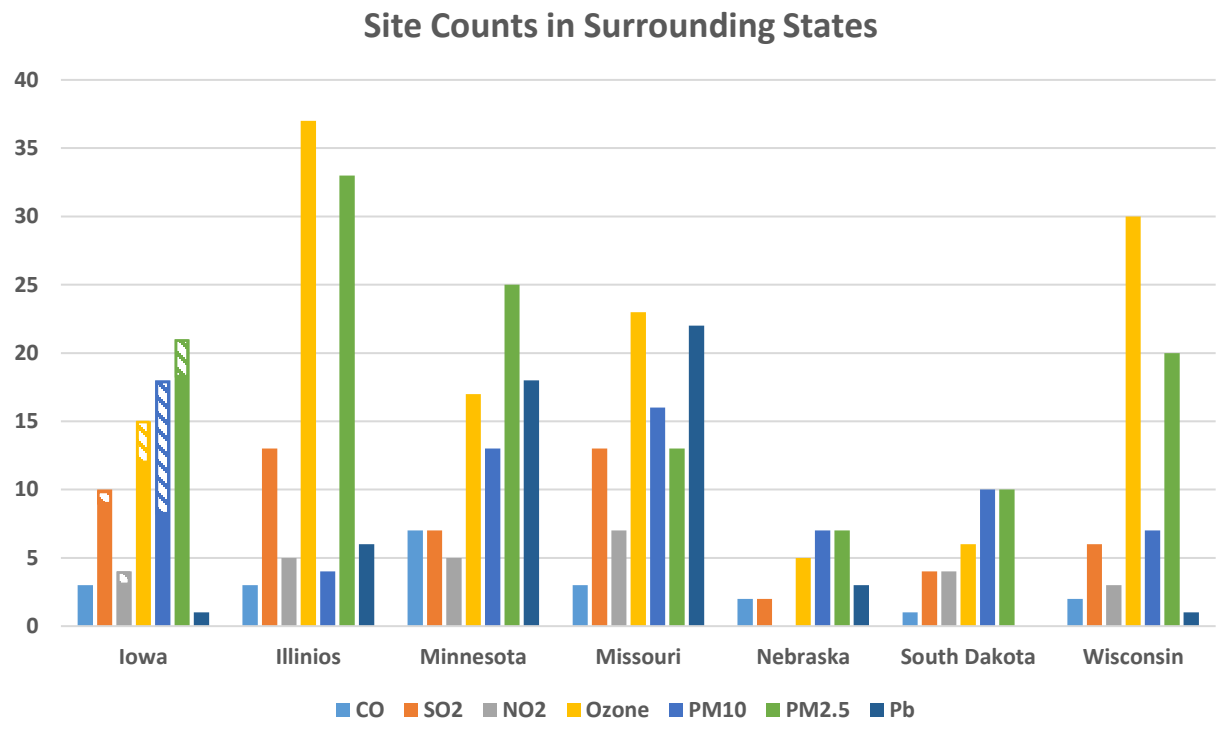
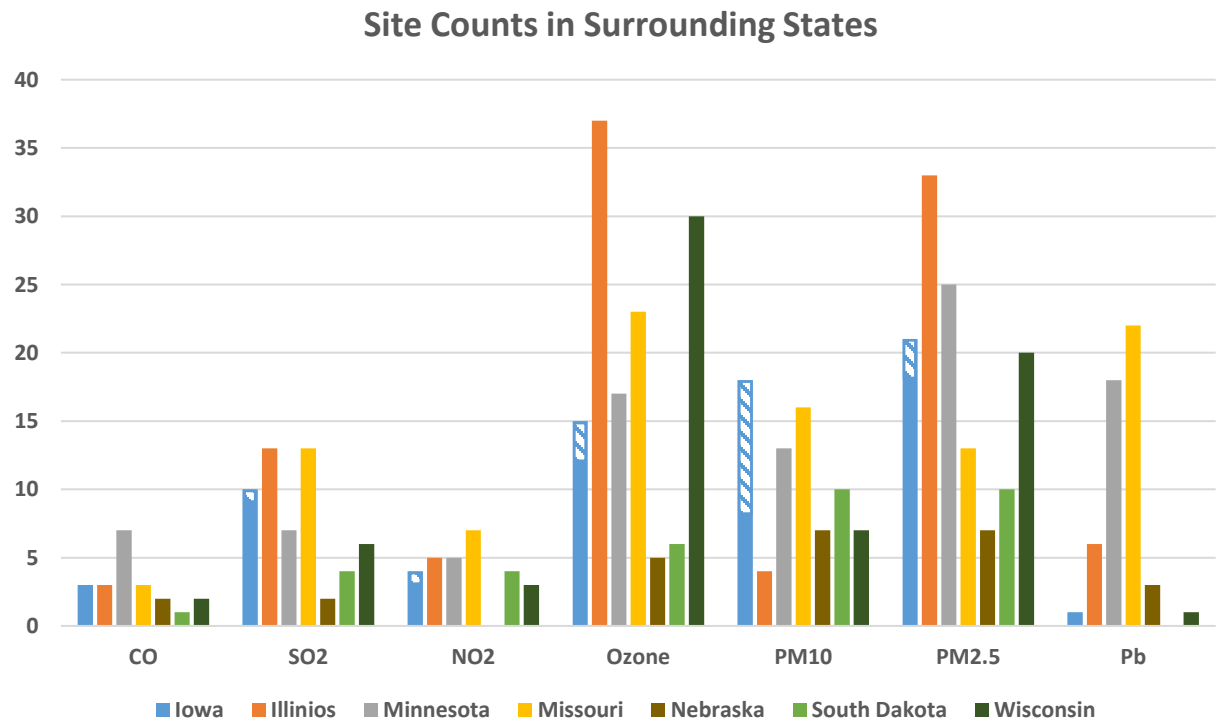
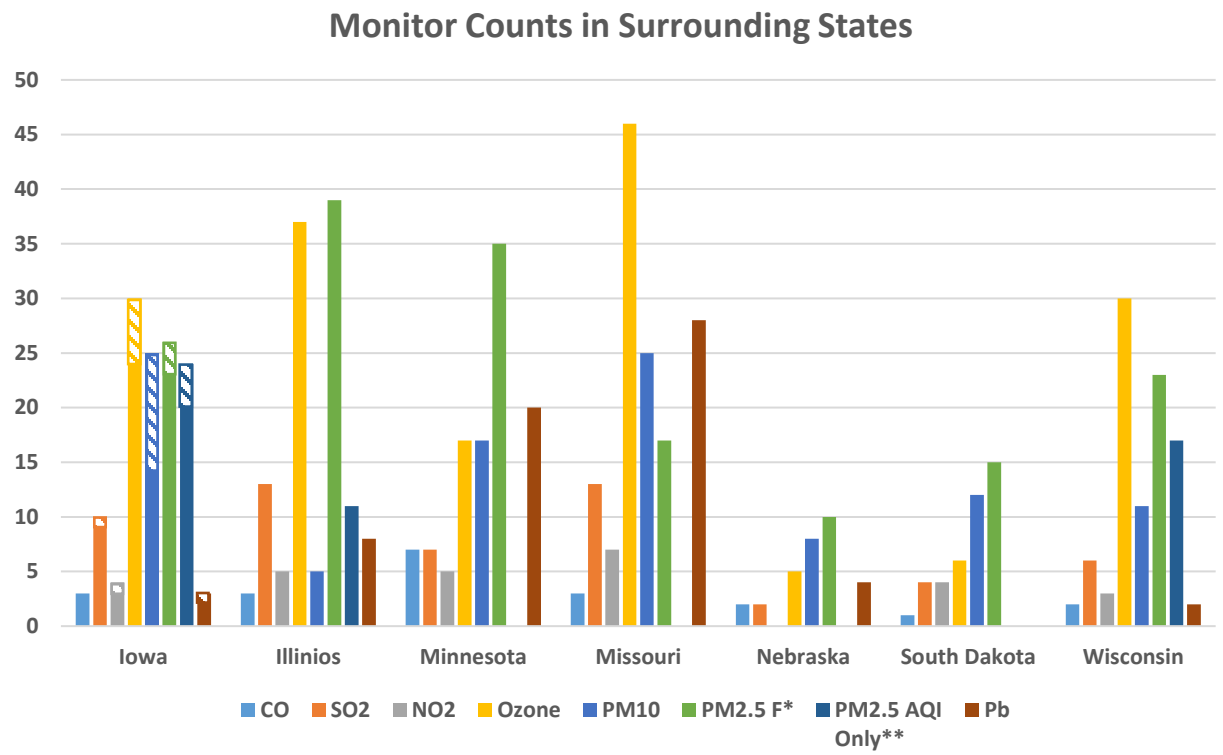
How Does the Number of Criteria Pollutant Sites and Monitors in Iowa Compare to Surrounding States?



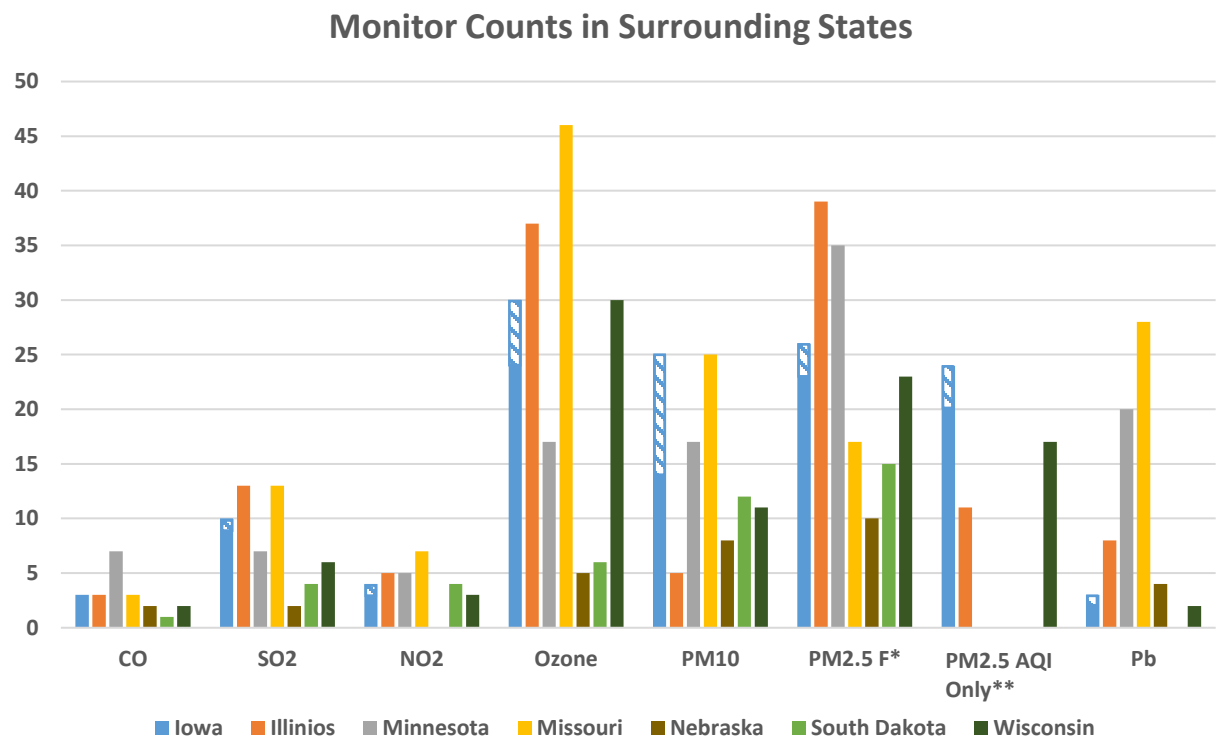
Colors indicated pollutant. Hatched area denotes lower value sites.



Colors indicate state. Hatched area denotes lower value sites.



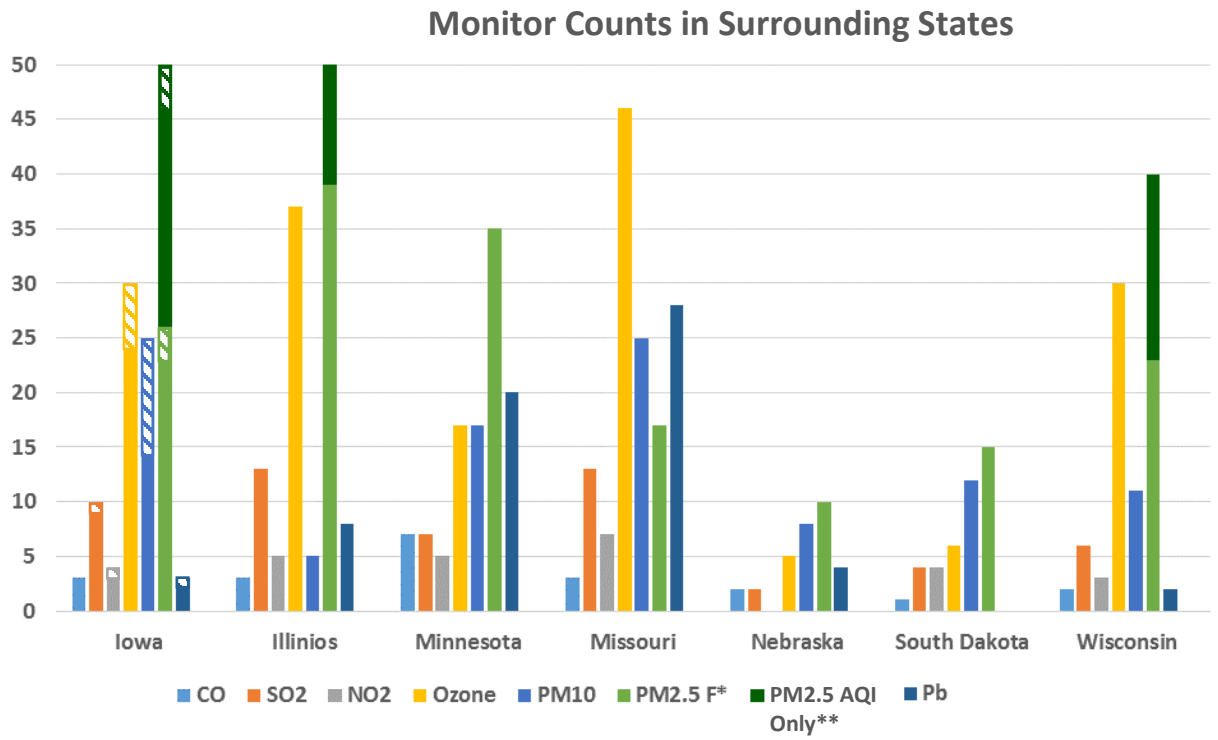
Colors indicate pollutant. Hatched area denotes lower value monitors.



Colors indicate state. Hatched area denotes lower value monitors.

* Monitors used for establishing attainment of the NAAQS.

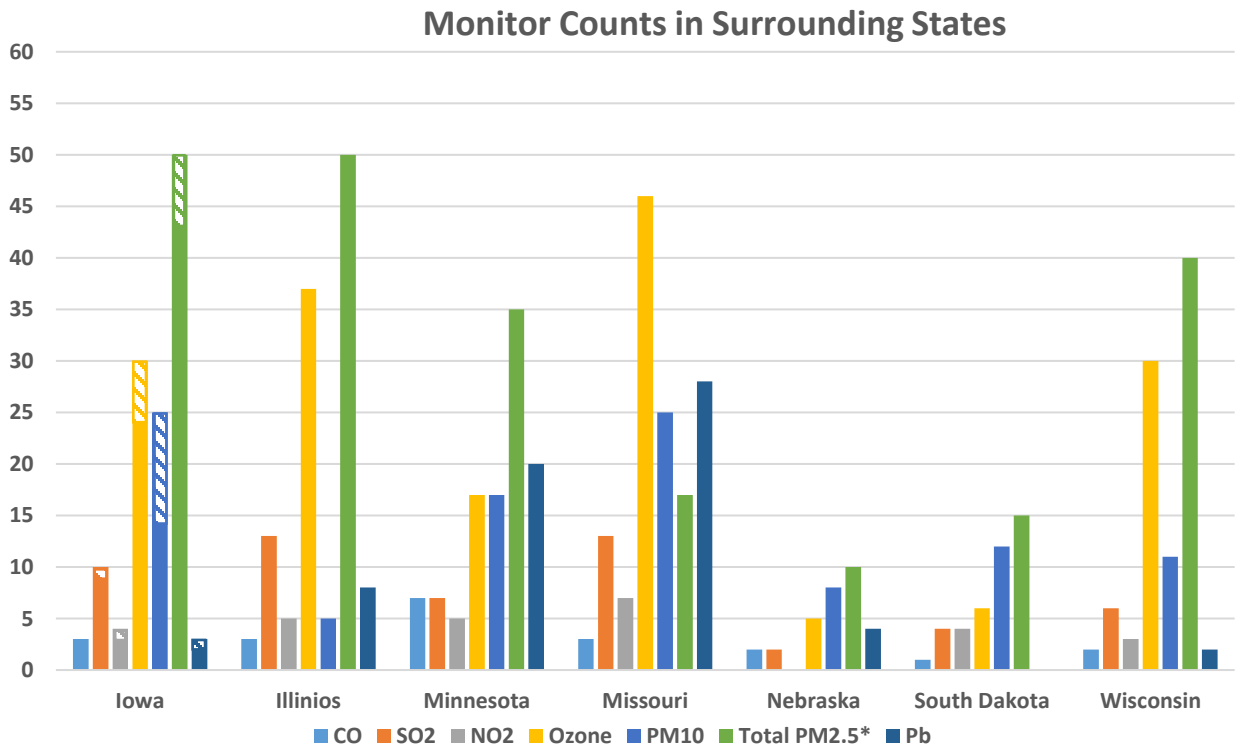
** Continuous PM2.5 monitors used for AQI only.



Colors indicate pollutant. Hatched area denotes lower value monitors.

* Monitors used for establishing attainment of the NAAQS.

** Continuous PM2.5 monitors used for AQI only.



Colors indicate pollutant. Hatched area denotes lower value monitors.

* Total of monitors used for establishing attainment and continuous BAMs for AQI Reporting.

Lead and PM_{10} Networks in Surrounding States			
Pollutant	**State**	**Monitor Count**	**Site Counts**
Lead	**Illinois**	8	6
	Iowa	3	1
	Minnesota	20	18
	Missouri	28	22
	Nebraska	4	3
	South Dakota	0	0
	Wisconsin	2	1
PM_{10}	**Illinois**	5	4
	Iowa	25	18
	Minnesota	17	13
	Missouri	25	16
	Nebraska	8	7
	South Dakota	12	10
	Wisconsin	11	7

$PM_{2.5}$ Networks in Surrounding States				
State	**$PM_{2.5}$ F Monitor Count**	**$PM_{2.5}$ AQI Only Monitor Count**	**Total $PM_{2.5}$**	**Site Counts**
Illinois	39	11	50	33
Iowa	26	24	50	21
Minnesota	35	0	35	25
Missouri	17	0	17	13
Nebraska	10	0	10	7
South Dakota	15	0	15	10
Wisconsin	23	17	40	20

Gas Networks in Surrounding States			
Pollutant	**State**	**Monitor Count**	**Site Counts**
CO	**Illinois**	3	3
	Iowa	3	3
	Minnesota	7	7
	Missouri	3	3
	Nebraska	2	2
	South Dakota	1	1
	Wisconsin	2	2
NO_2	**Illinois**	5	5
	Iowa	4	4
	Minnesota	5	5
	Missouri	7	7
	South Dakota	0	0
	Wisconsin	4	4
	Nebraska	3	3
Ozone	**Illinois**	37	37
	Iowa	30	15
	Minnesota	17	17
	Missouri	46	23
	Nebraska	5	5
	South Dakota	6	6
	Wisconsin	30	30
SO_2	**Illinois**	13	13
	Iowa	10	10
	Minnesota	7	7
	Missouri	13	13
	Nebraska	2	2
	South Dakota	4	4
	Wisconsin	6	6

Lower Value Sites and Monitors

Lower Value Sites (9 of 37; 24%)

- Backbone State Park (1xSPM PM_{10} (SPM); 1x$PM_{2.5}$ (SPM))
- Cedar Rapids, Kirkwood College (2xOzone (SPM))
- Davenport, Adams School (1xPM_{10} (SPM); 1x$PM_{2.5}$ (SPM))
- Des Moines, Near Road NO_2 (1xNO_2 (SPM))
- George Neal North (1xSO_2 (SLAMS))
- Lake Ahquabi State Park (2xOzone (SPM))
- Mason City, Washington School (1xPM_{10} (SPM))
- Muscatine, Franklin School (1x$PM_{2.5}$ (SPM))
- Pisgah, Highway Maintenance Shed (2xOzone (SLAMS))

Lower Value Monitors (13)

- Eight PM_{10} Monitors
    - Waterloo, Water Tower (1xSLAMS)
    - Iowa City, Hoover School (1xSPM)
    - Viking Lake State Park (1xSPM)
    - Emmetsburg, Iowa Lakes College (1xSPM)
    - Clive, Indian Hills Jr. High School (1xSLAMS)
    - Davenport, Hayes School (1xSLAMS)
    - Sioux City, Irving School (2xSLAMS)
- Four Continuous $PM_{2.5}$ BAMs (AQI Only)
    - Clinton, Rainbow Park (2xSPM)
    - Davenport, Hayes School (2xSPM)
- One Lead Monitor
    - Council Bluffs, Griffin Pipe (1xSLAMS)

Total Lower Value Monitors: 27 of 134 (20%)

Potential Reduction in Sampling Frequency (Daily to 1 in 3)

- $PM_{2.5}$
    - Clinton, Chancy Park (SPM)
    - Clinton, Rainbow Park (SPM)
- PM_{10}
    - Mason City, Holcim Cement (SLAMS)

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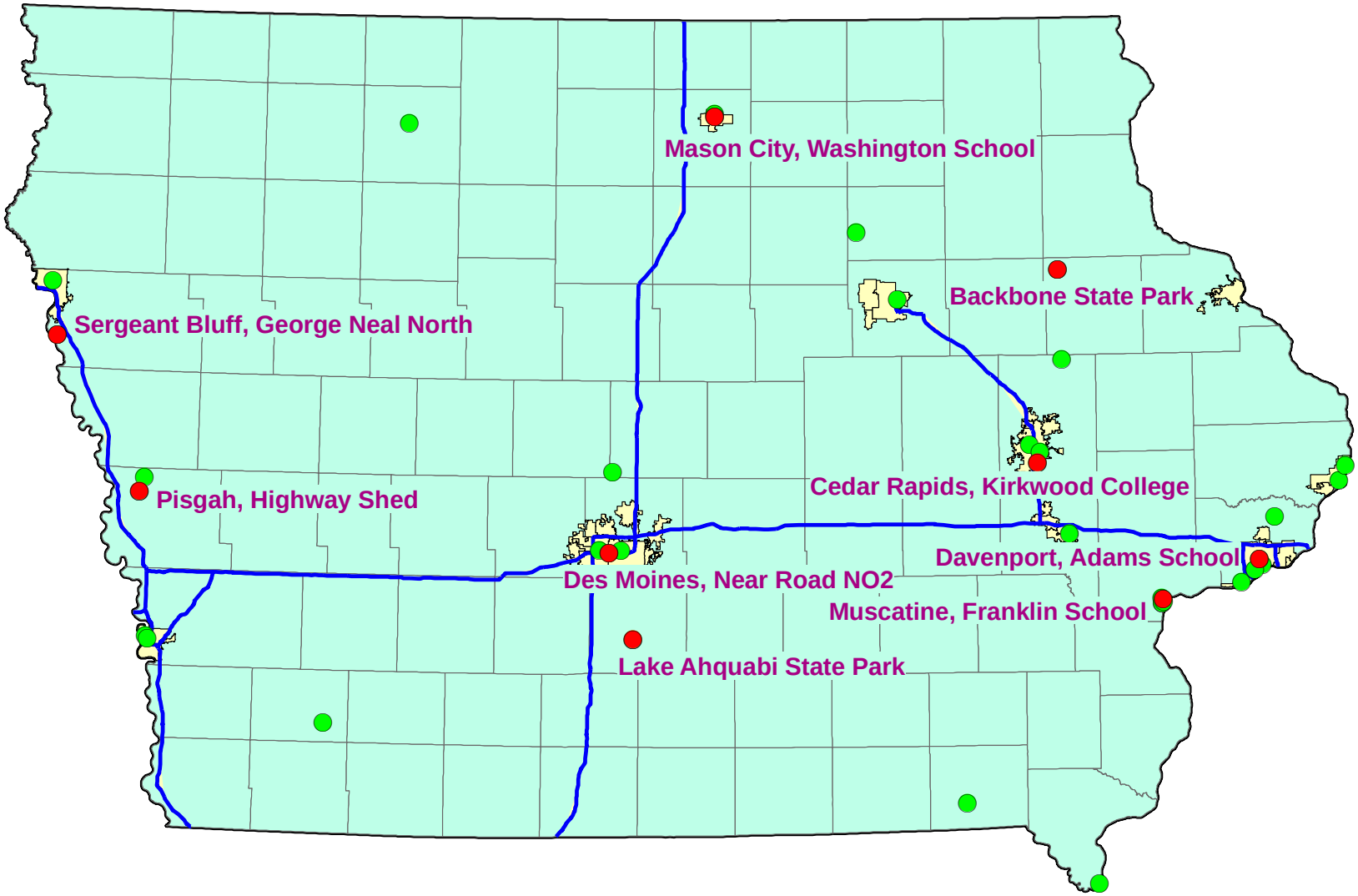
Iowa Site Map



Lower Value Site Higher Value Site

Site Table (Lower Value Sites Indicated in Red)			
Site	**City**	**Name**	**Site Label**
191630017	Buffalo	Linwood Mining	Buffalo-Linwood Mining
191130028	Cedar Rapids	Kirkwood College	Cedar Rapids-Kirkwood College
191130040	Cedar Rapids	Public Health	Cedar Rapids-Public Health
191130041	Cedar Rapids	Tait Cummins Park (Prairie Creek)	Cedar Rapids-Tait Cummins Park (Prairie Creek)
190450019	Clinton	Chancy Park	Clinton-Chancy Park
190450021	Clinton	Rainbow Park	Clinton-Rainbow Park
191532510	Clive	Indian Hills Jr. High School	Clive-Indian Hills Jr. High School
191130033	Coggon	Coggon Elementary School	Coggon-Coggon Elementary School
191550009	Council Bluffs	Franklin School	Council Bluffs-Franklin School
191550011	Council Bluffs	Griffin Pipe	Council Bluffs-Griffin Pipe
191630015	Davenport	Jefferson School	Davenport-Jefferson School
191630018	Davenport	Adams School	Davenport-Adams School
191630020	Davenport	Hayes School	Davenport-Hayes School
191530030	Des Moines	Health Dept.	Des Moines-Health Dept.
191536011	Des Moines	Near Road NO2	Des Moines-Near Road NO2
191471002	Emmetsburg	Iowa Lakes College	Emmetsburg-Iowa Lakes College
191810022	Indianola	Lake Ahquabi State Park	Indianola-Lake Ahquabi State Park
191032001	Iowa City	Hoover School	Iowa City-Hoover School
191110008	Keokuk	Fire Station	Keokuk-Fire Station
190330018	Mason City	Holcim Cement	Mason City-Holcim Cement
190330020	Mason City	Washington School	Mason City-Washington School
191390015	Muscatine	Muscatine HS, East Campus Roof	Muscatine-Muscatine HS East Campus Roof
191390016	Muscatine	Greenwood Cemetery	Muscatine-Greenwood Cemetery
191390018	Muscatine	Franklin School	Muscatine-Franklin School
191390019	Muscatine	Muscatine HS, East Campus Trailer	Muscatine-Muscatine HS East Campus Trailer
191390020	Muscatine	Musser Park	Muscatine-Musser Park
190850007	Pisgah	Forestry Office	Pisgah-Forestry Office
190851101	Pisgah	Highway Maintenance Shed	Pisgah-Highway Maintenance Shed
191930020	Sergeant Bluff	George Neal North	Sergeant Bluff-George Neal North
191930019	Sioux City	Bryant School	Sioux City-Bryant School
191690011	Slater	City Hall	Slater-City Hall
190130009	Waterloo	Water Tower	Waterloo-Water Tower
190170011	Waverly	Waverly Airport	Waverly-Waverly Airport
191630014	--	Scott County Park	Scott County Park
190550001	--	Backbone State Park	Backbone State Park
191370002	--	Viking Lake State Park	Viking Lake State Park
191770006	--	Lake Sugema	Lake Sugema

Iowa Ozone Monitoring Sites (Lower Value Sites Indicated in Red)				
Site	**Name**	**City**	**County**	**Site Label**
190170011	Waverly Airport	Waverly	Bremer	Waverly, Airport
190450021	Rainbow Park	Clinton	Clinton	Clinton, Rainbow Park
190850007	Forestry Office	Pisgah	Harrison	Pisgah, Forestry Office
190851101	Highway Maintenance Shed	Pisgah	Harrison	Pisgah, Highway Maintenance
191130028	Kirkwood College	Cedar Rapids	Linn	Cedar Rapids, Kirkwood Coll.
191130033	Coggon Elementary School	Coggon	Linn	Coggon, Coggon Sch.
191130040	Public Health	Cedar Rapids	Linn	Cedar Rapids, Public Health
191370002	Viking Lake State Park	not in a city	Montgomery	Viking Lake State Park
191471002	Iowa Lakes College	Emmetsburg	Palo Alto	Emmetsburg, Iowa Lakes Coll.
191530030	Health Department	Des Moines	Polk	Des Moines, Health Dept.
191630014	Scott County Park	Davenport	Scott	Scott County Park
191630015	Jefferson School	Davenport	Scott	Davenport, Jefferson Sch.
191690011	City Hall	Slater	Story	Slater, City Hall
191770006	Lake Sugema	not in a city	Van Buren	Keosauqua, Lake Sugema
191810022	Lake Ahquabi State Park	Indianola	Warren	Indianola, Lake Ahquabi

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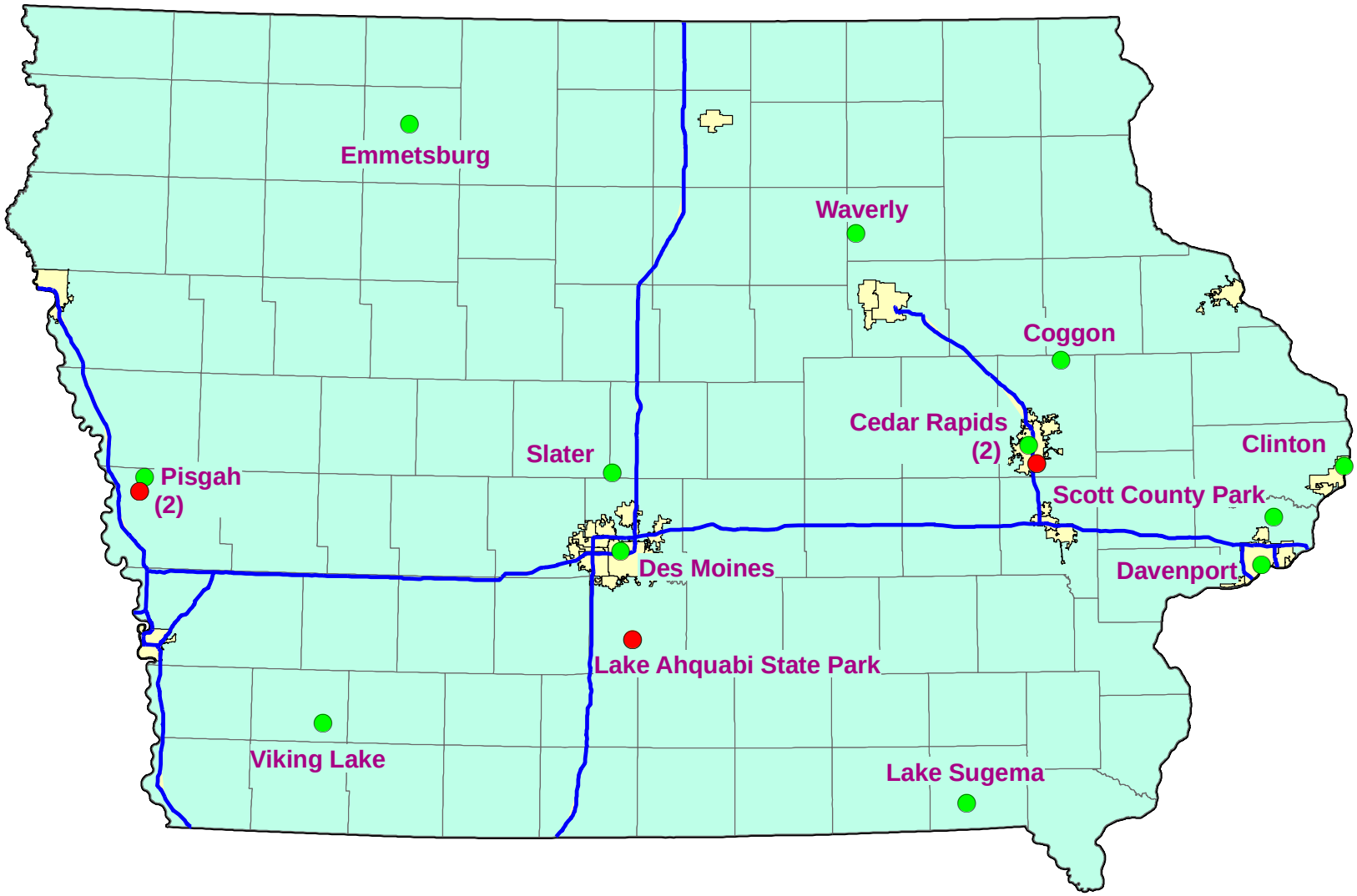
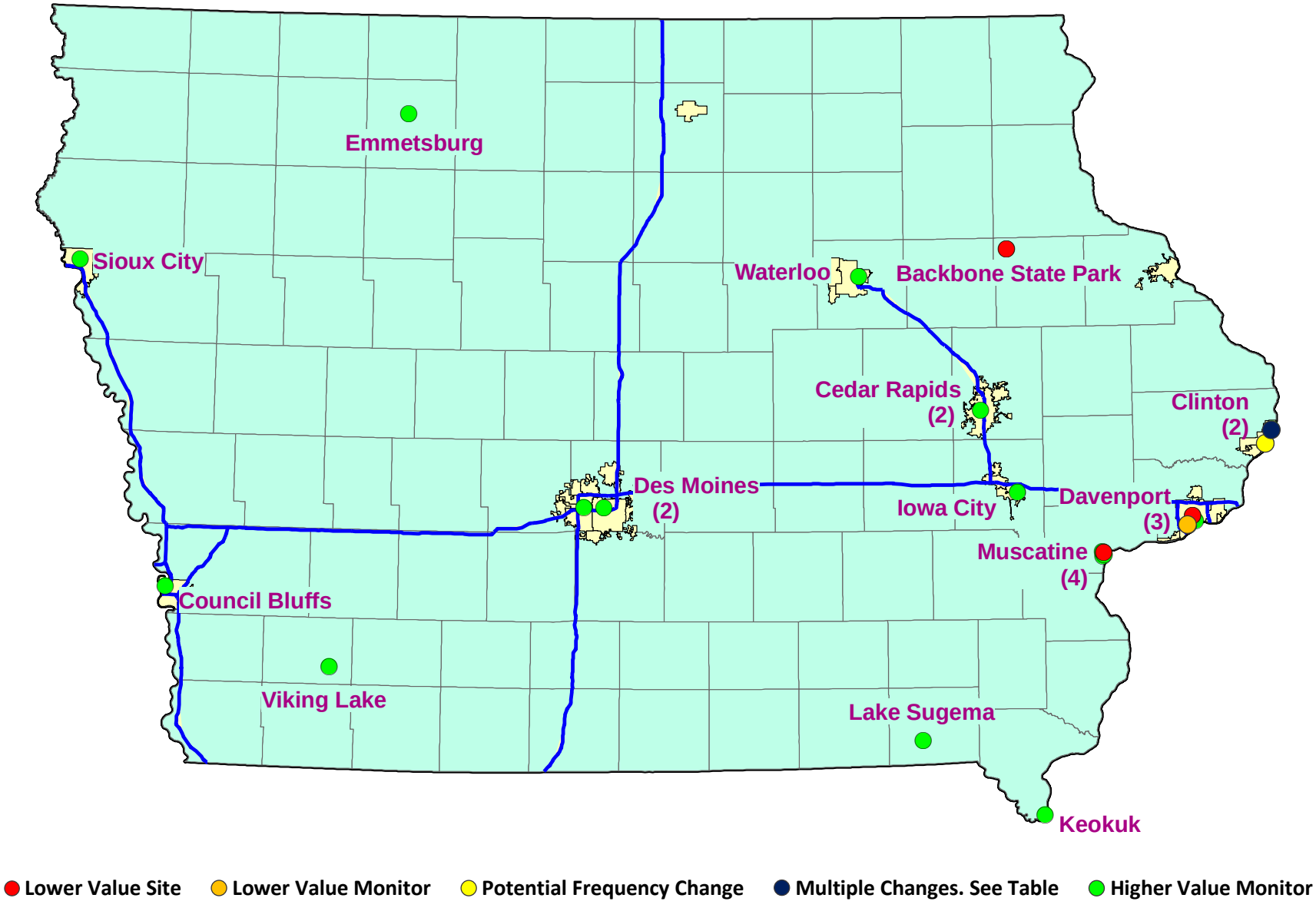
Ozone Monitoring Sites



Lower Value Site Lower Value Monitor Higher Value Monitor

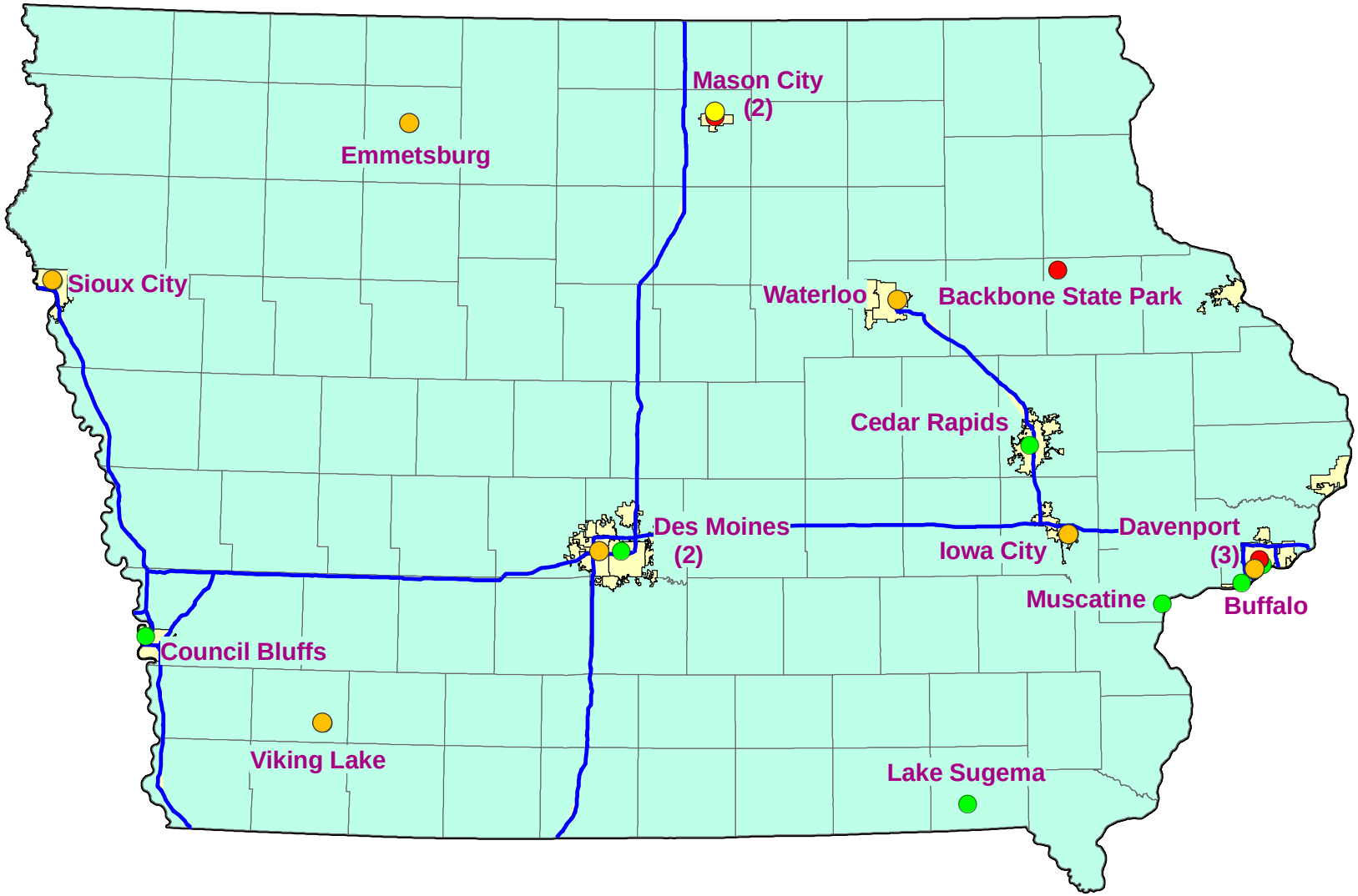
$PM_{2.5}$ Monitoring Sites (Lower Value Sites Indicated in Red; Lower Value Monitors Indicated in Orange; Proposed Frequency Changes Indicated in Yellow)					
Site	**County**	**Site Label**	**FRMs**	**Frequency**	**BAMs**
190130009	Black Hawk	Waterloo, Water Tower	1	1 in 3	2
190450019	Clinton	Clinton, Chancy Park	1	~~Daily~~ 1 in 3	2
190450021	Clinton	Clinton, Rainbow Park	1	~~Daily~~ 1 in 3	~~2~~ 0
190550001	Delaware	Backbone State Park	1	1 in 3	0
191032001	Johnson	Iowa City, Hoover Sch.	1	Daily	2
191110008	Lee	Keokuk, Fire Station	1	1 in 3	0
191130040	Linn	Cedar Rapids, Public Health	2	Daily	2
191370002	Montgomery	Viking Lake State Park	1	1 in 3	2
191390015&19	Muscatine	Muscatine, Muscatine High E. Campus (Trailer & Rooftop)	2	Daily	2
191390016	Muscatine	Muscatine, Greenwood Cemetery	1	1 in 3	0
191390018	Muscatine	Muscatine, Franklin Sch.	1	1 in 3	0
191390020	Muscatine	Muscatine, Musser Park	1	1 in 3	0
191471002	Palo Alto	Emmetsburg, Iowa Lakes Coll.	1	1 in 3	2
191530030	Polk	Des Moines, Health Dept.	2	Daily	2
191532510	Polk	Clive, Indian Hills Jr. High Sch.	1	1 in 3	0
191550009	Pottawattamie	Council Bluffs, Franklin Sch.	2	1 in 3	0
191630015	Scott	Davenport, Jefferson Sch.	2	Daily	2
191630018	Scott	Davenport, Adams Sch.	1	1 in 3	0
191630020	Scott	Davenport, Hayes Elementary	1	1 in 3	~~2~~ 0
191770006	Van Buren	Keosauqua, Lake Sugema	1	1 in 3	2
191930021	Woodbury	Sioux City, Irving Sch.	1	1 in 3	0

Iowa $PM_{2.5}$ Monitoring Sites



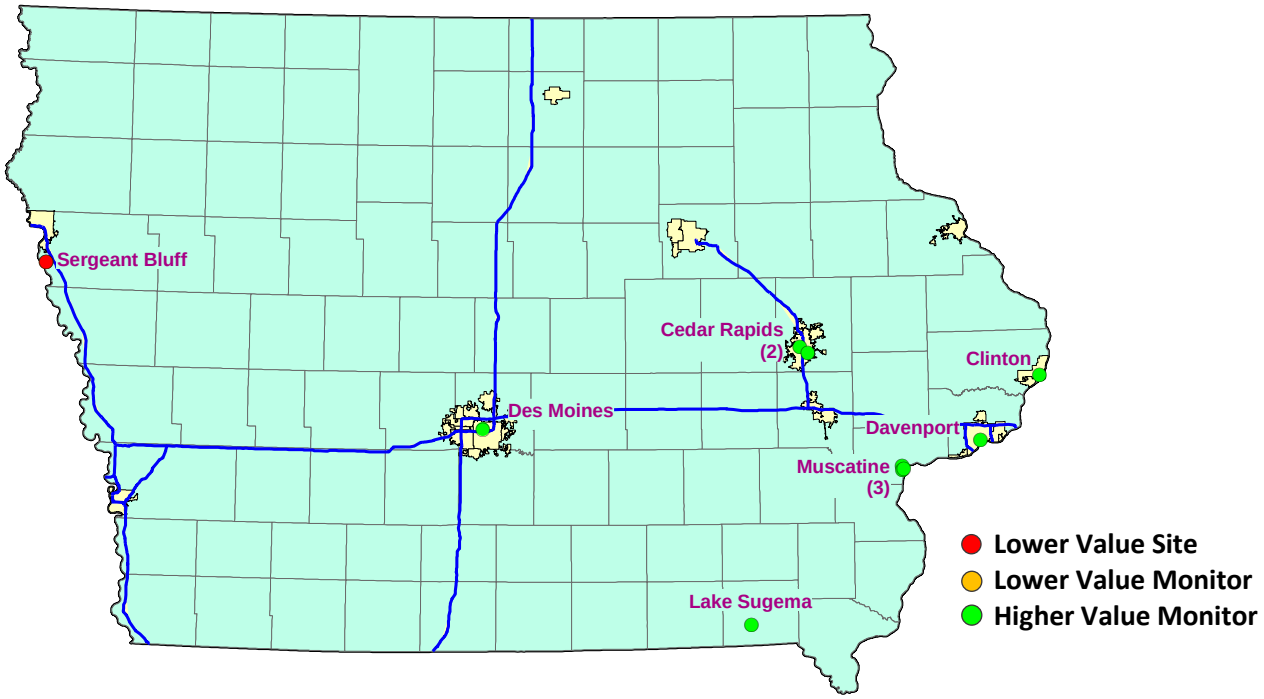
PM_{10} Monitoring Sites (Lower Value Sites Indicated in Red; Lower Value Monitors Indicated in Orange; Proposed Frequency Changes Indicated in Yellow)					
Site	**County**	**Site Label**	**FRMs**	**Frequency**	**BAMS**
190130009	Black Hawk	Waterloo, Water Tower	~~1~~ 0	1 in 3	0
190330018	Cerro Gordo	Mason City, Holcim Cement	2	~~Daily~~ 1 in 3	0
190330020	Cerro Gordo	Mason City, Washington Sch.	1	1 in 2	0
190550001	Delaware	Backbone State Park	1	1 in 3	0
191032001	Johnson	Iowa City, Hoover Sch.	~~1~~ 0	1 in 3	0
191130040	Linn	Cedar Rapids, Public Health	2	1 in 3	0
191370002	Montgomery	Viking Lake State Park	~~1~~ 0	1 in 3	0
191390015	Muscatine	Muscatine, Muscatine High E. Campus-Rooftop	1	1 in 3	0
191471002	Palo Alto	Emmetsburg, Iowa Lakes Coll.	~~1~~ 0	1 in 3	0
191530030	Polk	Des Moines, Health Dept.	2	1 in 3	0
191532510	Polk	Clive, Indian Hills Jr. High Sch.	~~1~~ 0	1 in 3	0
191550009	Pottawattamie	Council Bluffs, Franklin Sch.	1	1 in 3	0
191630015	Scott	Davenport, Jefferson Sch.	2	1 in 3	0
191630017	Scott	Buffalo, LW Mining	1	Daily	2
191630018	Scott	Davenport, Adams Sch.	1	1 in 3	0
191630020	Scott	Davenport, Hayes School	~~1~~ 0	1 in 3	0
191770006	Van Buren	Keosauqua, Lake Sugema	1	1 in 3	0
191930021	Woodbury	Sioux City, Irving Sch.	~~2~~ 0	1 in 3	0

Iowa PM_{10} Monitoring Sites



Lower Value Site | Lower Value Monitor | Potential Frequency Change | Multiple Changes. See Table | Higher Value Monitor

Iowa SO_2 Monitoring Sites



Lower Value Sites Indicated in Red				
Site	**Name**	**City**	**County**	**Site Label**
190450019	Chancy Park	Clinton	Clinton	Clinton, Chancy Park
191130040	Public Health	Cedar Rapids	Linn	Cedar Rapids, Public Health
191130041	Tait Cummins Park	Cedar Rapids	Linn	Cedar Rapids, Tait Cummins Park
191390016	Greenwood Cemetery	Muscatine	Muscatine	Muscatine, Greenwood Cemetery
191390019	Muscatine High E. Campus-Trailer	Muscatine	Muscatine	Muscatine, Muscatine High E. Campus-Trailer
191390020	Musser Park	Muscatine	Muscatine	Muscatine, Musser Park
191530030	Health Department	Des Moines	Polk	Des Moines, Health Dept.
191630015	Jefferson School	Davenport	Scott	Davenport, Jefferson Sch.
191770006	Lake Sugema	not in a city	Van Buren	Keosauqua, Lake Sugema
191930020	George Neal North	Sergeant Bluff	Woodbury	Sergeant Bluff, George Neal North

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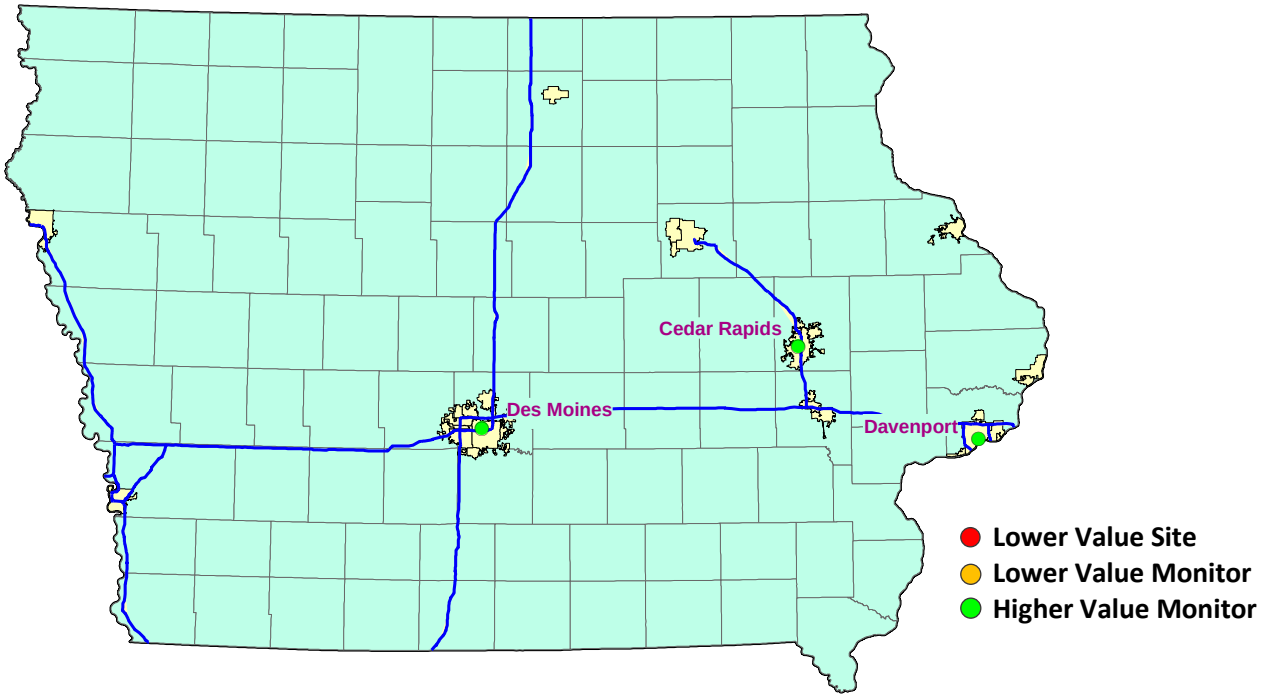
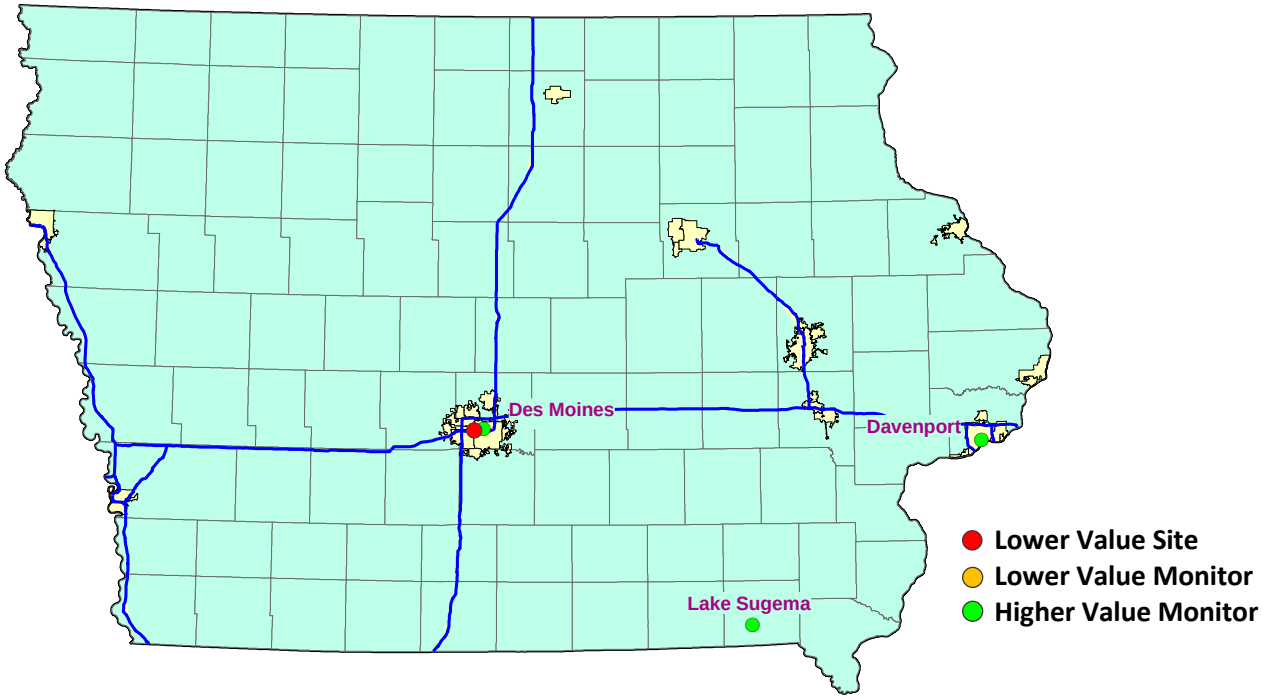
Iowa CO Monitoring Sites



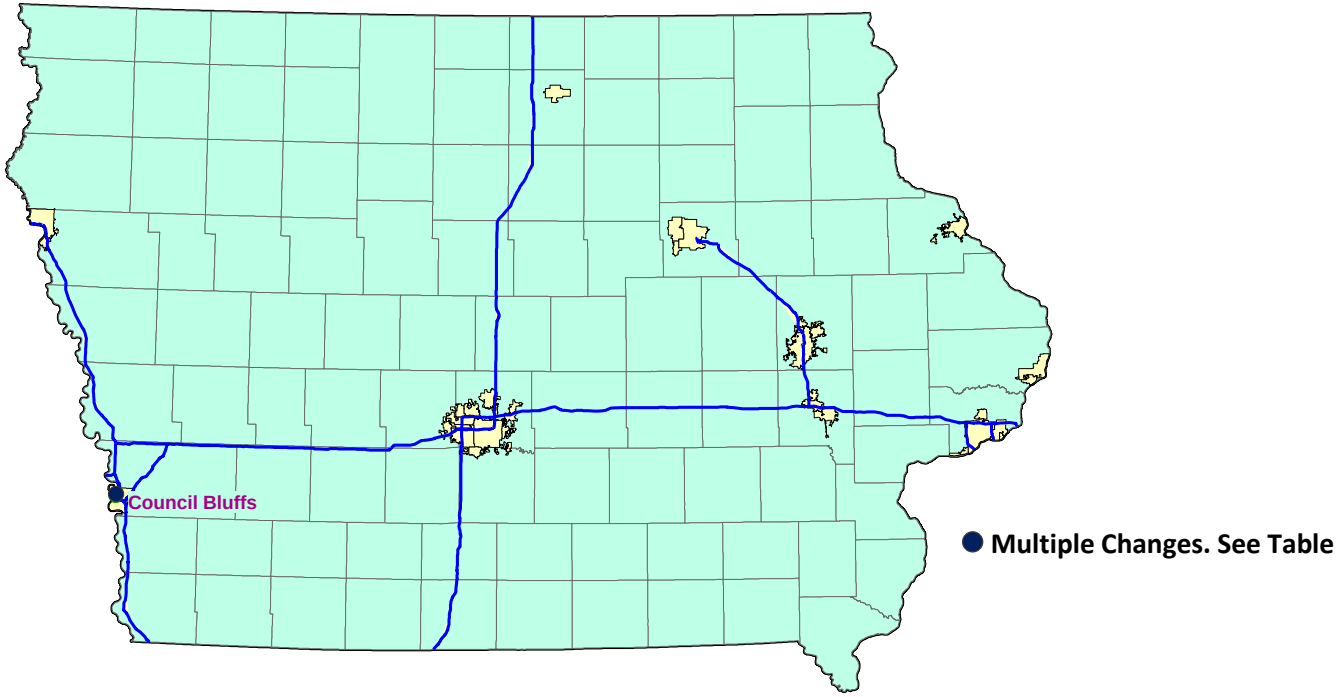
Site	Name	City	County	Site Label
191130040	Public Health	Cedar Rapids	Linn	Cedar Rapids, Public Health
191530030	Health Department	Des Moines	Polk	Des Moines, Health Dept.
191630015	Jefferson School	Davenport	Scott	Davenport, Jefferson Sch.

Iowa NO_2 Monitoring Sites



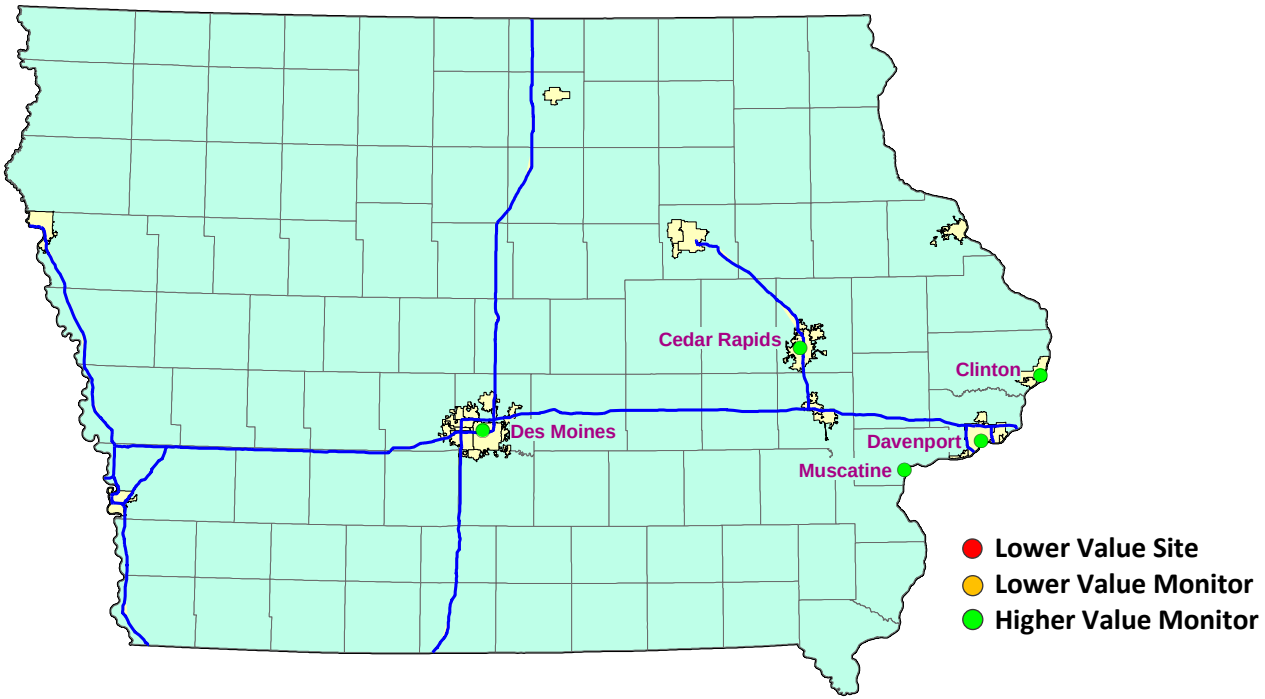
Lower Value Sites Indicated in Red				
Site	**Name**	**City**	**County**	**Site Label**
191530030	Health Department	Des Moines	Polk	Des Moines, Health Dept.
191536011	Des Moines, Near-Road NO_2	Des Moines	Polk	Des Moines, Near-Road NO_2
191630015	Jefferson School	Davenport	Scott	Davenport, Jefferson Sch.
191770006	Lake Sugema	not in a city	Van Buren	Keosauqua, Lake Sugema

Iowa Lead Monitoring Sites



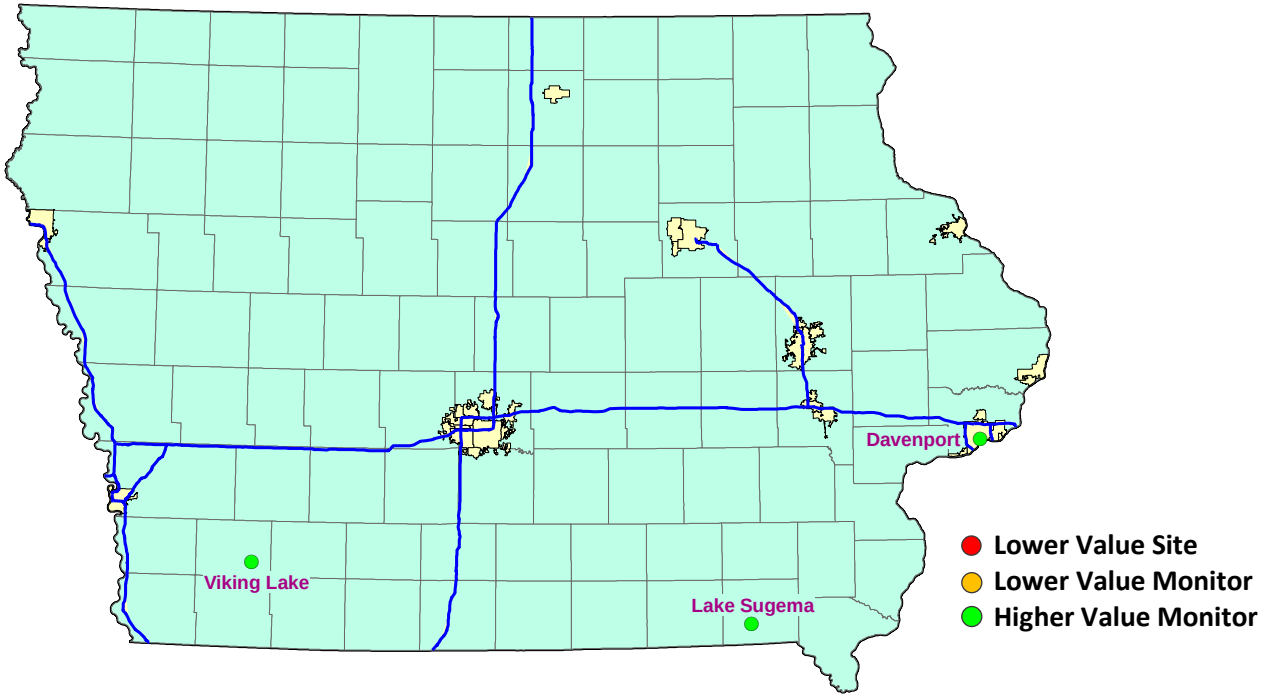
Lower Value Monitors Indicated in Orange; Proposed Frequency Changes Indicated in Yellow				
Site	**County**	**Site Label**	**Samplers**	**Frequency**
191550011	Pottawattamie	Council Bluffs, Griffin Pipe	~~3~~ 2	~~1 in 3~~ 1 in 6

Iowa Toxics Monitoring Sites



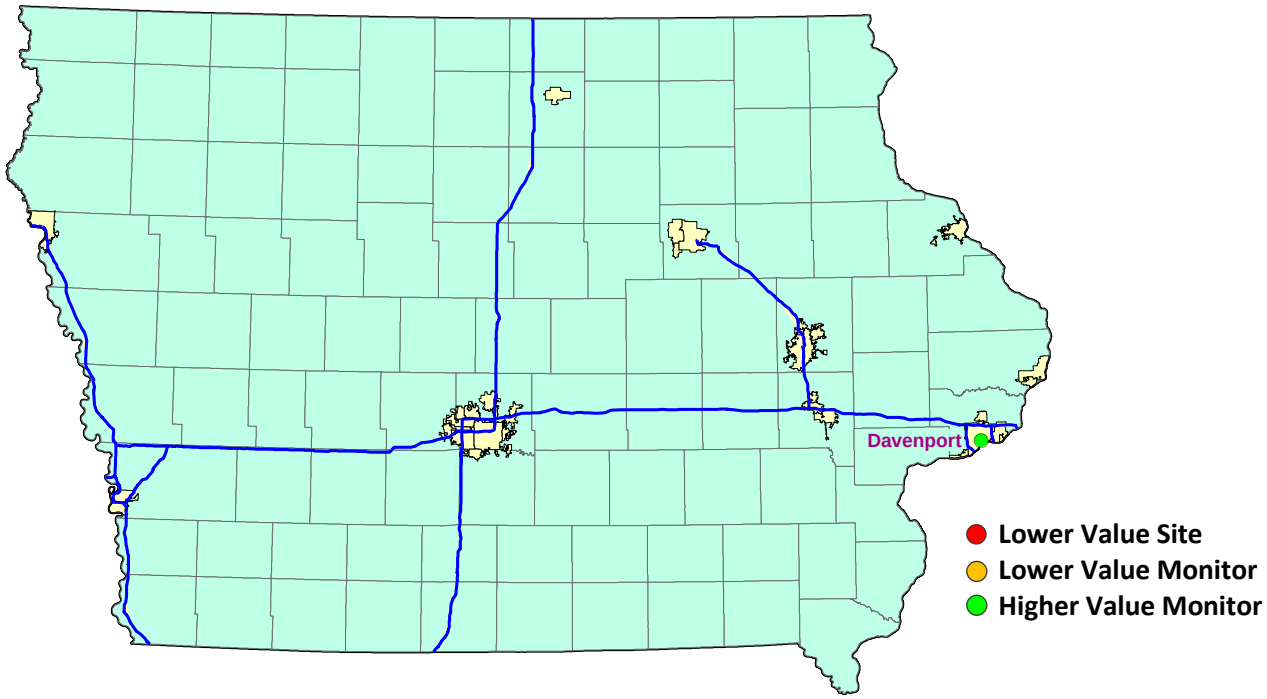
Site	Name	City	County	Site Label
190450019	Chancy Park	Clinton	Clinton	Clinton, Chancy Park
191130040	Public Health	Cedar Rapids	Linn	Cedar Rapids, Public Health
191390020	Musser Park	Muscatine	Muscatine	Muscatine, Musser Park
191530030	Health Department	Des Moines	Polk	Des Moines, Health Dept.
191630015	Jefferson School	Davenport	Scott	Davenport, Jefferson Sch.

Iowa Speciation Monitoring Sites



Site	Name	City	County	Site Label	Type of Speciation
191370002	Viking Lake State Park	N/A	Montgomery	Viking Lake State Park	IMPROVE
191630015	Jefferson School	Davenport	Scott	Davenport, Jefferson Sch.	Chemical Speciation Network
191770006	Lake Sugema	N/A	Van Buren	Keosauqua, Lake Sugema	IMPROVE

Iowa NO_Y Monitoring Sites



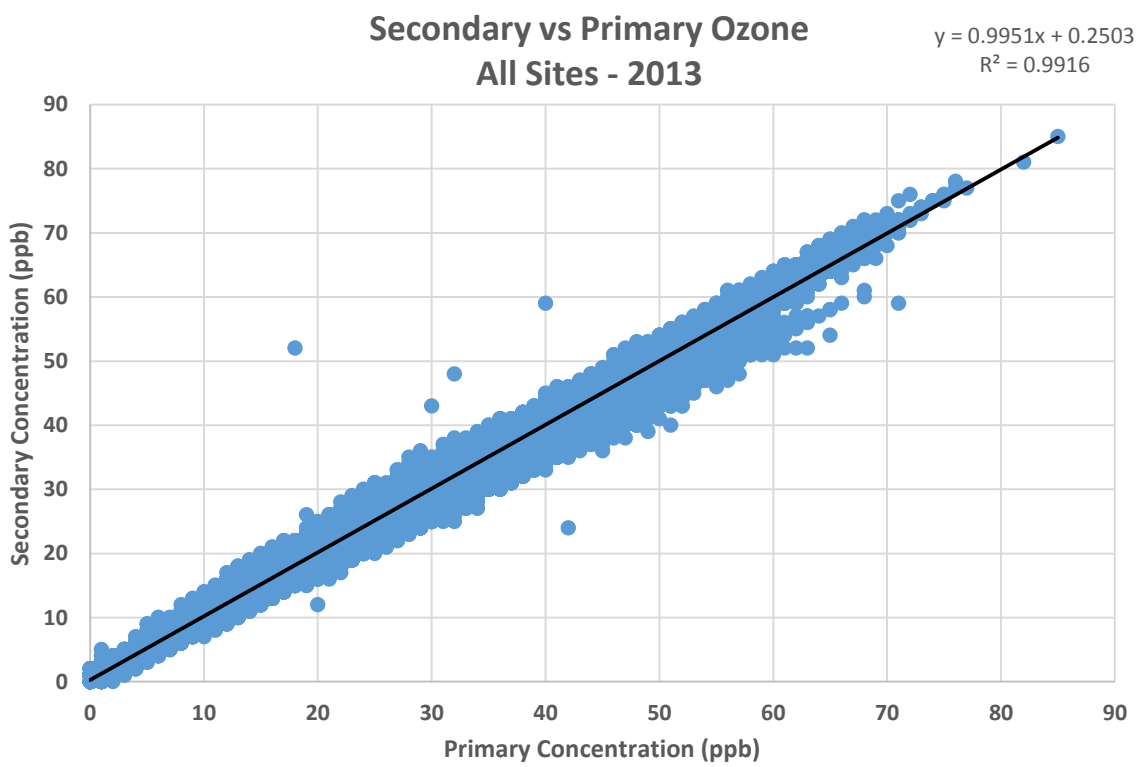
Site	Name	City	County	Site Label
191630015	Jefferson School	Davenport	Scott	Davenport, Jefferson Sch.

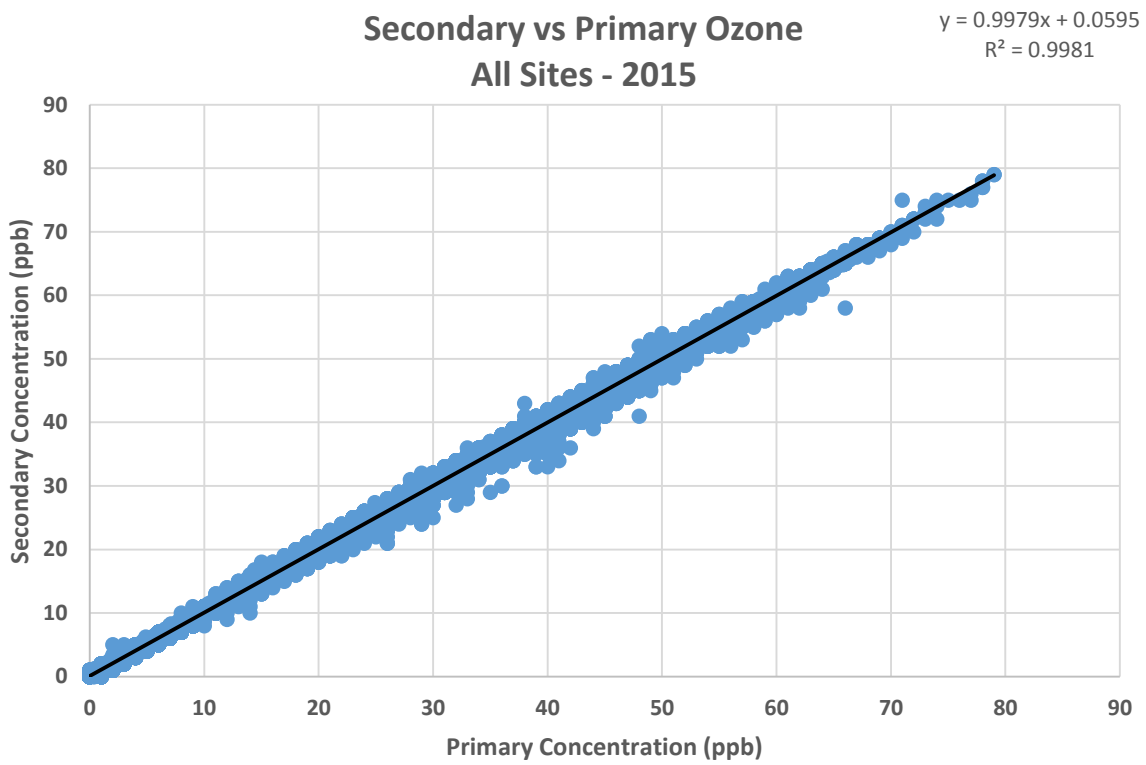
Collocated Ozone Monitors

Hourly Ozone Substitution: 2013-2015

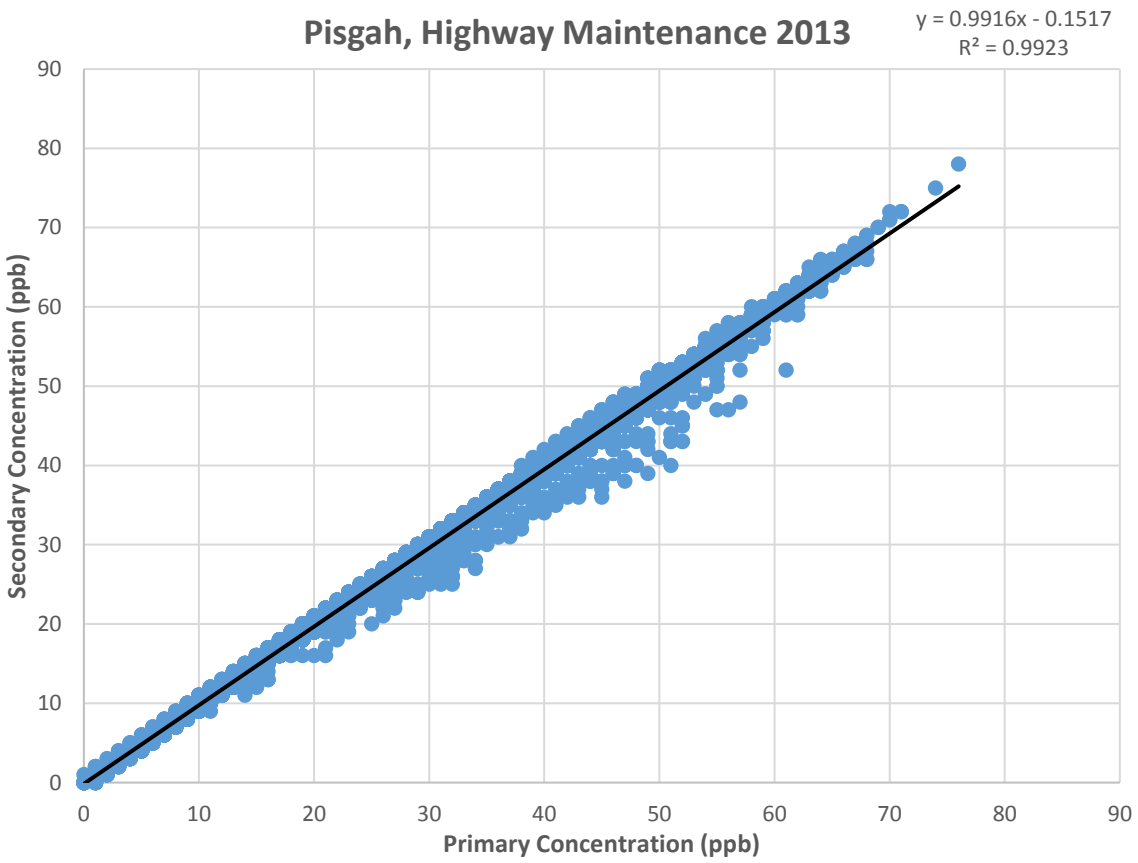
Year	Possible Hours	Hours Before Substitution	Hours After Substitution	Hourly Substitutions
2013	77,040	72,803 (94.5%)	73,253 (95.1%)	450 (0.6%)
2014	77,040	75,169 (97.6%)	75,610 (98.1%)	441 (0.6%)
2015	77,040	75,702 (98.3%)	75,935 (98.6%)	233 (0.3%)

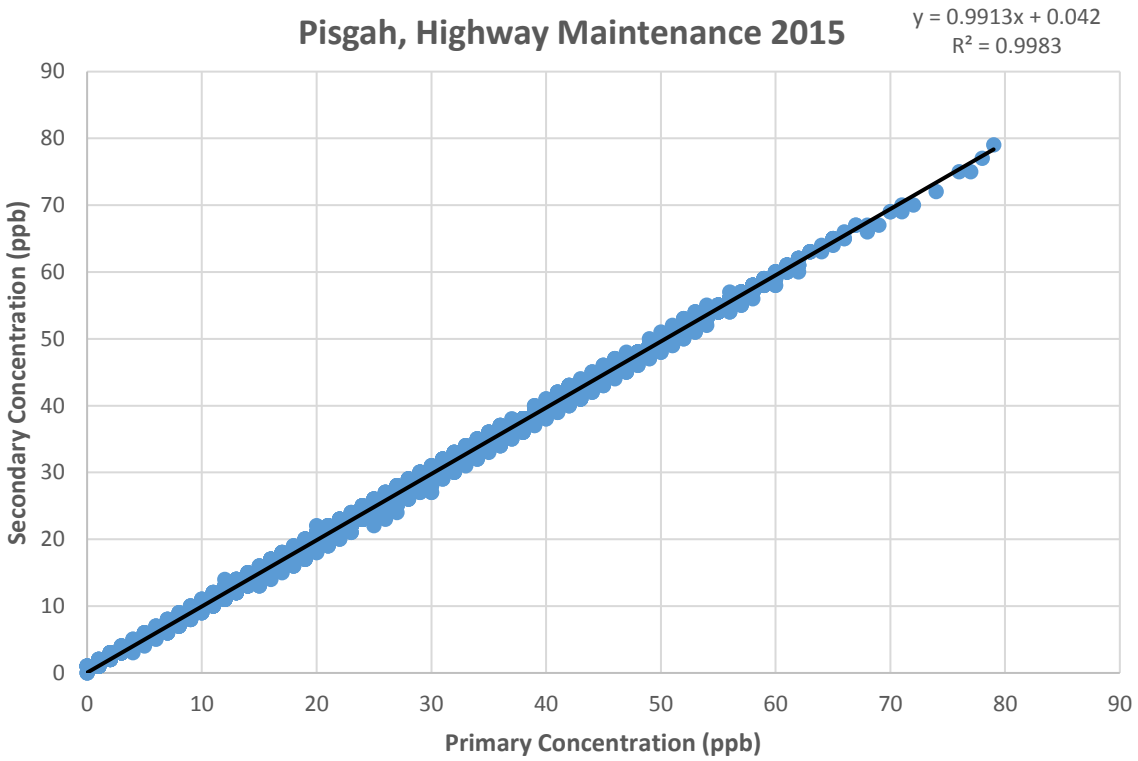
Hourly Ozone Comparisons for 2013 and 2015



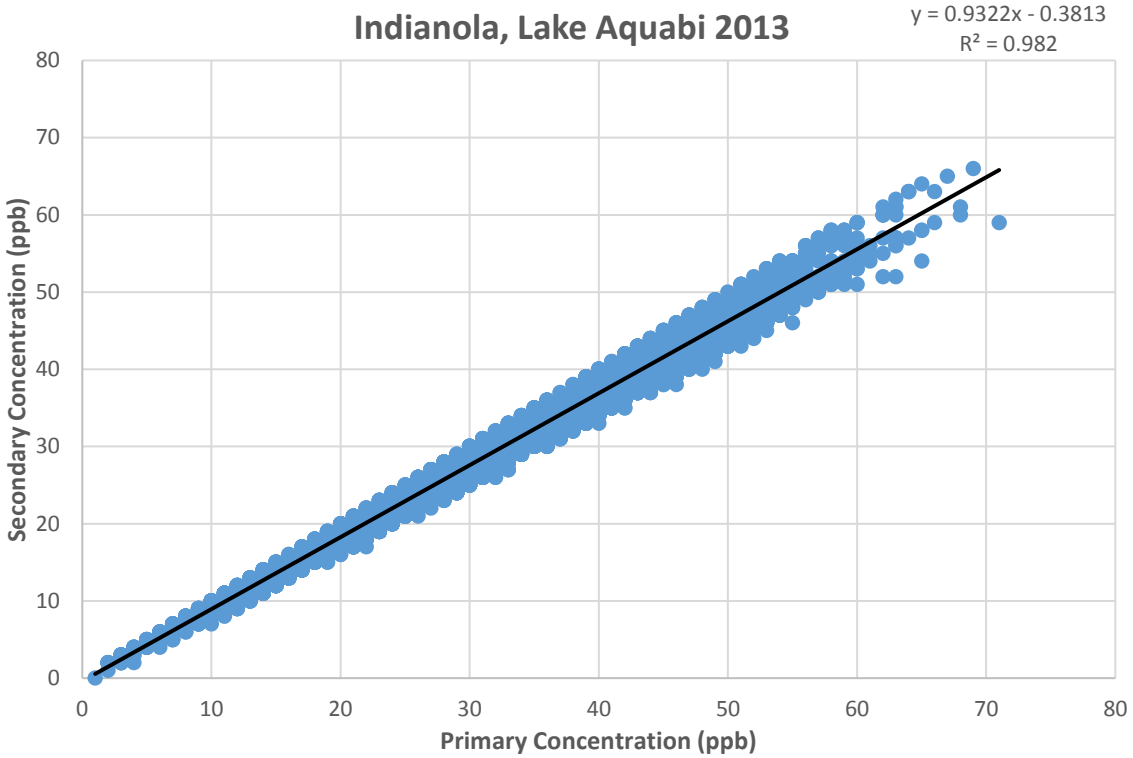


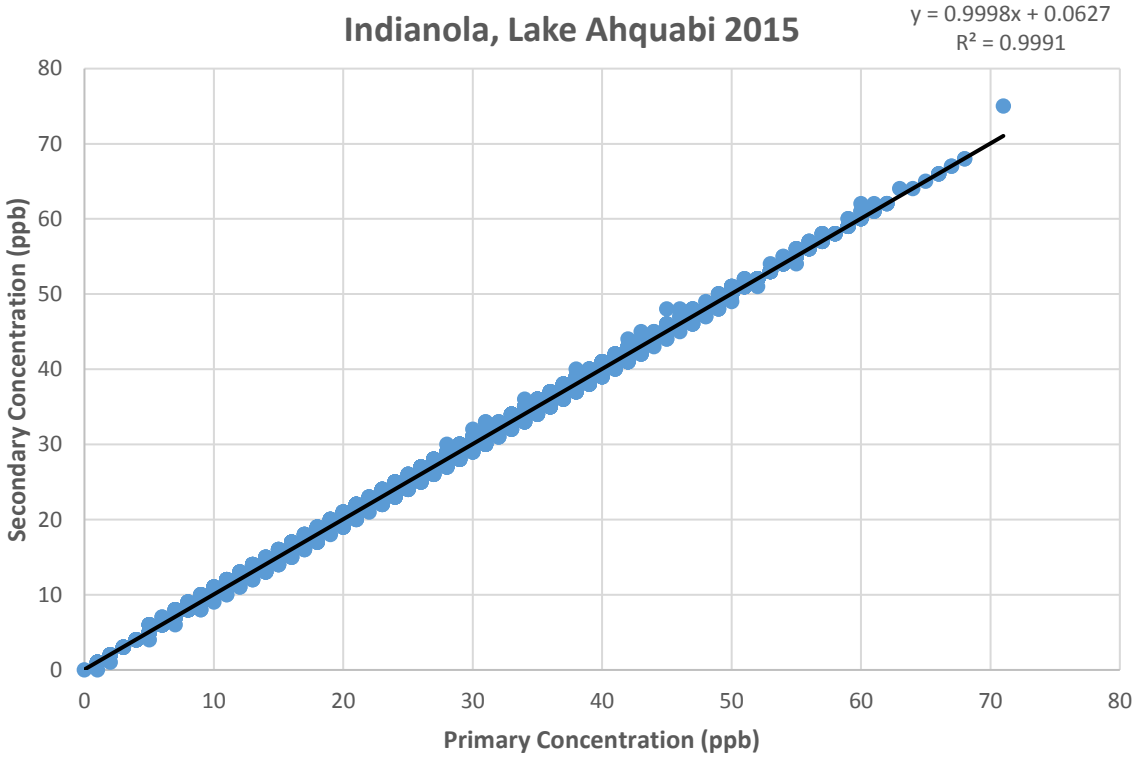
Hourly Ozone Comparisons for 2013 and 2015

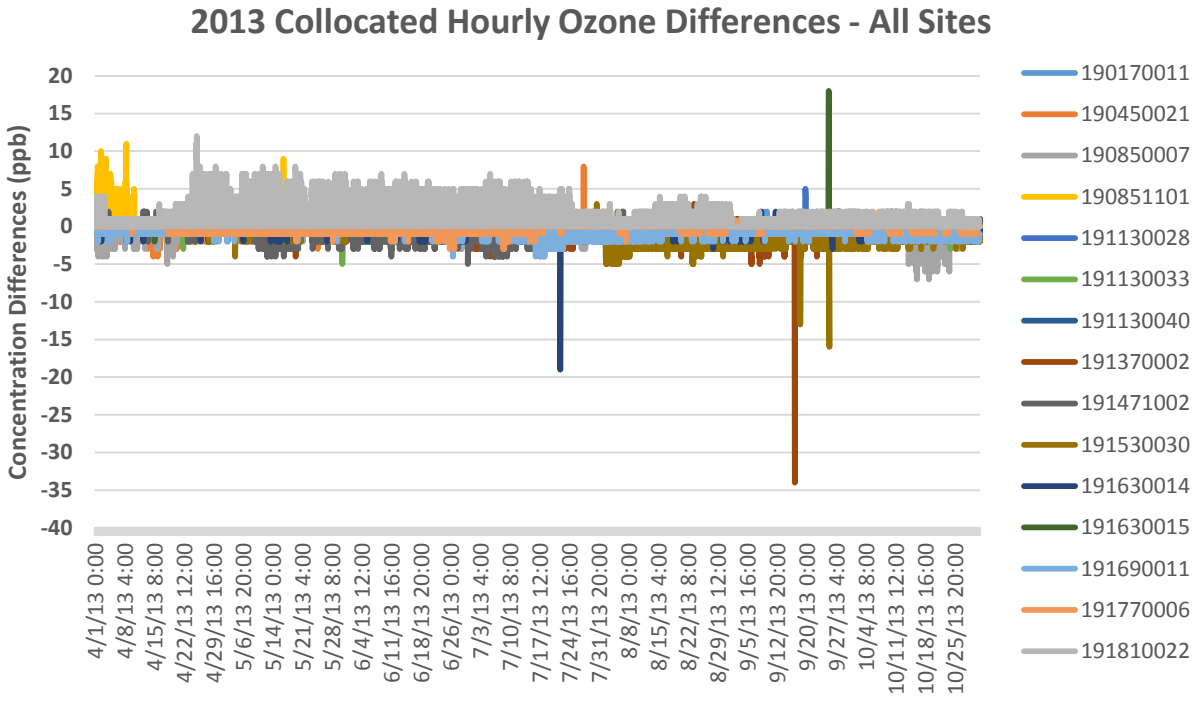


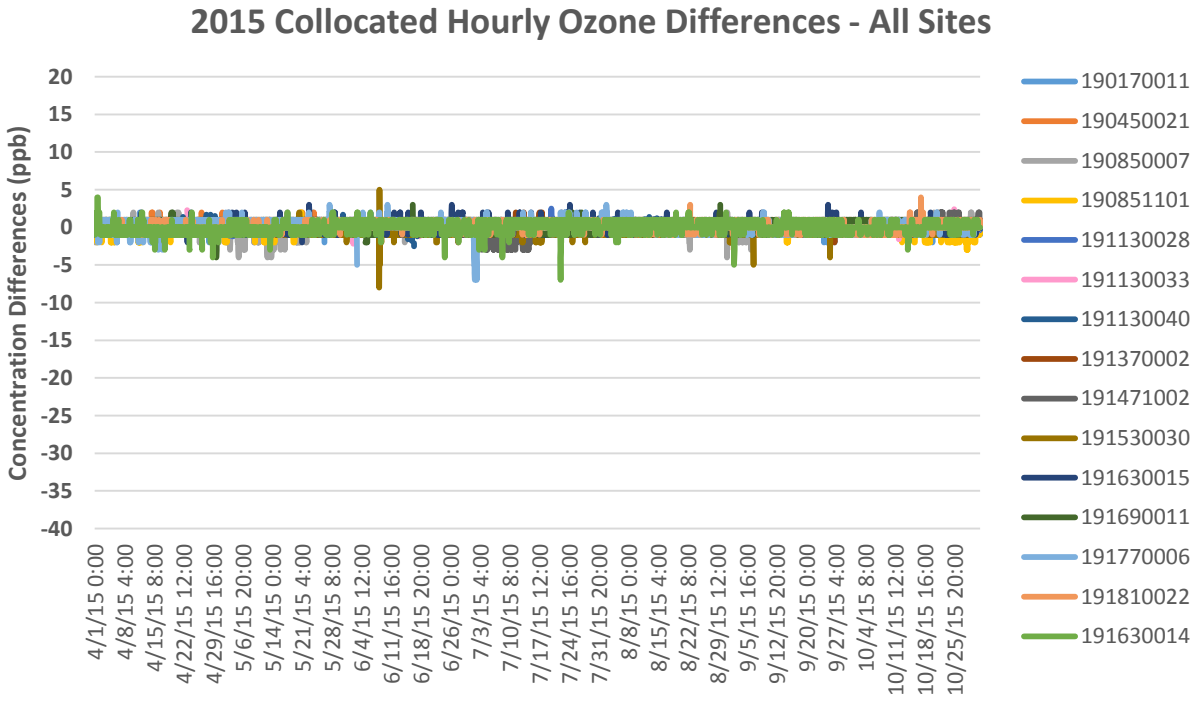


Hourly Ozone Comparisons for 2013 and 2015





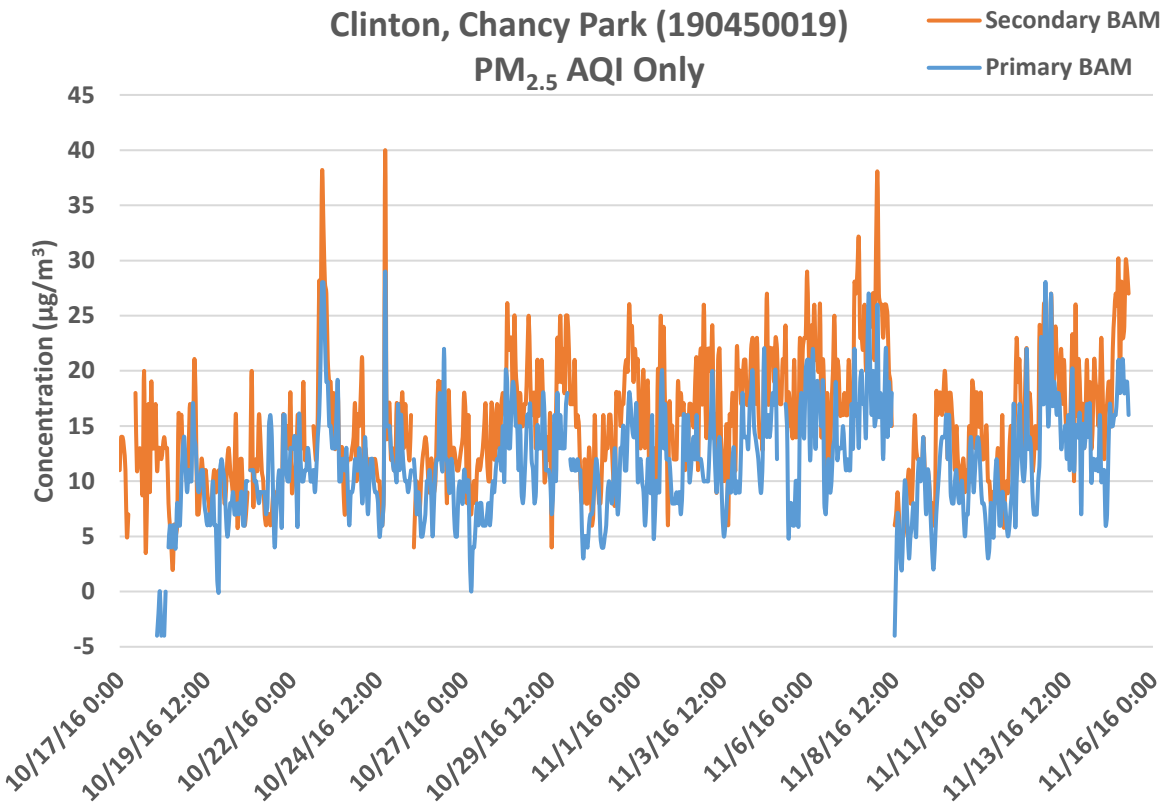

2013 Collocated Hourly Ozone Differences - All Sites
Concentration Differences (ppb)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4/1/13 0:00
4/8/13 4:00
4/15/13 8:00
4/22/13 12:00
4/29/13 16:00
5/6/13 20:00
5/14/13 0:00
5/21/13 4:00
5/28/13 8:00
6/4/13 12:00
6/11/13 16:00
6/18/13 20:00
6/26/13 0:00
7/3/13 4:00
7/10/13 8:00
7/17/13 12:00
7/24/13 16:00
7/31/13 20:00
8/8/13 0:00
8/15/13 4:00
8/22/13 8:00
8/29/13 12:00
9/5/13 16:00
9/12/13 20:00
9/20/13 0:00
9/27/13 4:00
10/4/13 8:00
10/11/13 12:00
10/18/13 16:00
10/25/13 20:00
190170011
190450021
190850007
190851101
191130028
191130033
191130040
191370002
191471002
191530030
191630014
191630015
191690011
191770006
191810022

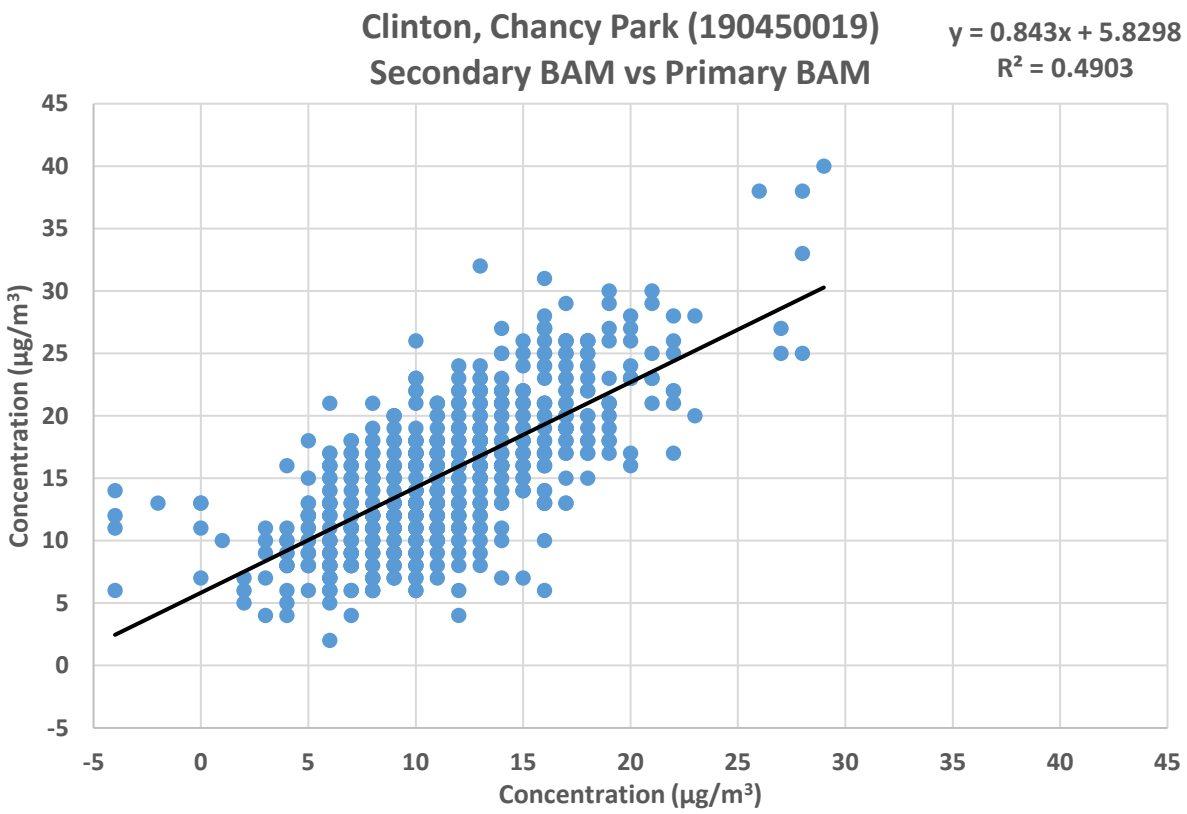

2015 Collocated Hourly Ozone Differences - All Sites
Concentration Differences (ppb)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4/1/15 0:00
4/8/15 4:00
4/15/15 8:00
4/22/15 12:00
4/29/15 16:00
5/6/15 20:00
5/14/15 0:00
5/21/15 4:00
5/28/15 8:00
6/4/15 12:00
6/11/15 16:00
6/18/15 20:00
6/26/15 0:00
7/3/15 4:00
7/10/15 8:00
7/17/15 12:00
7/24/15 16:00
7/31/15 20:00
8/8/15 0:00
8/15/15 4:00
8/22/15 8:00
8/29/15 12:00
9/5/15 16:00
9/12/15 20:00
9/20/15 0:00
9/27/15 4:00
10/4/15 8:00
10/11/15 12:00
10/18/15 16:00
10/25/15 20:00
190170011
190450021
190850007
190851101
191130028
191130033
191130040
191370002
191471002
191530030
191630015
191690011
191770006
191810022
191630014

Collocated Continuous $PM_{2.5}$ Monitors

Controlling Collocated Bias between Continuous $PM_{2.5}$ Monitors

- A 3-year average concentration or 12.1 $\mu g/m^3$ or greater exceeds the annual PM2.5 NAAQS.
- Annual $PM_{2.5}$ design values in Iowa range from 7.6 to 10.2 $\mu g/m^3$ (median of 9.0 $\mu g/m^3$). In other words, Iowa $PM_{2.5}$ monitors are between 1.9 $\mu g/m^3$ and 4.5 $\mu g/m^3$ below the NAAQs with the median monitor 3.1 $\mu g/m^3$ below the NAAQS.
- How much bias is typical between collocated continuous PM2.5 monitors in Iowa? The latest check of continuous $PM_{2.5}$ data from Airnow shows that 60% of collocated pairs have an average bias of 1.9 $\mu g/m^3$ or greater, and 20% of monitor pairs have a bias of 3.1 $\mu g/m^3$ or greater.


Clinton, Chancy Park (190450019)
PM2.5 AQI Only
Secondary BAM
Primary BAM
Concentration (µg/m³)
45
40
35
30
25
20
15
10
5
0
-5
10/17/16 0:00
10/19/16 12:00
10/22/16 0:00
10/24/16 12:00
10/27/16 0:00
10/29/16 12:00
11/1/16 0:00
11/3/16 12:00
11/6/16 0:00
11/8/16 12:00
11/11/16 0:00
11/13/16 12:00
11/16/16 0:00


Clinton, Chancy Park (190450019)
Secondary BAM vs Primary BAM
y = 0.843x + 5.8298
R² = 0.4903
Concentration (µg/m³)
45
40
35
30
25
20
15
10
5
0
-5
-5
0
5
10
15
20
25
30
35
40
45
Concentration (µg/m³)

PM$_{2.5}$ AQI (BAM) Only Collocated Comparison 10/17/2016 – 11/15/2016						
AQS ID	**Site Name**	**Count**	**R^2**	**Slope**	**Intercept**	**Average Difference**
190130009	Waterloo, Water Tower	351	0.5136	0.6908	4.0115	0.7123
190450019	Clinton, Chancy Park	663	0.4903	0.8430	5.8298	4.0407
190450021	Clinton, Rainbow Park	481	0.6358	0.9181	4.7876	4.1726
191032001	Iowa City, Hoover School	-	-	-	-	-
191130040	Cedar Rapids, Health Dept.	685	0.6662	0.8760	1.9394	0.9723
191370002	Viking Lake State Park	372	0.1923	0.5317	5.8042	2.7151
191390019	Muscatine, High School E. Campus	252	0.4521	0.7056	3.6791	0.8690
191471002	Emmetsburg, Iowa Lakes CC	407	0.6236	0.7188	4.5087	2.9656
191530030	Des Moines, Health Dept.	697	0.3145	0.7028	0.8544	-1.5265
191630015	Davenport, Jefferson School	481	0.6319	0.7973	4.5621	2.3493
191630020	Davenport, Hayes School	697	0.8141	0.9301	2.4980	1.8737
191770006	Lake Sugema	-	-	-	-	-

191032001 & 191770006 had one monitor that was offline during the time period.