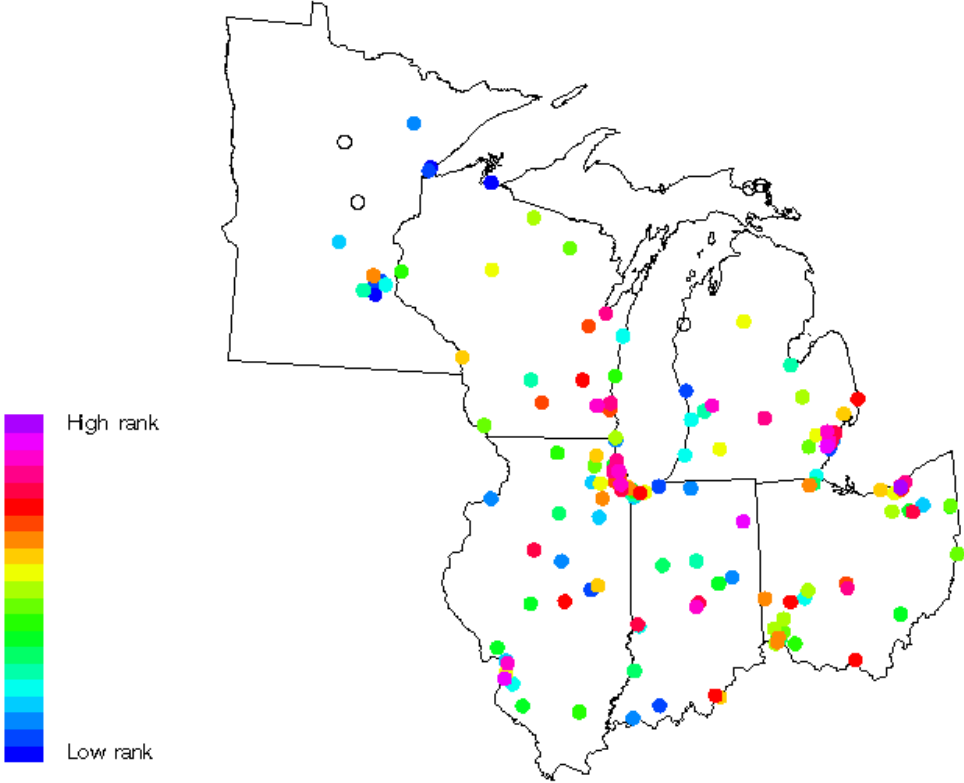
Ozone Monitors Ranked by All Ozone Parameters



Open circles are unranked monitors with incomplete data

Fig. 13. Overall ranking of ozone monitors

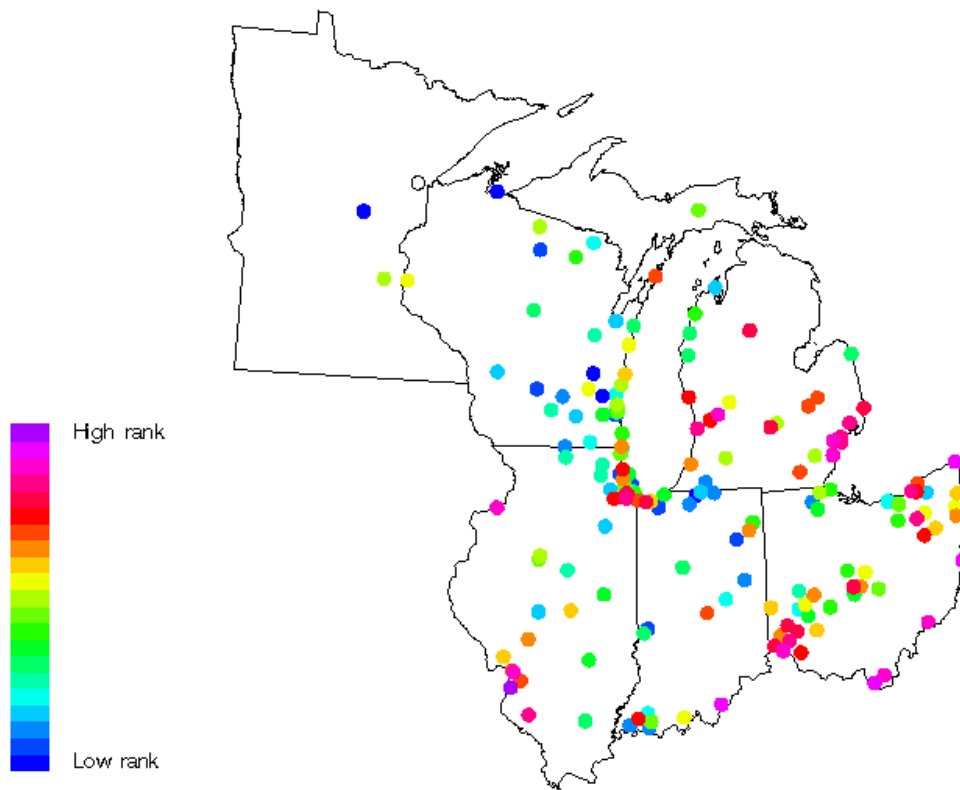
PM2.5 Monitors Ranked by All PM2.5 Parameters



Open circles are unranked monitors with incomplete data

Fig. 14. Overall ranking of PM2.5 monitors

Ozone Monitors Ranked by DV–Weighted Ozone Parameters



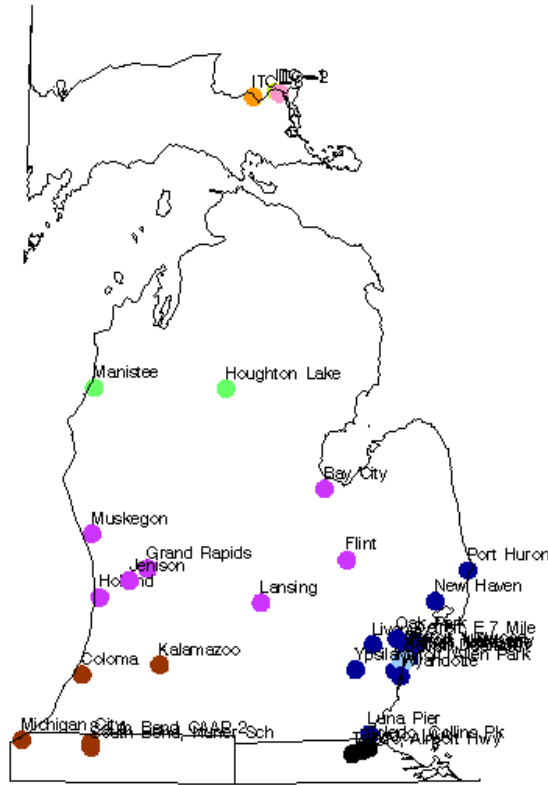
Open circles are unranked monitors with incomplete data

Fig. 15. Design-value-weighted ranking of ozone monitors

Revised Cluster Analysis for Michigan and Minnesota

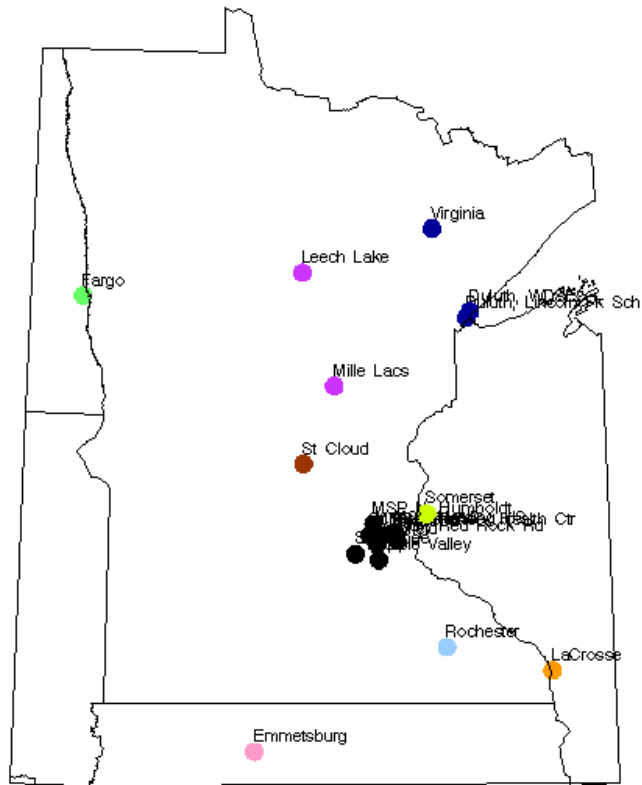
The PM_{2.5} cluster analysis was rerun for Michigan and Minnesota in order to include the additional tribal data. Results in the form of revised figures are given below.

Michigan Monitor Clusters



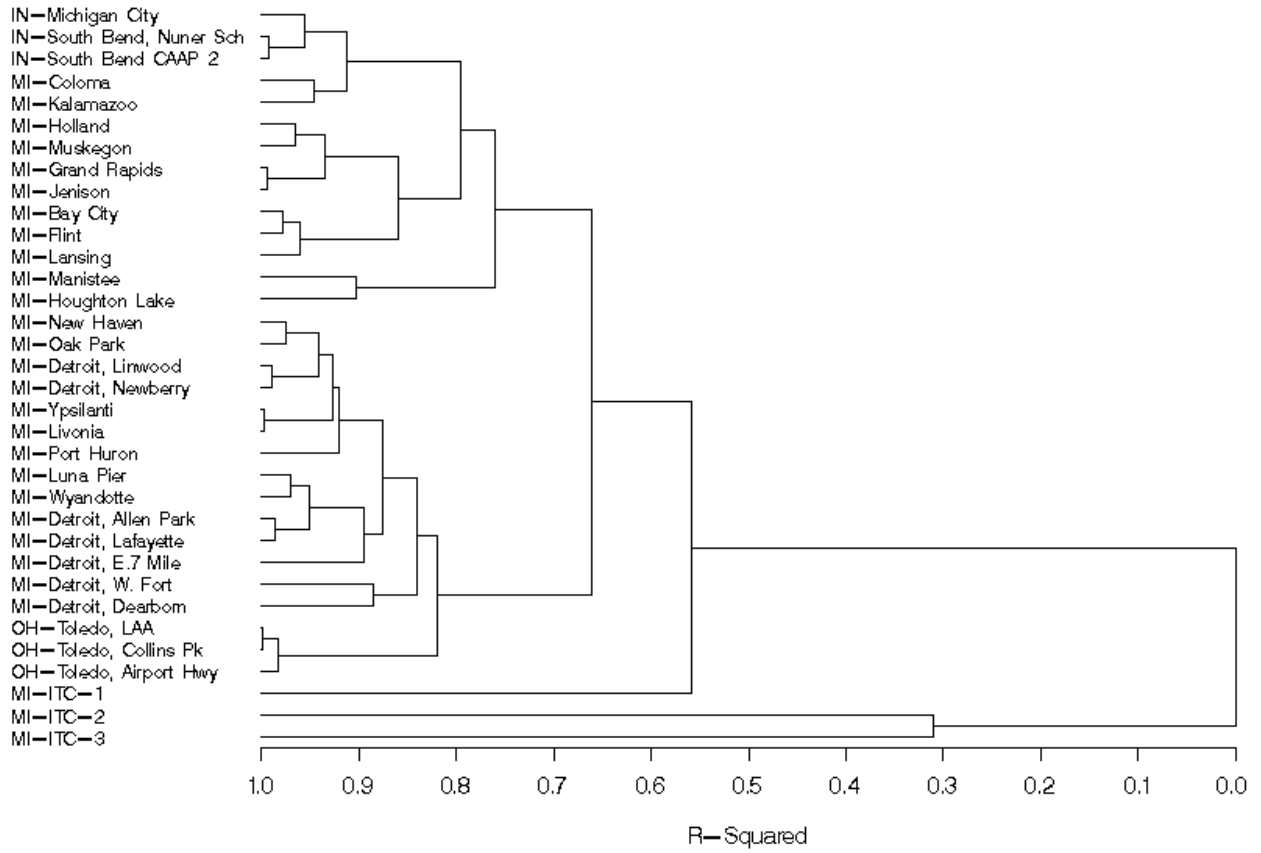
Each color indicates a cluster. Eight are shown.

Minnesota Monitor Clusters



Each color indicates a cluster. Eight are shown.

Michigan Monitor Clusters



Minnesota Monitor Clusters

