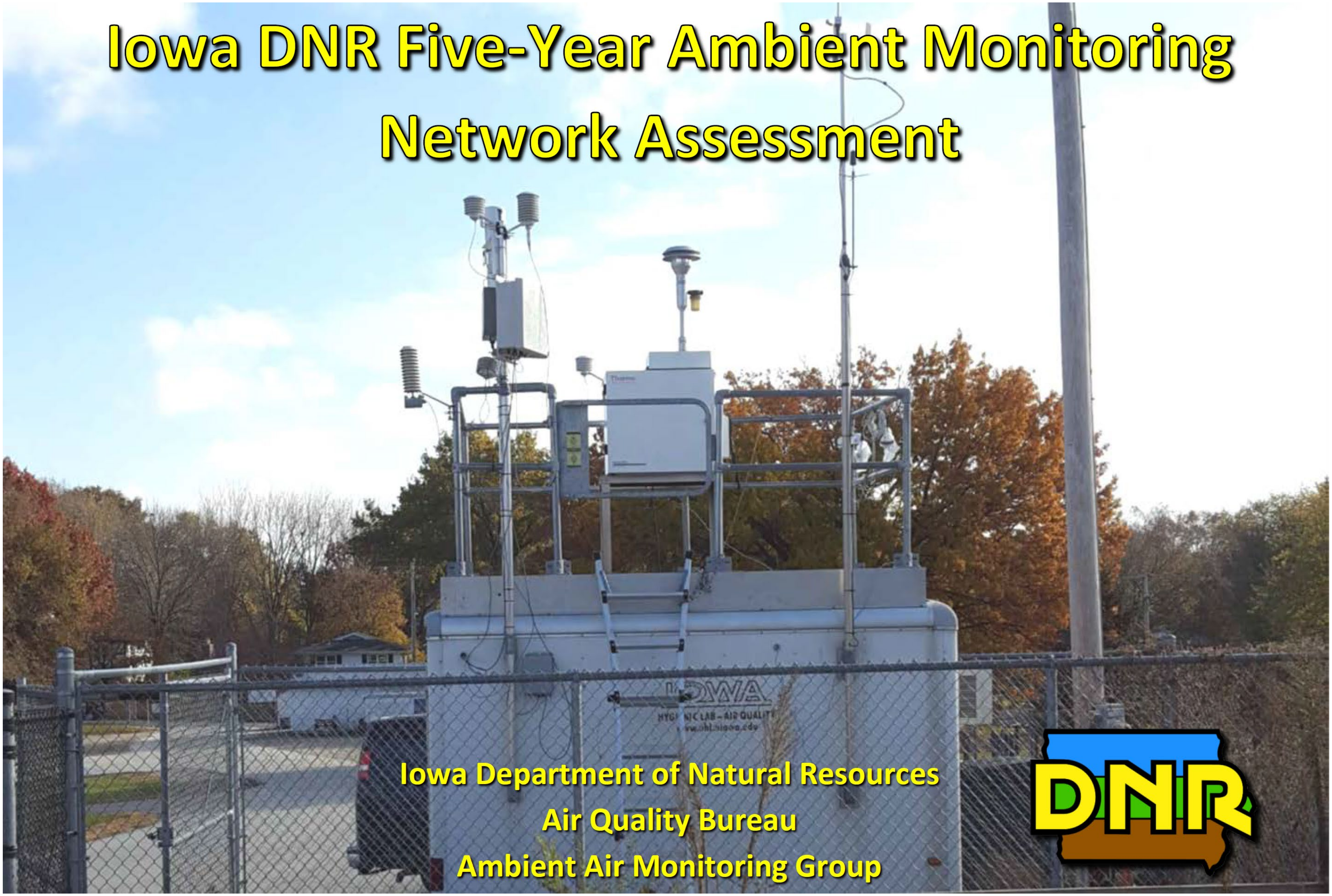
Iowa DNR Five-Year Ambient Monitoring Network Assessment



Iowa Department of Natural Resources

Air Quality Bureau

Ambient Air Monitoring Group

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The Five-Year Network Assessment: An Overview

Once every five years, federal rules require that states supplement their annual ambient air monitoring network plan with a five-year network assessment.[1] While the focus of the annual network plan is to demonstrate that a State's monitoring network meets the minimum federal requirements, the five-year assessment is intended to provide a more general explanation of how the State's air monitoring network meets the qualitative monitoring objectives established in federal monitoring rules,[2] for example, how the network protects individuals sensitive to the effects of air pollution. The five-year assessment also provides an opportunity for States to make significant changes to their long-term monitoring efforts (i.e. changes to State and Local Air Monitoring Stations or SLAMS), renew waivers of federal monitoring requirements[3] or to implement new technologies in their air monitoring network.

The DNR has reviewed the tools developed by EPA for this five-year network assessment and included results from some of these tools in this document.[4]

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[1] The federal requirement for the five-year assessment is reproduced in Appendix A.

[2] Objectives for the federal ambient air monitoring program are indicated in Appendix B.

[3] A discussion of the Department's lead monitoring requirements near certain sources is contained in Appendix C.

[4] The results from the network assessment tools utilized are reproduced in Appendix F.

Background: Local and Regional Pollutants

EPA has established NAAQS[5] for seven common ("criteria") pollutants: lead, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), and particulate matter less than 10 microns in diameter (PM_{10}).[6]

Lead, PM_{10}, CO, NO_2, and SO_2 are considered local pollutants. These pollutants are emitted directly from air pollution sources, and ambient levels are typically highest in "hotspots" in the neighborhoods near the emissions sources. (Power plant stacks are the exception to this general rule, as stacks approaching 200 feet in height are common, and the hotspots associated with the stack emissions may be miles from the location of the stack.) For a local air pollutant, concentrations approach background levels in areas distant from the emissions sources, and these background levels are usually small compared to the level of the NAAQS.[7]

Local Air Pollutant Example. Industrial lead emissions (left) and modeled hotspot (right). Note that the image and the modeling results are no longer current. The area inside the orange contour was predicted to violate the NAAQS.

$PM_{2.5}$ and ozone concentrations approaching NAAQS levels may occur during regional episodes and encompass large, multi-state areas. Such episodes are possible because under certain meteorological conditions $PM_{2.5}$ and ozone are formed in the atmosphere from chemical reactions between precursor compounds. For this reason, ozone and $PM_{2.5}$ are often referred to as regional pollutants because of the potential for background levels comparable to the NAAQS that are generated by secondary formation. $PM_{2.5}$ is also a local pollutant, as directly emitted smoke from combustion processes may also give rise to hot spots in the neighborhood of the emissions source even in the absence of an elevated background due to a regional episode.

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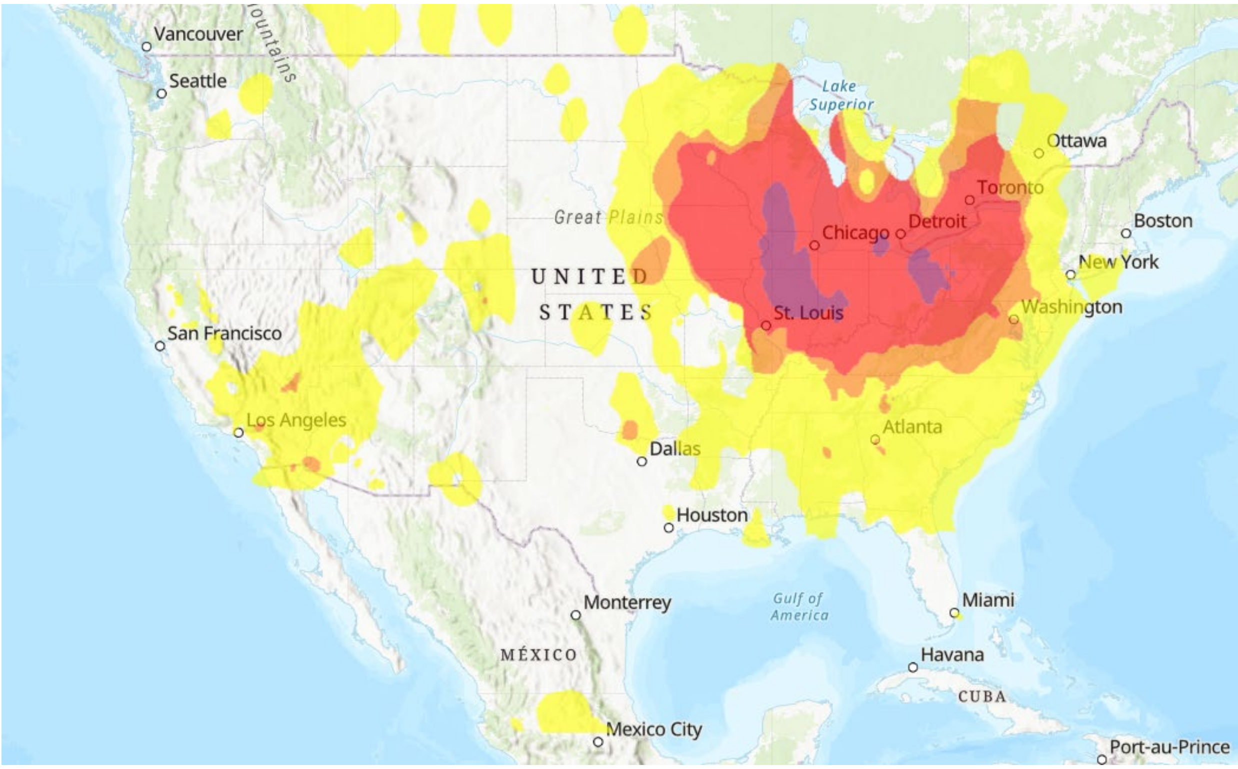
[5] A collection of resources concerning the NAAQS maybe be found at: https://www.epa.gov/naaqs.

[6] A description of the Iowa criteria pollutant monitoring network is contained in Appendix G.

[7] PM_{10} background levels in Iowa have occasionally generated NAAQS exceedances during dust storms driven by extremely high winds.



Regional Wildfire Smoke Related Ozone and PM2.5 Episode on 6/28/2023. Graphic Courtesy of EPA's AirNow Program.

Orange, red, and purple areas exceed the NAAQS and represent respectively higher levels of pollutant concentrations.

Objectives of the Iowa Ambient Air Monitoring Network

- **The monitoring network is designed to alert the public to air pollution levels that may threaten their health.** Associated with each of EPA's NAAQS is a level that represents the threshold for adverse health effects for sensitive groups (e.g. asthmatics, children, and the elderly). When an ambient air monitor records levels that exceed this threshold, it is said to have recorded a "NAAQS exceedance". An important objective of an ambient air monitoring network is to alert individuals to air pollution levels that exceed the level of the NAAQS.[8]

- **The monitoring network is designed to identify areas where the air quality does not meet health standards, and regulatory intervention is required.** A single monitored exceedance of the NAAQS is usually not sufficient to establish that the NAAQS is violated at a monitoring site. Violation of the NAAQS typically requires multiple exceedances at a monitoring site over several years.[9] For ozone, $PM_{2.5}$ and other criteria pollutants, federal regulations specify that a statistic called the "design value" is calculated from three years of monitoring data from a monitoring site. The design value is compared to the level of the NAAQS to establish whether the monitoring data

[8] NAAQS exceedances recorded in Iowa over the past 5 years are described in Appendix H.
[9] NAAQS violations (and design values) in Iowa over the past 5 years are discussed in Appendix I.

violates the NAAQS. If the air quality at a monitoring location is poor enough to violate the NAAQS, then after giving the State a year or so to try to work out the problem through its normal permitting process, EPA will formally declare the area around the monitor to be in non-attainment, and special and more stringent federal permitting rules apply within the area. The size of the non-attainment area is determined by dialog between EPA and the State; but any area that causes or contributes to the non-attainment problem at the monitor must be included in the non-attainment area. Additional monitors are often installed to articulate the non-attainment area and establish the effectiveness of control strategies after a monitor in an area records non-attainment.

- **The monitoring network is designed to characterize pollutant levels in heavily populated areas.** One of the main objectives of air monitoring is to protect human health. In large cities, there are many people affected by the air quality, and larger numbers of individuals (such as people with heart or lung ailments, children and the elderly) that are sensitive to the effects of air pollution. Certain types of air pollutant emissions, such as motor vehicle emissions, are also likely to be larger in urban areas than in outlying areas. EPA has established minimum monitoring requirements that apply to urban areas; or more precisely, areas established as metropolitan statistical areas (MSA's) by the U.S. Census Bureau.[10,11,12]

- **The monitoring network is designed to support permitting activities.** The DNR frequently conducts ambient air impact analyses as part of the permitting process.[13] Dispersion modeling is used to estimate the air pollutant levels generated from a new source. Some existing sources in the vicinity of the new source are usually included in the dispersion modeling analysis, but more distant sources are assumed to be part of the "background". Good estimates of background levels are an important part of the ambient impact analysis[14], especially in cases where background levels are significant compared to the NAAQS. Federal permitting requirements for large air pollution sources require industries to collect monitoring data if the State's air monitoring data is not adequate to characterize background levels. Currently, the State's ambient monitoring data and regional modeling is used to develop background levels for most permitting projects.

Public Availability of Iowa's Air Monitoring Data

In Iowa, the Iowa Department of Natural Resources (DNR) contracts with Local Air Pollution Control Programs in Polk and Linn Counties as well as the State Hygienic Laboratory (SHL) to gather air monitoring data. Data from each of these organizations is made available to the public in two formats: real-time data, to alert the public to air quality problems as they arise, and quality-assured data suitable for environmental decision making. The DNR also places reports that describe the State's air monitoring network and summarize the State's air monitoring data on its website.

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[10] A description of Iowa's MSA's and monitors located in these MSA's is contained in Appendix J.

[11] A description of the locations where some of the Iowans that are sensitive to the effects of air pollution reside is contained in Appendix K.

[12] A discussion of population changes in Iowa is contained in Appendix L.

[13] The department's dispersion modeling procedures are available at: https://www.iowadnr.gov/environmental-protection/air-quality/modeling

[14] https://www.iowadnr.gov/environmental-protection/air-quality/modeling/background-data.

- **Real-time Data.** On the local level, the SHL[15], and the Local Programs in Polk[16] and Linn[17] counties post real-time data from continuous monitors on their websites. On the national level, real-time data from all of the continuous monitors in Iowa is aggregated and disseminated by EPA's **AirNow**[18] program. EPA also provides access to real-time data to researchers via the ***AirNow API***[19]***.***

- **Finalized Monitoring Data.** Quality-assured data from continuous and non-continuous (e.g. filter samplers) monitors is loaded to EPA's Air Quality System (AQS) database by SHL and the Local Programs in a form that is suitable for environmental decision-making. In AQS, data from Iowa's air monitoring network along with the data from other States is aggregated and made available to EPA as well as the regulated and general public. This data is used for public health and air quality research,[20] to establish compliance with ambient air quality standards, and emissions reduction strategy development. AQS data is available online at EPA's ***AirData*** website[21] and through the ***AQS Data Mart***[22]***.*** Quality assured air monitoring data is also available upon request from the DNR and the Local Programs.

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[15] Available at: http://www.shl.uiowa.edu/env/ambient/data.xml.

[16] Available at: https://www.polkcountyiowa.gov/public-works/air-quality/air-quality-monitoring/current-aqi-real-time-data/.

[17] Available at: https://monitoring.linncleanair.org/ under Current Air Quality tab.

[18] Available at: https://www.airnow.gov/.

[19] Available at: https://docs.airnowapi.org/.

[20] See for example: C. Stanier, et. al, ***Understanding Episodes of High Airborne Particulate Matter in Iowa,*** 2/29/09. https://scholar.google.com/scholar?oi=bibs&cluster=7560844225877809949&btnI=1&hl=en

[21] Available at: https://www.epa.gov/outdoor-air-quality-data.

[22] Available at: https://aqs.epa.gov/aqsweb/documents/data_mart_welcome.html.

Appendix A: 40 CFR Part 58[23] Requiring 5-Year Network Assessments

§ 58.10 Annual monitoring network plan and periodic network assessment.

(a)

(1) Beginning July 1, 2007, the State, or where applicable local, agency shall submit to the Regional Administrator an annual monitoring network plan which shall provide for the documentation of the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations that can include FRM and FEM monitors that are part of SLAMS, NCore, CSN, PAMS, and SPM stations. The plan shall include a statement of whether the operation of each monitor meets the requirements of appendices A, B, C, D, and E to this part, where applicable. The Regional Administrator may require additional information in support of this statement. The annual monitoring network plan must be made available for public inspection and comment for at least 30 days prior to submission to the EPA and the submitted plan shall include and address, as appropriate, any received comments.

(2) Any annual monitoring network plan that proposes network modifications (including new or discontinued monitoring sites, new determinations that data are not of sufficient quality to be compared to the NAAQS, and changes in identification of monitors as suitable or not suitable for comparison against the annual $PM_{2.5}$ NAAQS) to SLAMS networks is subject to the approval of the EPA Regional Administrator, who shall approve or disapprove the plan within 120 days of submission of a complete plan to the EPA.

(3) The plan for establishing required NCore multipollutant stations shall be submitted to the Administrator not later than July 1, 2009. The plan shall provide for all required stations to be operational by January 1, 2011.

(4) A plan for establishing source-oriented Pb monitoring sites in accordance with the requirements of appendix D to this part for Pb sources emitting 1.0 ton per year (tpy) or greater shall be submitted to the EPA Regional Administrator no later than July 1, 2009, as part of the annual network plan required in paragraph (a)(1) of this section. The plan shall provide for the required source-oriented Pb monitoring sites for Pb sources emitting 1.0 tpy or greater to be operational by January 1, 2010. A plan for establishing source-oriented Pb monitoring sites in accordance with the requirements of appendix D to this part for Pb sources emitting equal to or greater than 0.50 tpy but less than 1.0 tpy shall be submitted to the EPA Regional Administrator no later than July 1, 2011. The plan shall provide for the required source-oriented Pb monitoring sites for Pb sources emitting equal to or greater than 0.50 tpy but less than 1.0 tpy to be operational by December 27, 2011.

(5)

(i) A plan for establishing or identifying an area-wide NO_2 monitor, in accordance with the requirements of Appendix D, section 4.3.3 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2012. The plan shall provide for these required monitors to be operational by January 1, 2013.

(ii) A plan for establishing or identifying any NO_2 monitor intended to characterize vulnerable and susceptible populations, as required in Appendix D, section 4.3.4 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2012. The plan shall provide for these required monitors to be operational by January 1, 2013.

(iii) A plan for establishing a single near-road NO_2 monitor in CBSAs having 1,000,000 or more persons, in accordance with the requirements of Appendix D, section 4.3.2 to this part, shall be submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2013. The plan shall provide for these required monitors to be operational by January 1, 2014.

(iv) A plan for establishing a second near-road NO_2 monitor in any CBSA with a population of 2,500,000 persons or more, or a second monitor in any CBSA with a population of 1,000,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts, in accordance with the requirements of appendix D, section 4.3.2 to this part, shall be

[23] Available online at: https://gov.ecfr.io/cgi-bin/text-idx?SID=a9ae17e22ab9eb580ac6ea0aef205b59&mc=true&node=se40.6.58_110&rgn=div8

submitted as part of the Annual Monitoring Network Plan to the EPA Regional Administrator by July 1, 2014. The plan shall provide for these required monitors to be operational by January 1, 2015.

(6) A plan for establishing SO_2 monitoring sites in accordance with the requirements of appendix D to this part shall be submitted to the EPA Regional Administrator by July 1, 2011 as part of the annual network plan required in paragraph (a) (1). The plan shall provide for all required SO_2 monitoring sites to be operational by January 1, 2013.

(7) A plan for establishing CO monitoring sites in accordance with the requirements of appendix D to this part shall be submitted to the EPA Regional Administrator. Plans for required CO monitors shall be submitted at least six months prior to the date such monitors must be established as required by section 58.13.

(8)

(i) A plan for establishing near-road $PM_{2.5}$ monitoring sites in CBSAs having 2.5 million or more persons, in accordance with the requirements of appendix D to this part, shall be submitted as part of the annual monitoring network plan to the EPA Regional Administrator by July 1, 2014. The plan shall provide for these required monitoring stations to be operational by January 1, 2015.

(ii) A plan for establishing near-road $PM_{2.5}$ monitoring sites in CBSAs having 1 million or more persons, but less than 2.5 million persons, in accordance with the requirements of appendix D to this part, shall be submitted as part of the annual monitoring network plan to the EPA Regional Administrator by July 1, 2016. The plan shall provide for these required monitoring stations to be operational by January 1, 2017.

(9) The annual monitoring network plan shall provide for the required O_3 sites to be operating on the first day of the applicable required O_3 monitoring season in effect on January 1, 2017 as listed in Table D-3 of appendix D of this part.

(10) A plan for making Photochemical Assessment Monitoring Stations (PAMS) measurements, if applicable, in accordance with the requirements of appendix D paragraph 5(a) of this part shall be submitted to the EPA Regional Administrator no later than July 1, 2018. The plan shall provide for the required PAMS measurements to begin by June 1, 2019.

(11) An Enhanced Monitoring Plan for O_3, if applicable, in accordance with the requirements of appendix D paragraph 5(h) of this part shall be submitted to the EPA Regional Administrator no later than October 1, 2019 or two years following the effective date of a designation to a classification of Moderate or above O_3 nonattainment, whichever is later.

(12) A detailed description of the PAMS network being operated in accordance with the requirements of appendix D to this part shall be submitted as part of the annual monitoring network plan for review by the EPA Administrator. The PAMS Network Description described in section 5 of appendix D may be used to meet this requirement.

(b) The annual monitoring network plan must contain the following information for each existing and proposed site:

(1) The AQS site identification number.

(2) The location, including street address and geographical coordinates.

(3) The sampling and analysis method(s) for each measured parameter.

(4) The operating schedules for each monitor.

(5) Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal.

(6) The monitoring objective and spatial scale of representativeness for each monitor as defined in appendix D to this part.

(7) The identification of any sites that are suitable and sites that are not suitable for comparison against the annual $PM_{2.5}$ NAAQS as described in § 58.30.

(8) The MSA, CBSA, CSA or other area represented by the monitor.

(9) The designation of any Pb monitors as either source-oriented or non-source-oriented according to Appendix D to 40 CFR part 58.

(10) Any monitors for which a waiver has been requested or granted by the EPA Regional Administrator as allowed for under appendix D or appendix E to this part. For those monitors where a waiver has been approved, the annual monitoring network plan shall include the date the waiver was approved.

(11) Any source-oriented or non-source-oriented site for which a waiver has been requested or granted by the EPA Regional Administrator for the use of Pb-PM_{10} monitoring in lieu of Pb-TSP monitoring as allowed for under paragraph 2.10 of Appendix C to 40 CFR part 58.

(12) The identification of required NO_2 monitors as near-road, area-wide, or vulnerable and susceptible population monitors in accordance with Appendix D, section 4.3 of this part.

(13) The identification of any $PM_{2.5}$ FEMs used in the monitoring agency's network where the data are not of sufficient quality such that data are not to be compared to the national ambient air quality standards (NAAQS). For required SLAMS where the agency identifies that the $PM_{2.5}$ Class III FEM does not produce data of sufficient quality for comparison to the NAAQS, the monitoring agency must ensure that an operating FRM or filter-based FEM meeting the sample frequency requirements described in § 58.12 or other Class III $PM_{2.5}$ FEM with data of sufficient quality is operating and reporting data to meet the network design criteria described in appendix D to this part.

(14) The identification of any site(s) intended to address being sited in an at-risk community where there are anticipated effects from sources in the area as required in section 4.7.1(b)(3) of appendix D to this part. An initial approach to the question of whether any new or moved sites are needed and to identify the communities in which they intend to add monitoring for meeting the requirement in this paragraph (b)(14), if applicable, shall be submitted in accordance with the requirements of section 4.7.1(b)(3) of appendix D to this part, which includes submission to the EPA Regional Administrator no later than July 1, 2024. Specifics on the resulting proposed new or moved sites for $PM_{2.5}$ network design to address at-risk communities, if applicable, would need to be detailed in annual monitoring network plans due to each applicable EPA Regional office no later than July 1, 2025. The plan shall provide for any required sites to be operational no later than 24 months from date of approval of a plan or January 1, 2027, whichever comes first.

(c) The annual monitoring network plan must document how state and local agencies provide for the review of changes to a $PM_{2.5}$ monitoring network that impact the location of a violating $PM_{2.5}$ monitor. The affected state or local agency must document the process for obtaining public comment and include any comments received through the public notification process within their submitted plan.

(d) The State, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (*e.g.,* children with asthma) and other at-risk populations, and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies. The State, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan, to the Regional Administrator. The assessments are due every 5 years beginning July 1, 2010.

(e) All proposed additions and discontinuations of SLAMS monitors in annual monitoring network plans and periodic network assessments are subject to approval according to § 58.14.

[71 FR 61298, Oct. 17, 2006, as amended at 72 FR 32210, June 12, 2007; 73 FR 67059, Nov. 12, 2008; 73 FR 77517, Dec. 19, 2008; 75 FR 6534, Feb. 9, 2010; 75 FR 35601, June 22, 2010; 75 FR 81137, Dec. 27, 2010; 76 FR 54341, Aug. 31, 2011; 78 FR 16188, Mar. 14, 2013; 78 FR 3282, Jan. 15, 2013; 80 FR 65466, Oct. 26, 2015; 81 FR 17279, Mar. 28, 2016; 81 FR 96388, Dec. 30, 2016; 89 FR 16388, Mar. 6, 2024]

Appendix B: 40 CFR Part 58 Appendix D[24] – Monitoring Objectives

Appendix D to Part 58—Network Design Criteria for Ambient Air Quality Monitoring

1. Monitoring Objectives and Spatial Scales

The purpose of this appendix is to describe monitoring objectives and general criteria to be applied in establishing the required SLAMS ambient air quality monitoring stations and for choosing general locations for additional monitoring sites. This appendix also describes specific requirements for the number and location of FRM and FEM sites for specific pollutants, NCore multipollutant sites, PM_{10} mass sites, $PM_{2.5}$ mass sites, chemically-speciated $PM_{2.5}$ sites, and O_3 precursor measurements sites (PAMS). These criteria will be used by EPA in evaluating the adequacy of the air pollutant monitoring networks.

1.1 Monitoring Objectives. The ambient air monitoring networks must be designed to meet three basic monitoring objectives. These basic objectives are listed below. The appearance of any one objective in the order of this list is not based upon a prioritized scheme. Each objective is important and must be considered individually.

(a) Provide air pollution data to the general public in a timely manner. Data can be presented to the public in a number of attractive ways including through air quality maps, newspapers, Internet sites, and as part of weather forecasts and public advisories.

(b) Support compliance with ambient air quality standards and emissions strategy development. Data from FRM and FEM monitors for NAAQS pollutants will be used for comparing an area's air pollution levels against the NAAQS. Data from monitors of various types can be used in the development of attainment and maintenance plans. SLAMS, and especially NCore station data, will be used to evaluate the regional air quality models used in developing emission strategies, and to track trends in air pollution abatement control measures' impact on improving air quality. In monitoring locations near major air pollution sources, source-oriented monitoring data can provide insight into how well industrial sources are controlling their pollutant emissions.

(c) Support for air pollution research studies. Air pollution data from the NCore network can be used to supplement data collected by researchers working on health effects assessments and atmospheric processes, or for monitoring methods development work.

1.1.1 In order to support the air quality management work indicated in the three basic air monitoring objectives, a network must be designed with a variety of types of monitoring sites. Monitoring sites must be capable of informing managers about many things including the peak air pollution levels, typical levels in populated areas, air pollution transported into and outside of a city or region, and air pollution levels near specific sources. To summarize some of these sites, here is a listing of six general site types:

(a) Sites located to determine the highest concentrations expected to occur in the area covered by the network.
(b) Sites located to measure typical concentrations in areas of high population density.
(c) Sites located to determine the impact of significant sources or source categories on air quality.
(d) Sites located to determine general background concentration levels.
(e) Sites located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards.
(f) Sites located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts.

1.1.2 This appendix contains criteria for the basic air monitoring requirements. The total number of monitoring sites that will serve the variety of data needs will be substantially higher than these minimum requirements provide. The optimum size of a particular network involves trade-offs among data needs and available resources. This regulation intends to provide for national air monitoring needs, and to lend support for the flexibility necessary to meet data collection needs of area air quality managers. The EPA, State, and local agencies will periodically collaborate on network design issues through the network assessment process outlined in §58.10.

1.1.3 This appendix focuses on the relationship between monitoring objectives, site types, and the geographic location of monitoring sites. Included are a rationale and set of general criteria for identifying candidate site locations in terms of physical characteristics which most closely match a specific monitoring objective. The criteria for more specifically locating the monitoring site, including spacing from roadways and vertical and horizontal probe and path placement, are described in appendix E to this part.

1.2 Spatial Scales. (a) To clarify the nature of the link between general monitoring objectives, site types, and the physical location of a particular monitor, the concept of spatial scale of representativeness is defined. The goal in locating monitors is to correctly match the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for the monitoring site type, air pollutant to be measured, and the monitoring objective.

(b) Thus, spatial scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring site throughout which actual pollutant concentrations are reasonably similar. The scales of representativeness of most interest for the monitoring site types described above are as follows:
(1) *Microscale*—Defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.

[24] Available online at:
https://www.ecfr.gov/cgi-bin/retrieveECFR?n=40y6.0.1.1.6.

(2) *Middle scale*—Defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.
(3) *Neighborhood scale*—Defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. The neighborhood and urban scales listed below have the potential to overlap in applications that concern secondarily formed or homogeneously distributed air pollutants.
(4) *Urban scale*—Defines concentrations within an area of city-like dimensions, on the order of 4 to 50 kilometers. Within a city, the geographic placement of sources may result in there being no single site that can be said to represent air quality on an urban scale.
(5) *Regional scale*—Defines usually a rural area of reasonably homogeneous geography without large sources, and extends from tens to hundreds of kilometers.
(6) *National and global scales*—These measurement scales represent concentrations characterizing the nation and the globe as a whole.

(c) Proper siting of a monitor requires specification of the monitoring objective, the types of sites necessary to meet the objective, and then the desired spatial scale of representativeness. For example, consider the case where the objective is to determine NAAQS compliance by understanding the maximum ozone concentrations for an area. Such areas would most likely be located downwind of a metropolitan area, quite likely in a suburban residential area where children and other susceptible individuals are likely to be outdoors. Sites located in these areas are most likely to represent an urban scale of measurement. In this example, physical location was determined by considering ozone precursor emission patterns, public activity, and meteorological characteristics affecting ozone formation and dispersion. Thus, spatial scale of representativeness was not used in the selection process but was a result of site location.

(d) In some cases, the physical location of a site is determined from joint consideration of both the basic monitoring objective and the type of monitoring site desired, or required by this appendix. For example, to determine $PM_{2.5}$ concentrations which are typical over a geographic area having relatively high $PM_{2.5}$ concentrations, a neighborhood scale site is more appropriate. Such a site would likely be located in a residential or commercial area having a high overall $PM_{2.5}$ emission density but not in the immediate vicinity of any single dominant source. Note that in this example, the desired scale of representativeness was an important factor in determining the physical location of the monitoring site.

(e) In either case, classification of the monitor by its type and spatial scale of representativeness is necessary and will aid in interpretation of the monitoring data for a particular monitoring objective (e.g., public reporting, NAAQS compliance, or research support).

(f) Table D-1 of this appendix illustrates the relationship between the various site types that can be used to support the three basic monitoring objectives, and the scales of representativeness that are generally most appropriate for that type of site.

TABLE D-1 OF APPENDIX D TO PART 58—RELATIONSHIP BETWEEN SITE TYPES AND SCALES OF REPRESENTATIVENESS

Site type	Appropriate siting scales
1. Highest concentration	Micro, middle, neighborhood (*sometimes* urban or regional for secondarily formed pollutants).
2. Population oriented	Neighborhood, urban.
3. Source impact	Micro, middle, neighborhood.
4. General/background & regional transport	Urban, regional.
5. Welfare-related impacts	Urban, regional.

[71 FR 61316, Oct. 17, 2006, as amended at 72 FR 32211, June 12, 2007; 73 FR 67062, Nov. 12, 2008; 75 FR 6534, Feb. 9, 2010; 75 FR 35602, June 22, 2010; 75 FR 81137, Dec. 27, 2010; 76 FR 54342, Aug. 31, 2011; 78 FR 3284, Jan. 15, 2013; 80 FR 65466, Oct. 26, 2015; 81 FR 17298, Mar. 28, 2016; 81 FR 96388, Dec. 30, 2016; 89 FR 16396, Mar. 6, 2024]

Appendix C: Request of Lead Monitoring Waiver

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Section 1: Summary: Emissions Based Lead Monitoring

EPA requires source-oriented SLAMS lead monitoring near industries that emit over 0.5 tpy of lead. This monitoring may be waived if modeling shows ambient impacts less than half the NAAQS. These waivers are renewed as an element of the five-year network assessment. [25] As indicated in the memo from the DNR Emissions Inventory Group cited in Section 2, Iowa does not currently have any industrial facilities that emit over 0.5 tpy of lead.

[25] Federal lead monitoring requirements are found in https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-58#Appendix-D-to-Part-58 (See section 4.5.)

Section 2: Lead (Pb) Emissions Inventory Memo

IOWA DNR
IOWA DEPARTMENT OF NATURAL RESOURCES

GOVERNOR, **KIM REYNOLDS**
LT. GOVERNOR, **CHRIS COURNOYER**
DIRECTOR, **KAYLA LYON**

Air Quality Bureau

Memo

To: John Gering

From: Nick Page

CC: Pete Zayudis, Brad Ashton, Marnie Stein, Brian Hutchins

Date: 3/27/2025

Re: Lead Emissions Inventory Narrative for 2025 Ambient Monitoring Network Plan

Purpose of this Document

To identify facilities that reported actual lead emissions of greater than or equal to 0.25 tons of lead (Pb) per year for calendar year 2023. The actual lead emissions estimates, as estimated by DNR, are estimated using the most recent and best available set of facility-specific data that includes, but is not limited to, actual throughput, valid stack test data, dust analyses, engineering estimates, operating schedules, and control efficiencies.

Introduction

The Environmental Protection Agency (EPA) finalized a revised standard for Pb on November 12, 2008. The standard was revised from 1.5 micrograms per cubic meter ($\mu g/m^3$) of air, to 0.15 $\mu g/m^3$. In conjunction with strengthening the lead NAAQS, EPA identified the need for states to improve existing lead monitoring networks by requiring monitors to be placed in areas with sources that have actual Pb emissions of 1.0 ton or more per year (tpy) and in urban areas with more than 500,000 people. States will base their specific siting decisions regarding Pb monitoring on dispersion modeling results and reviews of the existing emission inventories for Pb. On December 14, 2010, EPA signed an amendment to the lead ambient air monitoring requirement to expand the lead monitoring network. This amendment reduces the actual lead emissions threshold for the site specific monitoring requirement to 0.5 tons or more per year.

Table 1: Facilities included in the 2023 NEI submittal with actual emissions estimates of 0.25 tpy or greater.

Facility Name	Facility ID	2023 Actual Emissions (Tons)
No facilities emitted 0.25 tpy or greater		

6200 PARK AVE STE 200, DES MOINES IA 50321
Phone: 515-725-8200 www.IowaDNR.gov Fax: 515-725-8201

Appendix D: National Ambient Air Quality Standards (NAAQS) for Criteria Pollutants

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Section 1: Summary

Changes to federal rules may affect the Iowa air monitoring network in several important ways. They may change the threshold for adverse health effects (NAAQS exceedance levels) used for real-time reporting or the regulatory intervention levels (NAAQS violation levels). They may also affect the minimum number of monitors required in state networks and the location of these monitors. Changes to the ambient air monitoring network should anticipate these regulatory changes.

Section 2 presents the current primary and secondary NAAQS for all criteria pollutants. In the last 5 years, Iowa recorded more exceedances of the 24-hour PM2.5 and ozone standards than for the remaining criteria pollutants. The proposed standards for these two pollutants were still undetermined at the time Iowa's 2020 five-year Network Assessment was written. Sections 3 and 4 show how monitors in the national $PM_{2.5}$ and ozone network compare to the NAAQS, and indicate non-attainment and maintenance areas for the 24-hour PM 2.5 and ozone NAAQS. See Appendix I for a full discussion of NAAQS violations and design values for all criteria pollutants.

Section 2: Current NAAQS

The Clean Air Act requires EPA to set National Ambient Air Quality Standards to protect the public against levels of exposure to air contaminants that are considered harmful to human health or welfare. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings.

Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air (µg/m^3).

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3 month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb (2)	Annual Mean
Ozone (O_3)		primary and secondary	8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	9.0 µg/m^3	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m^3	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	1 year	10 ppb	annual mean, averaged over 3 years

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.

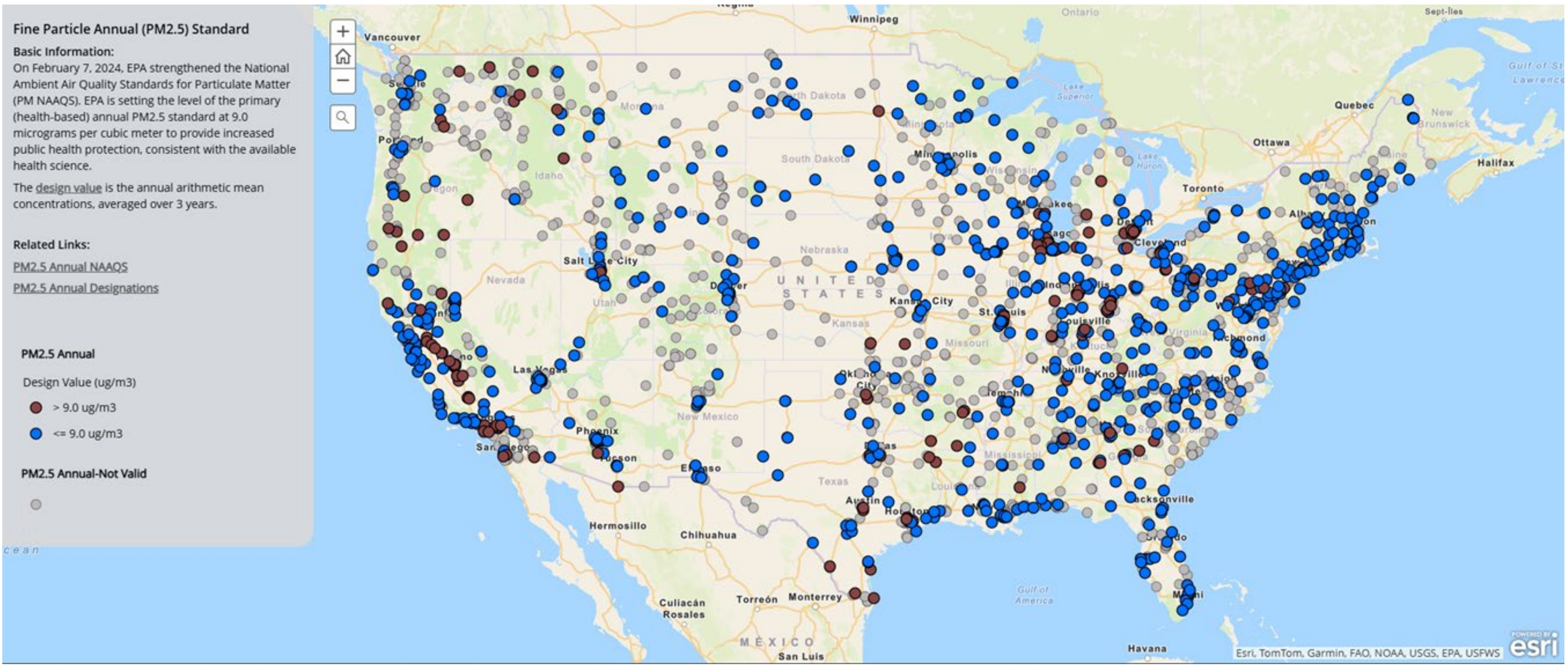
(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked 1-hour (1979) and 8-hour (1997) O_3 standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2)any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

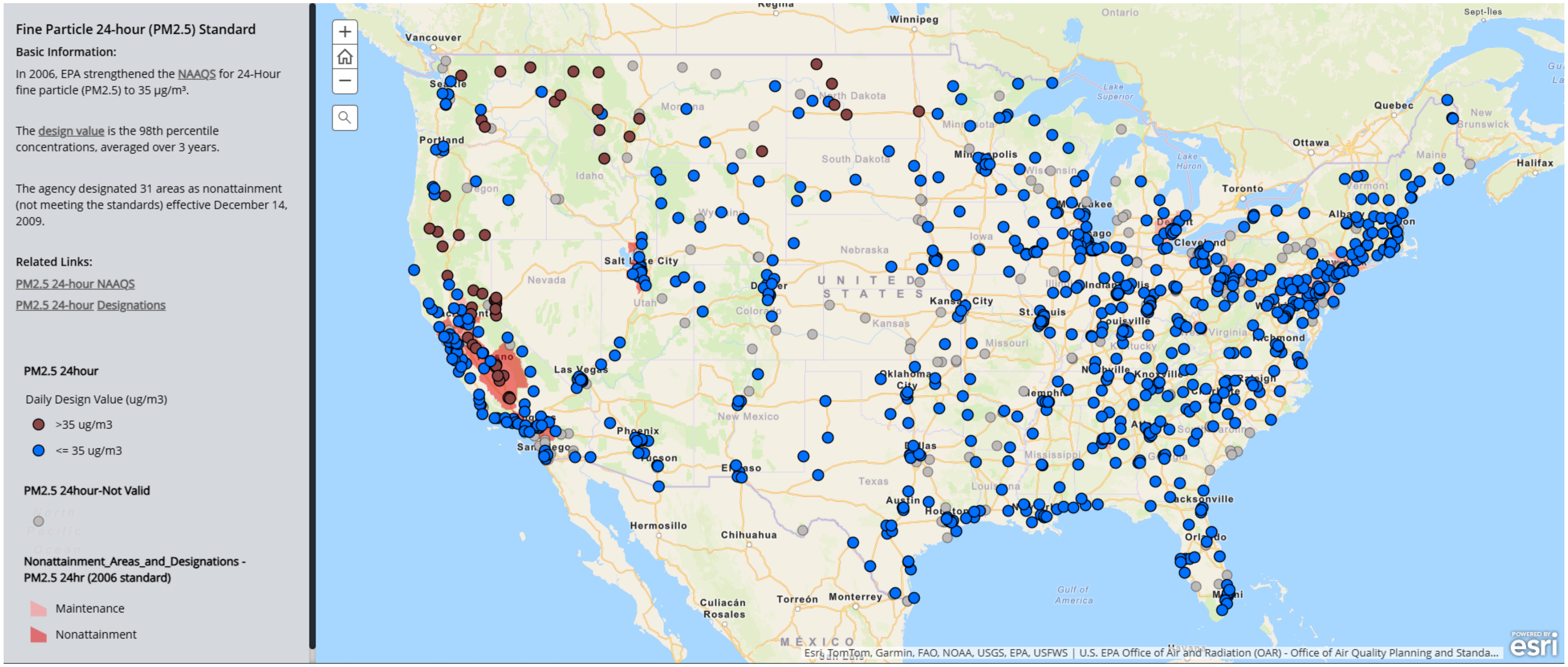
Section 3: Nationwide Comparison to $PM_{2.5}$ NAAQS

National maps of the most recent (2021-2023) annual and 24-hour design values for $PM_{2.5}$ are shown on the following pages.[26] A NAAQS violation occurs when the design value is greater than the level of the standard. The annual standard is defined as the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations. The 24-hour standard is defined as the 3-year average of the 98th percentile of 24-hour concentrations. The most recent five years of both annual and 24-hour $PM_{2.5}$ design values recorded by monitors in Iowa are shown in Appendix I.



2021-2023 $PM_{2.5}$ Annual Design Values for the Contiguous United States ($\mu g/m^3$)

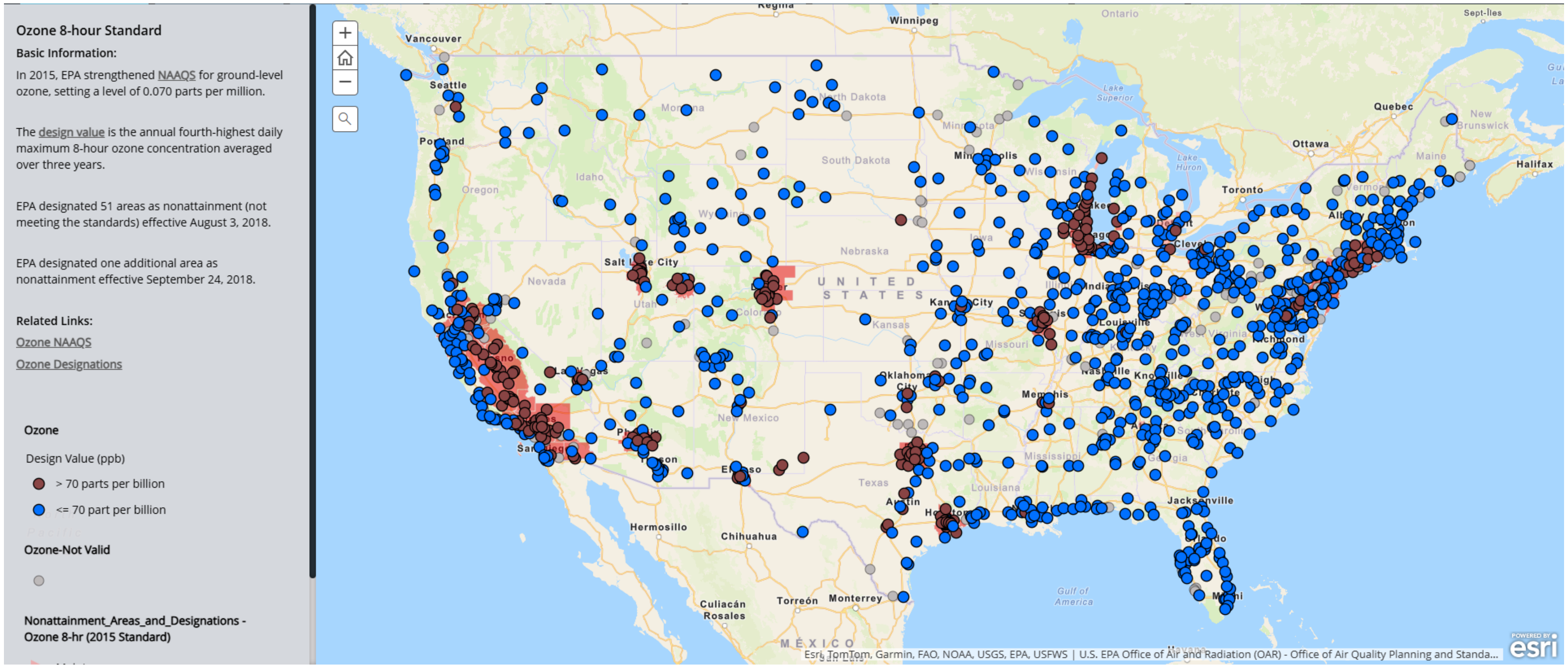
[26] https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=bc6f3a961ea14013afb2e0d0e450b0d1



2021-2023 $PM_{2.5}$ 24-hour Design Values for the Continuous United States ($\mu g/m^3$)

Section 4: Nationwide Comparison to the Ozone NAAQS

A national map of the most recent ozone design values (2021-2023) is shown on the following page. A NAAQS violation occurs when the design value is greater than the level of the 70 ppb standard. The standard is defined as the three-year average of the annual fourth highest daily maximum 8-hour ozone values. In Iowa, the highest design value is 68 ppb. The most recent five years of ozone design values recorded by monitors in Iowa are shown in Appendix I.



2021-2023 Ozone Design Values for the Contiguous United States (ppb) [27]

**Red areas represent non-attainment areas*

**Pink areas represent maintenance areas*

[27] https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=bc6f3a961ea14013afb2e0d0e450b0d1

Appendix E: Potential Changes to the Iowa Monitoring Network over the Next Five Years

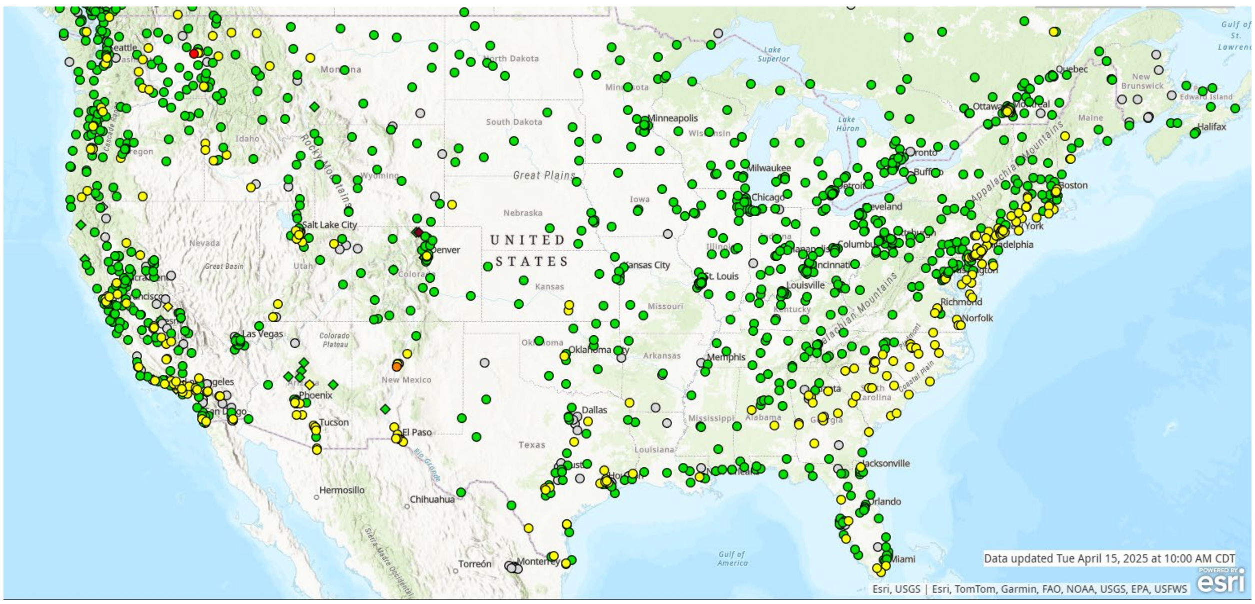
Over the next 5 years, Iowa intends to maintain and adjust the ambient monitoring network as funding allows to meet the objectives in 40 CFR Part 58, Appendix D and included as Appendix B:

1. Providing air pollution data to the general public in a timely manner.
2. Supporting compliance with ambient air quality standards (NAAQS) and emissions strategy development.

More specifically, Iowa intends to:

- **As resources allow, provide real time data to the public by maintaining our network of regulatory monitors and low cost sensors.**

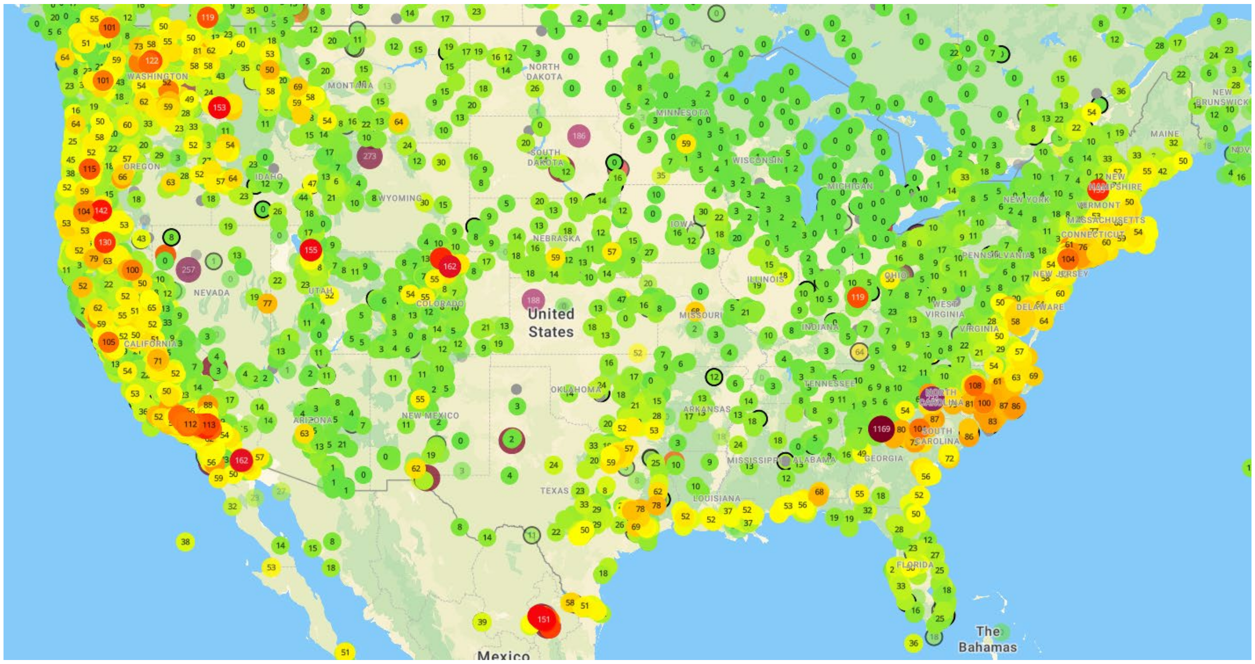
EPA uses its AirNow program to disseminate real-time data gathered by States and Local Programs.



EPA's AirNow $PM_{2.5}$ Network for the Contiguous United States (4/15/25)[28]

Over the past several years vendors have developed new low cost air quality sensors to provide opportunities for low cost air monitoring by citizen scientists. This data is provided to the public in real-time maps. Some of these designs have become so popular that the resulting network rivals the AirNow network in the number of monitors deployed.

[28]https://gispub.epa.gov/airnow/



Purple Air Network for the Contiguous United States (4/15/25)[29]

To the extent that there is no national program for citizen science monitors analogous to EPA's reference and equivalent method testing and certification program for NAAQS monitoring30,31, States have a role to play in establishing the comparability of Citizen Science and regulatory monitoring data, and in helping to develop consistency in the public health messaging from the two networks.32 The State currently operates the "Purple Air" brand low cost PM2.5 sensors at 14 different locations. If resources allow and low cost citizen science monitoring can be shown to be reliable and of sufficient quality to perform certain tasks such as air quality index reporting, then the State will continue to operate its existing network of Purple Air monitors.

- **Modifications to the State's toxics network:**

The scope of EPA's NAAQS program is limited to the seven criteria pollutants. There are many other air contaminants in addition to these seven. The state currently operates five toxic monitoring sites to determine the concentration of formaldehyde and other carbonyl compounds, including aldehydes and ketones, in ambient air. These sites utilize EPA's TO-11A for the lab analysis of compounds collected on DNPH-coated sorbent cartridges. The sites currently operated are located at Des Moines, Cedar Rapids, Davenport, Muscatine, and Clinton, with the first two locations being operated by the Polk and Linn County local programs respectively. Based on a seven year average (i.e. 2018-2024) Clinton has shown higher formaldehyde levels than either Davenport or Muscatine. Due to budget constraints and the cost of lab analysis, the State plans to discontinue toxic monitoring at Davenport and Muscatine on July 1, 2025. The remaining three sites will shift from a 1 in 6 day accelerated sampling schedule during ozone

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[29] https://map.purpleair.com/air-quality-standards-us-epa-aqi?opt=%2F1%2Flp%2Fa10%2Fp604800%2FcC0#3.99/37.32/-102.63

[30] https://www.ecfr.gov/cgi-bin/text-idx?SID=2cdc61535568c329b2a95aeee97c8f6b&mc=true&node=pt40.6.53&rgn=div5

[31] https://www.sciencedirect.com/science/article/pii/S2590162119300346?via%3Dihub

[32] https://cleanairact.org/wp-content/uploads/2019/09/New-Tools-For-Air-Quality-Evaluation-Air-Quality-Sensors-Andrea-Clements.pdf

season, and a 1 in 12 day sampling schedule outside of ozone season; to a year round 1 in 12 day schedule. These reductions will be offset at least in part by additional toxics sites as discussed in the next paragraph.

- **Establishment of three new sites, utilizing "Inflation Reduction Act (IRA)" funding:**

The State received an approximately 1.6 million dollar IRA grant to be used in part to establish three new monitoring sites. These sites and the pollutants that will be monitored are listed below:

- Fort Dodge – PM2.5 and PM10, operated by the Iowa DNR
- Des Moines East High School – PM2.5 and aldehyde toxics and analyzed using EPA method TO-11A, operated by Polk County Public Works Dept.
- Cedar Rapids – PM2.5 and toxics (volatile organic compounds) collected in cannisters and analyzed using EPA method TO-15A, operated by Linn County Health Dept.

At this point in time a site license agreement has only been obtained for the Fort Dodge and Des Moines sites, and location of the Cedar Rapids site is yet to be determined. These sites will be operated until the allotted IRA funds are exhausted. At that point the State and Local Programs may look to alternative funding sources to ensure their ongoing operation.

Monitor Type changes within the PM2.5 network:

Due to the lowering of the annual PM2.5 NAAQS, the DNR intends to change the existing PM2.5 site at Public Works from SPM to SLAMs, in the Des Moines MSA, change the Iowa City site from SPM to SLAMS, and change the Sioux City MSA site from SPM to SLAMS. These actions will meet network design criteria in consideration of the minimum monitoring requirements. The changes in monitor type (from SPM to SLAMS) for these three monitors are expected to be made on January 1, 2027.

New requirements as Omaha MSA population tops the one million mark:

According to the 2024 Census Bureau estimates the population of the Omaha MSA (1,001,010) has exceeded the 1 million mark. Exceeding the 1 million population threshold will trigger additional federal monitoring requirements for the Omaha MSA, specifically:

- The establishment of a Photochemical Assessment Monitoring Station (PAMS), with a suite of measurements intended to assess ozone precursor concentrations.
- Operating an NO_2 monitor year-round that represents a neighborhood or larger spatial scale.
- Establishing one microscale near-road NO2 site to monitor a location of expected maximum hourly concentrations sited near a major road with high annual average daily traffic counts. A CO monitor and a PM2.5 monitor are also required to be collocated with the required near road NO_2 monitor.

Based on 2023 census figures, the Iowa portion of the total MSA population is only 12%.[33,34] Also, in 2022 all interchanges on the Iowa side of the Omaha MSA were not listed in the top 10, in terms of Average Annual Daily Traffic (AADT) counts. (See https://mapacog.org/data-maps/2022-top-traffic-interchanges/) The annual Nebraska network plan covering the period of 1 July 2024 through 30 June 2025 indicates that the state of Nebraska plans to fulfill all these requirements.

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[33] *Source for Counties: US Census MSA Delineation*

[34] *Source for July 1, 2023 Population Estimates: US Census Population Estimates*

Trees and Siting Criteria - Request for Interpretation:

According to Appendix E to Part 58 of 40CFR, Section 2.3 (a): “The EPA does not generally consider objects or obstacles such as flag poles or site towers used for NOy convertors and meteorological sensors, etc. to be deemed obstructions.” Based on the preceding, is a dead tree without any foliage an obstruction? This question arose in relation to our Davenport Hayes site (622 South Concord St with AQS site ID 191630020). There is only one monitor located at this site, which is a SLAMS PM2.5 FRM sampler. The tree is located on private property, and is located to the immediate left of the garage in the image on the next page.

A recent EPA rule change that made the requirements for trees that could be considered obstructions when siting monitors substantially more rigorous. Appendix E to Part 58, of 40 CFR, section 2.3.(b) requires a 270 arc of unrestricted airflow around a monitor. Earlier versions of the CFR did not require this arc to be continuous, but the March 2024 revisions added the requirement that it be a continuous arc. Section 2.3.(b) states that “This arc must include the predominant wind direction for the season of greatest pollutant concentration potential.” Is the requirement regarding “the predominant wind direction for the season of greatest pollutant concentration potential” applicable for sites that are neither source orientated, nor intended to measure the maximum ozone concentration downwind of an urban area?

Appendix F: Results from Network Assessment Tools

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Section 1: Summary

The Data Analysis and Assessment group at EPA's Office of Air Quality Planning and Standards (OAQPS) developed a set of analytical tools "NetAssess2025" to assist states in performing their 5-year network assessments.[35]

NetAssess2025 has an "area served tool" that allows one to calculate the area and population served associated with each monitor in the seven criteria pollutant networks. To obtain these values, Net Assess creates a polygon, known as a Voronoi polygon[36], for each monitor in the network. The interior of each polygon consists of points that are closer to the associated monitor than any other monitor in the network.[37] The area of each polygon is known as the "area-served" by the monitor, and the population inside each polygon is known as the "population served" by the monitor. NetAssess2025 uses census data for its population served computations. The software allows for the removal and addition of monitors and the results presented in this document reflect the current Iowa network.

It should be noted that a Voronoi polygon is a purely mathematical construct, and the scale of an air pollution monitor (i.e. the area over which the monitor readings are representative) is not related to the area of the Voronoi polygon associated with the monitor.

NetAssess2025 also has a "correlation tool" that is used to compute the correlation (R) and mean absolute difference ($|d|$) for all monitor pairs x, y in a specified region. NetAssess2025 utilizes daily air quality data gathered from each monitor over the period 2021-2023 for these computations.

If n represents the number of days when both monitor x and monitor y have valid data, the correlation coefficient between the two data sets is given by: [38,39]

$$R_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

and the mean absolute difference between the two data sets by:

$$|d|_{xy} = \frac{\sum_{i=1}^{n}|x_i - y_i|}{n}$$

The software also provides the distance between each pair of monitors.

In this document we have utilized the correlation tool to examine two pollutants, ozone and $PM_{2.5}$, that are known to have a regional character.

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[35] https://sti-r-shiny.shinyapps.io/EPA_Network_Assessment/

[36] http://mathworld.wolfram.com/VoronoiDiagram.html

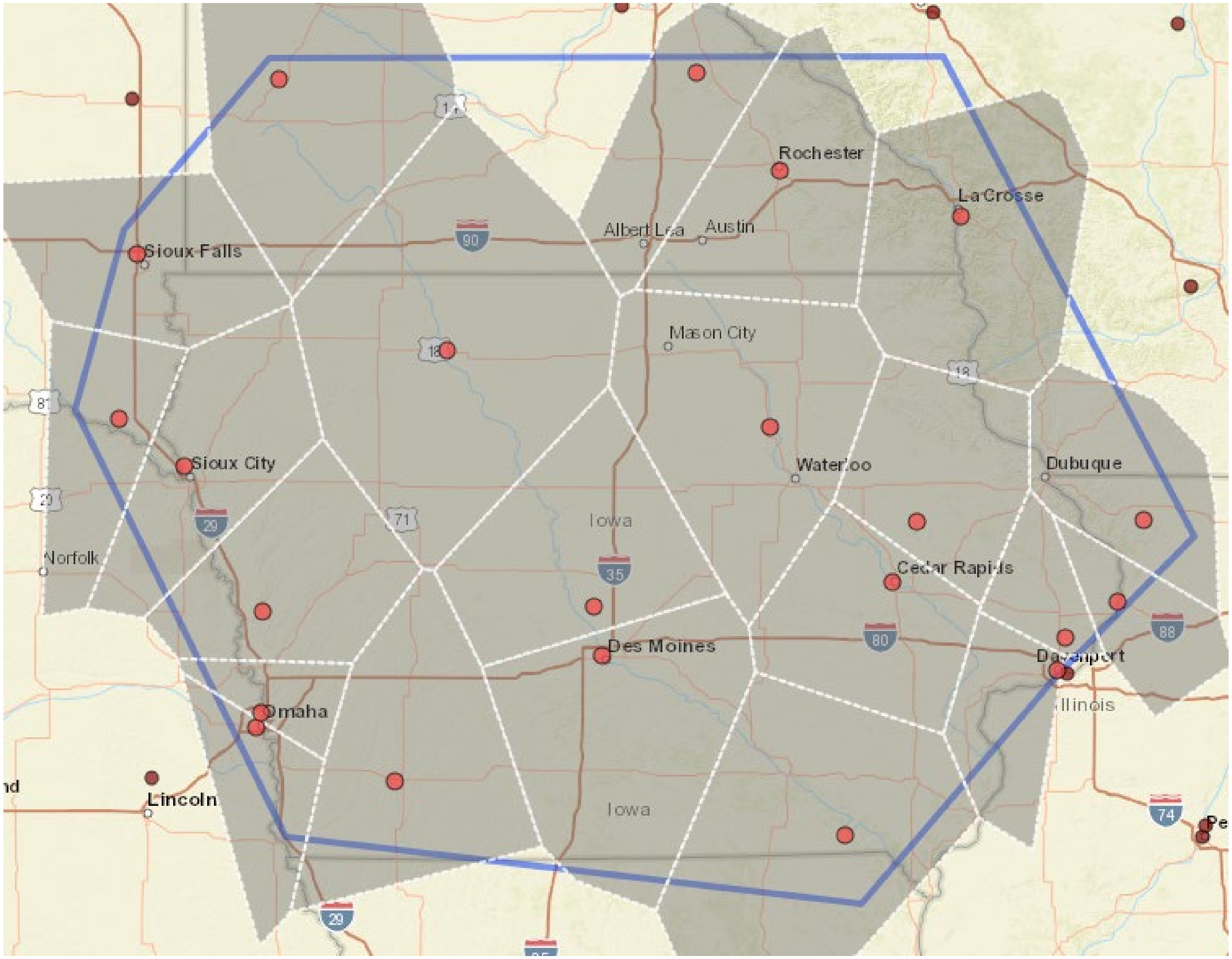
[37] http://ima.udg.edu/~sellares/ComGeo/Vor2D_1.ppt

[38] https://mathworld.wolfram.com/CorrelationCoefficient.html

[39] https://medium.com/@ns2586/geometric-interpretation-of-the-correlation-between-two-variables-4011fb3ea18e

Section 2: Results from the NetAssess2025 Area Served Tool

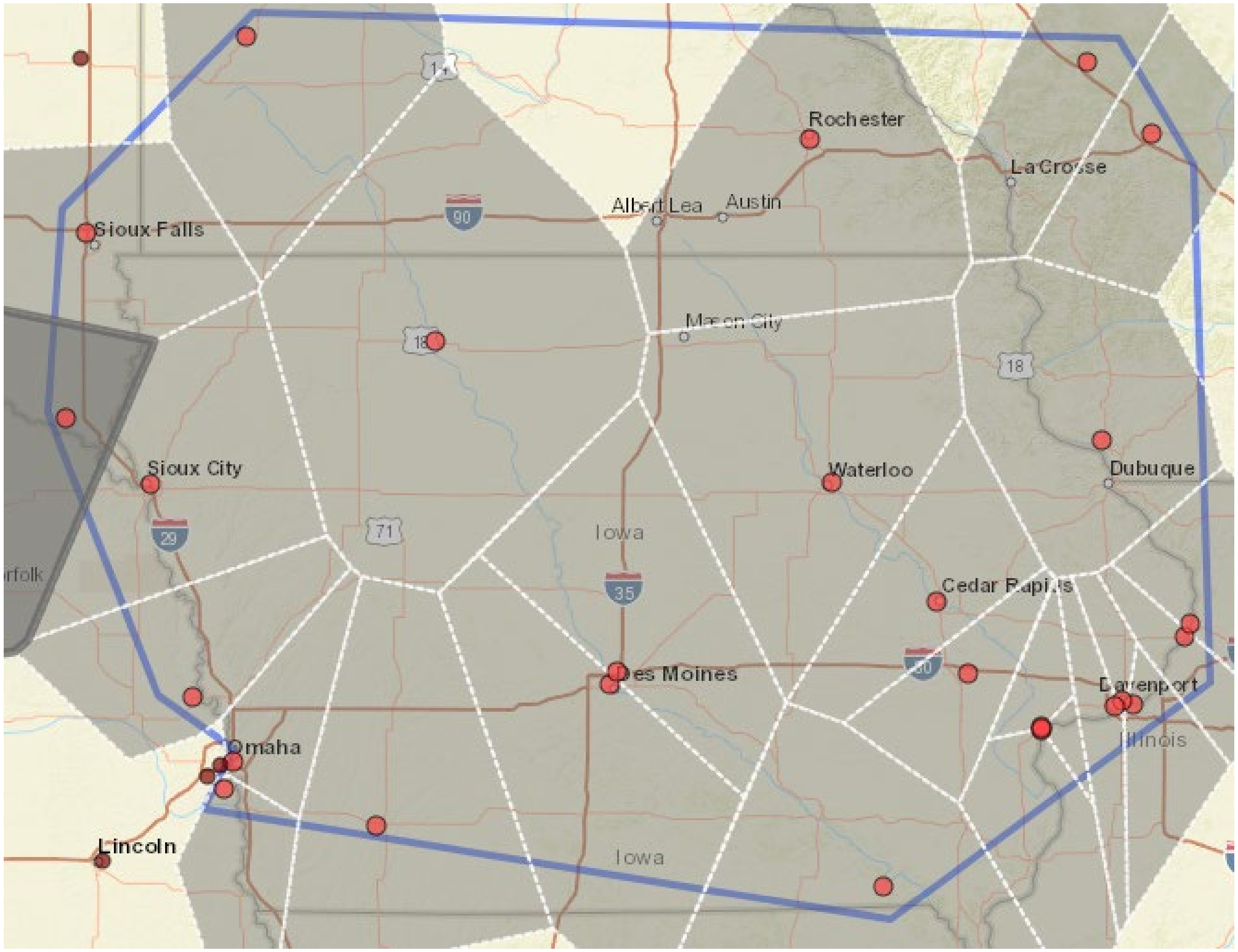
This section contains the population served and area served for each monitor in the seven criteria pollutant networks in and around Iowa. Monitors located in Iowa are always included in the analysis. Monitors located in surrounding states are included if they generate Voronoi polygons that lie partially in Iowa.



Ozone: Site Map

AQS Site ID	Local Site Name	State	City	Address	Area (Km^2)	Population Served
170010007	John Wood Community College	IL	Quincy	1301 S. 48th St.	12,296	187,309
170859991	Stockton	IL	Stockton	10952 E. Parker Rd	8,592	234,828
171613002	Rock Island Arsenal	IL	Moline-Rock Island	32 Rodman Ave.	4,689	269,676
190170011	Waverly Airport	IA	Waterloo-Cedar Falls	Waverly Airport	18,082	336,250
190450021	Rainbow Park	IA	Clinton	Roosevelt St.	5,063	111,019
190850007	Pisgah Forestry Office	IA	Pisgah	206 Polk St	10,353	71,730
191130033	Coggon Elementary School	IA	Cedar Rapids	408 E. Linn St	10,211	134,367
191130040	Public Health	IA	Cedar Rapids	500 11th St. NW	9,116	449,710
191370002	Viking Lake State Park	IA	Viking Lake State Park	2780 Viking Lake Rd	17,234	104,720
191471002	Iowa Lakes College	IA	Emmetsburg	Iowa Lakes College	27,636	244,755
191530030	Health Dept.	IA	Des Moines	1907 Carpenter	15,420	712,850
191531579	Sheldahl	IA	Des Moines	15795 NW 58th St.	12,718	294,343
191630014	Scott County Park	IA	Davenport	Scott County Park	2,807	44,507
191630015	Jefferson School	IA	Davenport	10th St. & Vine	5,082	209,224
191770006	Lake Sugema State Park	IA	Lake Sugema State Park	24430 Lacey Trail	20,831	239,533
191930022	Stone State Park	IA	Sioux City	5001 Talbot Rd	10,828	224,587
270495302	Stanton Air Field	MN	Red Wing	1235 Highway 19	7,848	287,372
270834210	SW Minnesota Regional Airport	MN	Marshall	W Highway 19	24,811	179,666
271095008	Ben Franklin School	MN	Rochester	1801 9th Ave. SE	10,896	300,052
290030001	Savannah	MO	Savanah	11796 Highway 71	10,947	152,808
310550019	Healthcenter Warehouse	NE	Omaha	42nd & Woolworth	5,125	773,127
310550053	Whitmore	NE	Omaha	1616 Whitmore	3,008	166,410
460270001	Vermillion DOT	SD	Vermillion	1005 N Crawford Rd	9,103	73,442
460990009	SF-USD	SD	Sioux Falls	4801 N Career Ave	8,251	293,232
550630012	DOT Building	WI	La Crosse	3550 Mormon Coulee Rd	15,884	341,854

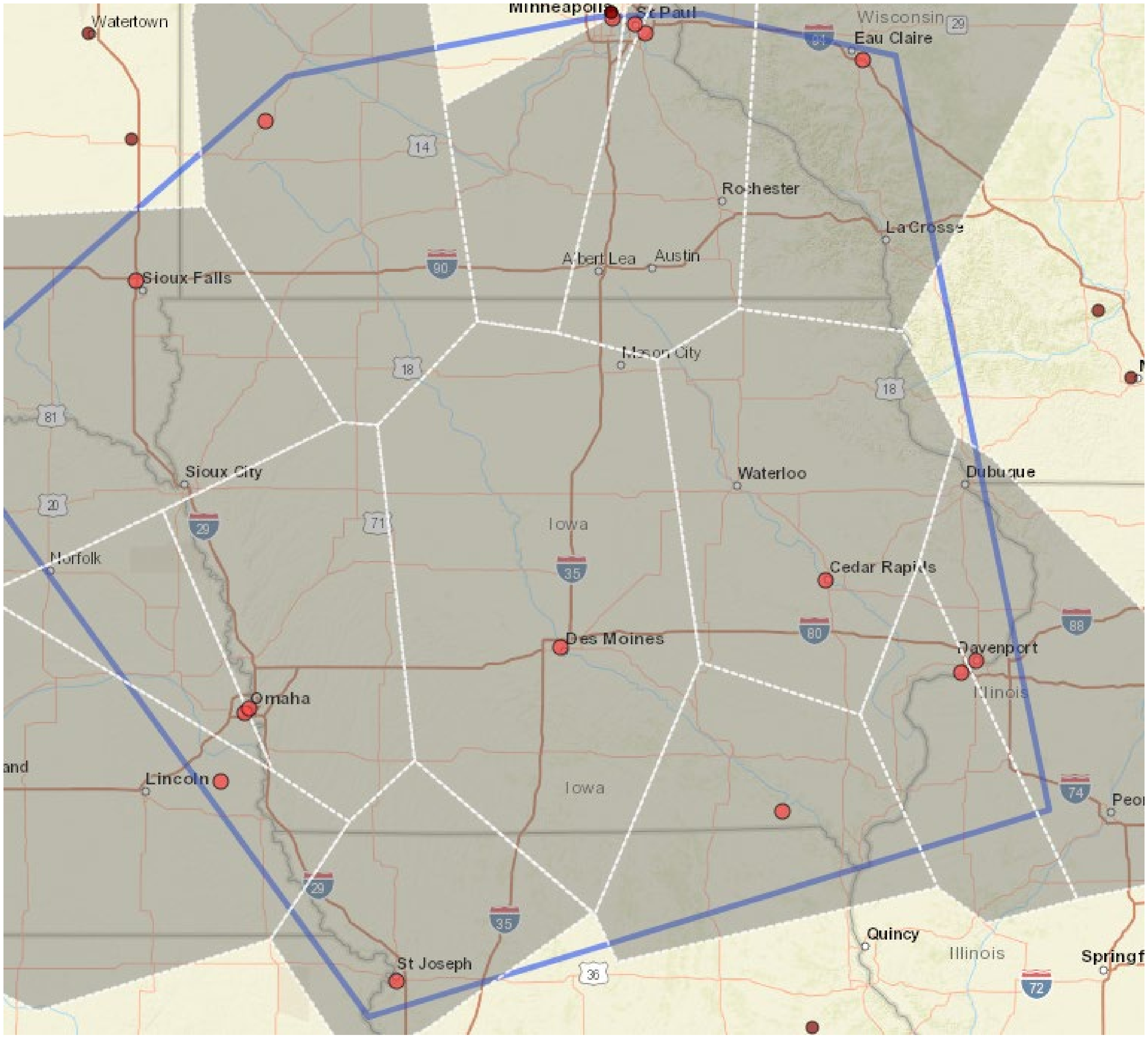
Ozone: Area and Population Served



$PM_{2.5}$: Site Map

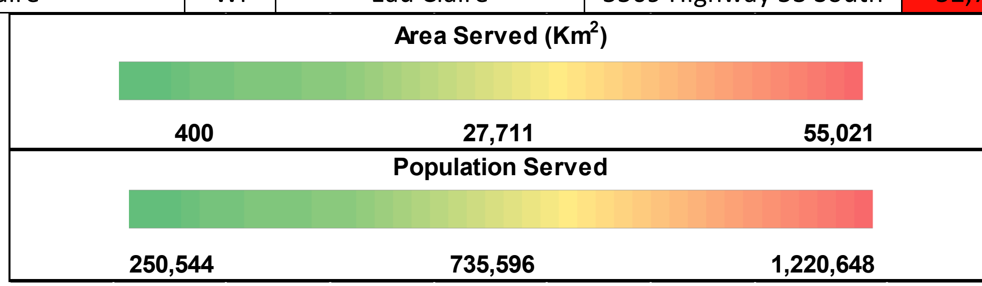
AQS Site ID	Local Site Name	State	City	Address	Area (Km^2)	Population Served
171613002	Rock Island Arsenal	IL	Moline-Rock Island	32 Rodman Ave.	4,101	255,557
190130009	Water Tower	IA	Waterloo-Cedar Falls	Vine St. & Steely	17,899	358,839
190450019	Chancy Park	IA	Clinton	23rd & Camanche	2,722	62,707
190450021	Rainbow Park	IA	Clinton	Roosevelt St.	5,195	102,547
191032001	Hoover School	IA	Iowa City	2200 East Court	4,282	178,618
191130040	Public Health	IA	Cedar Rapids	500 11th St. NW	8,440	317,303
191370002	Viking Lake State Park	IA	Viking Lake State Park	2780 Viking Lake Rd.	18,418	113,366
191390015	Muscatine H.S. East Campus Roof	IA	Muscatine	1409 Wisconsin	5,650	90,766
191390016	Greenwood Cemetary	IA	Muscatine	Fletcher St. and Kimble St.	2,292	50,665
191390020	Musser Park	IA	Muscatine	Oregon St. & Earl Ave.	694	13,558
191471002	Iowa Lakes College	IA	Emmetsburg	Iowa Lakes Comm. College	30,117	280,933
191530030	Health Dept.	IA	Des Moines	1907 Carpenter	14,528	536,868
191535885	Public Works	IA	Des Moines	5885 NE 14th St.	12,462	434,157
191550009	Frainklin School	IA	Council Bluffs	3130 C Ave.	3,721	118,833
191630015	Jefferson School	IA	Davenport	10th St. & Vine St.	1,179	97,448
191630020	Hayes School	IA	Davenport	622 South Concord Street	2,396	70,066
191770006	Lake Sugema	IA	Lake Sugema State Park	24430 Lacey Trail	35,884	578,946
191930021	Irving Elementry School	IA	Sioux City	901 Floyd Blvd	13,715	240,323
270834210	SW Minnesota Regional Airport	MN	Marshall	West Highway 19	24,811	179,666
271095008	Ben Franklin School	MN	Rochester	1801 9th Ave. SE	17,522	402,758
311530007	Golden Hills Elementary	NE	Omaha	2912 Coffey Ave.	3,985	137,820
311770002	Good Shepard Lutheran Home	NE	Omaha	2242 Wright St.	7,814	112,681
460270001	Vermillion DOT	SD	Vermillion	1005 N Crawford Rd	24,551	159,343
460990009	SF-USD	SD	Sioux Falls	4801 N Career Ave	11,723	322,156
550430009	Potosi	WI	Platteville	128 HWY 61 N	13,849	249,269
550532002	Five Horned Ave.	WI	Brockway	N 7289 Five Horned Ave	10,413	219,649
550812001	Monroe	WI	Wyeville	10750 Wyeville	6,887	97,675

$PM_{2.5}$: Area and Population Served

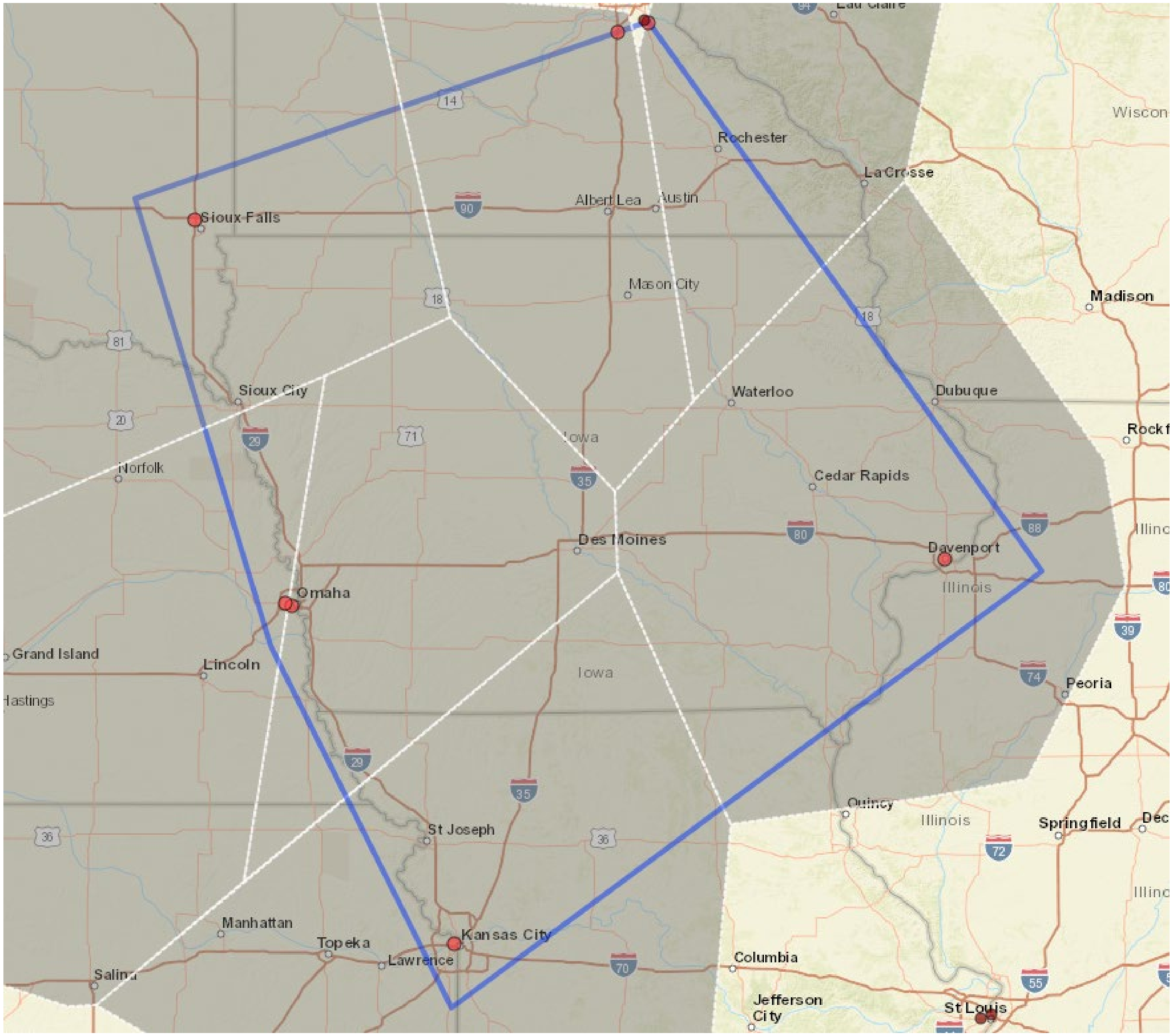


PM$_{10}$: Site Map

AQS Site ID	Local Site Name	State	City	Address	Area (Km^2)	Population Served
191130040	Public Health	IA	Cedar Rapids	500 11th St. NW	31,613	842,600
191530030	Health Dept.	IA	Des Moines	1907 Carpenter	48,882	1,213,452
191630015	Jefferson School	IA	Davenport	10th St. & Vine St.	24,975	1,053,676
191630017	Linnwood Mining	IA	Davenport	11100 110th Ave.	15,195	263,076
191770006	Lake Sugema	IA	Lake Sugema State Park	24430 Lacey Trail	24,476	258,059
270530966	City of Lakes Building	MN	Minneapolis-St. Paul	309 2nd Ave. S.	12,014	1,220,648
270834210	SW Minnesota Regional Airport	MN	Marshall	W Highway 19	49,646	453,397
271230866	Red Rock Road	MN	Minneapolis-St. Paul	1450 Red Rock Rd.	20,238	1,067,743
271230868	Ramsey Health Center	MN	Minneapolis-St. Paul	555 Cedar St.	400	509,886
290210005	St. Joseph Pump Station	MO	St. Joseph	St. Joseph Pump Station	21,660	250,544
310250002	Weeping Water	NE	Omaha	City sanitation Bldg.	46,000	685,834
310550019	4102 Woolworth Ave.	NE	Omaha	42nd & Woolworth	10,067	792,792
310550054	19th & Burt	NE	Omaha	723 N 18 Street	22,395	362,467
460990009	SF-USD	SD	Sioux Falls	4801 N Career Ave	55,021	671,816
550350014	Eau Claire	WI	Eau Claire	5509 Highway 53 South	52,777	818,998



PM_{10} : Area and Population Served



Carbon Monoxide (CO): Area Served Map

AQS Site ID	Local Site Name	State	City	Address	Area (Km^2)	Population Served
191630015	Jefferson School	IA	Davenport	10th St. & Vine St.	99,125	2,483,021
202090021	JFK	KS	Kansas City	1210 N. 10Th St. JFK Recreation Center	119,725	3,626,618
270370020	Flint Hills Refinery 420	MN	Minneapolis-St. Paul	12821 Pine Bend Trail	48,842	1,295,560
270370480	Near Road I-35	MN	Minneapolis-St. Paul	16750 Kenyon Ave	43,074	1,172,246
310550019	Healthcenter Warehouse	NE	Omaha	Douglas County HOSP 42nd & Woolworth	49,893	1,476,402
310550056	Dodge Street	NE	Omaha	7747 Dodge Street	105,264	1,563,599
460990009	SF-USD	SD	Sioux Falls	4801 N Career Ave	178,784	1,416,781

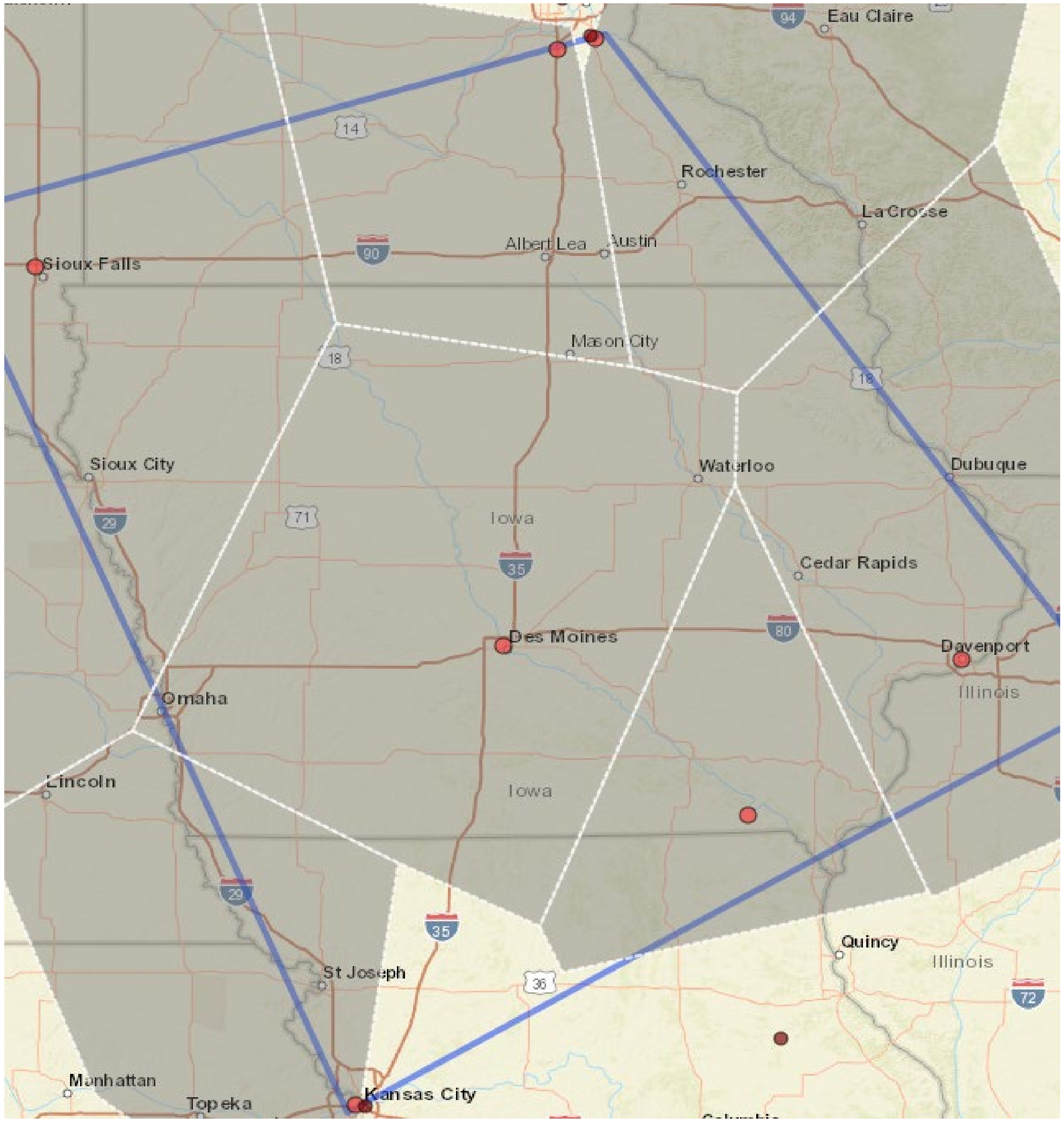
Area Served (km^2)

43,074 **110,929** **178,784**

Population Served

1,172,246 **2,399,432** **3,626,618**

CO: Area and Population Served



NO_2 : Site Map [Note that while the Des Moines monitor (AQS ID 19-153-0030) appears in the map above that was generated by EPA's NetAssess2025 tool, it was discontinued on July 1, 2024.]

AQS Site ID	Local Site Name	State	City	Address	Area (km^2)	Population Served
191530030	Health Dept.	IA	Des Moines	1907 Carpenter	74,663	2,019,532
191630015	Jefferson School	IA	Davenport	10th St. & Vine St.	67,212	1,962,941
191770006	Lake Sugema	IA	Lake Sugema State Park	24430 Lacey Trail	31,666	354,099
202090021	JFK	KS	Kansas City	1210 N. 10Th St.	44,072	1,969,871
270370020	Flint Hills Refinery 420	MN	Flint Hills Refinery 420	12821 Pine Bend Trail	51,606	1,330,148
270370480	Near Road I-35	MN	Near Road I-35	16750 Kenyon Ave	30,061	1,083,117
460990009	SF-USD	SD	SF-USD	4801 N Career Ave	159,304	1,664,684

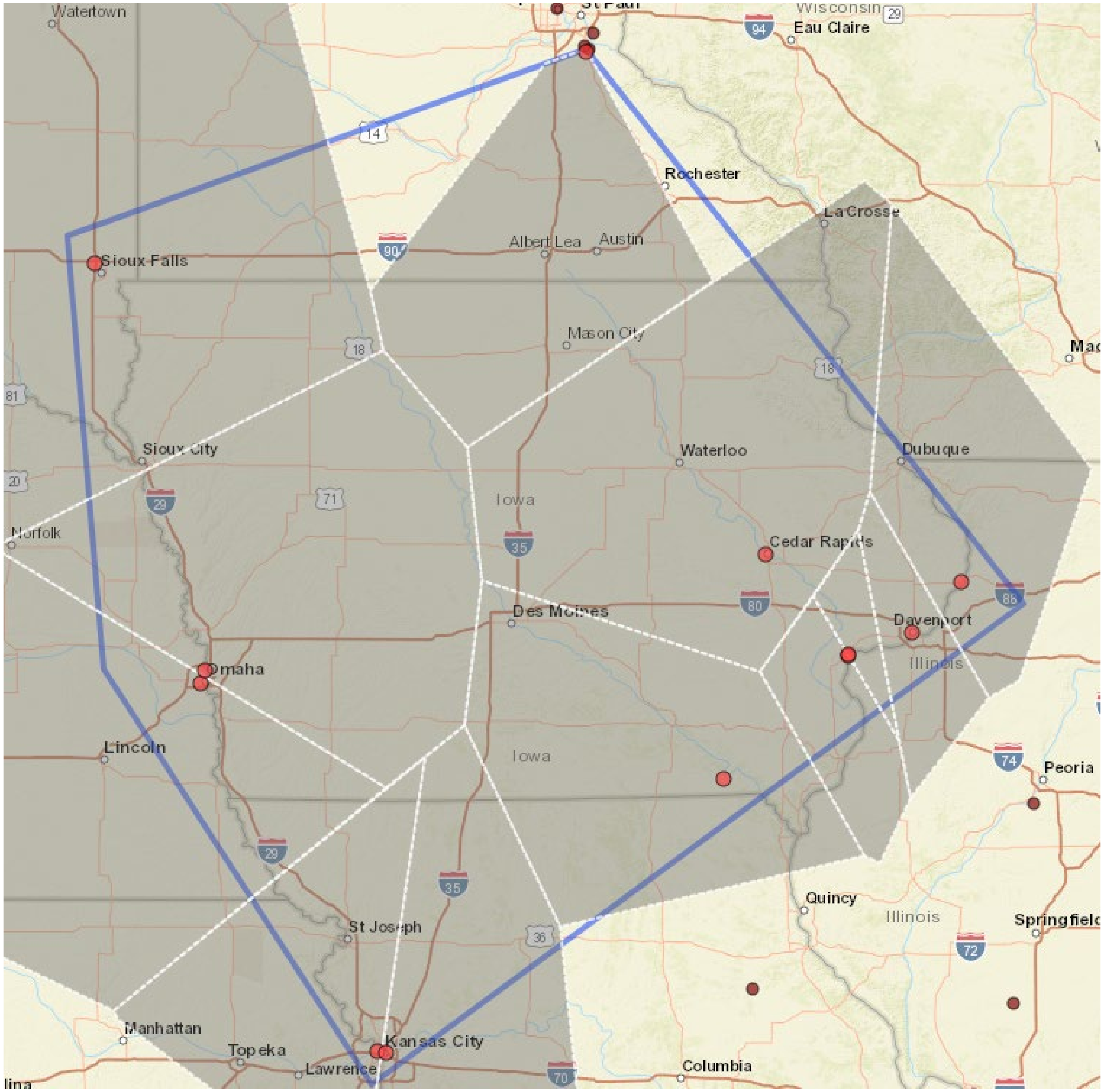
Area Served (km^2)

31,666 95,485 159,304

Population Served

354,099 1,186,816 2,019,532

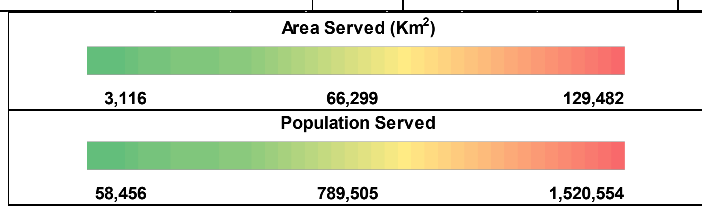
NO_2 : Area and Population Served



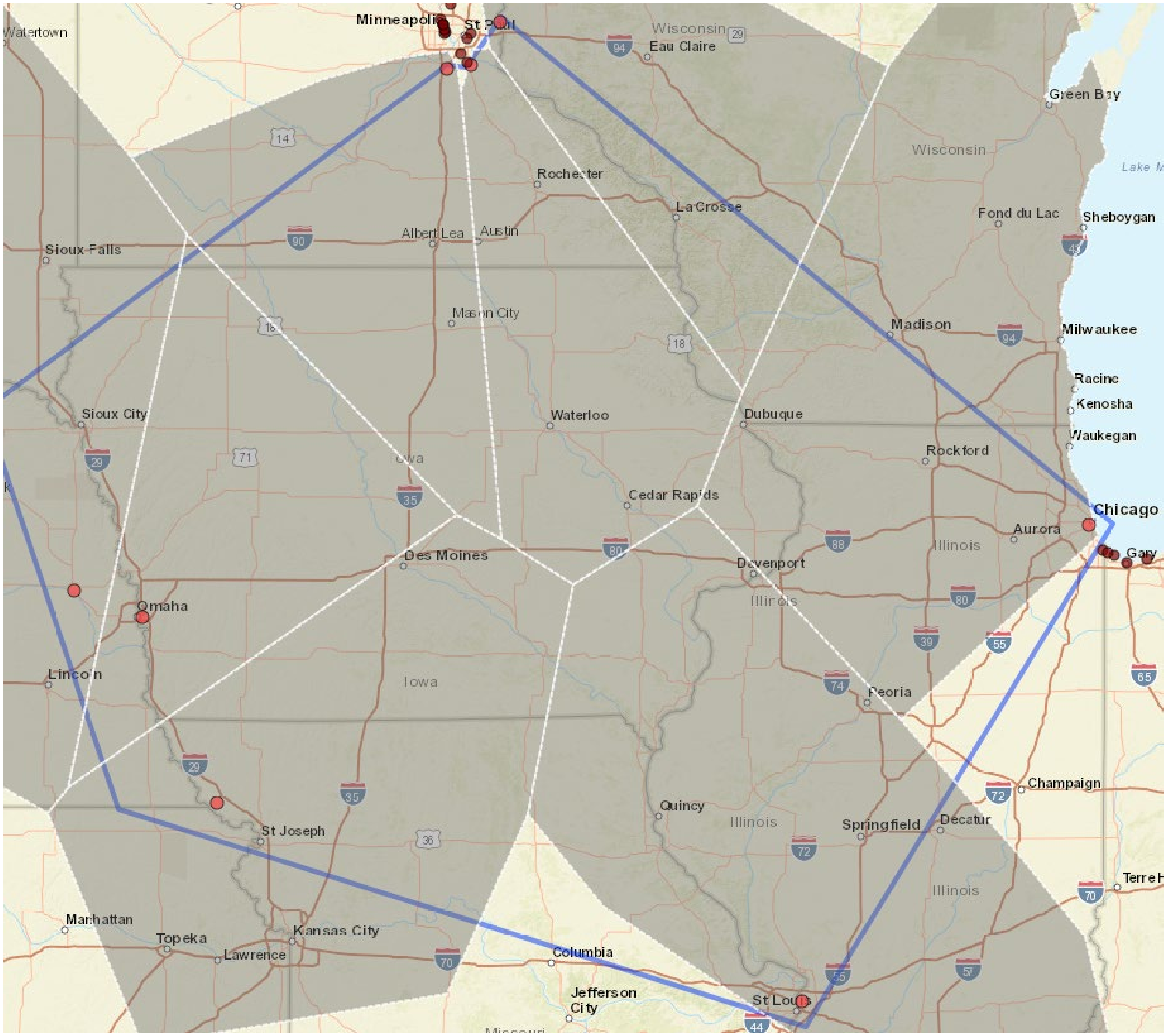
Watertown
Wisconsin
Eau Claire
Rochester
La Crosse
Sioux Falls
Albert Lea
Austin
Mason City
Sioux City
Waterloo
Dubuque
Iowa
Norfolk
Cedar Rapids
Des Moines
Davenport
Illinois
Omaha
Lincoln
Peoria
Quincy
Springfield
St Joseph
Manhattan
Topeka
Kansas City
Lawrence
Columbia

SO_2 : Site Map

AQS Site ID	Local Site Name	State	City	Address	Area (Km^2)	Population Served
190450019	Chancy Park	IA	Clinton	23rd & Camanche	21,356	492,819
191130040	Public Health	IA	Cedar Rapids	500 11th St. NW	47,326	1,234,766
191390019	Muscatine H.S. East Campus Roof	IA	Muscatine	1409 Wisconsin St.	6,689	106,165
191390020	Musser Park	IA	Muscatine	Oregon St. & Earl Ave.	3,116	58,456
191630015	Jefferson School	IA	Davenport	10th St. & Vine St.	6,727	405,121
191770006	Lake Sugema	IA	Lake Sugema	24430 Lacey Trail	35,402	928,631
202090021	JFK	KS	Kansas City	1210 N. 10th St.	25,528	1,520,554
270370443	Flint Hills Refinery 443	MN	Minneapolis-St. Paul	14035 Blaine Ave. E	27,106	612,468
290950034	Troost	MO	Kansas City	724 Troost	38,085	1,497,622
310550019	Health center Warehouse	NE	Omaha	42nd & Woolworth	55,684	1,488,383
310550053	Whitmore	NE	Omaha	1616 Whitmore	44,417	575,011
460990009	SF-USD	SD	Sioux Falls	4801 N Career Ave	129,482	1,000,968

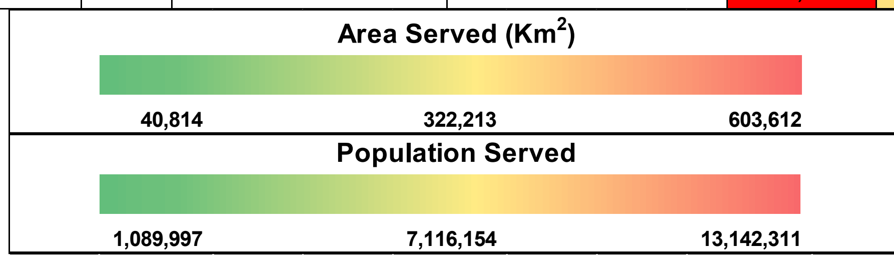


SO_2 : Area and Population Served



Lead (Pb): Site Map

AQS Site ID	Local Site Name	State	City	Address	Area (Km^2)	Population Served
170310110	Perez Elementary School	IL	Chicago	1241 19th St.	93,466	13,142,311
171190010	Air Products	IL	St. Louis	15th & Madison	116,664	4,708,502
191550011	Griffin Pipe	IA	Council Bluffs	8th Ave. and 27th St.	47,635	1,577,317
270370020	Flint Hills Refinery 420	MN	Minneapolis-St. Paul	12821 Pine Bend Trail	40,814	1,089,997
270370470	Apple Valley	MN	Minneapolis-St. Paul	225 Garden View Dr.	43,428	1,098,114
271630446	Point Road	MN	Minneapolis-St. Paul	22 Point Rd.	48,439	1,175,179
290870008	Forest City, Exide Levee	MO	Oregon	300 S. Washington St	92,449	3,571,848
310530005	Fremont	NE	Fremont	1255 Front St.	603,612	2,544,997



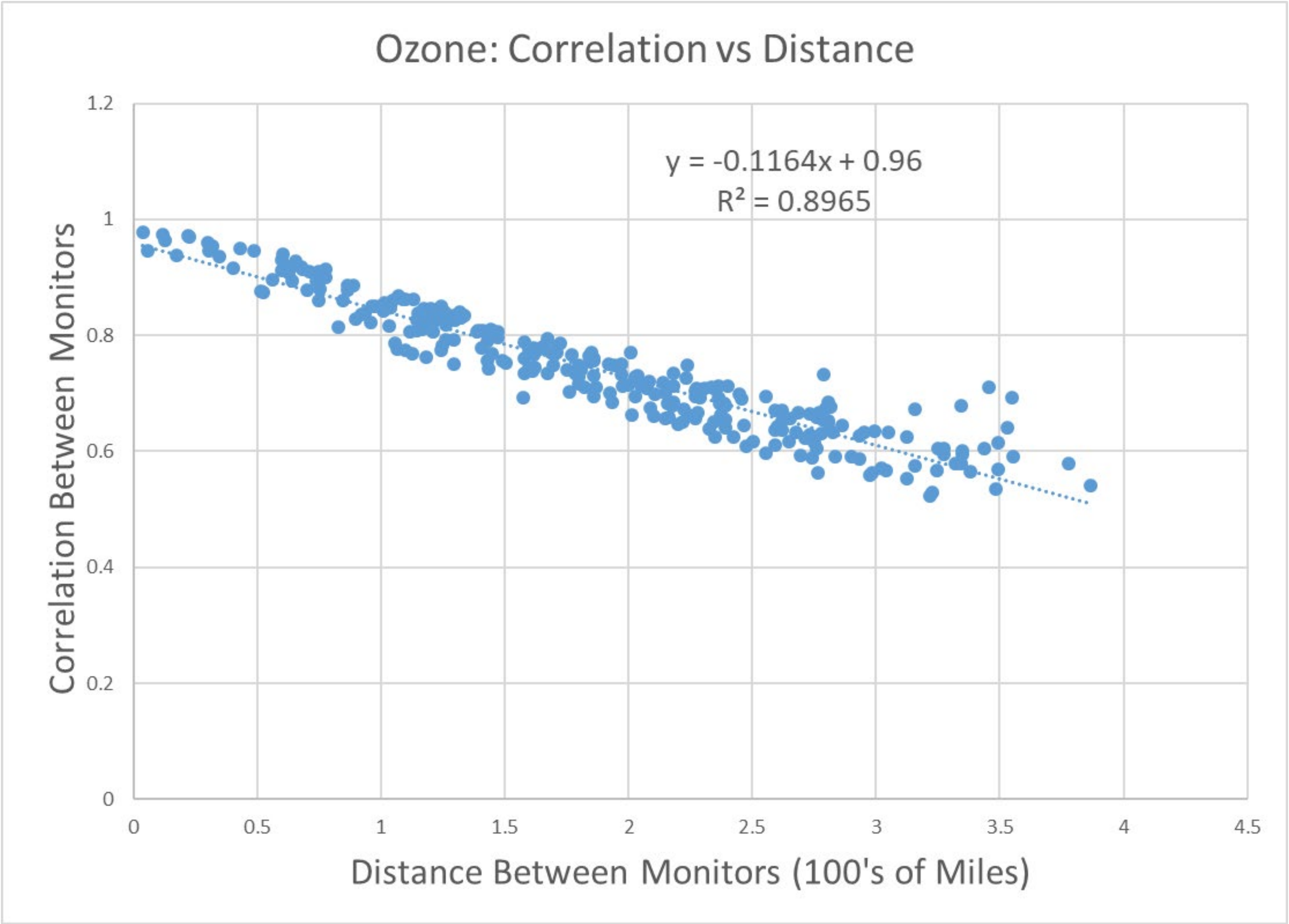
Lead (Pb): Area and Population Served

Section 3: Results from the NetAssess2025 Correlation Tool for Ozone

Results derived from the NetAssess2025 correlation tool for ozone are compiled in this section.

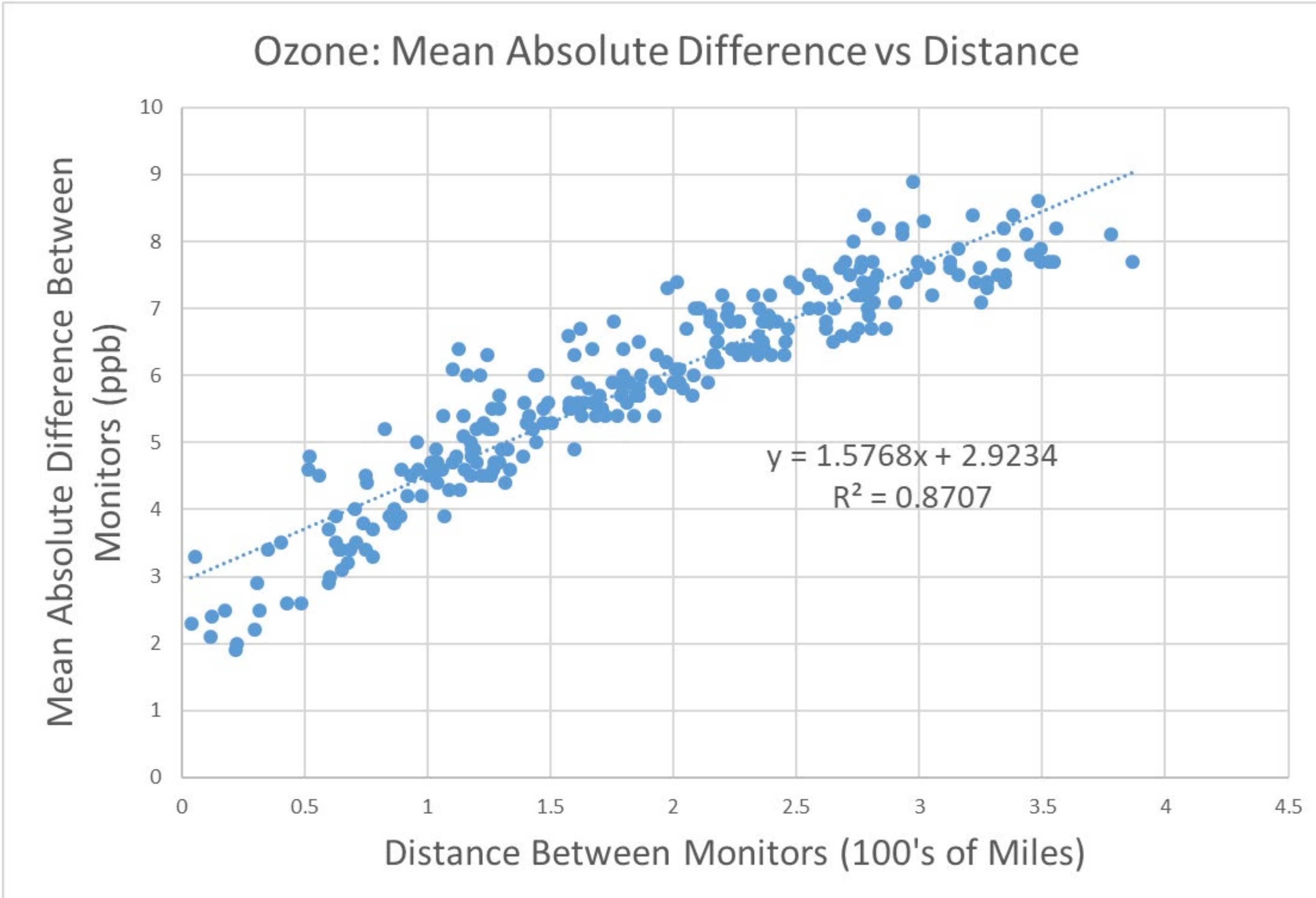
The NetAssess2025 correlation tool outputs include the correlation coefficient (R), mean absolute distance (|d|) and distance between monitor pairs. The NetAssess2025 output for pairs of monitors in the network are presented as matrices. These matrices are generated for the R and |d| metrics, as well as the pair counts and distance between monitoring sites.

Performing linear regression analysis on R and the distance between monitor pairs shows that the two parameters are correlated with an R^2=0.90. The correlation at zero separation is about 0.95 and decreases by about 11% for every 100 miles.

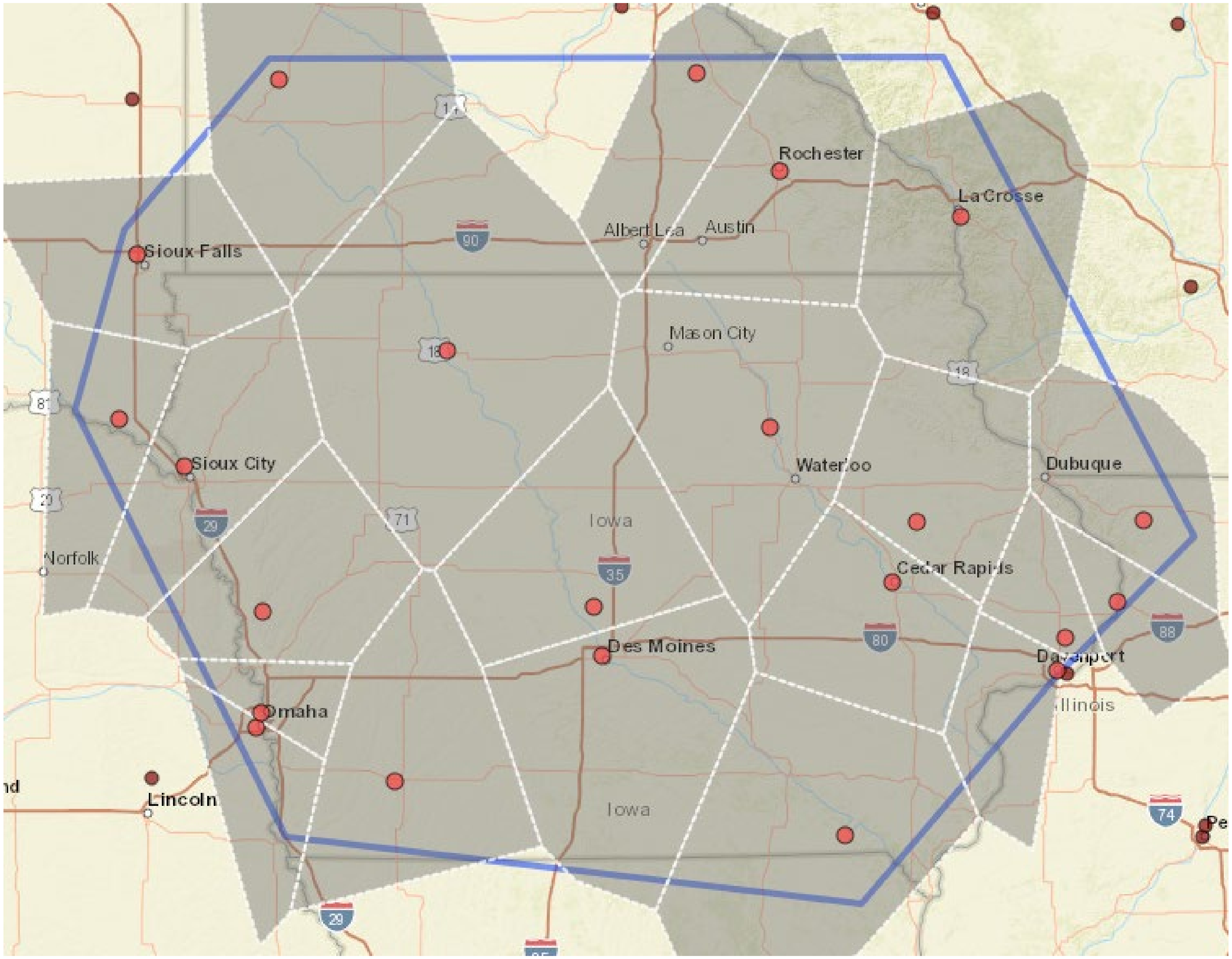


Ozone: Dependence of Correlation on the Distance between Sites

Performing linear regression analysis on |d| and the distance between monitor pairs shows that the two parameters are correlated with an R^2=0.87. The mean absolute difference at zero separation is 2.9 ppb and increases by about 1.6 ppb for every 100 miles.



Ozone: Dependence of Mean Absolute Difference on the Distance between Sites



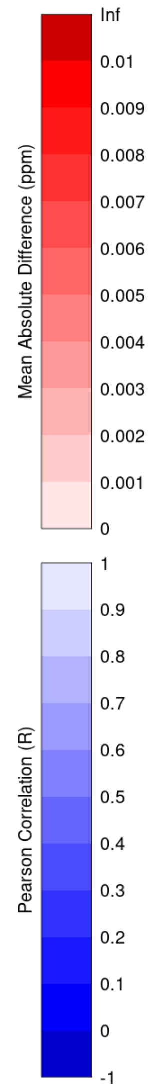
Ozone: Site Map

AQS Site ID	Local Site Name	State	City	Address
170010007	John Wood Community College	IL	Quincy	1301 S. 48th St.

170859991	Stockton	IL	Stockton	10952 E. Parker Rd
171613002	Rock Island Arsenal	IL	Moline-Rock Island	32 Rodman Ave.
190170011	Waverly Airport	IA	Waterloo-Cedar Falls	Waverly Airport
190450021	Rainbow Park	IA	Clinton	Roosevelt St.
190850007	Pisgah Forestry Office	IA	Pisgah	206 Polk St
191130033	Coggon Elementary School	IA	Cedar Rapids	408 E. Linn St
191130040	Public Health	IA	Cedar Rapids	500 11th St. NW
191370002	Viking Lake State Park	IA	Viking Lake State Park	2780 Viking Lake Rd
191471002	Iowa Lakes College	IA	Emmetsburg	Iowa Lakes College
191530030	Health Dept.	IA	Des Moines	1907 Carpenter
191531579	Sheldahl	IA	Des Moines	15795 NW 58th St.
191630014	Scott County Park	IA	Davenport	Scott County Park
191630015	Jefferson School	IA	Davenport	10th St. & Vine
191770006	Lake Sugema State Park	IA	Lake Sugema State Park	24430 Lacey Trail
191930022	Stone State Park	IA	Sioux City	5001 Talbot Rd
270495302	Stanton Air Field	MN	Red Wing	1235 Highway 19
270834210	SW Minnesota Regional Airport	MN	Marshall	W Highway 19
271095008	Ben Franklin School	MN	Rochester	1801 9th Ave. SE
290030001	Savannah	MO	Savanah	11796 Highway 71
310550019	Healthcenter Warehouse	NE	Omaha	42nd & Woolworth
310550053	Whitmore	NE	Omaha	1616 Whitmore
460270001	Vermillion DOT	SD	Vermillion	1005 N Crawford Rd
460990009	SF-USD	SD	Sioux Falls	4801 N Career Ave
550630012	DOT Building	WI	La Crosse	3550 Mormon Coulee Rd

Ozone Site Information

	170859991	190170011	190450021	190850007	191130033	191130040	191370002	191471002	191530030	191531579	191630014	191630015	191770006	270495302	271095008	310550019	310550053	460270001	460990009	550630012
170859991	0.066	212	48	491	125	143	443	394	310	309	78	97	242	344	275	508	503	568	571	193
190170011	705	0.066	215	298	96	109	287	182	157	139	200	208	230	196	139	330	323	358	359	155
190450021	715	713	0.068	475	120	125	417	395	289	291	35	51	201	368	299	486	482	561	572	227
190850007	698	701	706	0.066	366	351	120	175	191	184	448	444	350	376	371	65	56	133	208	440
191130033	715	713	722	706	0.066	36	326	275	190	185	105	114	180	271	204	385	380	444	452	168
191130040	694	694	703	686	702	0.067	301	277	167	167	101	104	144	297	232	365	360	437	453	203
191370002	704	703	712	696	712	692	0.062	240	136	148	385	377	257	422	397	83	84	253	324	441
191471002	705	704	713	697	713	693	705	0.066	189	163	377	380	348	202	205	233	224	184	177	289
191530030	718	717	726	710	726	706	716	717	0.065	28	259	254	170	322	282	198	193	299	339	311
191531579	717	716	725	709	725	705	716	716	729	0.062	263	260	190	296	259	200	195	283	318	293
191630014	716	715	724	708	724	704	714	715	728	727	0.067	19	166	368	299	456	452	538	553	237
191630015	1024	696	705	690	705	685	699	699	709	708	707	0.065	150	381	313	449	446	538	556	254
191770006	698	697	706	690	706	686	698	697	710	709	708	690	0.059	426	367	338	336	467	508	347
270495302	656	654	663	648	663	644	653	655	667	666	665	647	648	0.064	69	431	422	365	317	162
271095008	692	686	695	682	696	675	687	687	699	699	697	681	679	637	0.066	419	411	384	351	101
310550019	1033	707	716	700	716	696	706	707	720	719	718	1042	700	657	694	0.068	9	187	269	479
310550053	671	671	681	665	680	664	672	672	683	682	681	663	663	628	653	673	0.069	181	261	472
460270001	663	449	456	443	455	452	457	453	459	458	458	685	449	426	432	684	434	0.068	90	472
460990009	921	654	662	646	662	645	657	656	666	665	664	934	649	610	640	941	622	689	0.07	447
550630012	603	601	609	593	610	591	600	601	613	612	612	597	598	561	587	612	568	388	585	0.064



Values in lower triangle = # of obs used in correlation
Values in upper triangle = Distance in km between sites
Values along the diagonal = Most recent design values

Pollutant = Ozone
Area of Interest = Custom
To save chart, right-click and select 'Save image as...'

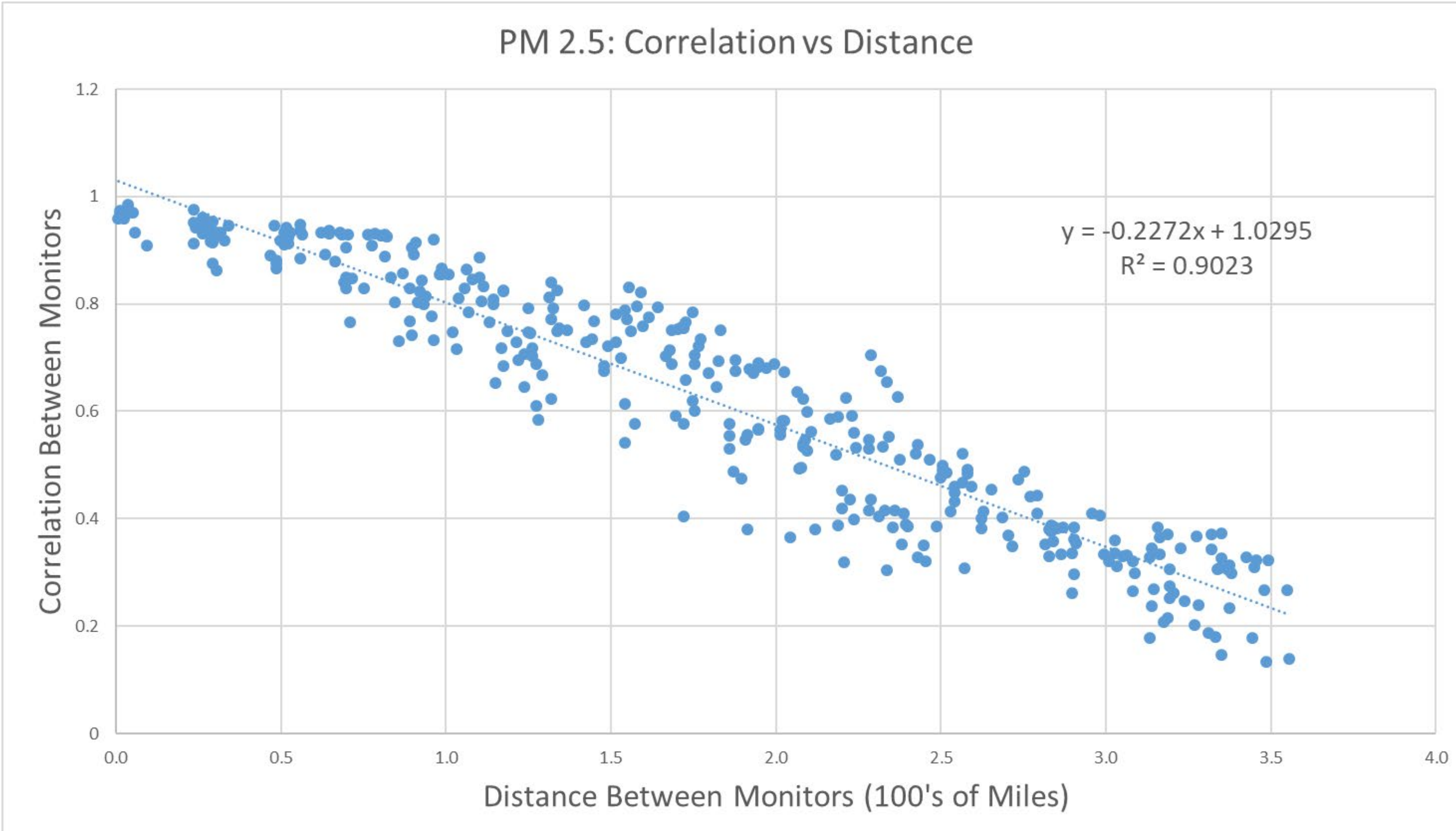
Ozone: Matrix

Section 4: Results from the NetAssess2025 Correlation Tool for $PM_{2.5}$

Results derived from the NetAssess2025 correlation tool for $PM_{2.5}$ are compiled in this section.

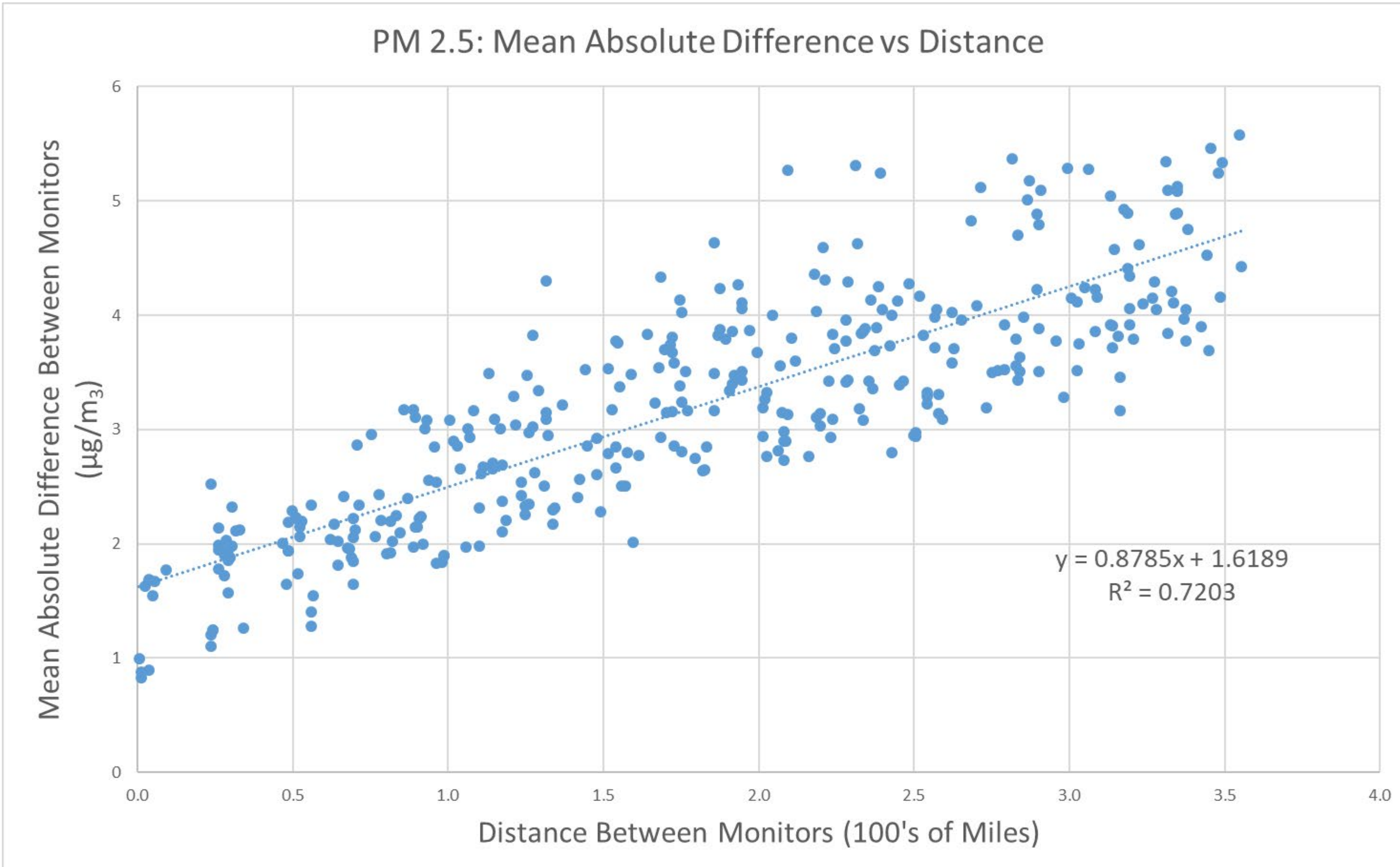
The NetAssess2025 correlation tool outputs include the correlation coefficient (R), mean absolute distance (|d|) and distance between monitor pairs. The NetAssess2025 output for pairs of monitors in the network are presented as matrices. These matrices are generated for the R and |d| metrics, as well as the pair counts and distance between monitoring sites.

Performing linear regression analysis on R and the distance between monitor pairs shows that the two parameters are correlated with an R^2 of about 0.90. The correlation at zero separation is about 0.95 and decreases by about 0.23 for every 100 miles.

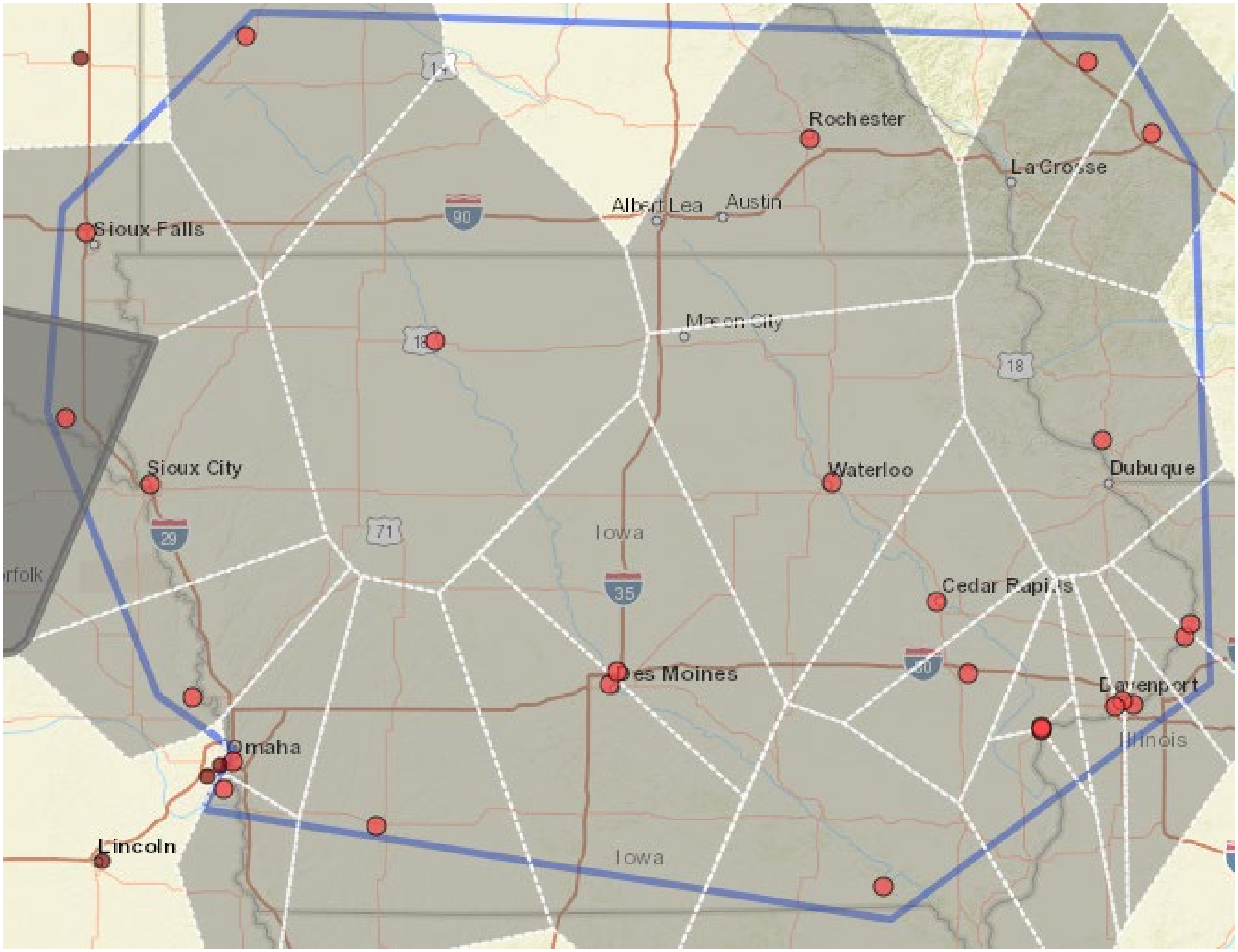


$PM_{2.5}$: Dependence of Correlation between Monitors on the Distance between Monitors

Performing linear regression analysis on |d| and the distance between monitor pairs shows that the two parameters are correlated with an R^2 of about 0.72. The mean absolute difference at zero separation is about 1.6 $\mu g/m^3$ and increases by about 0.88 $\mu g/m^3$ for every 100 miles.



$PM_{2.5}$: Dependence of Mean Absolute Difference on the Distance between Monitors

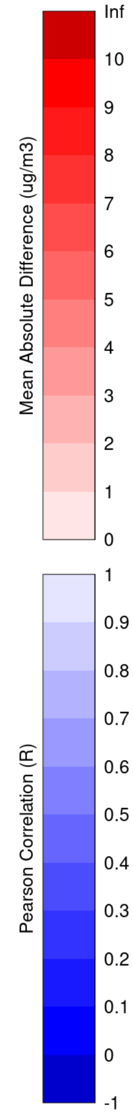


PM$_{2.5}$ Site Map

AQS Site ID	Local Site Name	State	City	Address
171613002	Rock Island Arsenal	IL	Moline-Rock Island	32 Rodman Ave.
190130009	Water Tower	IA	Waterloo-Cedar Falls	Vine St. & Steely
190450019	Chancy Park	IA	Clinton	23rd & Camanche
190450021	Rainbow Park	IA	Clinton	Roosevelt St.
191032001	Hoover School	IA	Iowa City	2200 East Court
191130040	Public Health	IA	Cedar Rapids	500 11th St. NW
191370002	Viking Lake State Park	IA	Viking Lake State Park	2780 Viking Lake Rd.
191390015	Muscatine H.S. East Campus Roof	IA	Muscatine	1409 Wisconsin
191390016	Greenwood Cemetary	IA	Muscatine	Fletcher St. and Kimble St.
191390020	Musser Park	IA	Muscatine	Oregon St. & Earl Ave.
191471002	Iowa Lakes College	IA	Emmetsburg	Iowa Lakes Community College
191530030	Health Dept.	IA	Des Moines	1907 Carpenter
191535885	Public Works	IA	Des Moines	5885 NE 14th St.
191550009	Frainklin School	IA	Council Bluffs	3130 C Ave.
191630015	Jefferson School	IA	Davenport	10th St. & Vine St.
191630020	Hayes School	IA	Davenport	622 South Concord Street
191770006	Lake Sugema	IA	Lake Sugema State Park	24430 Lacey Trail
191930021	Irving Elementry School	IA	Sioux City	901 Floyd Blvd
270834210	SW Minnesota Regional Airport	MN	Marshall	West Highway 19
271095008	Ben Franklin School	MN	Rochester	1801 9th Ave. SE
311530007	Golden Hills Elementary	NE	Omaha	2912 Coffey Ave.
311770002	Good Shepard Lutheran Home	NE	Omaha	2242 Wright St.
460270001	Vermillion DOT	SD	Vermillion	1005 N Crawford Rd
460990009	SF-USD	SD	Sioux Falls	4801 N Career Ave
550430009	Potosi	WI	Platteville	128 HWY 61 N
550532002	Five Horned Ave.	WI	Brockway	N 7289 Five Horned Ave
550812001	Monroe	WI	Wyeville	10750 Wyeville

$PM_{2.5}$ Site Information

	190130009	190450019	190450021	191032001	191130040	191370002	191390015	191390016	191390020	191471002	191530030	191535885	191550009	191630015	191630020	191770006	191930021
190130009	8.4/23	189	189	115	78	282	159	158	159	206	148	140	326	179	177	201	334
190450019	357	9.2/23	6	109	123	413	85	84	84	394	285	281	476	45	48	195	514
190450021	353	356	8.3/21	112	125	417	91	90	90	395	289	284	480	51	55	201	516
191032001	353	1057	351	8.4/22	38	305	46	45	46	308	178	174	368	77	75	114	414
191130040	359	1073	357	1062	8.6/23	301	82	80	82	277	167	162	358	104	102	144	391
191370002	339	352	336	348	354	7.2/19	335	335	336	240	136	143	78	377	374	257	203
191390015	350	1045	348	1039	1053	346	8.6/22	2	1	354	215	212	403	42	39	111	456
191390016	347	353	344	349	353	332	346	8.3/19	2	352	215	212	402	42	39	112	455
191390020	344	353	341	349	355	328	347	337	8.5/20	354	216	213	403	42	38	112	457
191471002	301	320	298	317	324	293	318	297	293	7.6/21	189	185	228	380	379	348	155
191530030	362	1080	360	1069	1088	357	1060	356	358	327	8.2/23	8	191	254	251	170	248
191535885	119	362	121	362	361	120	360	120	118	120	362	10.2/27	196	250	248	171	248
191550009	357	360	355	356	362	342	353	349	346	304	365	121	8.7/25	443	440	332	143
191630015	361	1077	359	1066	1085	356	1057	355	358	326	1092	361	364	8.4/21	4	150	491
191630020	336	343	336	339	346	322	339	329	326	289	349	118	338	348	8.9/22	147	488
191770006	345	348	341	343	349	328	341	336	333	294	352	120	346	351	325	7.5/18	415
191930021	338	341	335	338	343	324	335	330	328	285	346	118	340	345	323	327	8.6/21



Values in lower triangle = # of obs used in correlation
Values in upper triangle = Distance in km between sites
Values along the diagonal = Most recent design values

Pollutant = PM2.5
Area of Interest = Iowa
To save chart, right-click and select 'Save image as...'

***$PM_{2.5}$* : Matrix** *(Note that this matrix had to be restricted to sites that are operated by Iowa. EPA's NetAssess2025 tool does not show the last digit of the site ID if monitors from surrounding states with Voronoi polygons that impinge into Iowa are included.)*

Appendix G: Current Ambient Air Monitoring Network

Table of Contents

Section 1: Summary

This appendix contains a description of the current (January2025) Iowa ambient air monitoring network. A table and map of monitoring sites is shown in Section 2, and a count of monitors in the network is contained in Section 3. Section 4 compares the number of monitors for different pollutants; $PM_{2.5}$ filter samplers are the most numerous discrete samplers in the network, ozone monitors are the most numerous continuous samplers. Section 5 contains maps of monitor locations for the various pollutants. Additional information concerning Iowa's current ambient air monitoring network is contained in Iowa's *2024 Ambient Air Monitoring Network Plan*.[40]

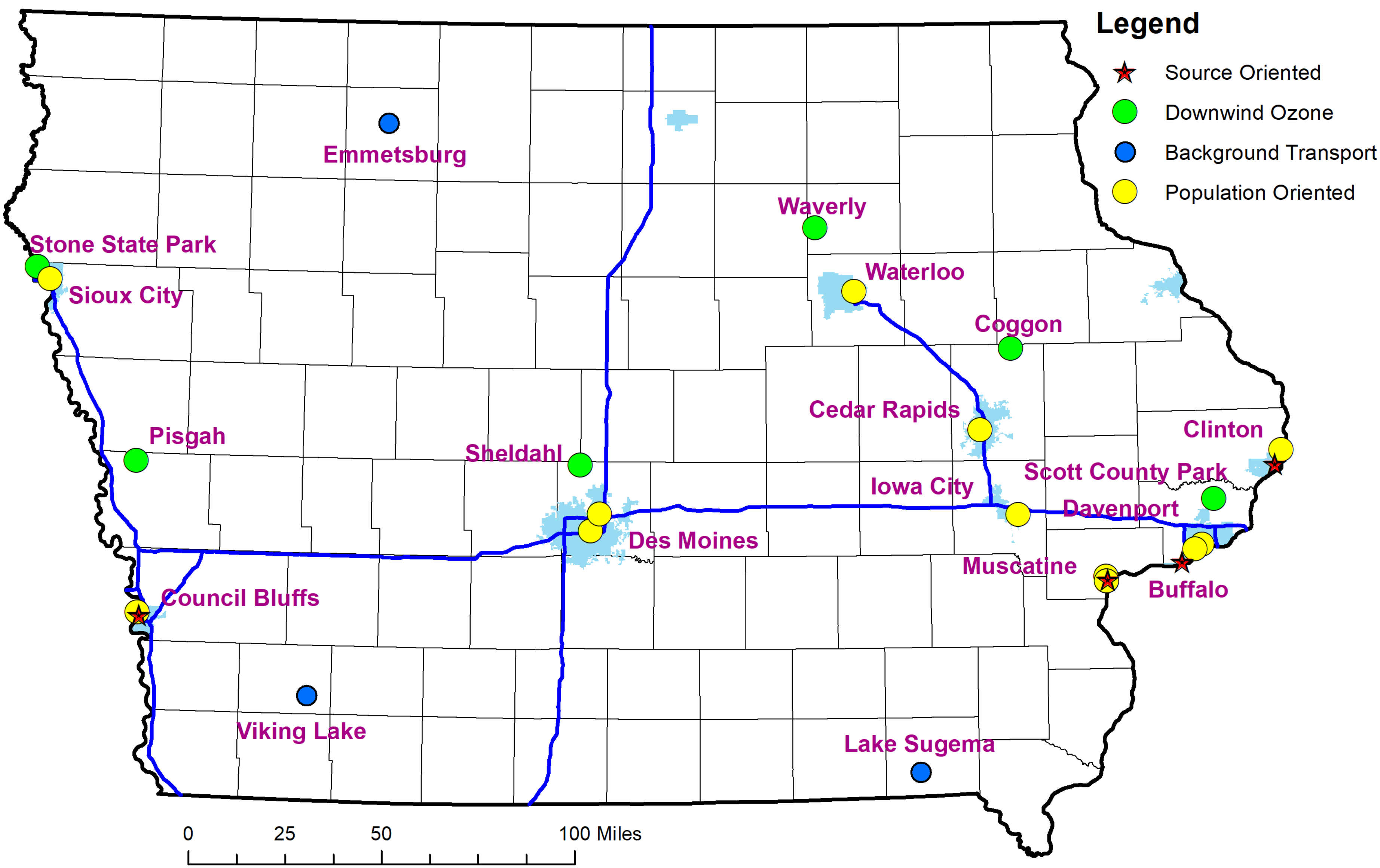
[40] Available online at: https://www.iowadnr.gov/Environmental-Protection/Air-Quality/Monitoring-Ambient-Air.

Section 2: Current Iowa Air Monitoring Sites (January, 2025)

City	Site	Address	County	MSA	Latitude	Longitude	AQS Site ID	Responsible Agency
Buffalo	Linwood Mining	11100 110th Ave.	Scott	DMR	41.46724	-90.68845	191630017	DNR
Cedar Rapids	Public Health	500 11th St. NW	Linn	CDR	41.97677	-91.68766	191130040	Linn Local Prog.
Clinton	Chancy Park	23rd & Camanche	Clinton	-	41.82328	-90.21198	190450019	DNR
Clinton	Rainbow Park	Roosevelt St.	Clinton	-	41.875	-90.17757	190450021	DNR
Coggon	Coggon Elementary School	408 E Linn St.	Linn	CDR	42.28056	-91.52694	191130033	Linn Local Prog.
Council Bluffs	Franklin School	3130 C Ave.	Pottawattamie	OMC	41.26417	-95.89612	191550009	DNR
Council Bluffs	Griffin Pipe	8th Avenue and 27th St	Pottawattamie	OMC	41.25425	-95.88725	191550011	DNR
Davenport	Hayes School	622 South Concord St	Scott	DMR	41.51208	-90.62404	191630020	DNR
Davenport	Jefferson School	10th St. & Vine St.	Scott	DMR	41.53001	-90.58761	191630015	DNR
Des Moines	Health Dept.	1907 Carpenter	Polk	DSM	41.60318	-93.6433	191530030	Polk Local Prog.
Des Moines	Public Works	5885 NE 14th	Polk	DSM	41.667032	-93.599221	191535885	Polk Local Prog.
Emmetsburg	Iowa Lakes College	Iowa Lakes Community College	Palo Alto	-	43.1237	-94.69352	191471002	DNR
Iowa City	Hoover School	2200 East Court	Johnson	IAC	41.65723	-91.50348	191032001	DNR
Muscatine	Greenwood Cemetery	Fletcher St. & Kimble St.	Muscatine	-	41.41943	-91.07098	191390016	DNR
Muscatine	Muscatine HS, East Campus Roof	1409 Wisconsin	Muscatine	-	41.40095	-91.06781	191390015	DNR
Muscatine	Muscatine HS, East Campus Trailer	1409 Wisconsin	Muscatine	-	41.40145	-91.06845	191390019	DNR
Muscatine	Musser Park	Oregon St. & Earl Ave.	Muscatine	-	41.4069	-91.0616	191390020	DNR
Pisgah	Forestry Office	206 Polk St.	Harrison	OMC	41.83226	-95.92819	190850007	DNR
Sheldahl	Southern Crossroads	15795 NW 58th St	Polk	DSM	41.84943	-93.69762	191531579	Polk Local Prog.
Sioux City	Irving School	901 Floyd Blvd.	Woodbury	SXC	42.499844	-96.394755	191930021	DNR
Waterloo	Water Tower	Vine St. & Steely	Black Hawk	WTL	42.50154	-92.31602	190130009	DNR
Waverly	Waverly Airport	Waverly Airport	Bremer	WTL	42.74117	-92.51285	190170011	DNR
-	Lake Sugema	24430 Lacey Trl, Keosauqua	Van Buren	-	40.69508	-92.00632	191770006	DNR
-	Scott County Park	Scott County Park	Scott	DMR	41.69917	-90.52194	191630014	DNR

City	Site	Address	County	MSA	Latitude	Longitude	AQS Site ID	Responsible Agency
-	Stone State Park	5001 Talbot Rd	Woodbury	SXC	42.55468	-96.46293	191930022	DNR
-	Viking Lake State Park	2780 Viking Lake Road	Montgomery	-	40.96911	-95.04495	191370002	DNR

MSA abbreviations are as follows: DMR = Davenport, Moline, Rock Island; CDR = Cedar Rapids; DSM = Des Moines; OMC = Omaha-Council Bluffs; IAC = Iowa City; SXC = Sioux City; AMW = Ames; WTL = Waterloo. More information on MSA's is available in Appendix J.



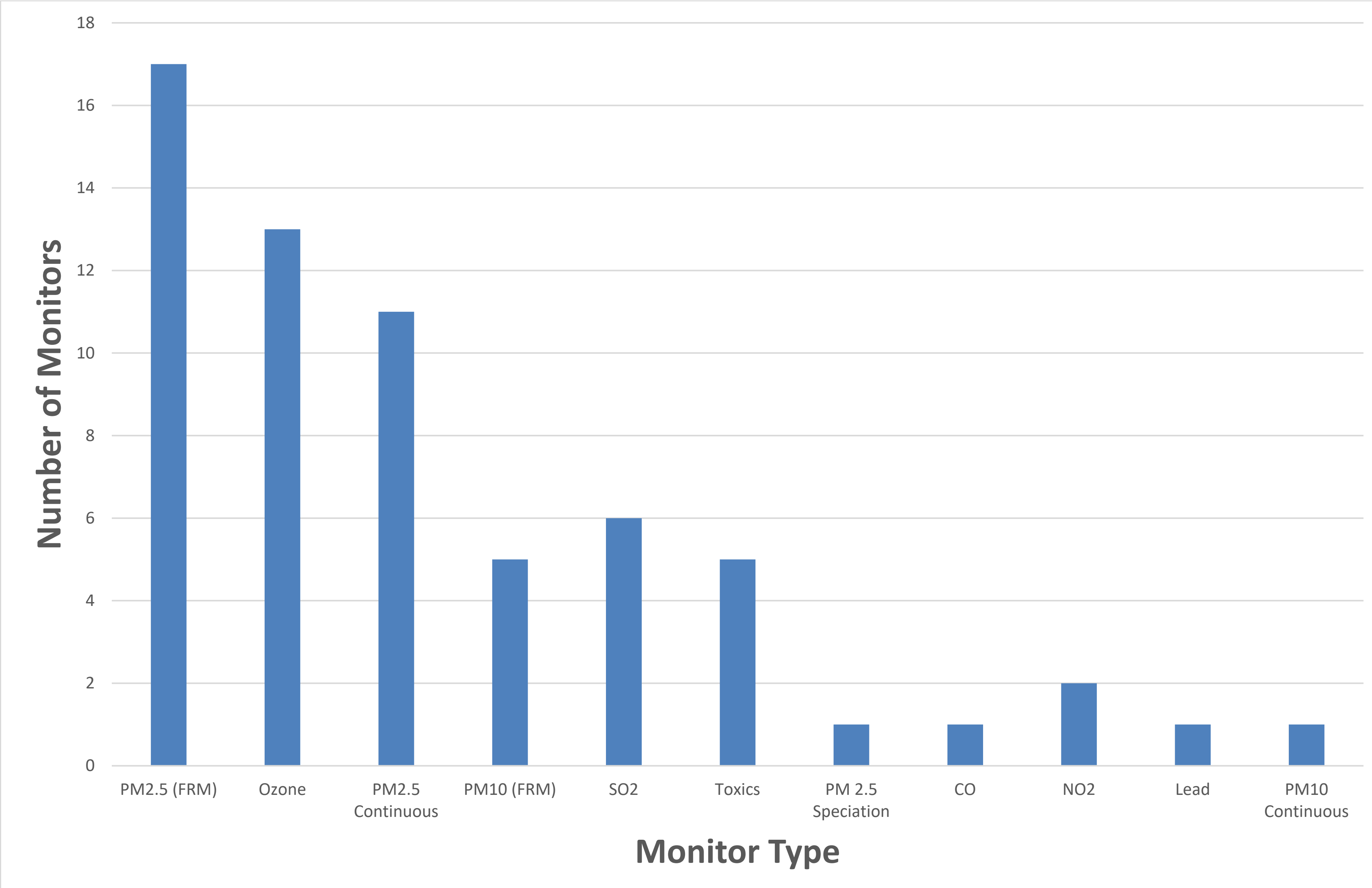
2025 Iowa Ambient Air Monitoring Network (26 sites)

Section 3: Criteria[41] Pollutant Monitors at Each Site in the Network as of January 1, 2025.

City, Site Name	$PM_{2.5}$ (FRM)	Ozone	$PM_{2.5}$ Cont.	PM_{10} (FRM)	SO_2	Toxics	$PM_{2.5}$ Spec.	CO	NO_2	Lead	PM_{10} Cont.
Buffalo, Linwood Mining				1							1
Cedar Rapids, Public Health	1	1	1	1	1	1					
Clinton, Chancy Park	1		1		1	1					
Clinton, Rainbow Park	1	1									
Coggon, Elementary School		1									
Council Bluffs, Franklin School	1										
Council Bluffs, Griffin Pipe										1	
Davenport, Hayes Sch.	1										
Davenport, Jefferson Sch.	1	1	1	1	1	1	1	1	1		
Des Moines, Health Dept.	1	1	1	1		1					
Des Moines, Public Works	1		1								
Emmetsburg, Iowa Lakes Coll.	1	1	1								
Iowa City, Hoover Sch.	1		1								
Lake Sugema	1	1	1	1	1				1		
Muscatine HS, East Campus Roof	1										
Muscatine HS, East Campus Trailer			1		1						
Muscatine, Greenwood Cemetery	1										
Muscatine, Musser Park	1				1	1					
Pisgah, Forestry Office		1									
Scott County Park		1									
Sheldahl, Southern Crossroads		1									
Sioux City, Irving School	1										
Stone State Park		1									
Viking Lake State Park	1	1	1								
Waterloo, Water Tower	1		1								
Waverly Airport		1									
Totals	17	13	11	5	6	5	1	1	2	1	1

[41] $PM_{2.5}$ Speciation and Toxics monitors do not monitor criteria pollutants, but are an important component of the network and are included for completeness.

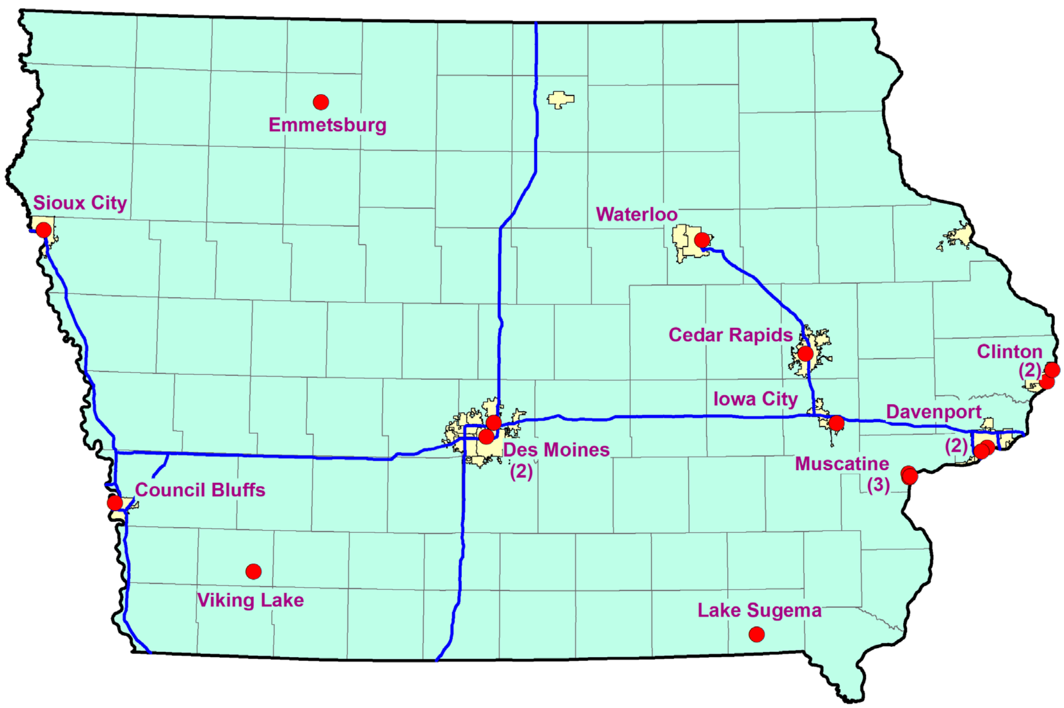
Section 4: Criteria[42] Pollutant Monitors Operated in the Current Network



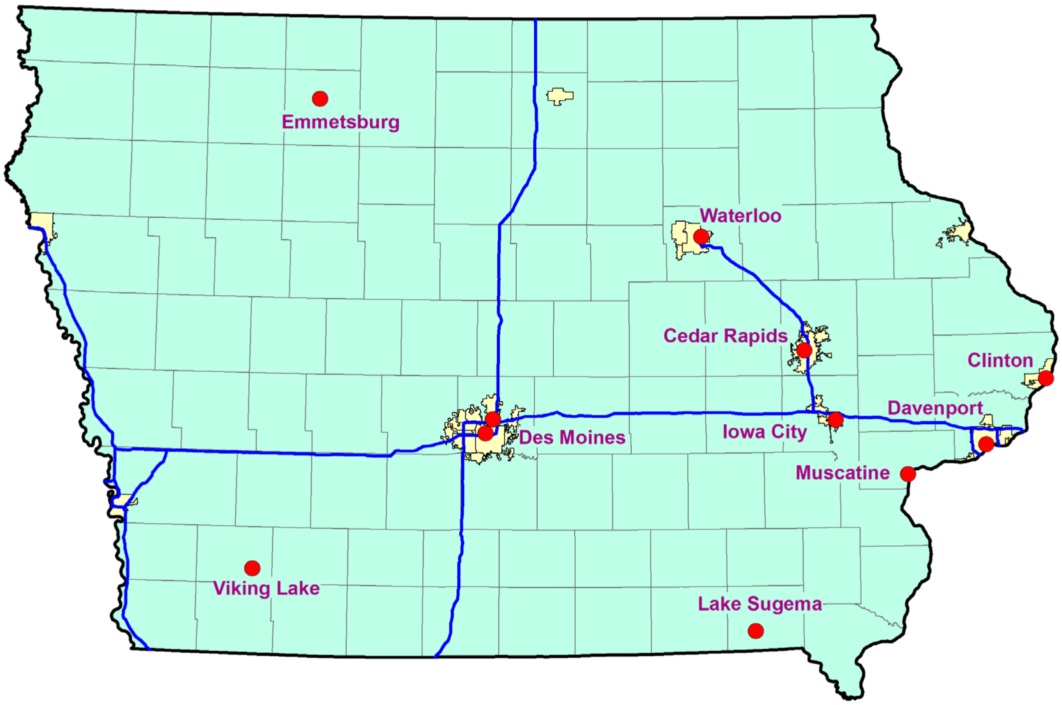
[42] $PM_{2.5}$ Speciation and Toxics monitors do not monitor criteria pollutants, but are an important component of the network and are included for completeness.

Section 5: Monitoring Network Maps

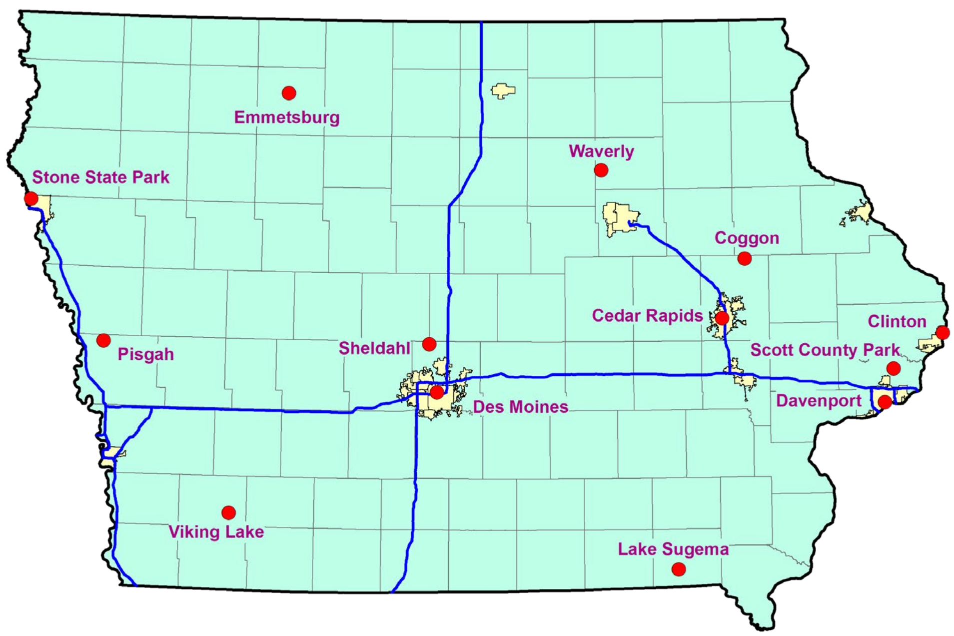
The following maps show the locations for the criteria pollutant monitors in the state of Iowa that are current as of January 1, 2025. Non-criteria pollutant maps are also included for the Toxics and Speciation monitoring networks.



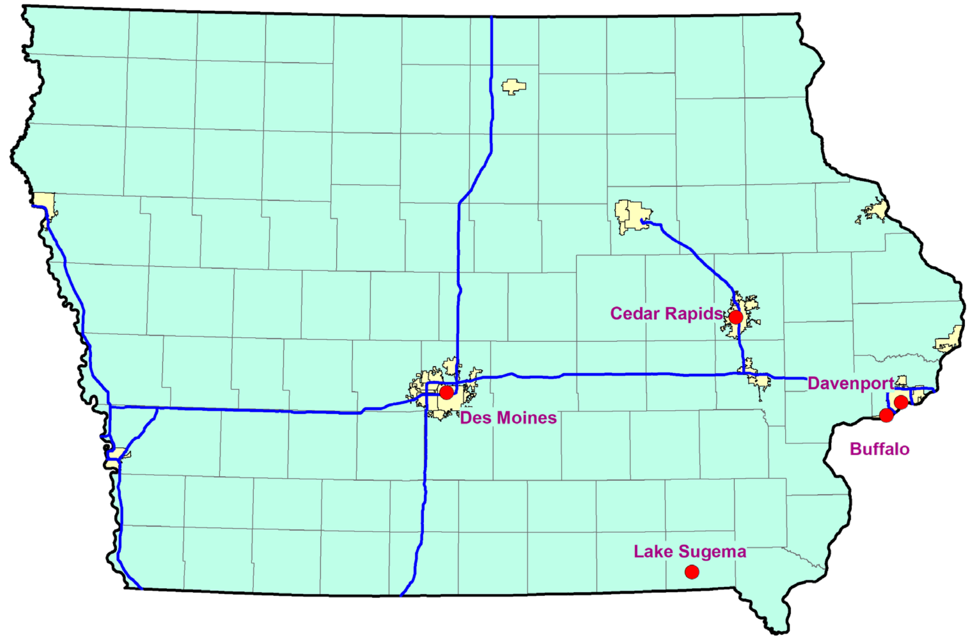
Manual $PM_{2.5}$ (FRM) Monitoring Sites



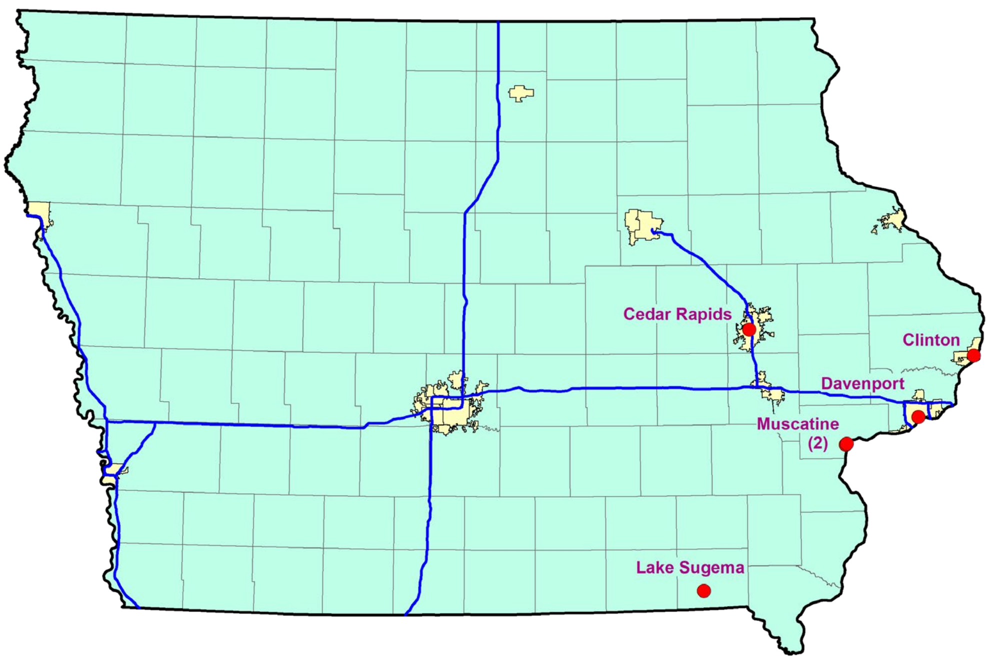
Continuous $PM_{2.5}$ (non-FRM) Monitoring Sites



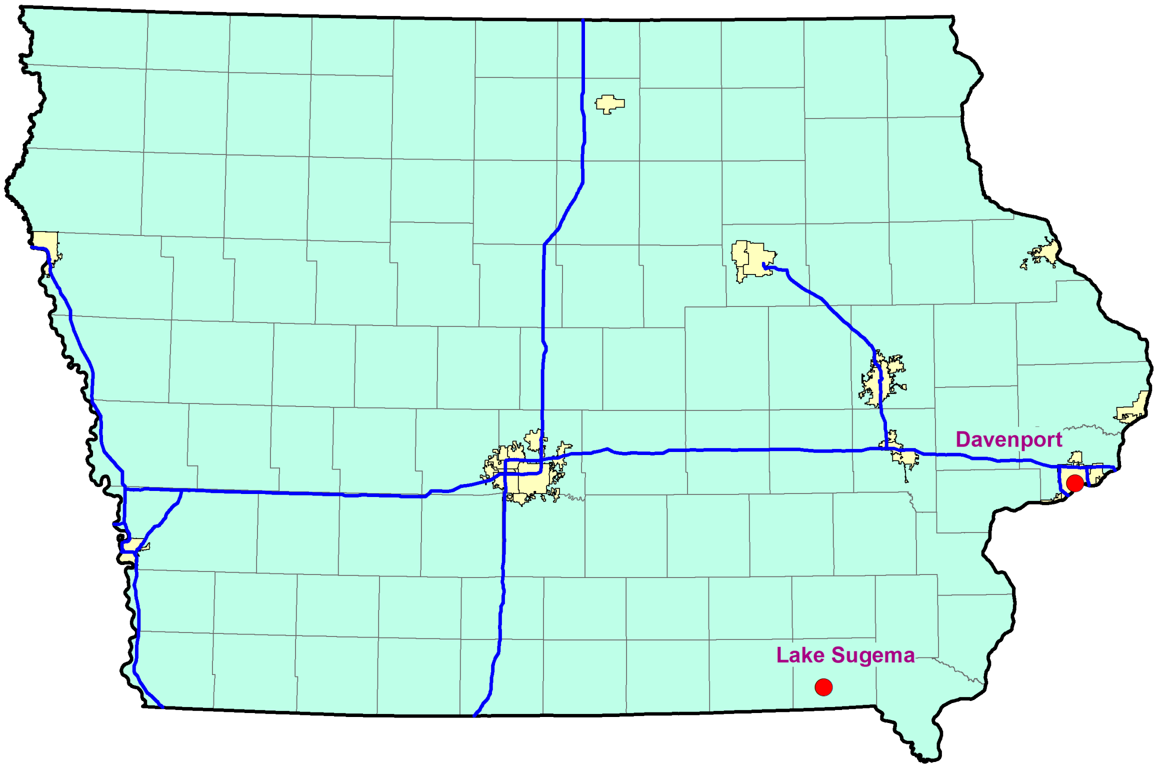
Ozone Monitoring Sites



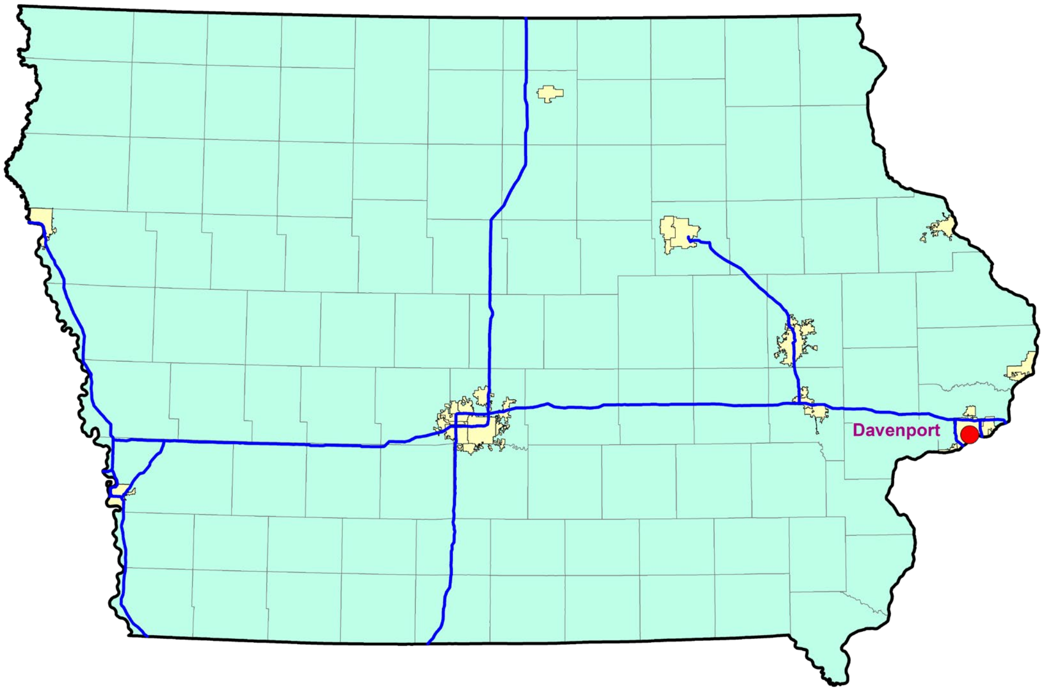
PM_{10} Monitoring Sites



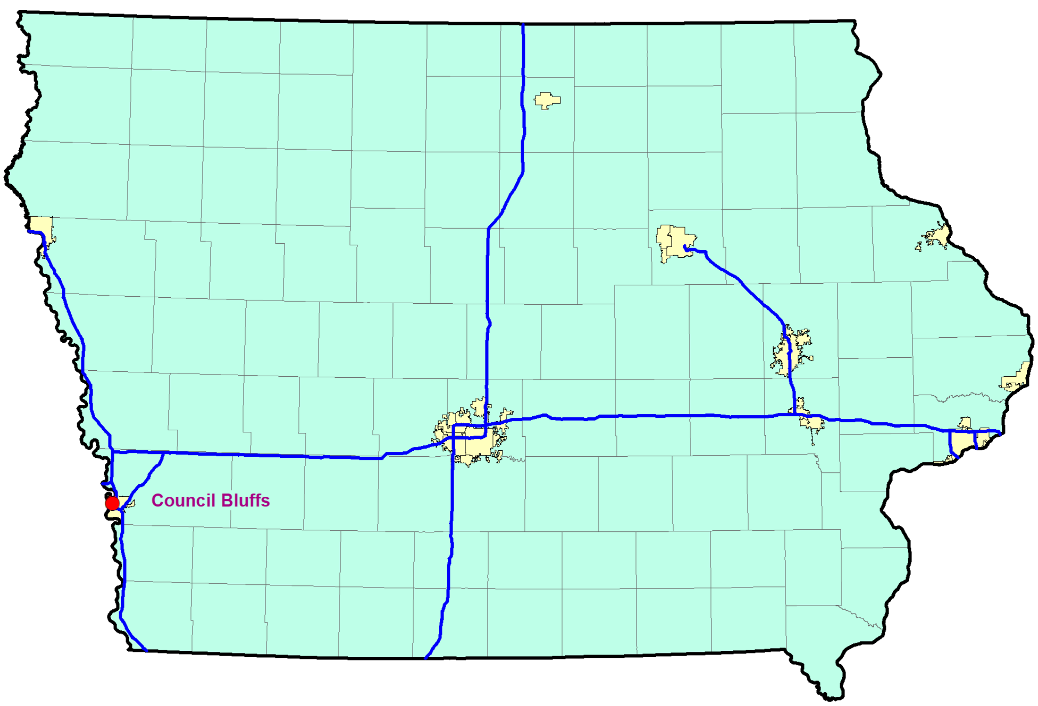
SO_2 Monitoring Sites



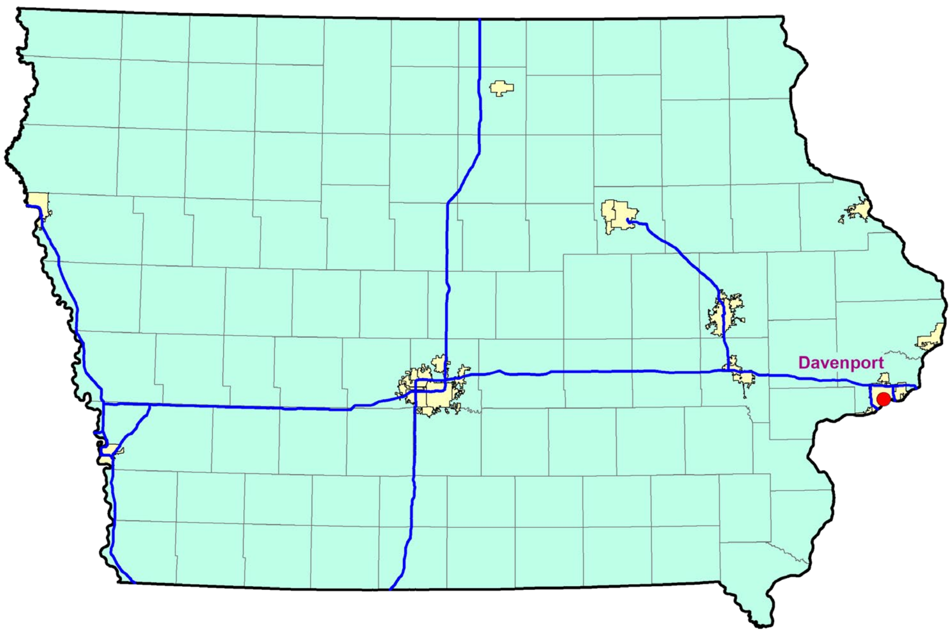
NO_2 Monitoring Sites



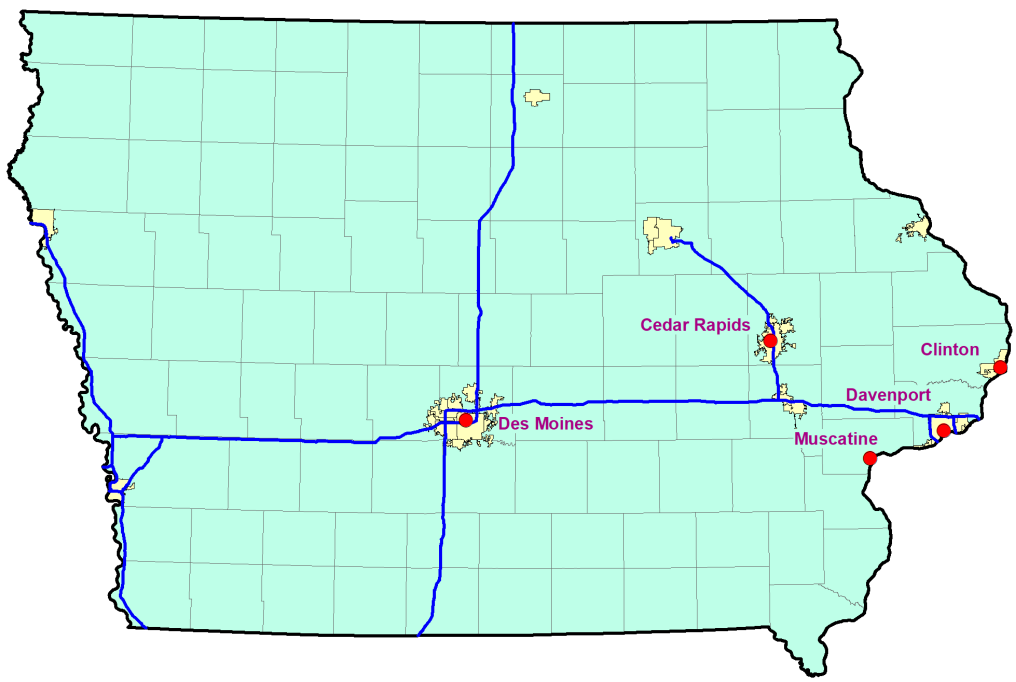
CO Monitoring Site



Lead (Pb) Monitoring Site



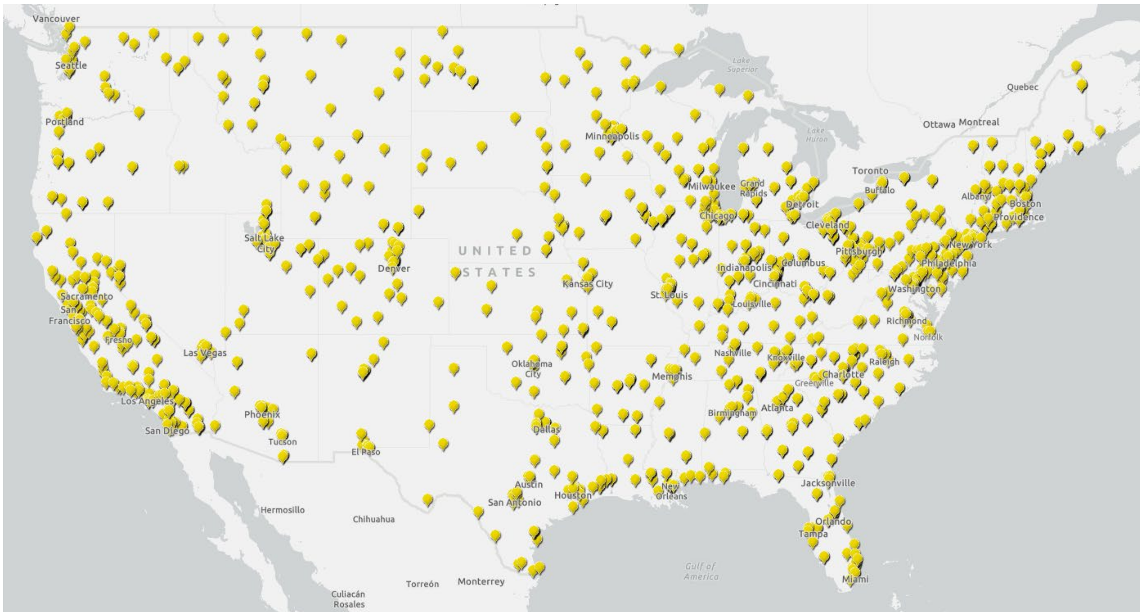
Speciation Monitoring; The CSN Speciation sampler is located at the red dot



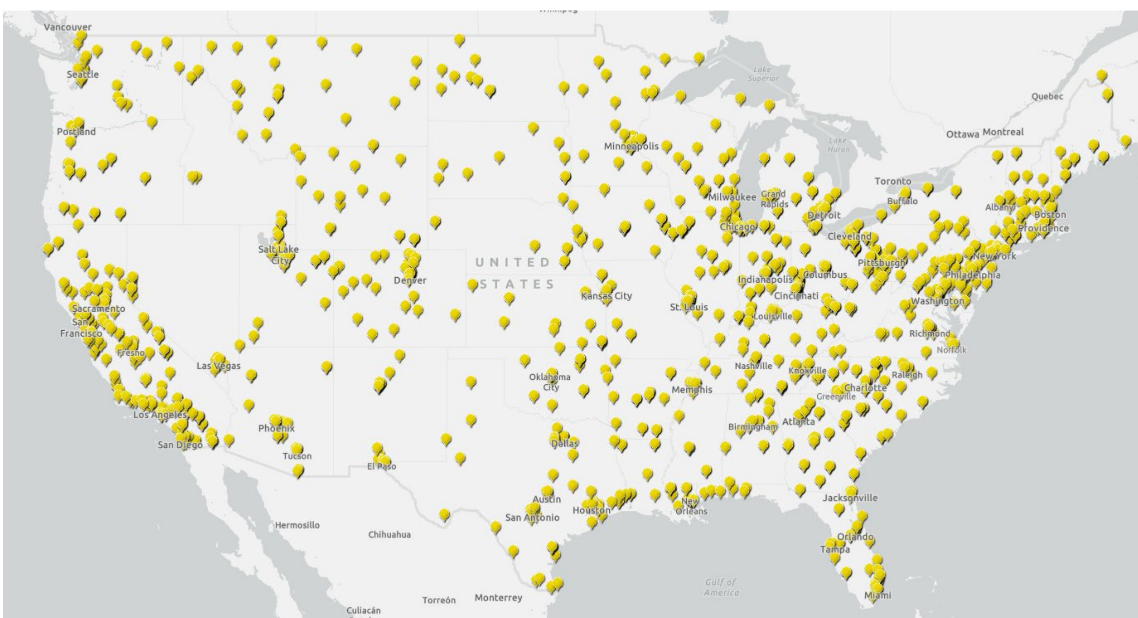
Toxics Monitoring Sites

National Maps

The following maps show the locations for the criteria pollutant monitors across the nation as of March 21, 2025. [43] Non-criteria pollutant maps are also included for the NCore, NATTs and Speciation monitoring networks.



PM$_{2.5}$ Monitoring Sites



Ozone Monitoring Sites

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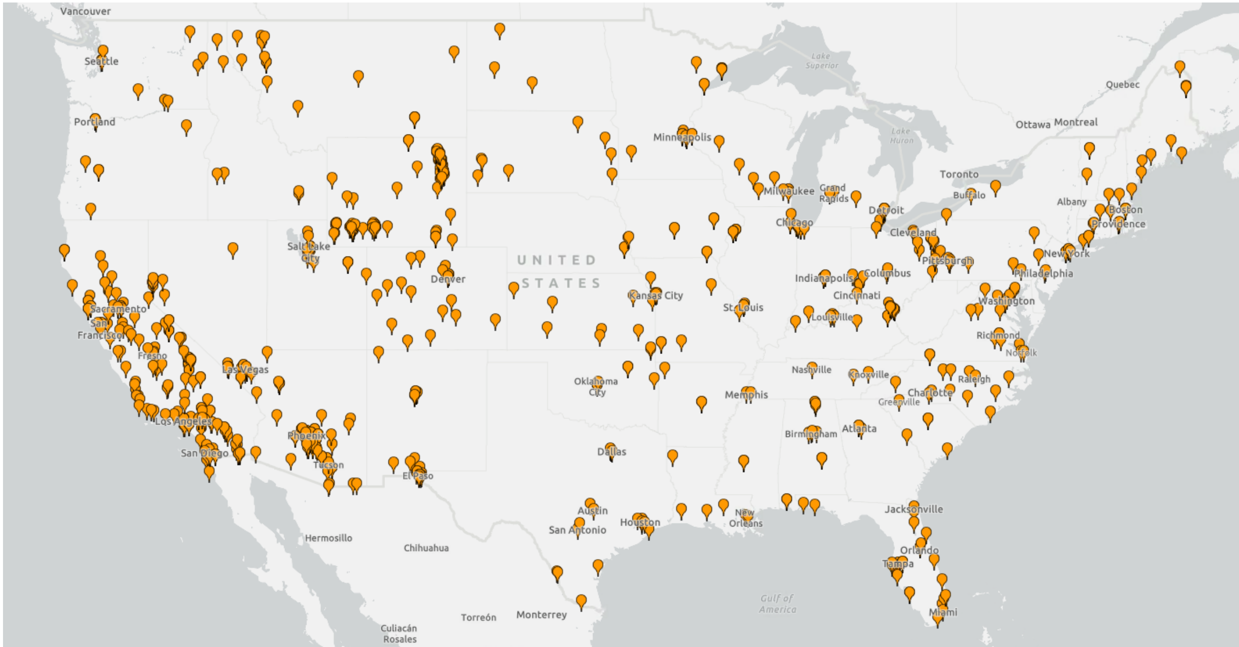
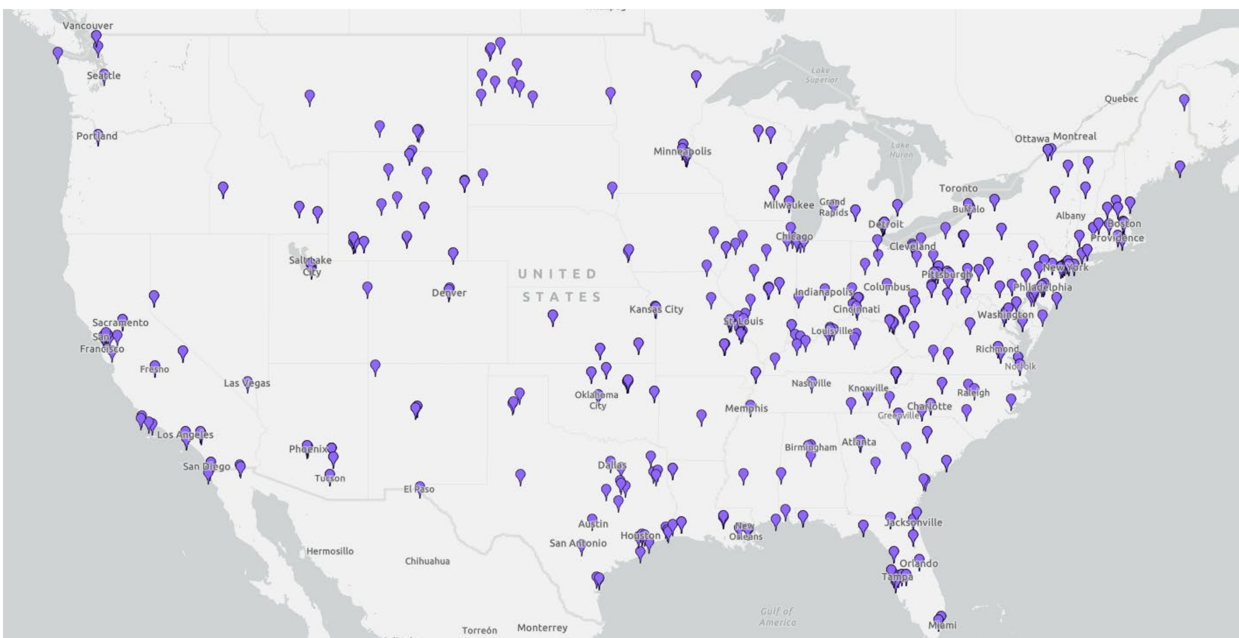
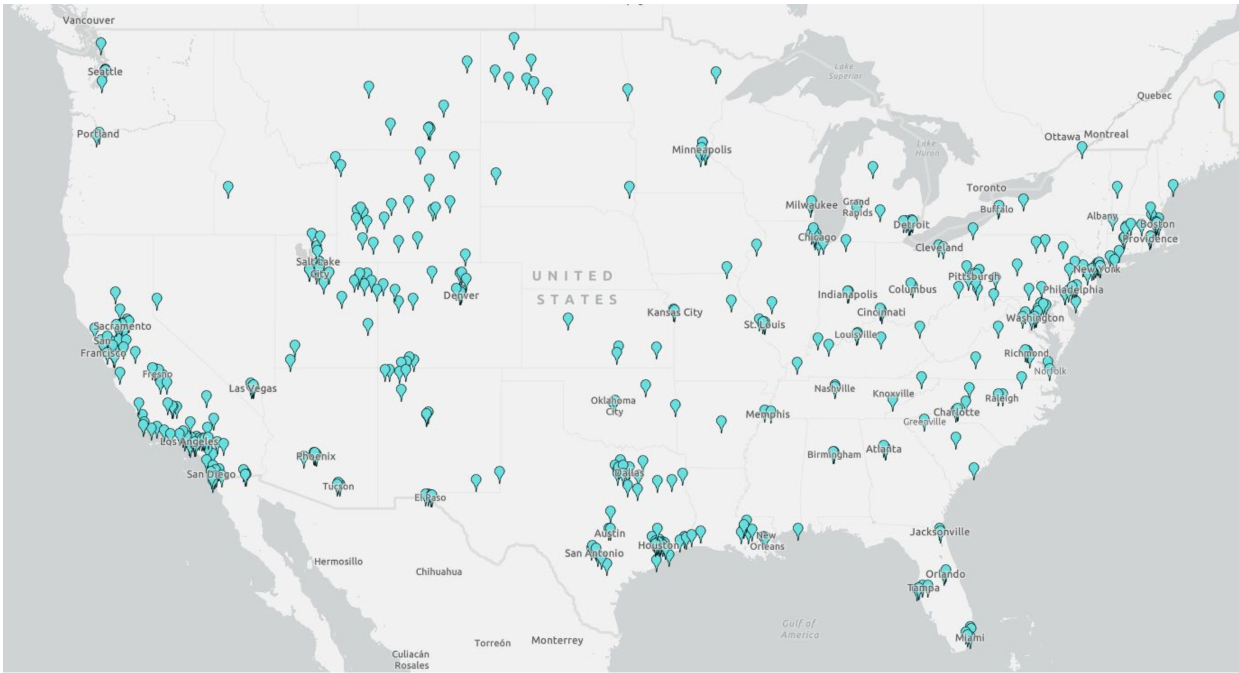
[43] Maps were generated from monitors indicated as active on 3/21/25: https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=5f239fd3e72f424f98ef3d5def547eb5.



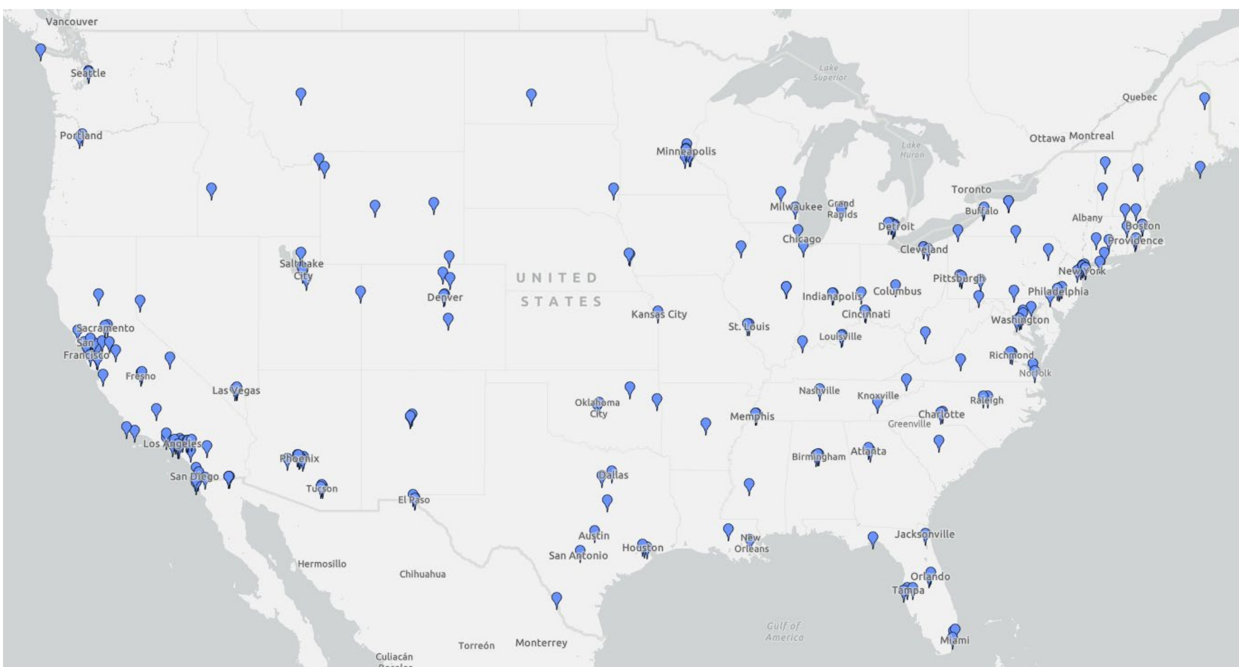
PM$_{10}$ Monitoring Sites



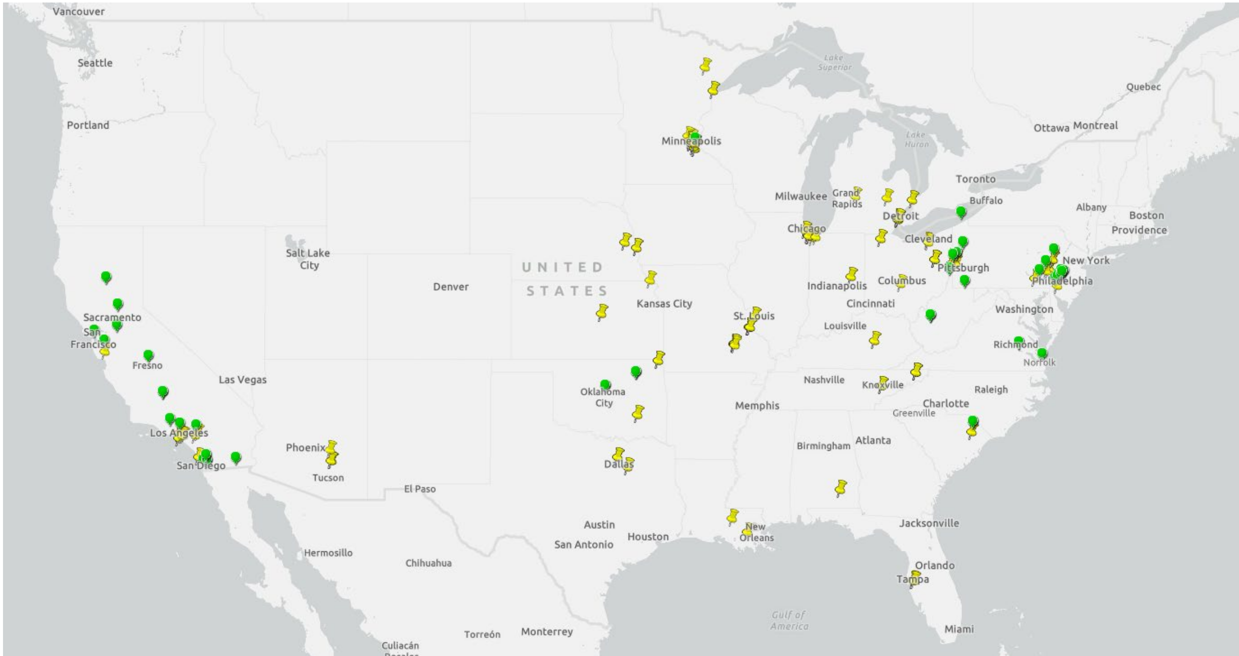
SO$_2$ Monitoring Sites



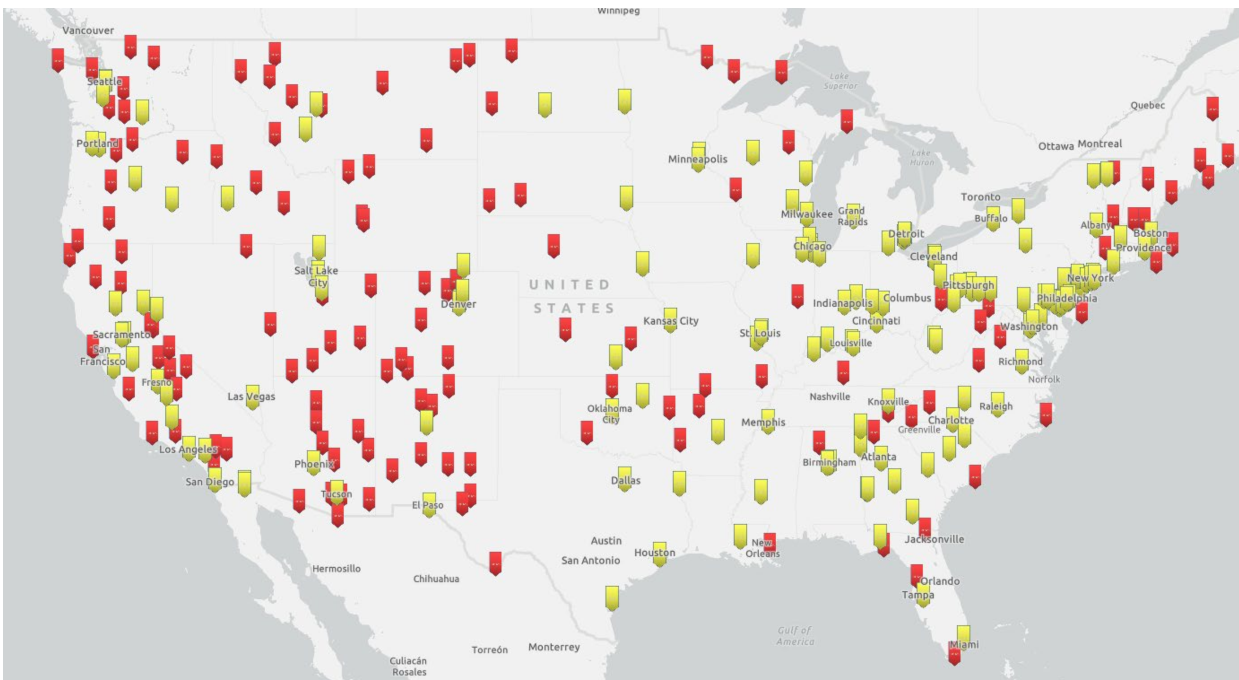
NO₂ Monitoring Sites



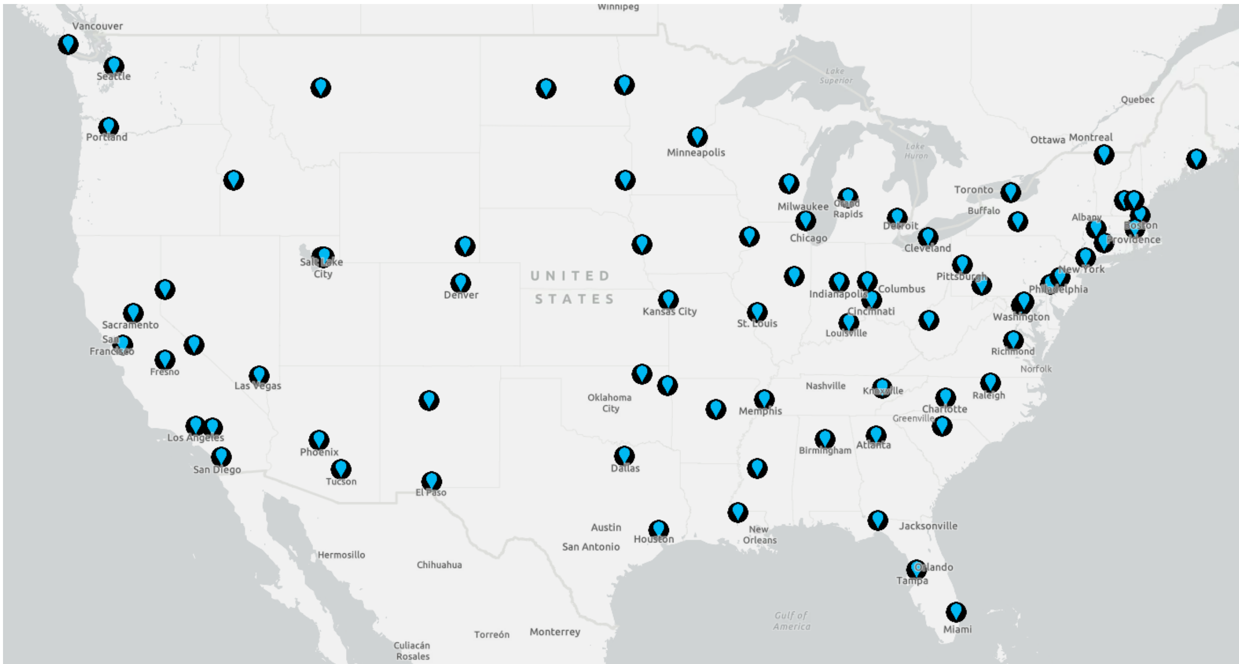
CO Monitoring Sites



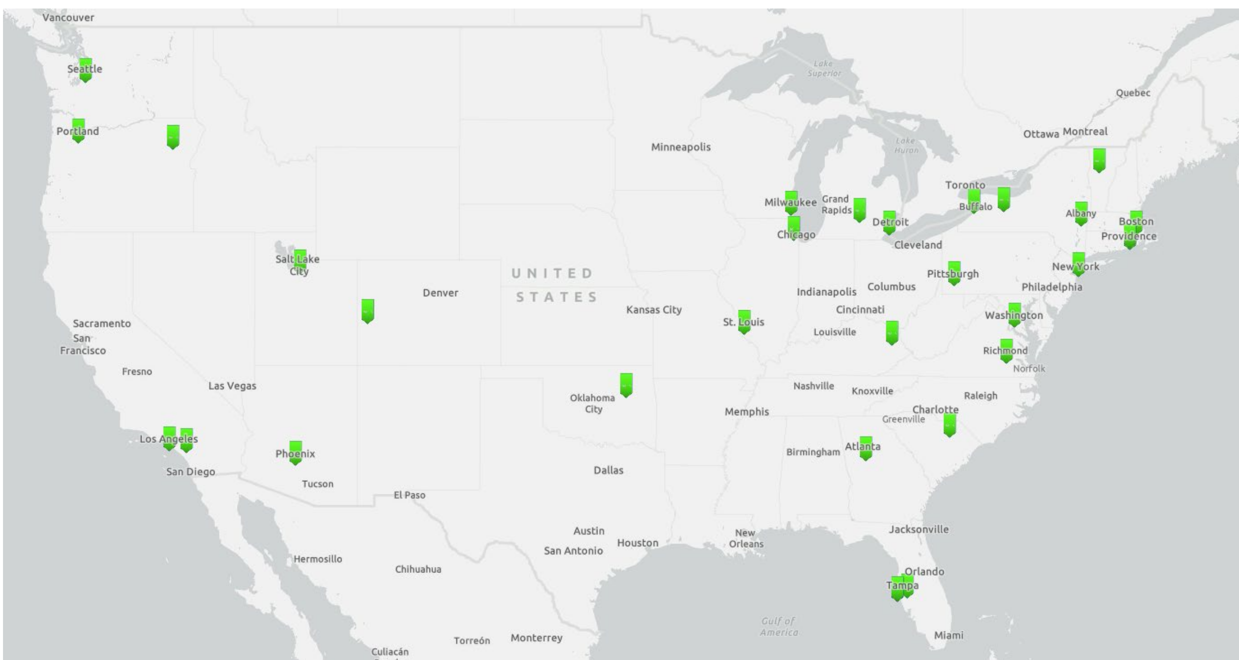
Lead Monitoring Sites (green indicates active Lead sites yellow indicates active Lead TSP sites)



Speciation (Yellow) and IMPROVE (Red) Monitoring Sites



National Core (NCore) Multipollutant Network



National Air Toxics Trends Stations (NATTS)

Appendix H: NAAQS Exceedances

Table of Contents

Section 1: Summary

A NAAQS exceedance for a given pollutant occurs when an air monitor records a concentration that exceeds the level of the short-term, primary NAAQS.[44] When an air pollutant concentration reaches this level, sensitive groups such as children, the elderly, and those with respiratory illness may experience adverse health effects.

Over a period of about a decade there has been a general trend downward in pollutant levels. (For example, the trend from 2010 – 2022 for PM2.5, and 2012 – 2022 for ozone.)[45] However, 2023 was a very exceptional year that interrupted this trend. In 2023 and with respect to EPA health thresholds, there were 122 ozone exceedances, and 45 exceedances of the 24-hour PM2.5 standard. When these numbers are compared to the average number of exceedances Iowa observed from years 2018-2022:

- There was a 36 fold increase in the number of annual ozone exceedances (an average of 3-4 per year, to 122 in 2023 alone)
- And a 20 fold increase in the number of annual exceedances of the 24-hour PM 2.5 standard (an average of 2-3 per year, to 45 in 2023 alone)

These exceedances were due entirely, or almost entirely, to wildfire smoke.

In 2024, things returned to normal and there were no exceedances of any criteria pollutant that the EPA has National Ambient Air Quality Standards (NAAQS) for. Levels so far in 2025 are similarly low, as in 2024.

PM2.5:

There are two types of $PM_{2.5}$ exceedances routinely recorded in the Iowa network: local exceedances and regional exceedances. Local exceedances occur when a single monitor records an exceedance on a given day, usually because the wind is blowing from the direction of a nearby primary $PM_{2.5}$ emitter. Regional exceedances occur when multiple monitors over a wide (multi-county or multi-state) area record exceedances on a given day. Regional exceedances are common in Iowa during wintertime periods when a temperature inversion and stagnant air persists over much of the state, causing pollutant concentrations to build up, and secondary fine particles to form. Regional exceedances attributable to wildfire smoke were especially prevalent in the summer of 2023. Note that the number of particulate matter

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[44] When there is more than one short-term primary NAAQS for a given pollutant, the averaging period used to define the Air Quality Index is selected to define a NAAQS exceedance. For the period from 2019-2025, 24-hour average PM_{10} and $PM_{2.5}$, one-hour SO_2 values, one-hour NO_2 values and 8-hour average O_3 and CO values were compared to the level of the corresponding NAAQS to determine exceedance counts. Information concerning the Air Quality Index is available in 40 CFR Part 58, Appendix G available online at: https://www.ecfr.gov/cgi-bin/retrieveECFR?n=40y6.0.1.1.6 Additional guidance is available online at: https://www3.epa.gov/airnow/aqi-technical-assistance-document-sept2018.pdf.

[45] https://experience.arcgis.com/experience/04e9782943fa487ca35486df7cf543e2/page/Page?views=Ozone (The rolling 3 year averages that the design values shown on this website are based on, somewhat obscure the sudden rise in PM2.5 and ozone levels in 2023.)

exceedances recorded for a city will depend on the number of monitors in the city and the frequency at which particulate samplers in the city are operated.

Values used to compare to the short-term primary NAAQS were 24-hour average concentrations throughout this period. Concentrations greater than or equal to 35.5 µg/m3 were considered to be exceeding the NAAQS. PM2.5 monitors in Iowa sample on a 1 in 3 day or daily schedule, with daily sampling frequencies reserved for highly populated areas or areas that have a history of elevated PM2.5 levels. Monitors in Muscatine (Musser Park) and Clinton (Chancy Park) are located near industries that emit PM2.5.

Ozone

The primary NAAQS utilized 8-hour average ozone values throughout this period. An ozone exceedance day occurs when the highest eight-hour average in the day exceeds the level of the standard. States are required to measure ozone levels during ozone season; in Iowa ozone season runs from March through October. The NAAQS exceedance level was changed from 76 ppb to 71 ppb in October 2015.

On June 3rd of 2023, all twelve ozone sites in Iowa recorded an exceedance due to wildfire smoke.

SO2

Values used to compare to the short-term primary NAAQS were hourly concentrations throughout this period. Concentrations greater than or equal to 75.5 ppb were considered to be exceeding the NAAQS. SO_2 monitors in Iowa sample continuously. The monitor in Clinton at Chancy Park is located near industries that emit SO_2.

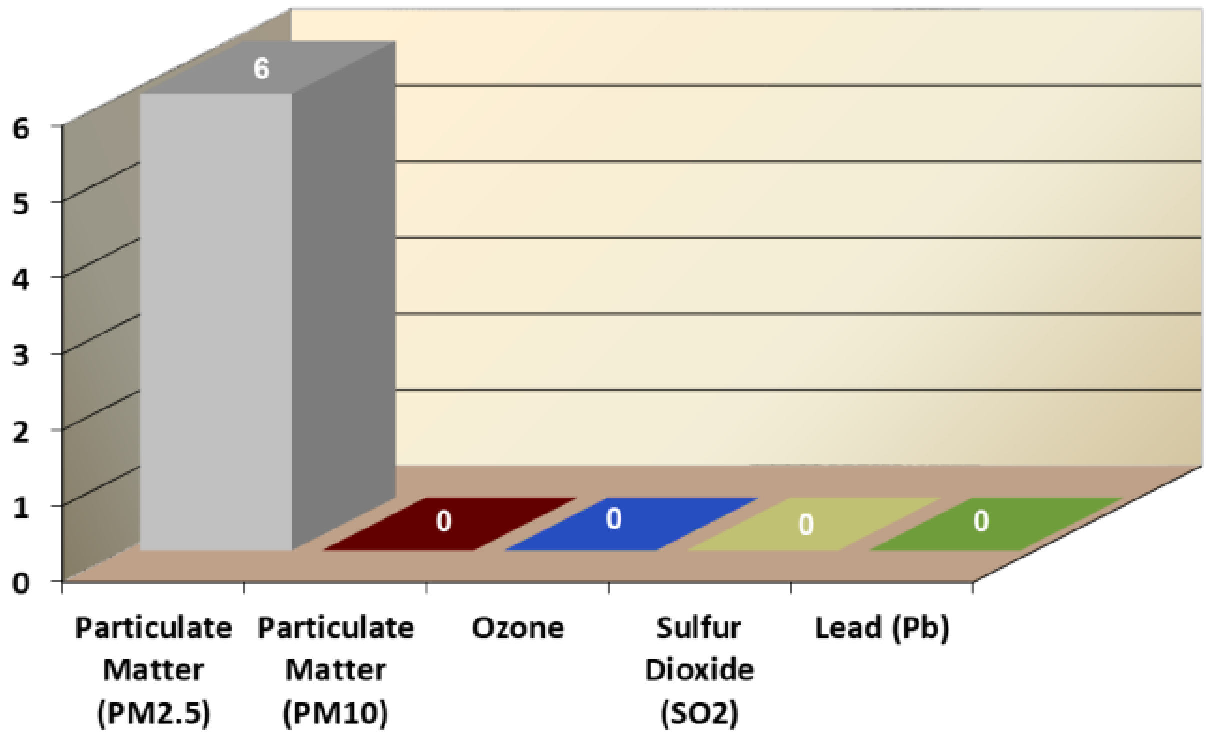
Section 2: NAAQS Exceedances Listing for 2020 to 2024

The tables and charts below provide the monitoring sites, dates, concentrations, and AQI levels for criteria pollutant exceedances measured in Iowa from 2020 through 2024. During this time frame, $PM_{2.5}$, PM_{10}, ozone, NO_2, and SO_2 exceedances were recorded in the Iowa network.[46]

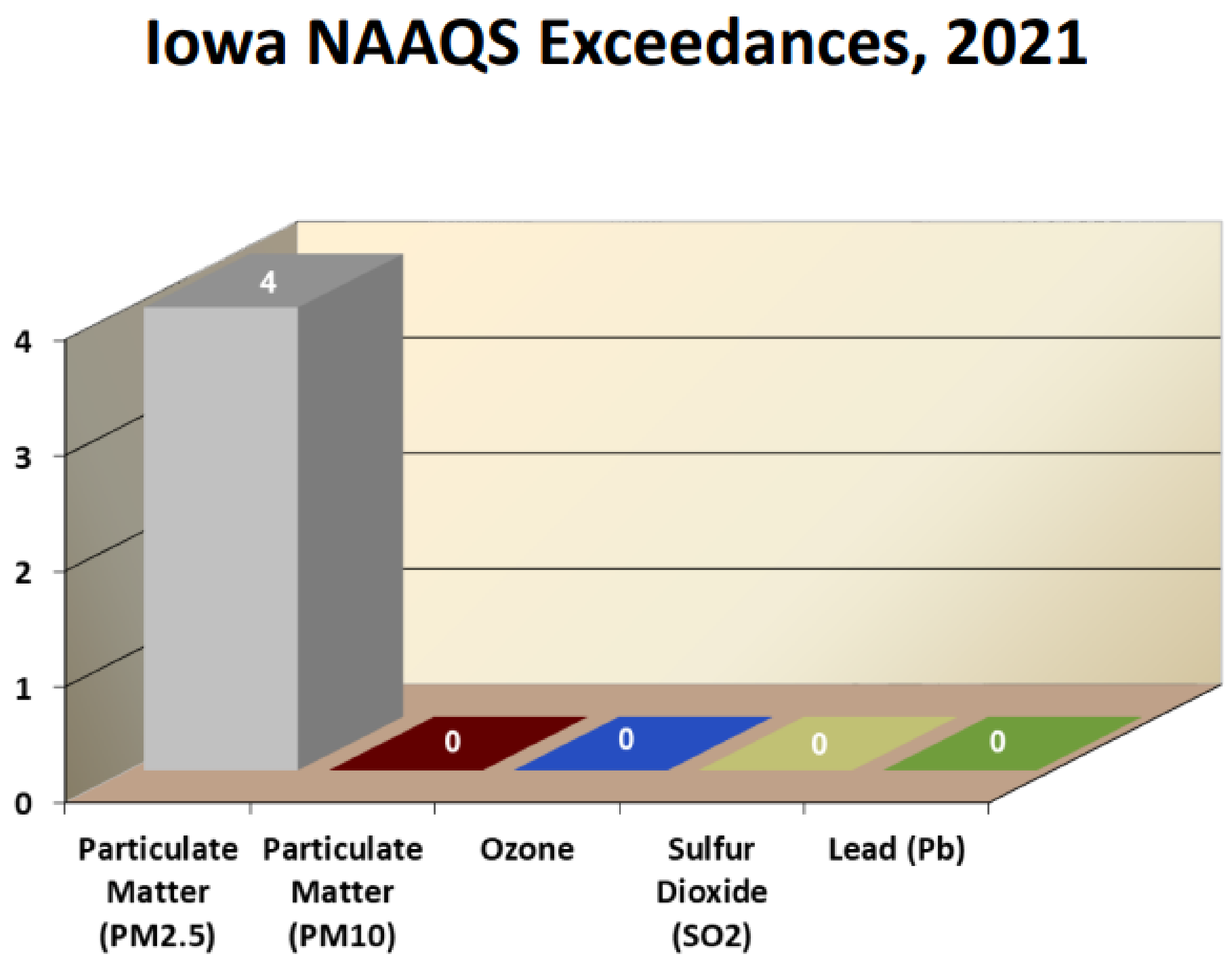
2020 NAAQS Exceedances						
Monitor Type	Site Location	Site Name	Exceedance Date	Concentration	Units	AQI
$PM_{2.5}$	Davenport	Hayes Elementary	7/4/20	48.0	µg/m³	132
$PM_{2.5}$	Central Davenport	Jefferson Elementary	7/4/20	62.8	µg/m³	155
$PM_{2.5}$	Muscatine	Muscatine HS E Campus (Garfield)	7/4/20	44.8	µg/m³	124
$PM_{2.5}$	Des Moines	Polk County Health	7/4/20	108.7	µg/m³	178
$PM_{2.5}$	Des Moines	Polk County Health	7/5/20	60.9	µg/m³	154
$PM_{2.5}$	Clive	Indian Hills	7/5/20	46.9	µg/m³	129
(2) The AQI is not defined for 1-hour SO2 values greater than 304 ppb (AQI of 200).						

[46] NAAQS exceedance counts for the Iowa monitoring network are available online at: http://www.iowadnr.gov/InsideDNR/RegulatoryAir/MonitoringAmbientAir.aspx.

Iowa NAAQS Exceedances, 2020

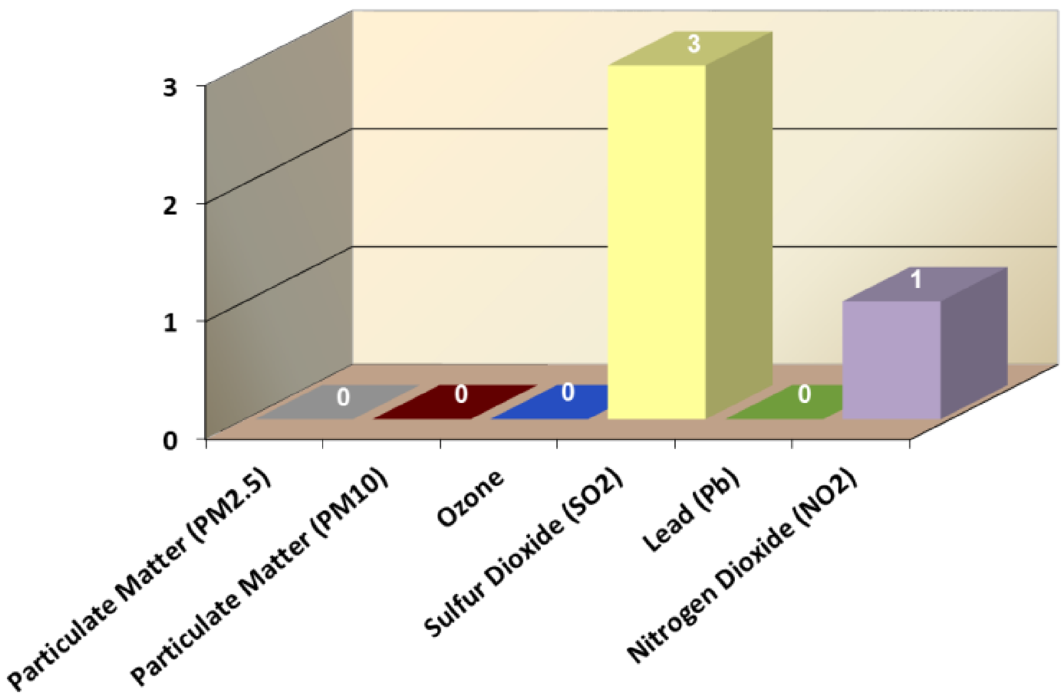


2021 NAAQS Exceedances						
Monitor Type	Site Location	Site Name	Exceedance Date	Concentration	Units	AQI
$PM_{2.5}$	Sioux City	Irving School	7/30/21	79.4	µg/m³	163
$PM_{2.5}$	Emmetsburg	Iowa Lakes Coll.	7/30/21	76.5	µg/m³	162
$PM_{2.5}$	Council Bluffs	Franklin School	7/30/21	42.2	µg/m³	117
$PM_{2.5}$	Des Moines	Des Moines Health Department	8/1/21	37.3	µg/m³	105



2022 NAAQS Exceedances						
Monitor Type	Site Location	Site Name	Exceedance Date	Concentration	Units	AQI
NO_2	Keosauqua	Lake Sugema	3/28/22	107.4	ppb	102
SO_2	Clinton	Chancy Park	6/21/22	81.0	ppb	103
SO_2	Clinton	Chancy Park	6/23/22	83.7	ppb	104
SO_2	Clinton	Chancy Park	6/30/22	133.0	ppb	127

Iowa NAAQS Exceedances, 2022



Iowa NAAQS Exceedances 2023

Monitor Type	Site Location	Site Name	Exceedance Date	Concentration	Units	AQI
Ozone	Pisgah	Forestry Office	5/18/23	75	ppb	115
$PM_{2.5}$	Emmetsburg	Iowa Lakes Coll.	5/18/23	46.7	$\mu g/m^3$	129
$PM_{2.5}$	Sioux City	Irving School	5/18/23	81.3	$\mu g/m^3$	164
Ozone	Pisgah	Forestry Office	5/21/23	72	ppb	105
Ozone	Pisgah	Forestry Office	5/22/23	74	ppb	112
Ozone	Emmetsburg	Iowa Lakes Coll.	5/22/23	72	ppb	105
Ozone	Waverly	Waverly Airport	5/23/23	71	ppb	101
Ozone	Pisgah	Forestry Office	5/23/23	74	ppb	112
Ozone	North Cedar Rapids	Coggon	5/23/23	72	ppb	105
Ozone	Cedar Rapids	Linn Public Health	5/23/23	72	ppb	105
Ozone	Emmetsburg	Iowa Lakes Coll.	5/23/23	74	ppb	112
Ozone	North Davenport	Scott County Park	5/23/23	74	ppb	112
Ozone	Waverly	Waverly Airport	5/24/23	76	ppb	119
Ozone	Pisgah	Forestry Office	5/24/23	72	ppb	105
Ozone	North Cedar Rapids	Coggon	5/24/23	73	ppb	108
Ozone	Cedar Rapids	Linn Public Health	5/24/23	75	ppb	115
Ozone	Emmetsburg	Iowa Lakes Coll.	5/24/23	75	ppb	115
Ozone	North Davenport	Scott County Park	5/24/23	72	ppb	105
Ozone	Waverly	Waverly Airport	5/28/23	71	ppb	101
Ozone	Pisgah	Forestry Office	5/28/23	71	ppb	101
Ozone	Emmetsburg	Iowa Lakes Coll.	5/28/23	72	ppb	105
Ozone	Waverly	Waverly Airport	5/29/23	74	ppb	112
Ozone	Clinton	Rainbow Park	5/29/23	75	ppb	115
Ozone	North Cedar Rapids	Coggon	5/29/23	74	ppb	112
Ozone	Cedar Rapids	Linn Public Health	5/29/23	73	ppb	108
Ozone	North Davenport	Scott County Park	5/29/23	80	ppb	133
Ozone	Central Davenport	Jefferson Elementary	5/29/23	75	ppb	115
Ozone	Clinton	Rainbow Park	5/30/23	74	ppb	112

Iowa NAAQS Exceedances 2023

Monitor Type	Site Location	Site Name	Exceedance Date	Concentration	Units	AQI
Ozone	North Cedar Rapids	Coggon	5/30/23	76	ppb	119
Ozone	Cedar Rapids	Linn Public Health	5/30/23	76	ppb	119
Ozone	North Davenport	Scott County Park	5/30/23	79	ppb	129
Ozone	Central Davenport	Jefferson Elementary	5/30/23	76	ppb	119
Ozone	Clinton	Rainbow Park	5/31/23	75	ppb	115
Ozone	North Davenport	Scott County Park	5/31/23	72	ppb	105
Ozone	Clinton	Rainbow Park	6/2/23	71	ppb	101
Ozone	Cedar Rapids	Linn Public Health	6/2/23	72	ppb	105
Ozone	North Davenport	Scott County Park	6/2/23	76	ppb	119
Ozone	Waverly	Waverly Airport	6/3/23	79	ppb	129
Ozone	Clinton	Rainbow Park	6/3/23	78	ppb	126
Ozone	Pisgah	Forestry Office	6/3/23	78	ppb	126
Ozone	North Cedar Rapids	Coggon	6/3/23	82	ppb	140
Ozone	Cedar Rapids	Linn Public Health	6/3/23	85	ppb	150
Ozone	Red Oak	Viking Lake	6/3/23	74	ppb	112
Ozone	Emmetsburg	Iowa Lakes Coll.	6/3/23	73	ppb	108
Ozone	Des Moines	Polk County Health	6/3/23	79	ppb	129
Ozone	North Des Moines	Sheldahl, Southern Crossroads	6/3/23	77	ppb	122
Ozone	North Davenport	Scott County Park	6/3/23	81	ppb	136
Ozone	Central Davenport	Jefferson Elementary	6/3/23	76	ppb	119
Ozone	Keosauqua	Lake Sugema	6/3/23	79	ppb	129
Ozone	Clinton	Rainbow Park	6/4/23	72	ppb	105
Ozone	Pisgah	Forestry Office	6/4/23	77	ppb	122
Ozone	Emmetsburg	Iowa Lakes Coll.	6/4/23	71	ppb	101
Ozone	North Davenport	Scott County Park	6/4/23	72	ppb	105
Ozone	Central Davenport	Jefferson Elementary	6/4/23	71	ppb	101
Ozone	Waverly	Waverly Airport	6/5/23	81	ppb	136
Ozone	Pisgah	Forestry Office	6/5/23	72	ppb	105
Ozone	North Cedar Rapids	Coggon	6/5/23	71	ppb	101

Iowa NAAQS Exceedances 2023

Monitor Type	Site Location	Site Name	Exceedance Date	Concentration	Units	AQI
Ozone	Emmetsburg	Iowa Lakes Coll.	6/5/23	74	ppb	112
Ozone	North Des Moines	Sheldahl, Southern Crossroads	6/5/23	74	ppb	112
Ozone	North Davenport	Scott County Park	6/5/23	74	ppb	112
Ozone	Pisgah	Forestry Office	6/6/23	82	ppb	140
Ozone	Red Oak	Viking Lake	6/6/23	72	ppb	105
Ozone	Des Moines	Polk County Health	6/6/23	77	ppb	122
Ozone	North Davenport	Scott County Park	6/6/23	72	ppb	105
Ozone	Central Davenport	Jefferson Elementary	6/6/23	74	ppb	112
Ozone	Pisgah	Forestry Office	6/7/23	78	ppb	126
Ozone	Clinton	Rainbow Park	6/10/23	72	ppb	105
Ozone	Cedar Rapids	Linn Public Health	6/10/23	72	ppb	105
Ozone	North Davenport	Scott County Park	6/10/23	77	ppb	122
Ozone	Central Davenport	Jefferson Elementary	6/10/23	72	ppb	105
Ozone	Emmetsburg	Iowa Lakes Coll.	6/13/23	73	ppb	108
Ozone	Pisgah	Forestry Office	6/13/23	71	ppb	101
Ozone	Pisgah	Forestry Office	6/14/23	73	ppb	105
Ozone	Red Oak	Viking Lake	6/14/23	72	ppb	105
Ozone	Emmetsburg	Iowa Lakes Coll.	6/14/23	74	ppb	112
Ozone	Des Moines	Polk County Health	6/14/23	72	ppb	105
Ozone	North Des Moines	Sheldahl, Southern Crossroads	6/14/23	71	ppb	101
Ozone	Pisgah	Forestry Office	6/15/23	76	ppb	119
Ozone	Emmetsburg	Iowa Lakes Coll.	6/15/23	77	ppb	122
Ozone	Des Moines	Polk County Health	6/15/23	72	ppb	105
$PM_{2.5}$	Iowa City	Hoover School	6/15/23	36.5	$\mu g/m^3$	103
$PM_{2.5}$	Clinton	Chancy Park	6/15/23	43.4	$\mu g/m^3$	120
$PM_{2.5}$	Central Davenport	Jefferson Elementary	6/15/23	38.7	$\mu g/m^3$	109
$PM_{2.5}$	Cedar Rapids	Linn Public Health	6/15/23	43.0	$\mu g/m^3$	119
Ozone	Clinton	Rainbow Park	6/19/23	83	ppb	143
Ozone	North Cedar Rapids	Coggon	6/19/23	79	ppb	129

Iowa NAAQS Exceedances 2023

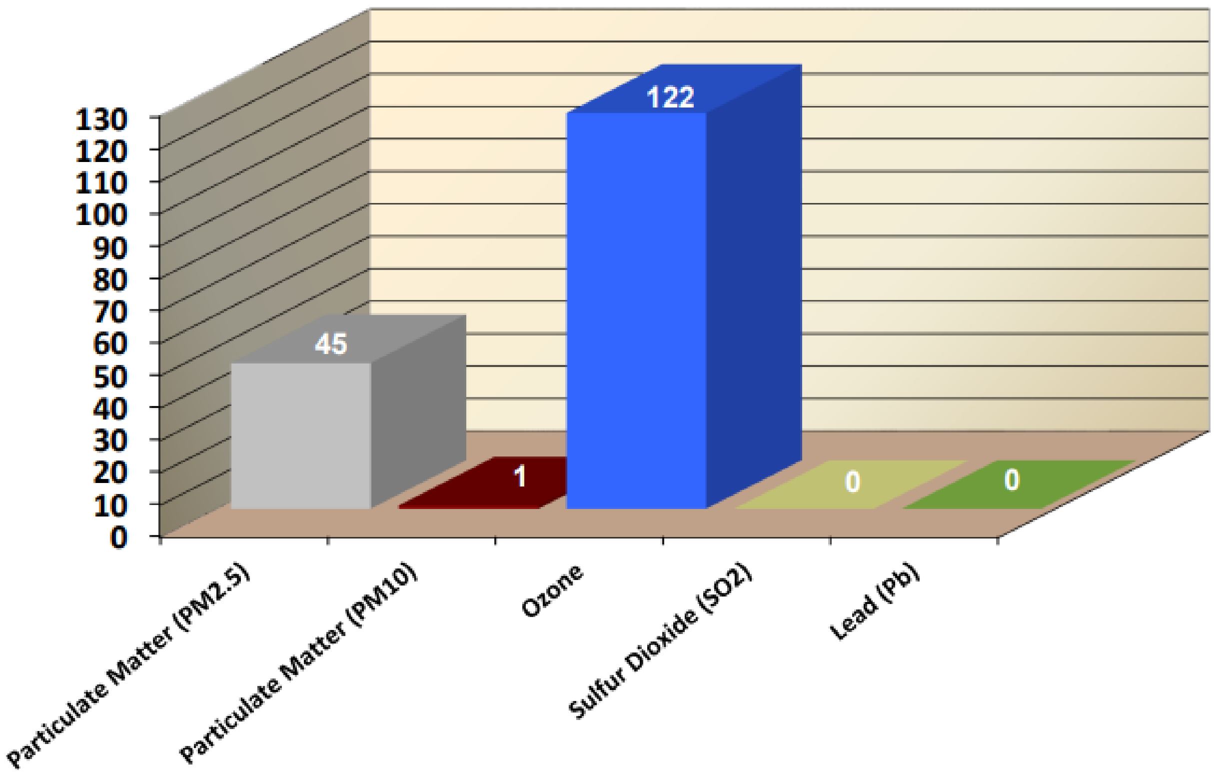
Monitor Type	Site Location	Site Name	Exceedance Date	Concentration	Units	AQI
Ozone	Cedar Rapids	Linn Public Health	6/19/23	85	ppb	150
Ozone	North Davenport	Scott County Park	6/19/23	82	ppb	140
Ozone	Central Davenport	Jefferson Elementary	6/19/23	79	ppb	129
Ozone	Keosauqua	Lake Sugema	6/19/23	73	ppb	108
Ozone	Waverly	Waverly Airport	6/20/23	85	ppb	150
Ozone	Clinton	Rainbow Park	6/20/23	80	ppb	133
Ozone	Pisgah	Forestry Office	6/20/23	75	ppb	115
Ozone	North Cedar Rapids	Coggon	6/20/23	81	ppb	139
Ozone	Cedar Rapids	Linn Public Health	6/20/23	82	ppb	140
Ozone	Red Oak	Viking Lake	6/20/23	74	ppb	112
Ozone	Emmetsburg	Iowa Lakes Coll.	6/20/23	87	ppb	154
Ozone	Des Moines	Polk County Health	6/20/23	79	ppb	129
Ozone	North Des Moines	Sheldahl, Southern Crossroads	6/20/23	76	ppb	119
Ozone	North Davenport	Scott County Park	6/20/23	80	ppb	133
Ozone	Central Davenport	Jefferson Elementary	6/20/23	79	ppb	129
Ozone	Keosauqua	Lake Sugema	6/20/23	83	ppb	143
Ozone	Clinton	Rainbow Park	6/21/23	77	ppb	122
Ozone	Pisgah	Forestry Office	6/21/23	75	ppb	115
Ozone	Emmetsburg	Iowa Lakes Coll.	6/21/23	76	ppb	119
Ozone	North Davenport	Scott County Park	6/21/23	75	ppb	115
Ozone	Waverly	Waverly Airport	6/22/23	78	ppb	126
Ozone	North Cedar Rapids	Coggon	6/22/23	78	ppb	126
Ozone	Cedar Rapids	Linn Public Health	6/22/23	80	ppb	133
Ozone	Emmetsburg	Iowa Lakes Coll.	6/22/23	75	ppb	115
Ozone	Des Moines	Polk County Health	6/22/23	73	ppb	108
Ozone	North Davenport	Scott County Park	6/22/23	73	ppb	108
Ozone	Waverly	Waverly Airport	6/23/23	75	ppb	115
Ozone	Clinton	Rainbow Park	6/23/23	71	ppb	101
Ozone	North Cedar Rapids	Coggon	6/23/23	76	ppb	119

Iowa NAAQS Exceedances 2023

Monitor Type	Site Location	Site Name	Exceedance Date	Concentration	Units	AQI
Ozone	Cedar Rapids	Linn Public Health	6/23/23	78	ppb	126
Ozone	Des Moines	Polk County Health	6/23/23	77	ppb	122
Ozone	North Des Moines	Sheldahl, Southern Crossroads	6/23/23	72	ppb	105
Ozone	North Davenport	Scott County Park	6/23/23	77	ppb	122
Ozone	Central Davenport	Jefferson Elementary	6/23/23	76	ppb	119
Ozone	Clinton	Rainbow Park	6/24/23	75	ppb	115
Ozone	North Davenport	Scott County Park	6/24/23	74	ppb	112
Ozone	Cedar Rapids	Linn Public Health	6/27/23	71	ppb	101
Ozone	Central Davenport	Jefferson Elementary	6/27/23	72	ppb	105
$PM_{2.5}$	Iowa City	Hoover School	6/27/23	102.1	µg/m^3	175
$PM_{2.5}$	Clinton	Chancy Park	6/27/23	93.1	µg/m^3	170
$PM_{2.5}$	Central Davenport	Jefferson Elementary	6/27/23	93.1	µg/m^3	170
$PM_{2.5}$	Cedar Rapids	Linn Public Health	6/27/23	95.1	µg/m^3	171
$PM_{2.5}$	Muscatine	Muscatine H.S. East Campus	6/27/23	93.0	µg/m^3	170
$PM_{2.5}$	Des Moines	Des Moines, Health Dept.	6/27/23	52.3	µg/m^3	142
$PM_{2.5}$	Des Moines	Public Works	6/27/23	59.6	µg/m^3	153
Ozone	Clinton	Rainbow Park	6/28/23	86	ppb	151
Ozone	North Cedar Rapids	Coggon	6/28/23	73	ppb	108
Ozone	North Davenport	Scott County Park	6/28/23	79	ppb	129
Ozone	Central Davenport	Jefferson Elementary	6/28/23	76	ppb	119
$PM_{2.5}$	Iowa City	Hoover School	6/28/23	116.9	µg/m^3	183
$PM_{2.5}$	Clinton	Chancy Park	6/28/23	133.1	µg/m^3	191
$PM_{2.5}$	Central Davenport	Jefferson Elementary	6/28/23	127.5	µg/m3	188
$PM_{2.5}$	Muscatine	Muscatine H.S. East Campus	6/28/23	125.5	µg/m3	187
$PM_{2.5}$	Cedar Rapids	Linn Public Health	6/28/23	110.0	µg/m3	179
$PM_{2.5}$	Des Moines	Des Moines, Health Dept.	6/28/23	63.1	µg/m3	155
$PM_{2.5}$	Des Moines	Public Works	6/28/23	76.8	µg/m^3	162
PM_{10}	Buffalo	Linwood Mining	6/28/23	160	µg/m^3	103

Iowa NAAQS Exceedances 2023						
Monitor Type	Site Location	Site Name	Exceedance Date	Concentration	Units	AQI
$PM_{2.5}$	Iowa City	Hoover School	6/29/23	100.6	µg/m3	188
$PM_{2.5}$	Clinton	Chancy Park	6/29/23	78.9	µg/m3	163
$PM_{2.5}$	Central Davenport	Jefferson Elementary	6/29/23	67.0	µg/m3	157
$PM_{2.5}$	Cedar Rapids	Linn Public Health	6/29/23	103.3	µg/m3	176
$PM_{2.5}$	Des Moines	Des Moines, Health Dept.	6/29/23	38.3	µg/m3	108
$PM_{2.5}$	Des Moines	Public Works	6/29/23	41.9	µg/m3	117
$PM_{2.5}$	Waterloo	Water Tower	6/29/23	56.2	µg/m3	151
$PM_{2.5}$	Muscatine	Muscatine H.S. East Campus	6/29/23	76.0	µg/m3	162
$PM_{2.5}$	Keosauqua	Lake Sugema	6/29/23	38.7	µg/m3	109
$PM_{2.5}$	Clinton	Rainbow Park	6/29/23	84.1	µg/m3	166
$PM_{2.5}$	Muscatine	Greenwood Cemetery	6/29/23	76.8	µg/m3	162
$PM_{2.5}$	Muscatine	Musser Park	6/29/23	77.6	µg/m3	162
$PM_{2.5}$	Davenport	Hayes School	6/29/23	70.5	µg/m3	159
$PM_{2.5}$	Des Moines	Des Moines, Health Dept.	7/15/23	44.5	µg/m3	123
$PM_{2.5}$	Des Moines	Public Works	7/15/23	47.4	µg/m^3	130
$PM_{2.5}$	Muscatine	Muscatine H.S. East Campus	7/16/23	52.3	µg/m3	142
$PM_{2.5}$	Iowa City	Hoover School	7/16/23	49.5	µg/m3	135
$PM_{2.5}$	Central Davenport	Jefferson Elementary	7/16/23	45.3	µg/m3	125
$PM_{2.5}$	Cedar Rapids	Linn Public Health	7/16/23	46.9	µg/m3	129
$PM_{2.5}$	Des Moines	Des Moines, Health Dept.	7/16/23	61.6	µg/m3	154
$PM_{2.5}$	Des Moines	Public Works	7/16/23	67.2	µg/m^3	157
$PM_{2.5}$	Emmetsburg	Iowa Lakes Coll.	9/6/23	41.6	µg/m3	116
$PM_{2.5}$	Red Oak	Viking Lake	9/6/23	50.0	µg/m3	137
$PM_{2.5}$	Sioux City	Irving School	9/6/23	58.0	µg/m^3	152
$PM_{2.5}$	Council Bluffs	Franklin School	9/6/23	55.5	µg/m^3	151

Iowa NAAQS Exceedances, 2023



No Exceedances of the National Ambient Air Quality Standards (NAAQS) were measured in Iowa in the 2024 Calendar Year.

Appendix I: NAAQS Violations and Design Values

Table of Contents

Section 1: Summary

Iowa's most recent year of monitoring data (2024) shows no monitored NAAQS violations. Appendix H provides information concerning NAAQS exceedances in Iowa for the past five years of certified monitoring data. A NAAQS exceedance is not the same as a NAAQS violation. Multiple exceedances of the NAAQS may occur at a monitoring site without violating the NAAQS. (A more precise description of the process used to establish NAAQS violations for PM_{10}, $PM_{2.5}$ and ozone monitoring data is indicated below.) When a NAAQS exceedance occurs at a monitoring site, air pollutant levels have exceeded the threshold for adverse health effects. When a NAAQS violation is recorded at a monitoring site, the State acquires additional authority under the provision of the Clean Air Act[47] to address the air quality problem around the monitor. These measures may include modifications to the State's permitting program that apply to industries with emissions that contribute to the monitored violation. [48]

The 24-hour PM_{10} NAAQS is violated at a monitoring site if the three year average of the annual number of expected exceedances is greater than one (1.05 or greater).[49] A PM_{10} NAAQS exceedance occurs when a 24-hour PM_{10} concentration is 155 $\mu g/m^3$ or greater. The annual number of expected exceedances for a given year is obtained by adding the quarterly expected exceedances for the four quarters of that year. The quarterly expected exceedances are obtained by dividing the number of exceedances in a particular quarter by the data capture rate for that quarter. Agencies typically adopt a daily sampling schedule at a PM_{10} monitoring location where an exceedance is measured and additional exceedances are likely. Owing to the form of the NAAQS, any monitoring site that records four exceedances in three years will violate the standard. A monitoring site that records three exceedances in three years is also quite likely to violate the standard, as data capture rates exceeding 95% are difficult to achieve with a filter sampler. In Iowa, over the past five years, no PM_{10} monitoring sites have recorded violations of the PM_{10} NAAQS.

For $PM_{2.5}$, ozone and other criteria pollutants, a number called the design value is computed from three years of monitoring data to compare the air quality at a monitoring site to the NAAQS.[50,51] The 8-hour design value for ozone is the annual fourth-highest daily maximum 8-hour ozone concentration averaged over three years. The $PM_{2.5}$ 24-hour design value is the annual 98th percentile 24-hour value averaged over three years. The $PM_{2.5}$ annual design value is the annual mean 24-hour value averaged over three years.

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[47] See the Clean Air Act requirements for non-attainment areas in U.S. Code Title 42, Chapter 85, Subchapter I, Part D, available online at: https://www.law.cornell.edu/uscode/text/42/chapter-85/subchapter-I/part-D

[48] See the description of permitting requirements in non-attainment areas in 40 CFR 51.165, available on line at: https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr51_main_02.tpl.

[49] Procedures for calculating PM_{10} attainment status from three years of monitoring data are contained in 40 CFR Part 50, Appendix K, available online at: https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr50_main_02.tpl.
Note that the procedure described in the text for establishing violations of the PM_{10} NAAQS is somewhat descriptive and does not apply in certain special cases.

[50] Procedures for calculating design values for $PM_{2.5}$ and Ozone are contained in 40 CFR Part 50, Appendices N and P available online at: https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr50_main_02.tpl.

[51] Design values for this report have been calculated by the department. When data capture at a monitoring site is poor, EPA has discretion in application of some of the data handling rules in the computation of design values. Official design values are calculated by the EPA and are available online at: https://www.epa.gov/air-trends/air-quality-design-values.

Based on the most recent three year period of certified data available at the writing of this report (2021-2023) median design values for ozone in the Iowa network are 94% of the ozone NAAQS, median $PM_{2.5}$ 24-hour design values are 61% of the $PM_{2.5}$ 24-hour NAAQS, and median $PM_{2.5}$ annual design values are 93% of the $PM_{2.5}$ annual NAAQS. (See the summary section of Appendix H for a more detailed discussion of the temporary increase in ozone and PM2.5 levels due to the impact of wildfire smoke in 2023.)

For the most recent three-year period (2021-2023), no NAAQS violations have been recorded in the Iowa networks.

Sections 2 - 4 examine the ozone and $PM_{2.5}$ design values over the five-year period from 2017 to 2023.

Sections 5 - 6 examine the one-hour SO_2 and NO_2 design values for the period 2017 to 2023.

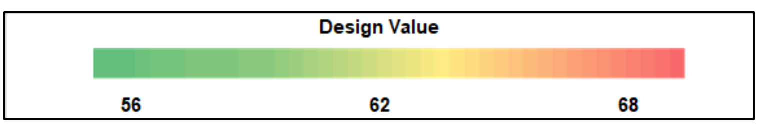
Section 7 examines the lead design values over the period from 2017 to 2023.

Section 2: Ozone Design Values

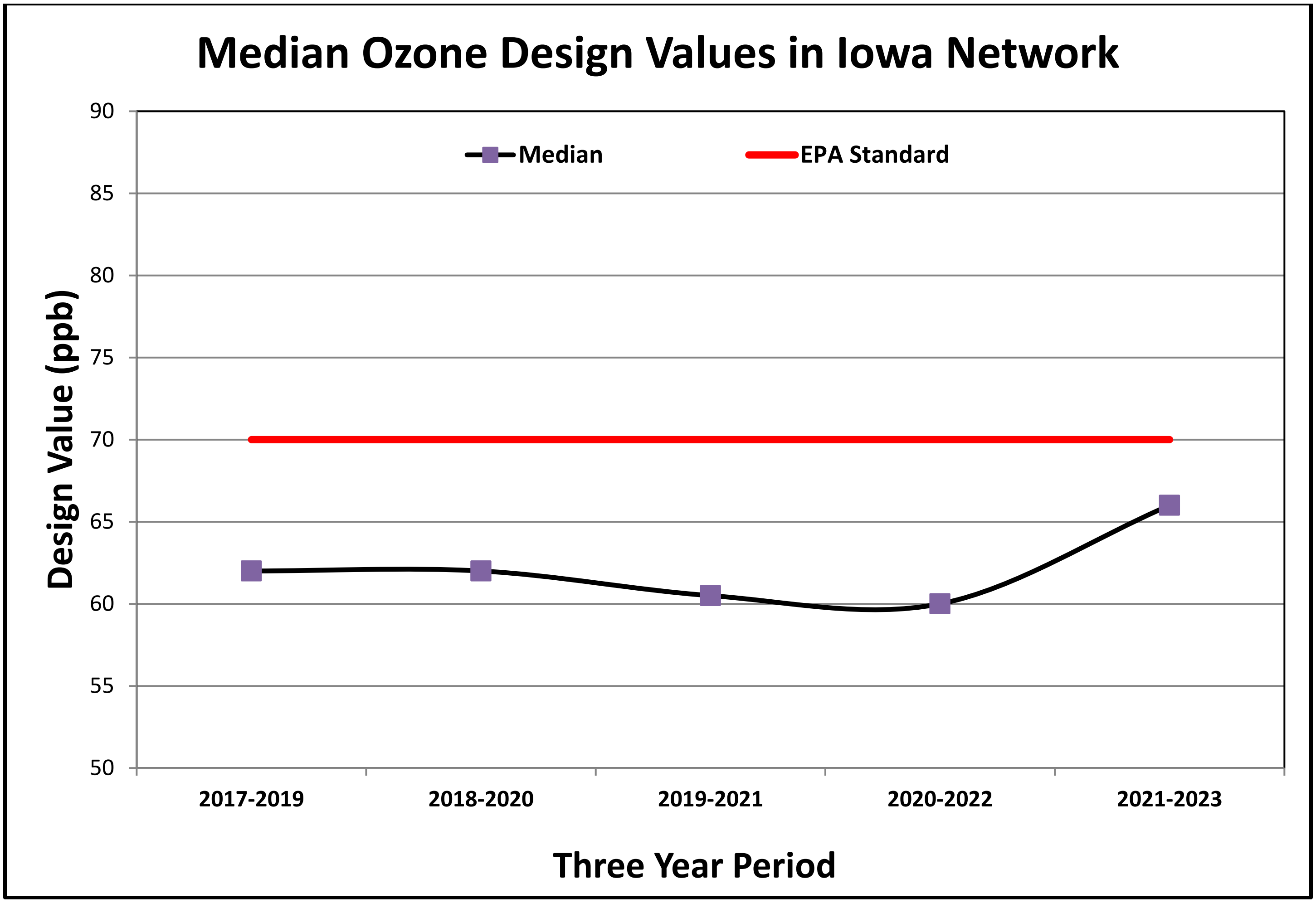
Trends in ozone design values for the period 2017-2023 are indicated below. 2021-2023 monitoring data shows design values across the State ranged from 59-68 ppb, with a median value of 66 ppb.

2017 – 2023 Ozone Design Values (ppb)

Years	Waterloo Downwind (Waverly, Airport Site 190170011)	Clinton Metro (Clinton, Rainbow Park 190450021)	Omaha- Council Bluffs Downwind (Pisgah, Forestry Office 190850007)	Cedar Rapids Downwind (Coggon Elementary School 191130033)	Cedar Rapids Metro (Cedar Rapids, Public Health 191130040)	Southwest Background (Viking Lake State Park 191370002)	Northwest Background (Emmetsburg, Iowa Lakes Community College 191471002)	Des Moines Metro (Des Moines, Health Department 191530030)	Des Moines Downwind (Sheldahl, Southern Crossroads 191531579)	Davenport Downwind (Scott County Park 191630014)	Davenport Metro (Davenport, Jefferson Schools 191630015)	Southeast Background (Lake Sugema State Park 191770006)
2017-2019	62	62	64	63	60	60	64	61	62	63	62	61
2018-2020	63	62	63	64	60	59	64	60	61	63	62	60
2019-2021	61	61	62	62	59	57	63	59	60	60	61	58
2020-2022	60	63	61	61	60	57	61	58	57	60	60	56
2021-2023	66	68	66	66	67	62	66	65	62	67	65	59

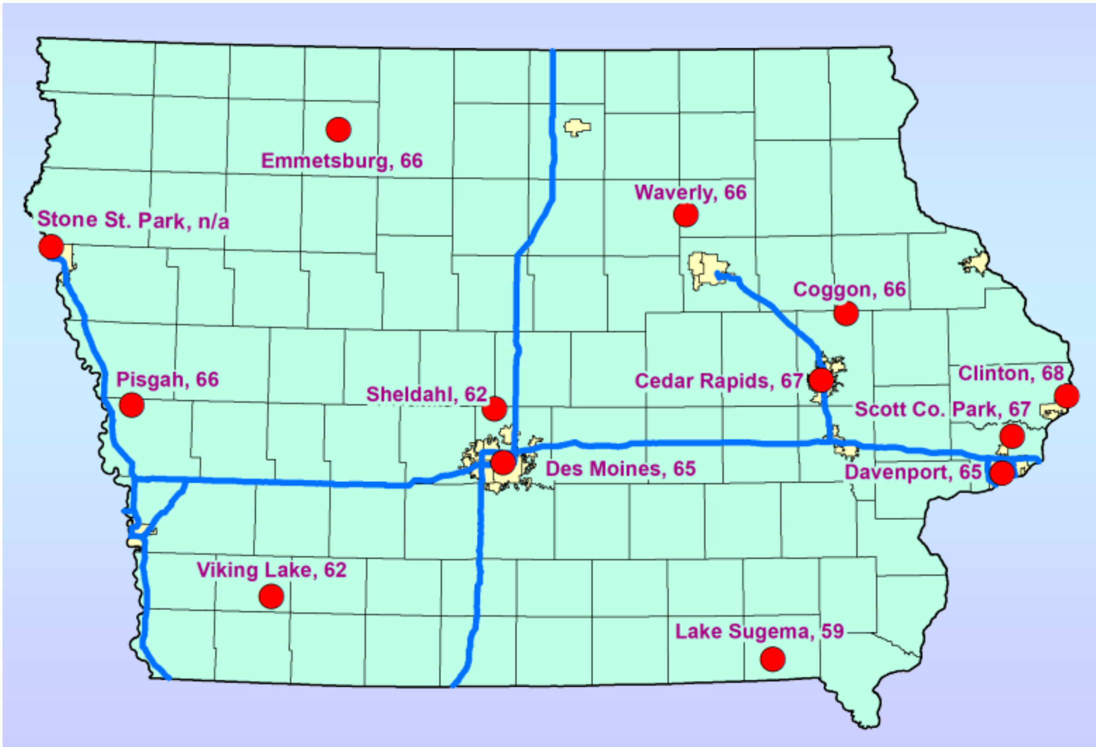


Iowa ozone design values by site and three-year period. Current NAAQS is 70 ppb. Grey cells indicate invalid design values as the site was not operational or did not meet data completeness requirements.

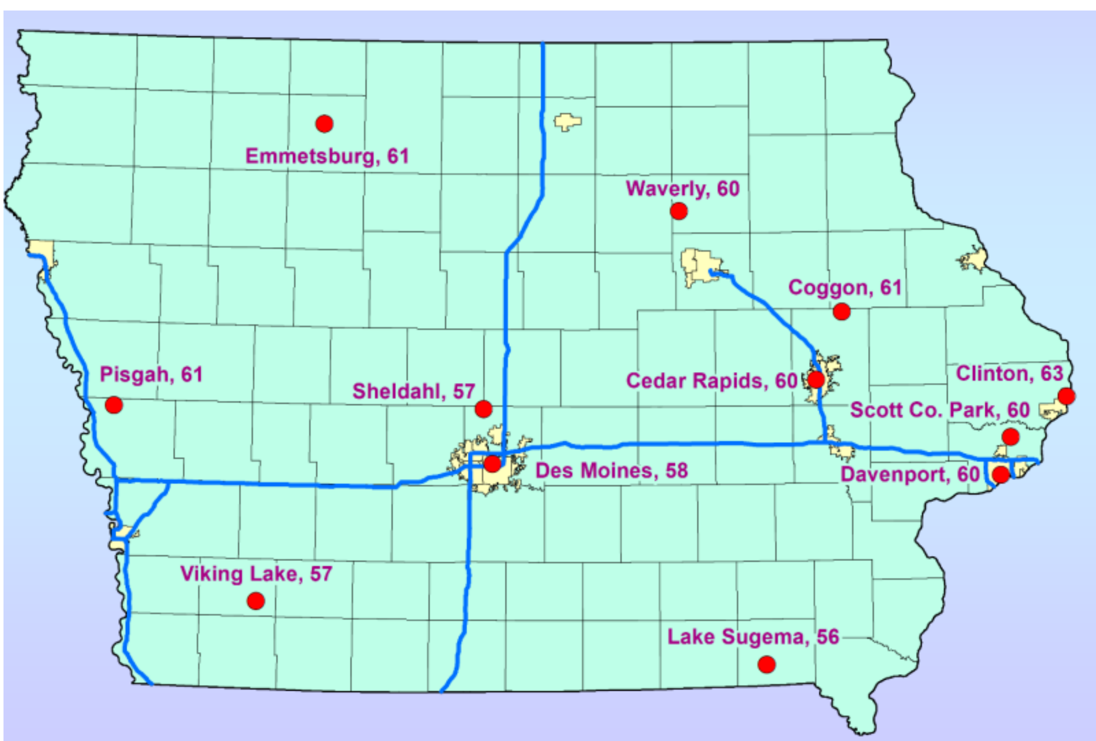


Median Ozone Design Values in Iowa Network
Median
EPA Standard
Design Value (ppb)
90
85
80
75
70
65
60
55
50
2017-2019
2018-2020
2019-2021
2020-2022
2021-2023
Three Year Period

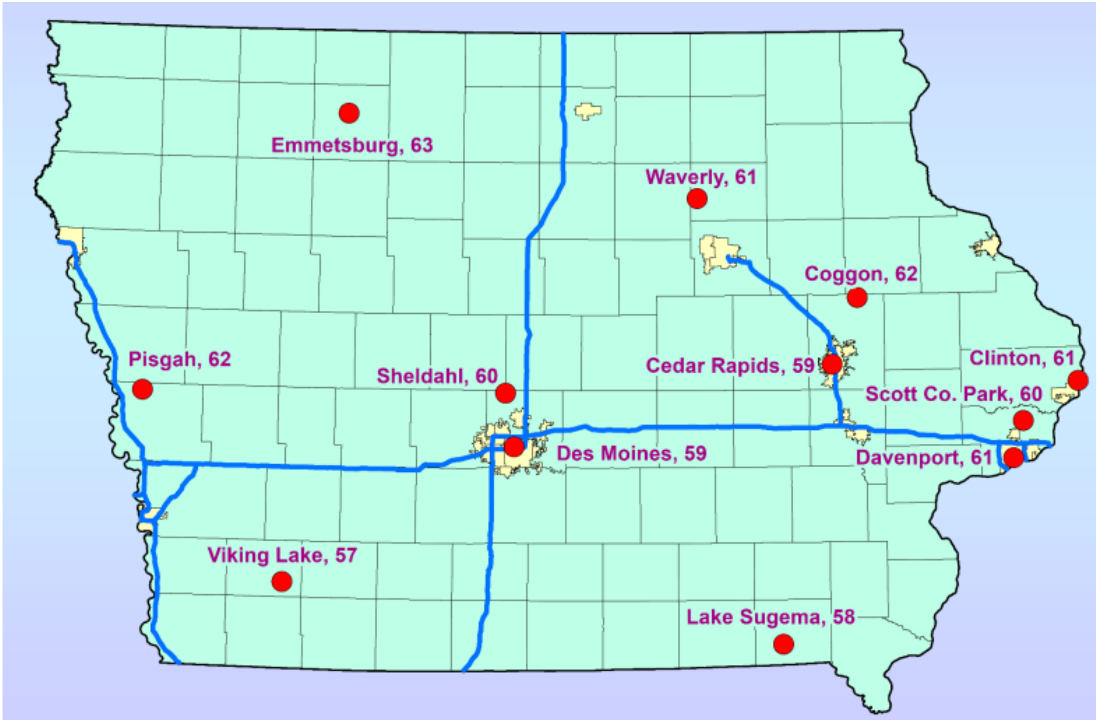
Ozone design value maps for the past five years are shown below. Three years of complete data are required to compute a design value, and only sites with complete data are indicated. 2021-2023 data shows ozone levels at monitoring sites in Linn County, Scott County, and Clinton County, to be the highest in the network.



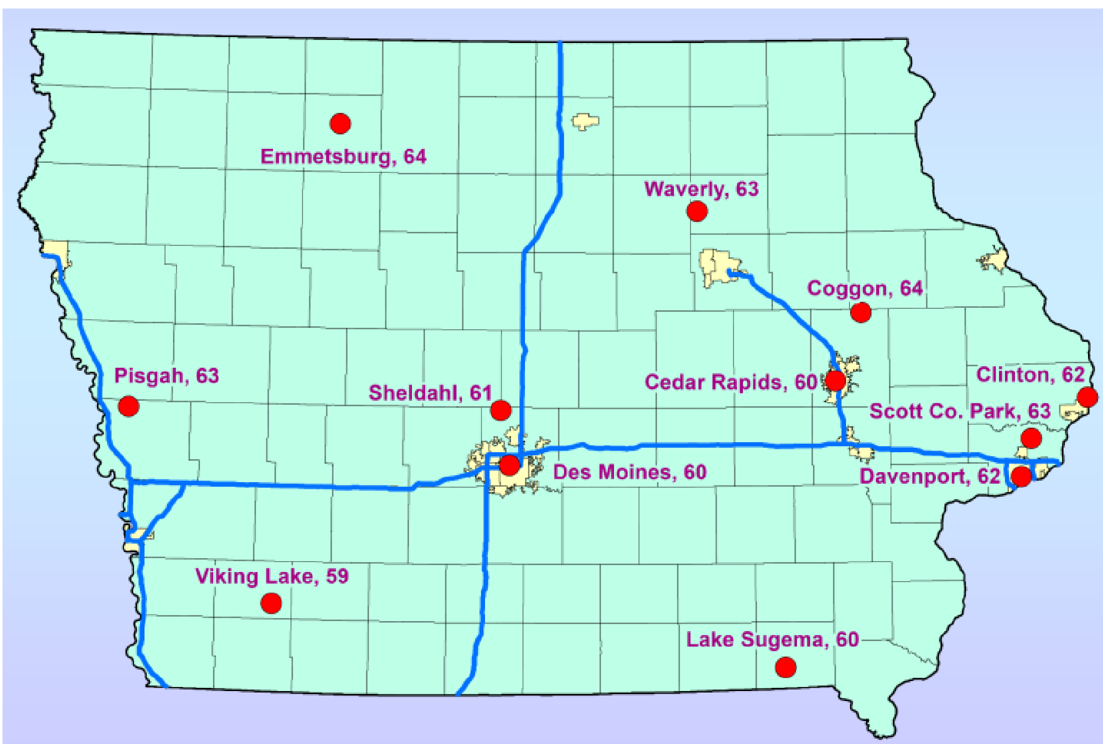
2021-2023 Design Values (values in ppb, values greater than 70 exceed the standard)



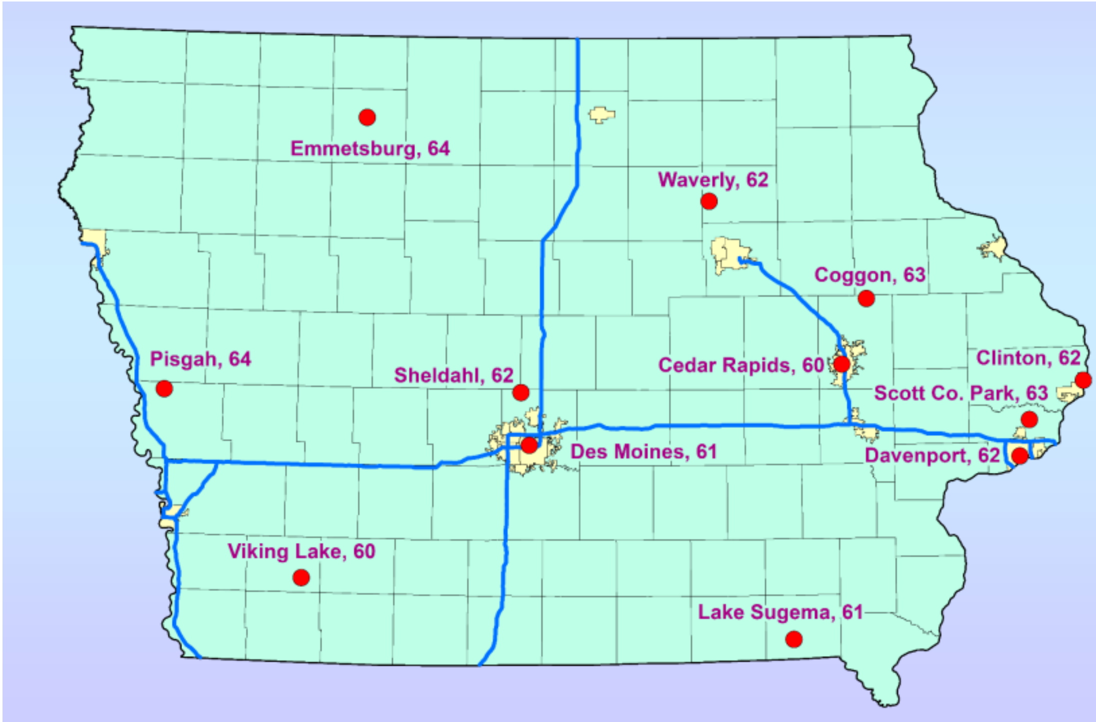
2020-2022 Design Values (values in ppb, values greater than 70 exceed the standard)



2019-2021 Design Values (values in ppb, values greater than 70 exceed the standard)



2018-2020 Design Values (values in ppb, values greater than 70 exceed the standard)



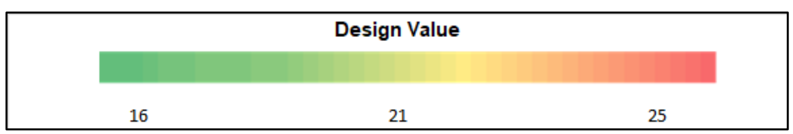
2017-2019 Design Values (values in ppb, values greater than 70 exceed the standard)

Section 3: $PM_{2.5}$ 24-Hour Design Values

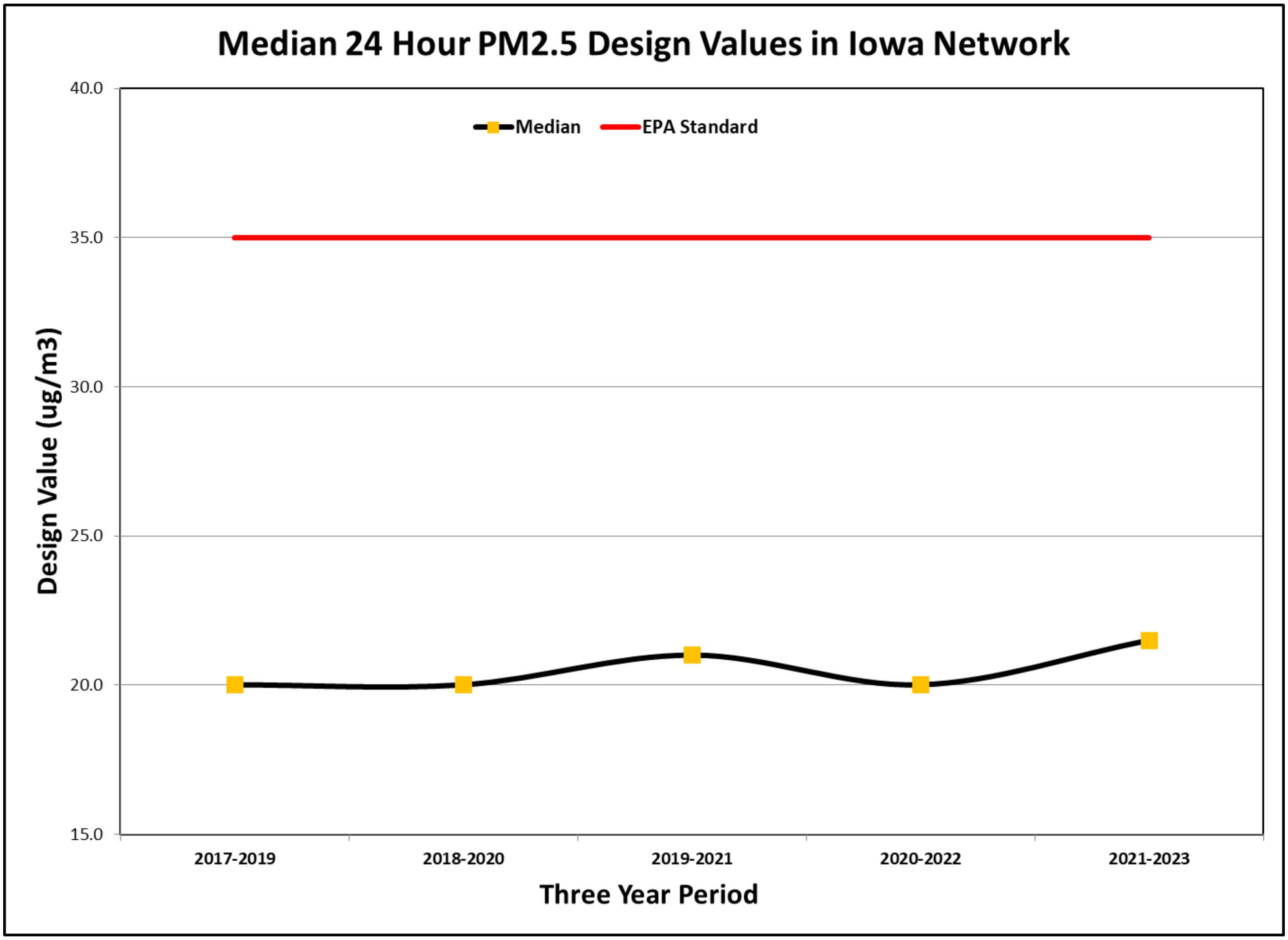
Trends and maps of $PM_{2.5}$ 24-hour design values for the period 2017-2023 are provided below. During the five-year period, no violations of the NAAQS were recorded in the Iowa network. 2021-2023 monitoring data shows design values ranging from 18 to 25 µg/m^3, with a median value of 21.5 µg/m^3. There are three monitoring sites located in Eastern Iowa cities that are influenced by industrial $PM_{2.5}$ emitters. A monitor at Chancy Park (next to the Archer Daniels Midland Plant) in Clinton recorded levels that were 66% less than violation levels. Monitors at Muscatine High School East Campus and Musser Park (both about a quarter mile from Grain Processing Corporation) in Muscatine recorded levels about 63% and 57% under the violation level respectively.

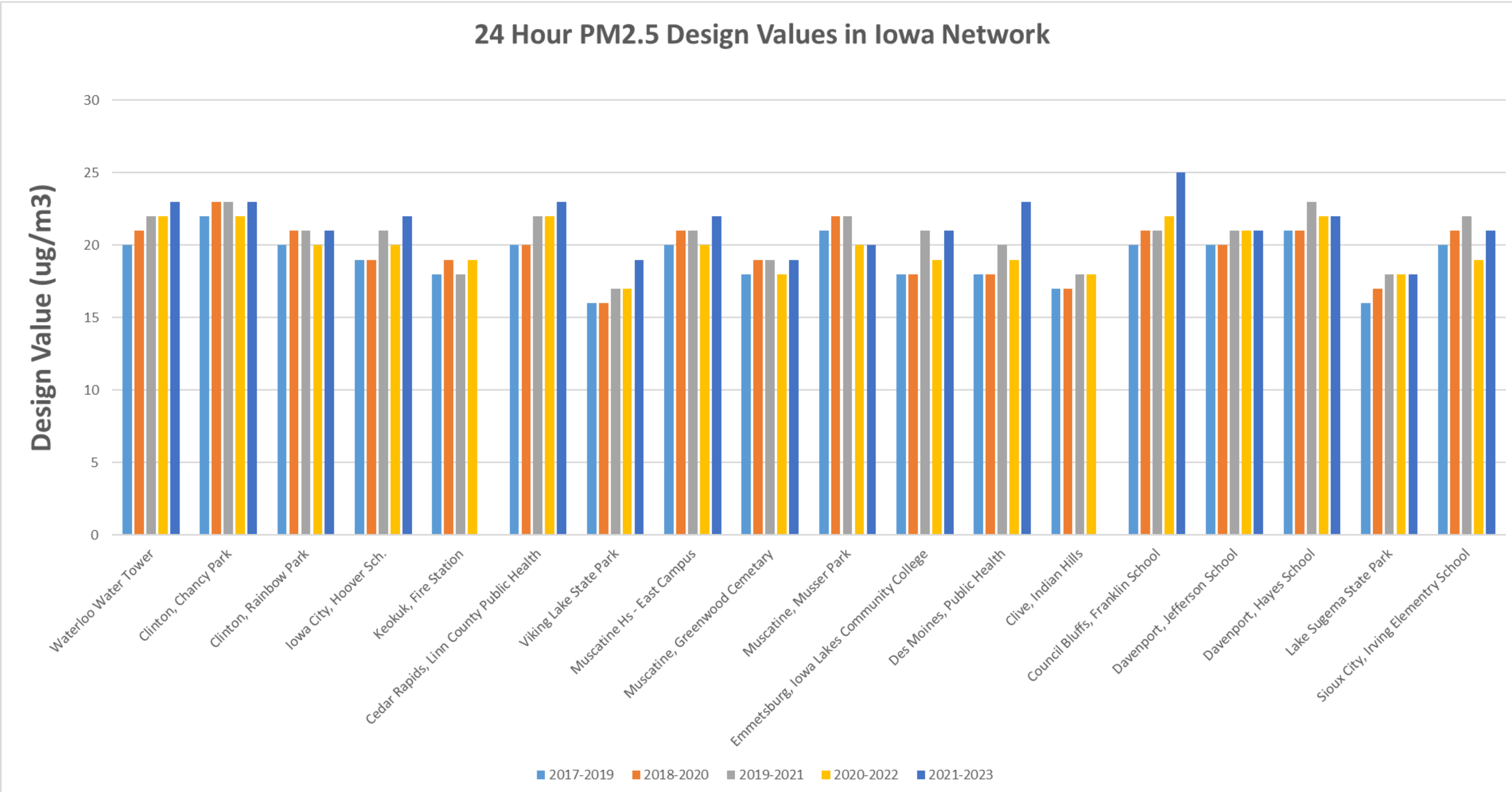
PM$_{2.5}$ 24-Hour Design Values 2017-2023 (µg/m^3)

AQS Site ID	Site Name	2017-2019	2018-2020	2019-2021	2020-2022	2021-2023
190130009	Waterloo Water Tower	20	21	22	22	23
190450019	Clinton, Chancy Park	22	23	23	22	23
190450021	Clinton, Rainbow Park	20	21	21	20	21
191032001	Iowa City, Hoover Sch.	19	19	21	20	22
191110008	Keokuk, Fire Station	18	19	18	19	
191130040	Cedar Rapids, Linn County Public Health	20	20	22	22	23
191370002	Viking Lake State Park	16	16	17	17	19
191390015	Muscatine Hs - East Campus	20	21	21	20	22
191390016	Muscatine, Greenwood Cemetary	18	19	19	18	19
191390020	Muscatine, Musser Park	21	22	22	20	20
191471002	Emmetsburg, Iowa Lakes Community College	18	18	21	19	21
191530030	Des Moines, Public Health	18	18	20	19	23
191532510	Clive, Indian Hills	17	17	18	18	
191550009	Council Bluffs, Franklin School	20	21	21	22	25
191630015	Davenport, Jefferson School	20	20	21	21	21
191630020	Davenport, Hayes School	21	21	23	22	22
191770006	Lake Sugema State Park	16	17	18	18	18
191930021	Sioux City, Irving Elementry School	20	21	22	19	21



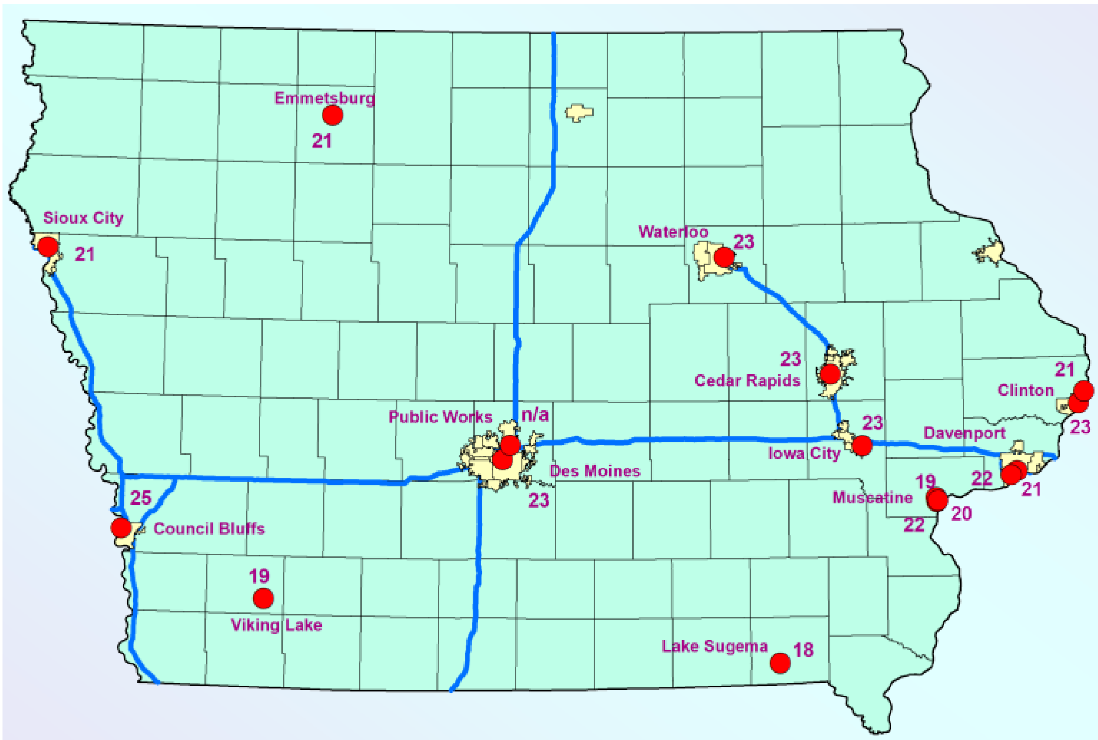
Iowa 24-hour PM$_{2.5}$ design values by site and three-year period. Grey cells indicate the site was not operational or had incomplete data. Current NAAQS is 35 µg/m3.


Median 24 Hour PM2.5 Design Values in Iowa Network
Median
EPA Standard
Design Value (ug/m3)
40.0
35.0
30.0
25.0
20.0
15.0
2017-2019
2018-2020
2019-2021
2020-2022
2021-2023
Three Year Period

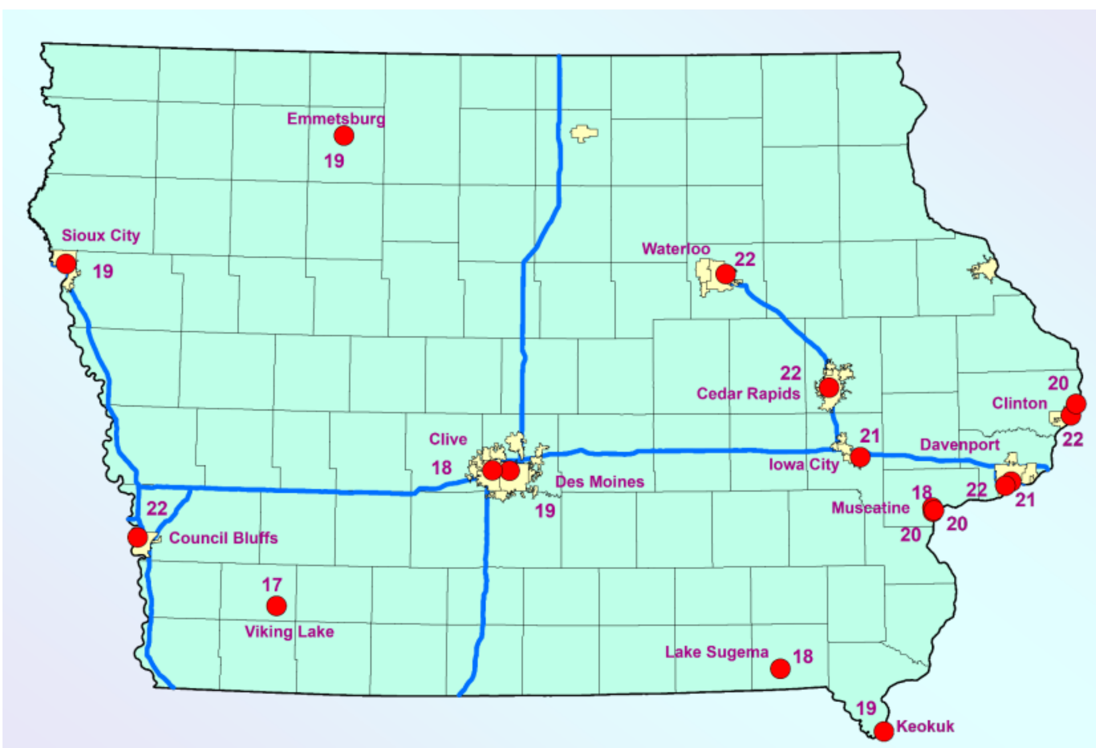


24 Hour PM2.5 Design Values in Iowa Network
Design Value (ug/m3)
0
5
10
15
20
25
30
Waterloo Water Tower
Clinton, Chancy Park
Clinton, Rainbow Park
Iowa City, Hoover Sch.
Keokuk, Fire Station
Cedar Rapids, Linn County Public Health
Viking Lake State Park
Muscatine Hs - East Campus
Muscatine, Greenwood Cemetary
Muscatine, Musser Park
Emmetsburg, Iowa Lakes Community College
Des Moines, Public Health
Clive, Indian Hills
Council Bluffs, Franklin School
Davenport, Jefferson School
Davenport, Hayes School
Lake Sugema State Park
Sioux City, Irving Elementry School
2017-2019
2018-2020
2019-2021
2020-2022
2021-2023

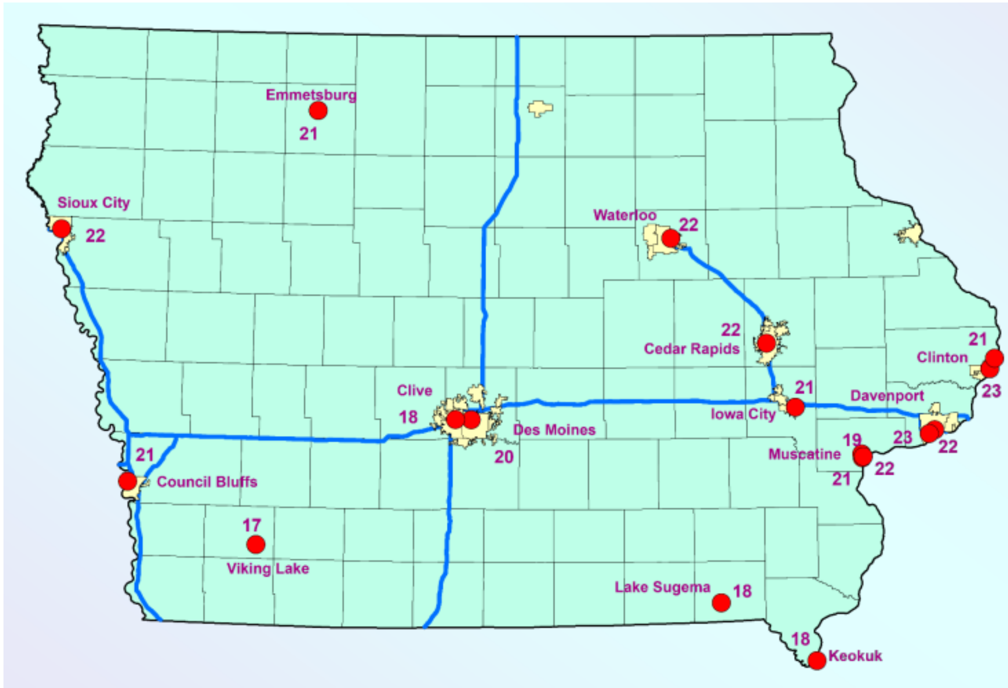
Maps of $PM_{2.5}$ 24-hour design values for the past five years are indicated below. Three years of complete data are required to compute a design value, and only sites with complete data are indicated. Monitors located near primary $PM_{2.5}$ emitters in Davenport, Clinton and Muscatine record the highest values. Monitors in the east tend to read slightly higher than those in the west. Monitors at background/ transport locations (Lake Sugema, Viking Lake, Emmetsburg) usually read less than those in more populated areas nearby.



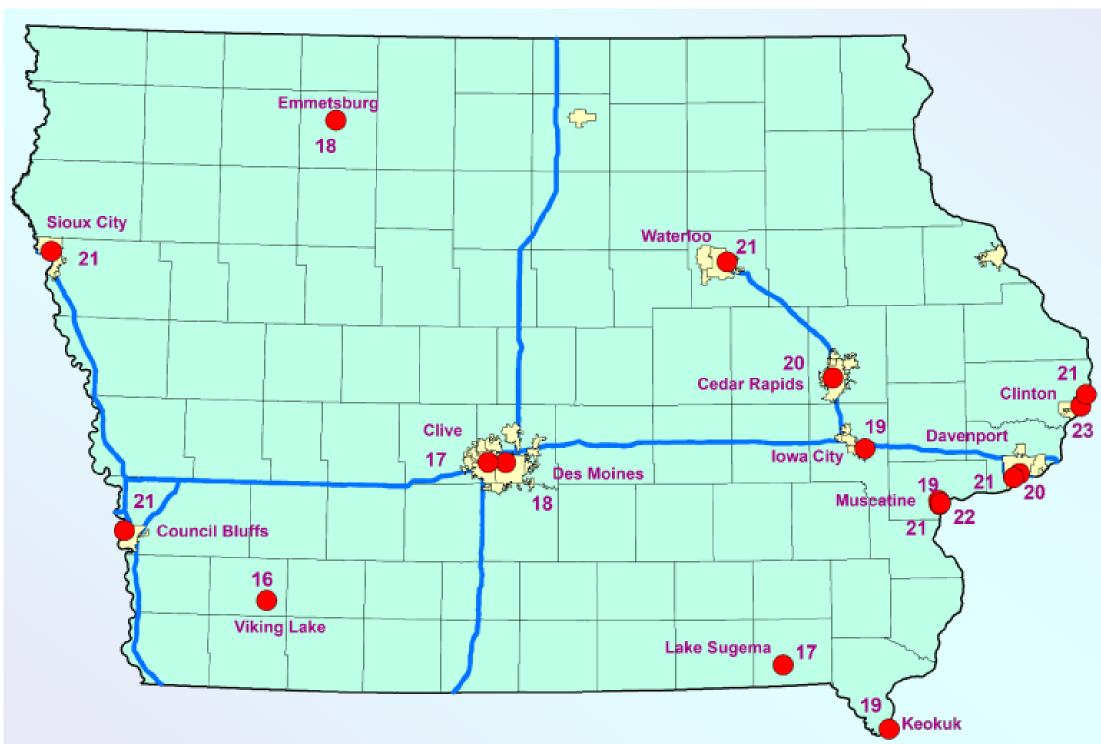
2021-2023 $PM_{2.5}$ 24-Hour Design Values ($\mu g/m^3$) NAAQs Standard is 35 $\mu g/m^3$



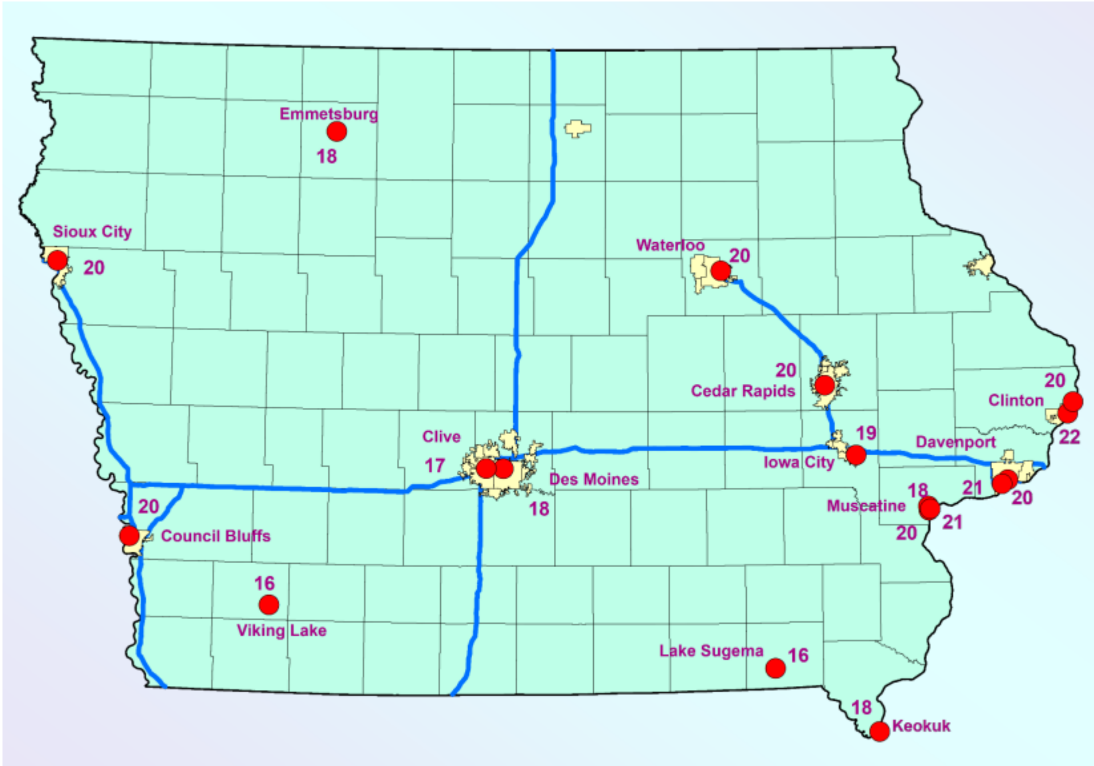
2020-2022 $PM_{2.5}$ 24-Hour Design Values ($\mu g/m^3$) NAAQs Standard is 35 $\mu g/m^3$



2019-2021 PM$_{2.5}$ 24-Hour Design Values (µg/m^3) NAAQs Standard is 35 µg/m^3



2018-2020 PM$_{2.5}$ 24-Hour Design Values (µg/m^3) NAAQs Standard is 35 µg/m^3



2017-2019 $PM_{2.5}$ 24-Hour Design Values ($\mu g/m^3$) NAAQs Standard is 35 $\mu g/m^3$

Section 4: $PM_{2.5}$ Annual Design Values

Trends and maps of $PM_{2.5}$ annual design values over the past five years are provided below. No violations of the annual NAAQS were recorded anywhere in the network over this period. Monitors located next to industrial facilities that are not eligible for comparison with the annual NAAQS include Musser Park in Muscatine and Chancy Park in Clinton. In March of 2024 the $PM_{2.5}$ annual NAAQS was lowered from 12.0 µg/m^3 to 9.0 µg/m^3.

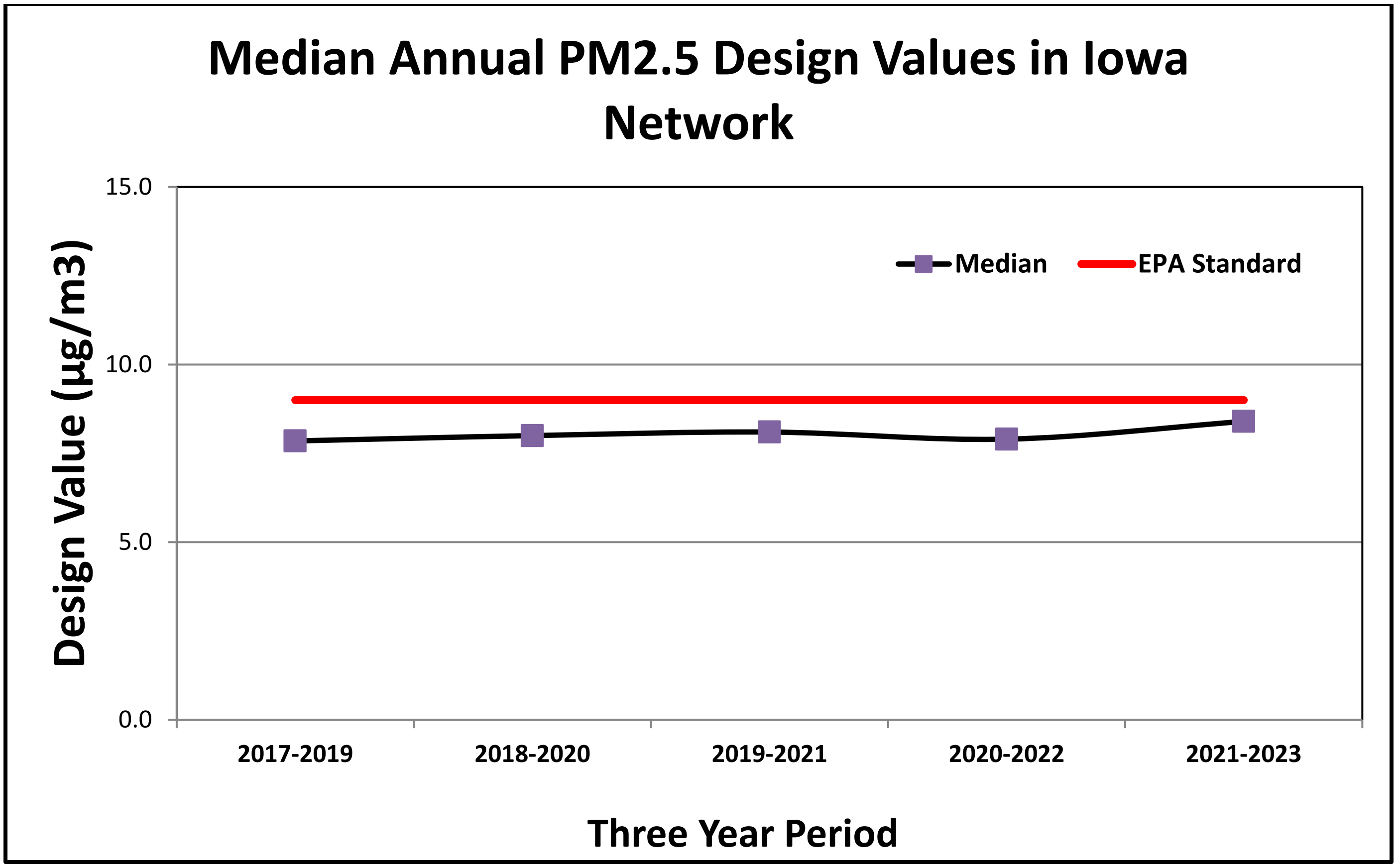
$PM_{2.5}$ Annual Design Values 2017-2023 (µg/m^3)

AQS Site ID	Site Name	2017-2019	2018-2020	2019-2021	2020-2022	2021-2023
190130009	Waterloo Water Tower	7.8	7.9	8.1	7.9	8.4
190450019	Clinton, Chancy Park	8.6	8.8	8.9	8.6	9.2
190450021	Clinton, Rainbow Park	7.9	8.1	8.1	7.8	8.3
191032001	Iowa City, Hoover Sch.	7.6	7.8	7.9	7.8	8.4
191110008	Keokuk, Fire Station	8.4	8.3	8.3		
191130040	Cedar Rapids, Linn County Public Health	8.1	8.2	8.3	8.0	8.6
191370002	Viking Lake State Park	6.6	6.7	6.9	6.7	7.2
191390015	Muscatine Hs - East Campus	8.3	8.3	8.2	8.0	8.6
191390016	Muscatine, Greenwood Cemetary	7.6	7.7	7.7	7.7	8.3
191390020	Muscatine, Musser Park	8.2	8.3	8.3	8.1	8.5
191471002	Emmetsburg, Iowa Lakes Community College	6.7	6.9	7.1	7.0	
191530030	Des Moines, Public Health	7.3	7.3	7.6	7.6	8.2
191532510	Clive, Indian Hills	7.4	7.5	7.5	7.4	
191550009	Council Bluffs, Franklin School	8.1	8.2	8.3	8.2	8.7
191630015	Davenport, Jefferson School	8.0	8.1	8.1	7.9	8.4
191630020	Davenport, Hayes School	8.5	8.5	8.7	8.4	8.9
191770006	Lake Sugema State Park	7.0	7.1	7.3	7.1	7.5
191930021	Sioux City, Irving Elementry School	7.8	7.8	8.1	7.9	8.6

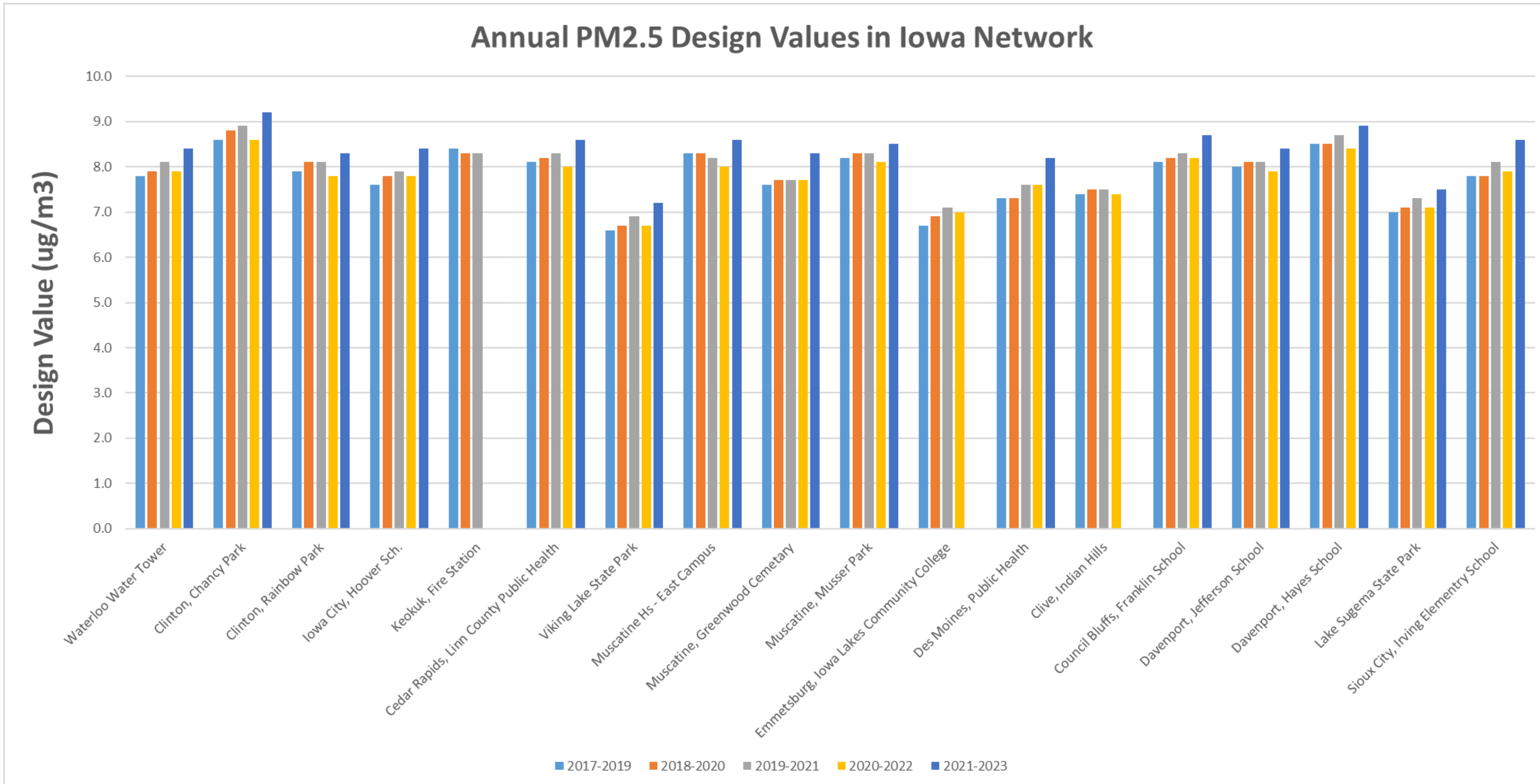
Design Value

6.6 7.9 9.2

Iowa Annual $PM_{2.5}$ design values by site and three-year period. Grey cells indicate the site was not operational or had incomplete data. The current NAAQS is 35 µg/m3. [PM2.5 monitoring sites near Chancy Park in Clinton (AQS ID 190450019), and Musser Park in Muscatine (AQS ID 191390020), are adjacent to industrial sources and are not comparable to the annual PM2.5 NAAQS.]

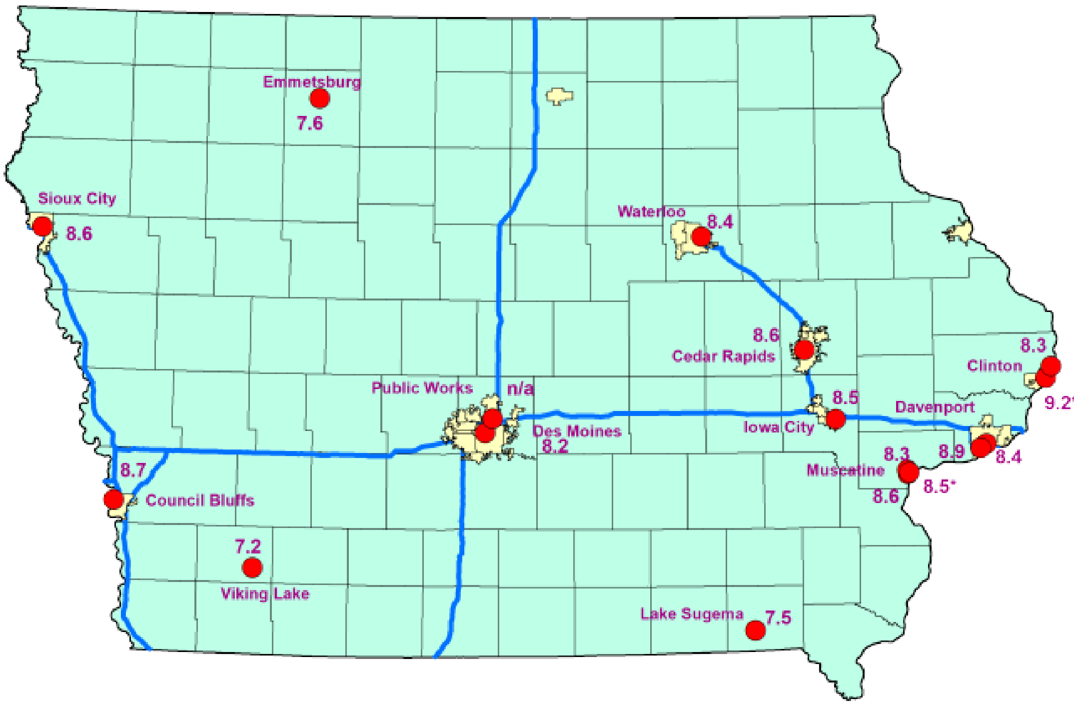


The red line represents the current standard. In March of 2024 the PM2.5 annual standard was lowered from 12.0 µg/m3 to 9.0 µg/m3.



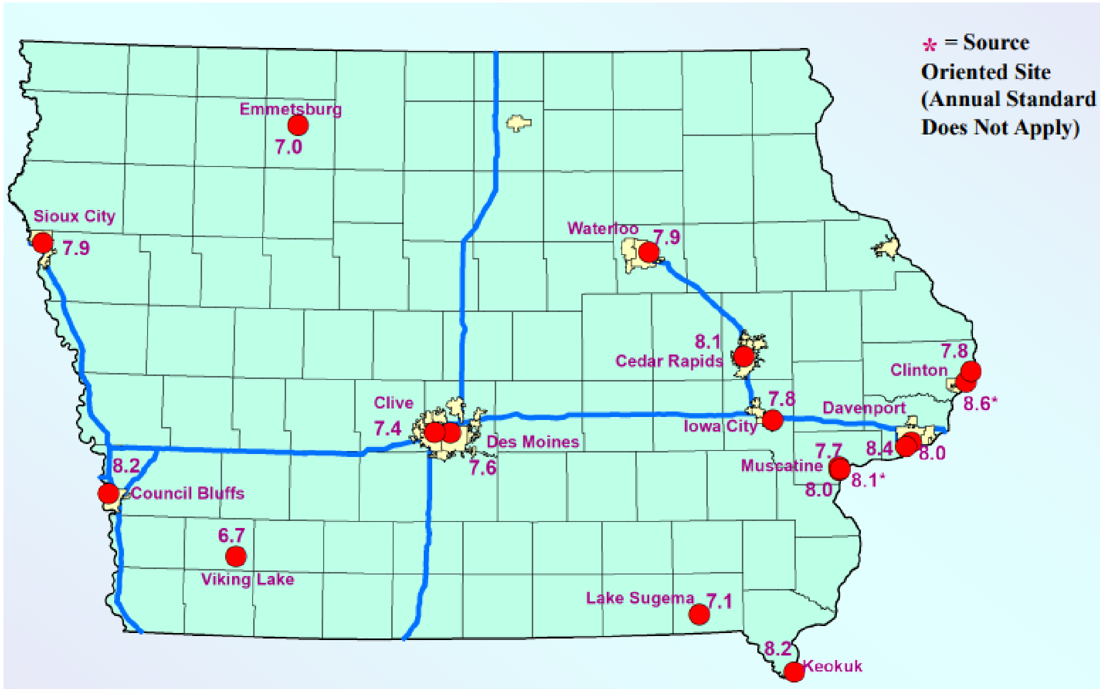
Annual PM2.5 Design Values in Iowa Network
Design Value (ug/m3)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Waterloo Water Tower
Clinton, Chancy Park
Clinton, Rainbow Park
Iowa City, Hoover Sch.
Keokuk, Fire Station
Cedar Rapids, Linn County Public Health
Viking Lake State Park
Muscatine Hs - East Campus
Muscatine, Greenwood Cemetary
Muscatine, Musser Park
Emmetsburg, Iowa Lakes Community College
Des Moines, Public Health
Clive, Indian Hills
Council Bluffs, Franklin School
Davenport, Jefferson School
Davenport, Hayes School
Lake Sugema State Park
Sioux City, Irving Elementry School
2017-2019
2018-2020
2019-2021
2020-2022
2021-2023

Maps of $PM_{2.5}$ annual design values for the most recent five-year period are indicated below. Three years of complete data are required to compute a design value, and only sites with complete data are indicated. Monitors in the east tend to read slightly higher than those in the west.[52] Monitors at background/transport locations (Lake Sugema, Viking Lake, and Emmetsburg) tend to read less than those in more populated areas.

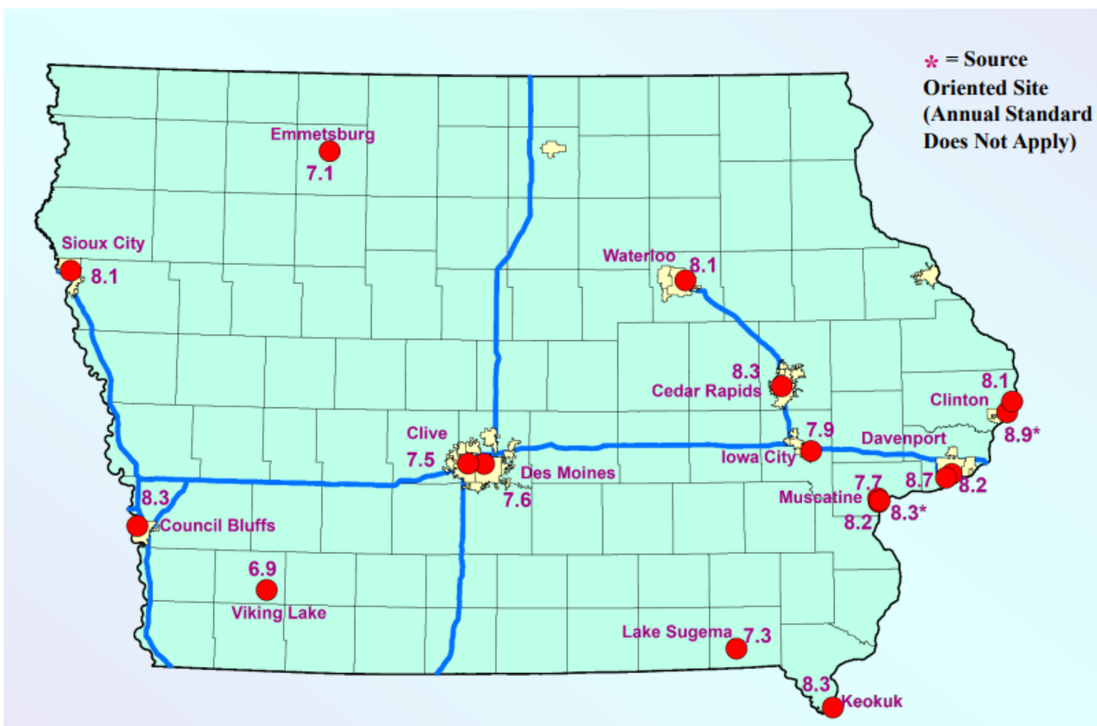


2021-2023 PM2.5 Annual Design Values (µg/m3) Source: EPA Design Value Report (AMP 480) 4/22/24 Note: Asterisks indicate source-oriented sites where the annual NAAQS does not apply. (The National Ambient Air Quality annual standard applicable to this Design Value is 9.0 µg/m3 .)

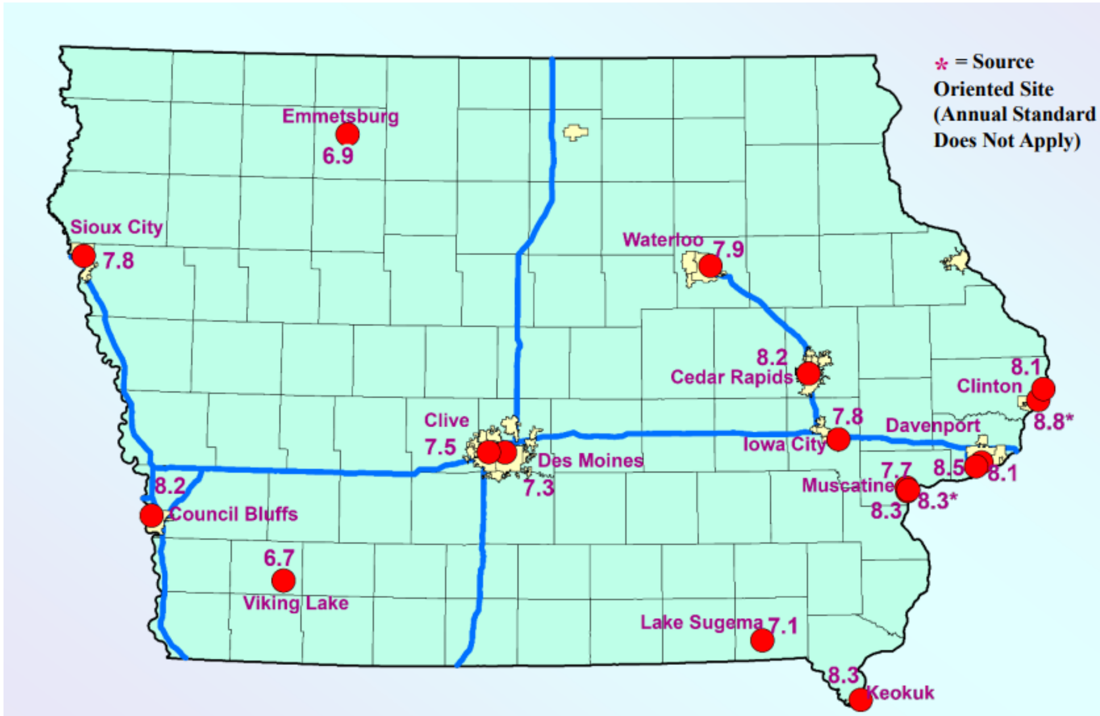
[52] The reduction in fine particle levels as one moves from the industrial Midwest to the western plains is well known; see for example: See Chapter 2 of: http://vista.cira.colostate.edu/Improve/spatial-and-seasonal-patterns-and-temporal-variability-of-haze-and-its-constituents-in-the-united-states-report-v-june-2011/.



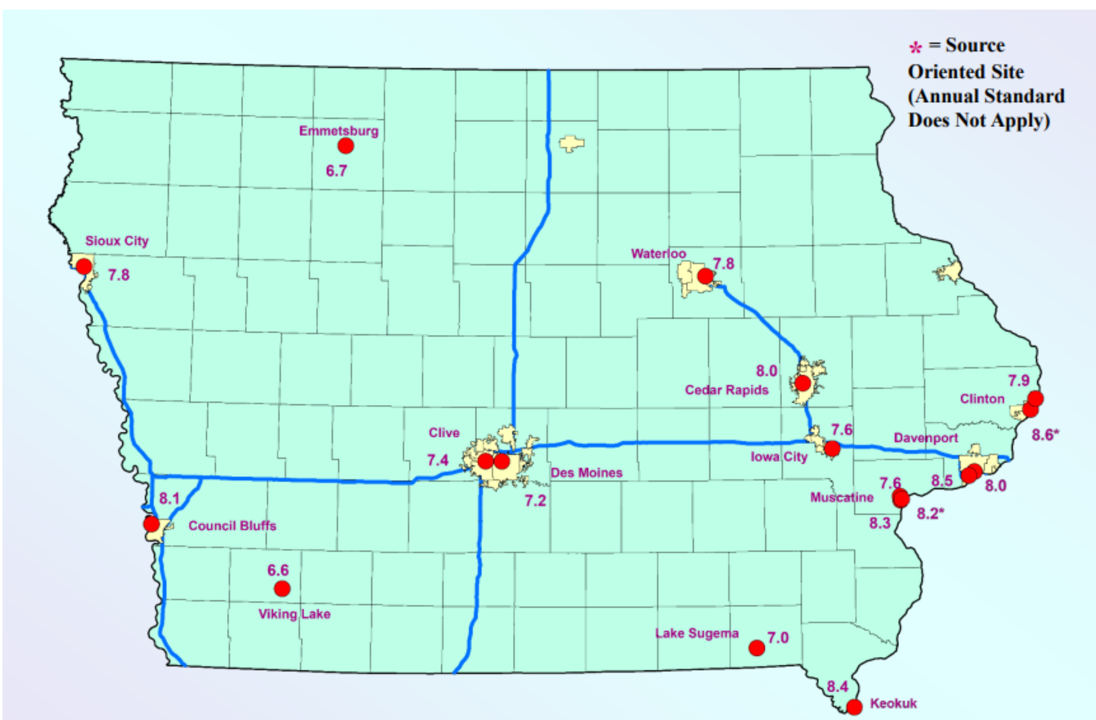
2020-2022 PM2.5 Annual Design Values (µg/m3) Source: EPA Design Value Report (AMP 480) 4/22/24 Note: Asterisks indicate source-oriented sites where the annual NAAQS does not apply. (The National Ambient Air Quality annual Standard for PM2.5 applicable to this time frame, and the maps for earlier periods shown below is 12.0 µg/m3 .)



2019-2021 PM2.5 Annual Design Values (µg/m3) Source: EPA Design Value Report (AMP 480) 4/22/24 Note: Asterisks indicate source-oriented sites where the annual NAAQS does not apply.



2018-2020 PM2.5 Annual Design Values (µg/m3) Source: EPA Design Value Report (AMP 480) 4/22/24 Note: Asterisks indicate source-oriented sites where the annual NAAQS does not apply.



2017-2019 PM2.5 Annual Design Values (µg/m3) Source: EPA Design Value Report (AMP 480) 4/22/24 Note: Asterisks indicate source-oriented sites where the annual NAAQS does not apply.

Section 5: SO_2 One-Hour Design Values

The one-hour SO_2 standard went into effect in August 2010. SO_2 one-hour design values over the most recent five years are provided below. The design values are the three year average of the annual 99th percentile daily maximum one-hour SO_2 concentrations calculated according to 40 CFR Part 50 Appendix T. A monitoring site must have a design value less than 76 ppb to attain the NAAQS.[53]

EPA declared an area of Muscatine adjacent to industrial SO_2 emitters to be in non-attainment with the SO_2 NAAQS in August of 2013.[54] Design values indicating NAAQS violations were recorded in Muscatine in 2011-2013 through 2014-2016. Iowa's State Implementation Plan (SIP) contains federally enforceable provisions to return the area to attainment no later than October of 2018. A consent decree signed in 2014 has resulted in significant SO_2 emissions reductions beginning in July of 2015.[55] No NAAQS violations have been recorded in Iowa for the 2015-2017 or the 2016-2018 periods, or in any of the succeeding periods shown below.

The 2021-2023 median SO_2 one-hour design value in the Iowa SO_2 network is 12 ppb.

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[53] Information on the SO_2 NAAQS is available at https://www.epa.gov/so2-pollution.

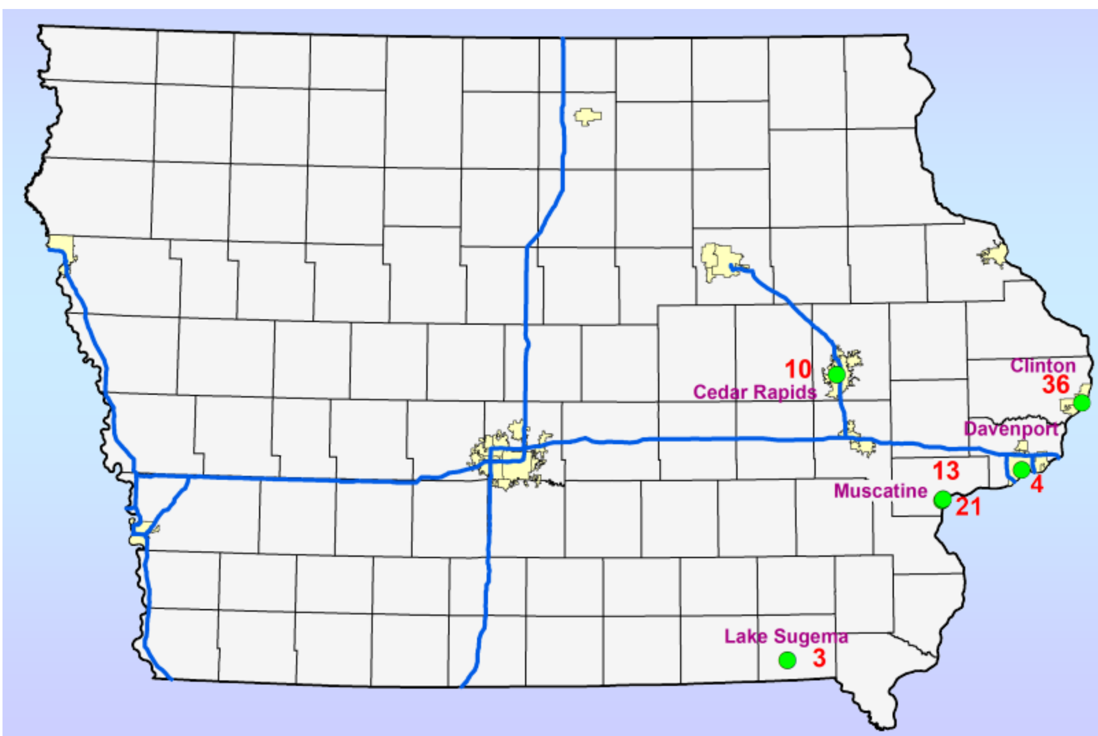
[54] https://www.federalregister.gov/documents/2013/08/05/2013-18835/air-quality-designations-for-the-2010-sulfur-dioxide-so2-primary-national-ambient-air-quality

[55] Paragraph 3(d) of 40 CFR Part 50 Appendix T of allows EPA the discretion to "consider consistency and levels of valid measurements" when it evaluates monitoring data for establishing attainment. EPA argued that the dataset from 2009-2011, although incomplete for the purposes of calculating a design value in accordance with Appendix T, was adequate to show that a complete dataset would have violated the NAAQS. Information on the Muscatine non-attainment designation is at: https://www.federalregister.gov/articles/2013/08/05/2013-18835/air-quality-designations-for-the-2010-sulfur-dioxide-so2-primary-national-ambient-air-quality#page-47200 and https://www.epa.gov/sulfur-dioxide-designations/so2-designations-round-2-iowa-state-recommendation-and-epa-response.

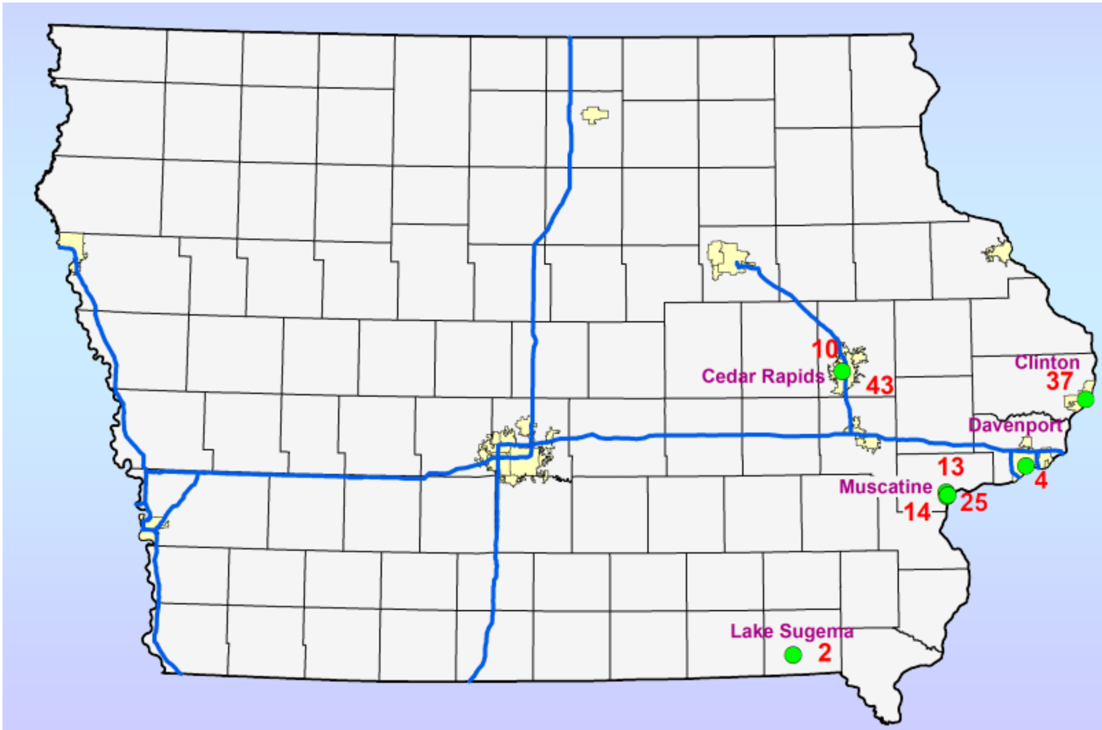
Iowa SO2 Design Values 2017-2023. Current NAAQS is 75 ppb.

Years	Clinton, Chancey Park 190450019	Cedar Rapids, Linn County Public Health 191130040	Cedar Rapids, Tait Cummings Park 191130041	Muscatine, Greenwood cemetary 191390016	Muscatine Hs - East Campus School Trailer 191390019	Muscatine, Musser Park 191390020	Davenport, Jefferson Schools 191630015	Lake Sugema 191770006
2017-2019	18	8	35	17	21	25	4	2
2018-2020	19	9	32	15	18	20	5	1
2019-2021	17	9	36	14	18	21	4	2
2020-2022	37	10	43	13	14	25	4	2
2021-2023	36	10			13	21	4	3

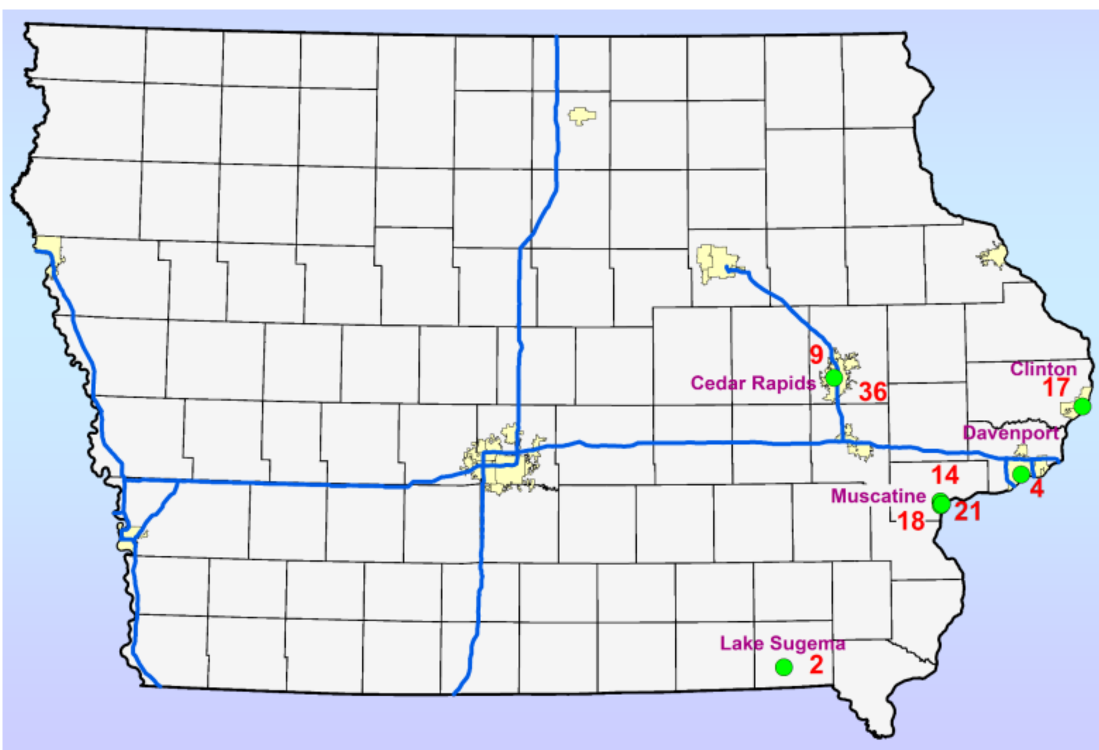
Shaded boxes indicate invalid design values as the site was not operational or did not meet data completeness requirements.



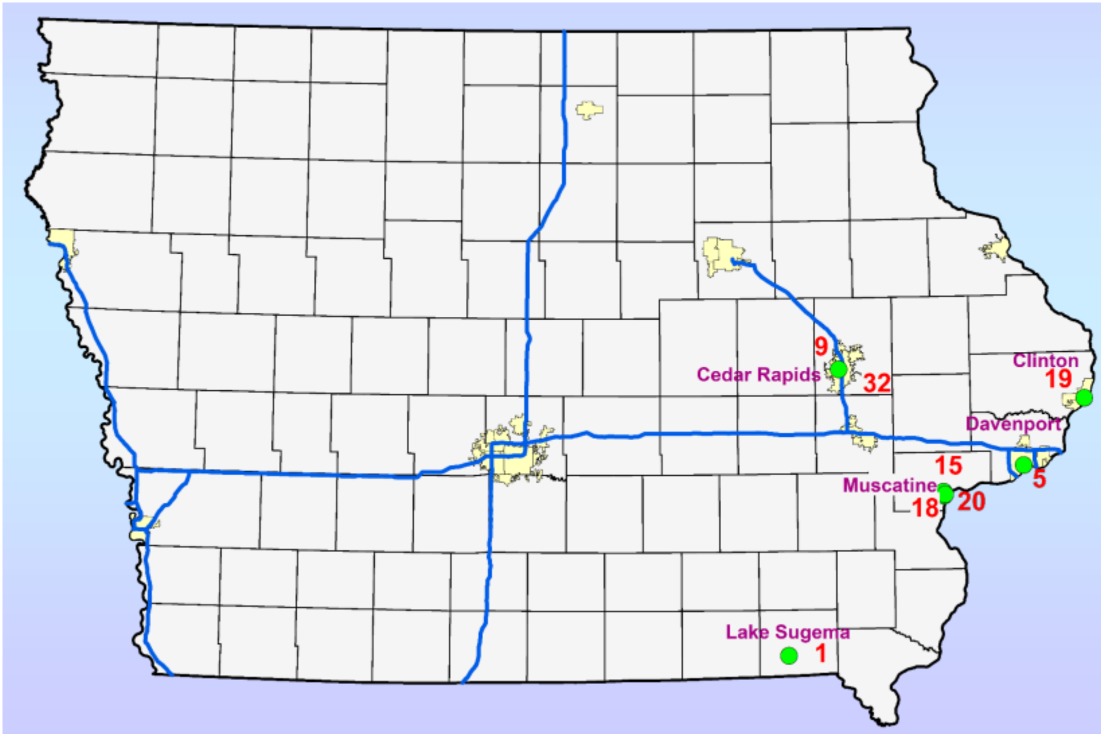
2021-2023 SO_2 One-Hour Design Values



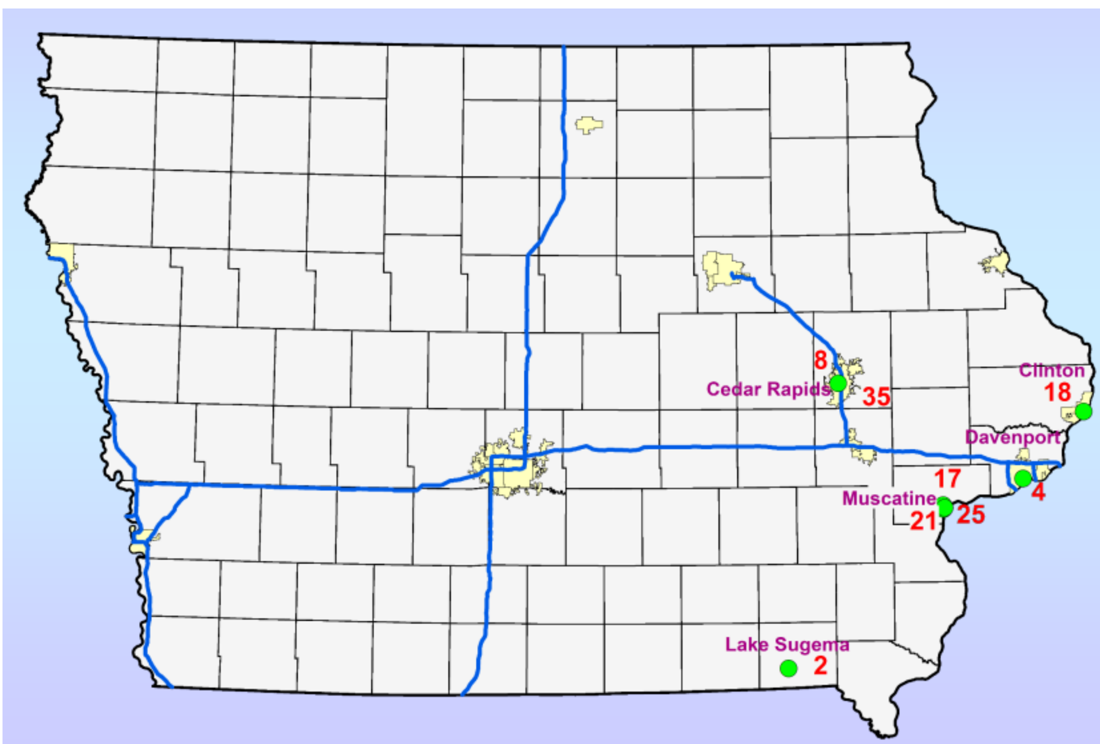
2020-2022 SO_2 One-Hour Design Values



2019-2021 SO_2 One-Hour Design Values



2018-2020 SO_2 One-Hour Design Values



2017-2019 SO_2 One-Hour Design Values

Section 6: NO_2 One-Hour Design Values

The one-hour NO_2 standard went into effect in April 2010. NO_2 one-hour design values over the most recent five years are provided below. The design values are the three year average of the annual 98th percentile daily maximum one-hour NO_2 concentrations calculated according to 40 CFR Part 50 Appendix S.[56] A monitoring site must have a design value less than 101 ppb to attain the NAAQS.[57]

The median 2021-2023 NO_2 one-hour design value in the Iowa NO_2 network is 35 ppb. No NAAQS violations were recorded.

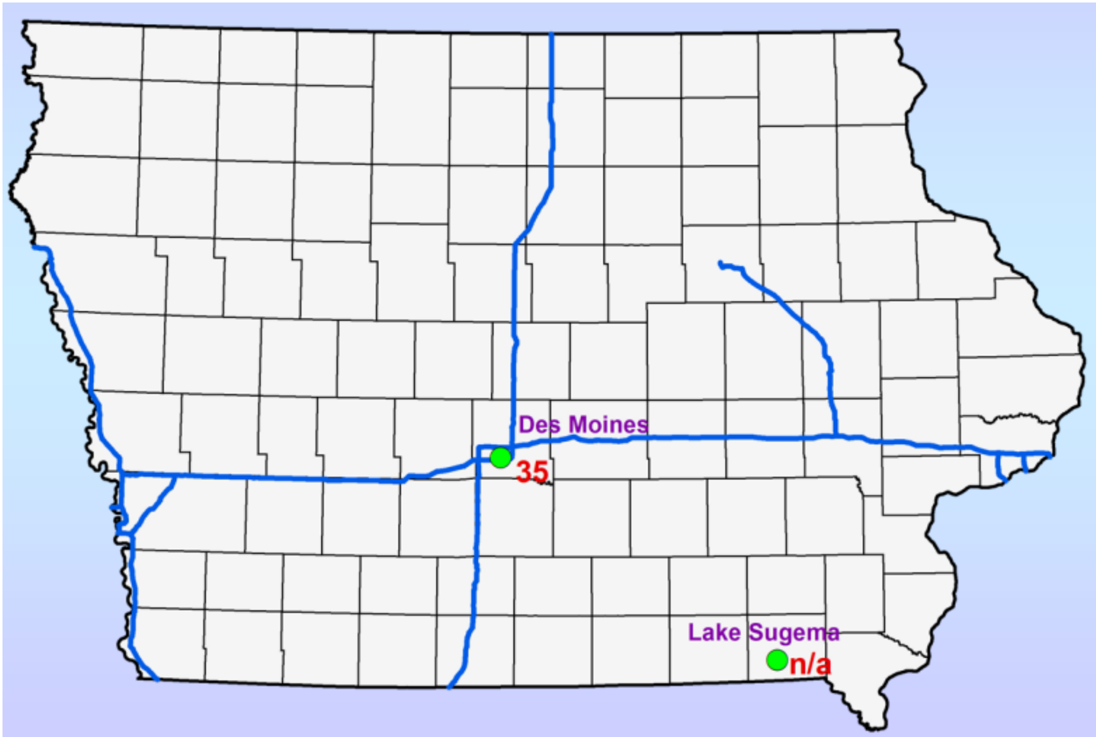
NO_2 One-Hour Design Values 2017 – 2023 (ppb)

Years	Des Moines, Health Department 191530030	Lake Sugema 191770006
2017-2019	36	10
2018-2020	35	9
2019-2021	35	
2020-2022	34	
2021-2023	35	

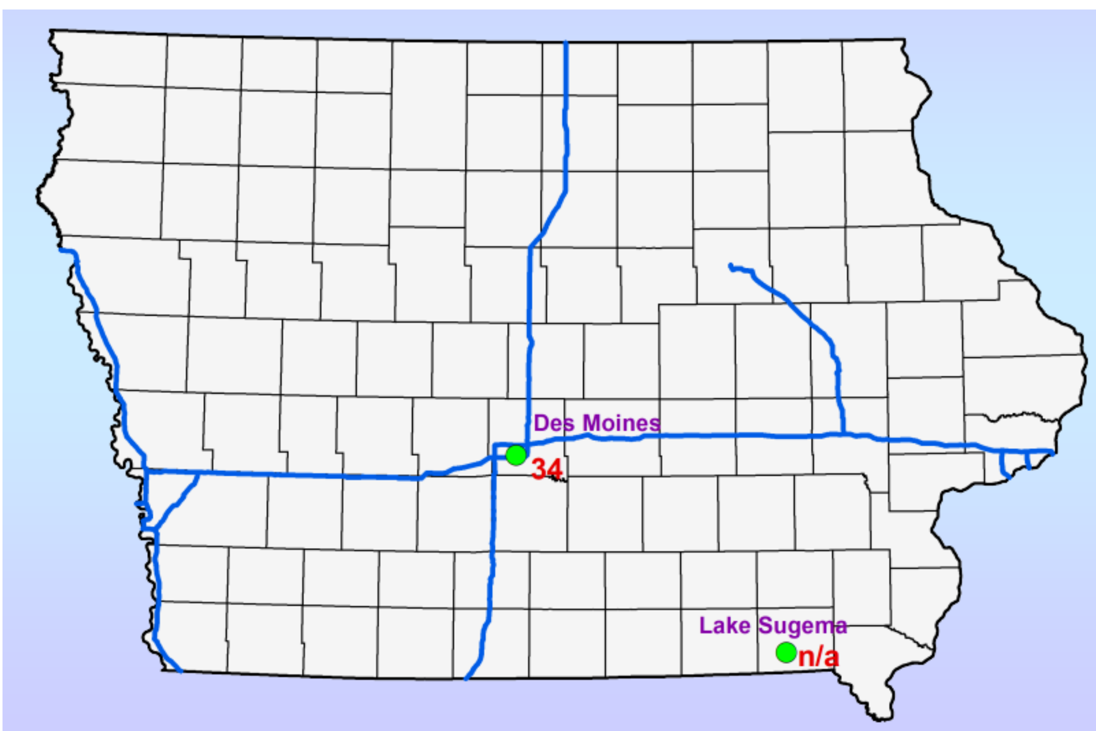
Shaded boxes indicate invalid design values as the site was not operational or did not meet data completeness requirements. The current NAAQS is 100 ppb.

[56] 40 CFR 50 Appendix S is found at https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr50_main_02.tpl.

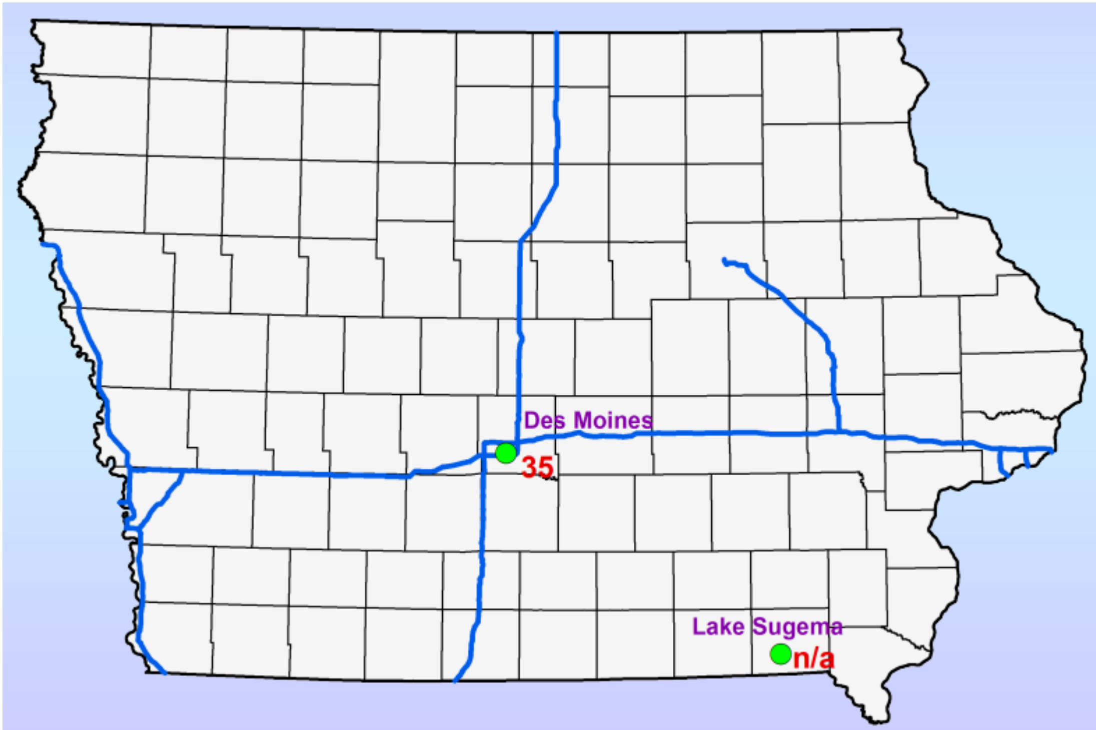
[57] Information on the NO_2 NAAQS is available at https://www.epa.gov/no2-pollution/primary-national-ambient-air-quality-standards-naaqs-nitrogen-dioxide.



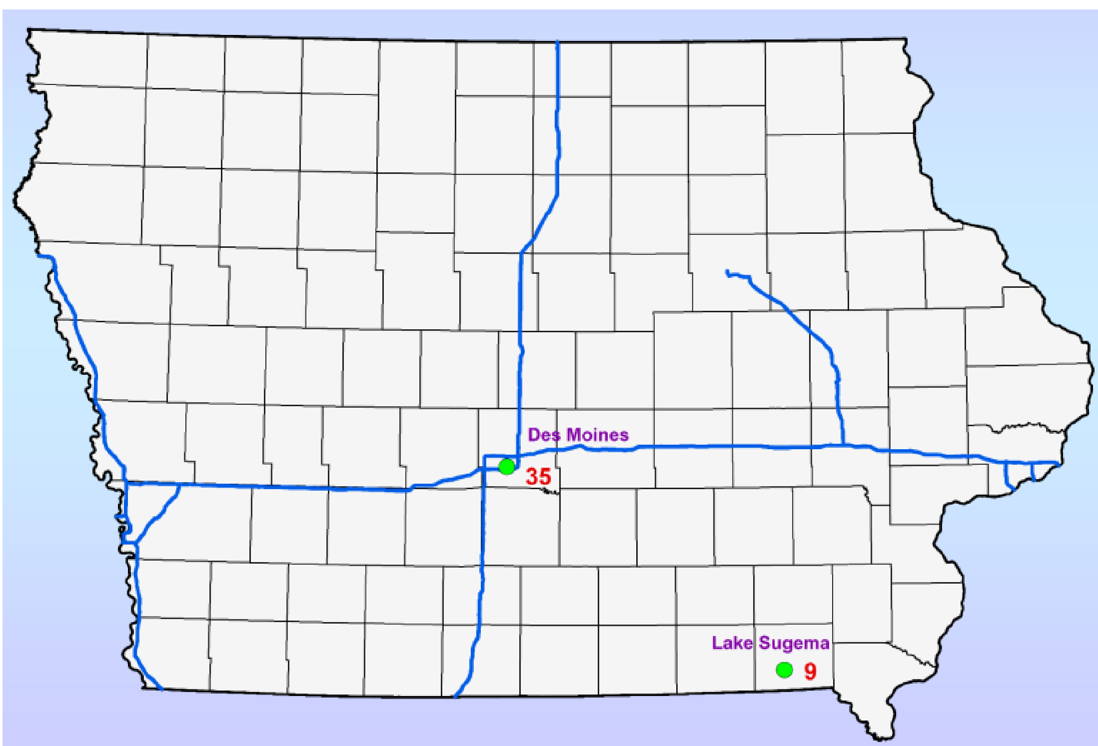
2021-2023 NO_2 One-Hour Design Values



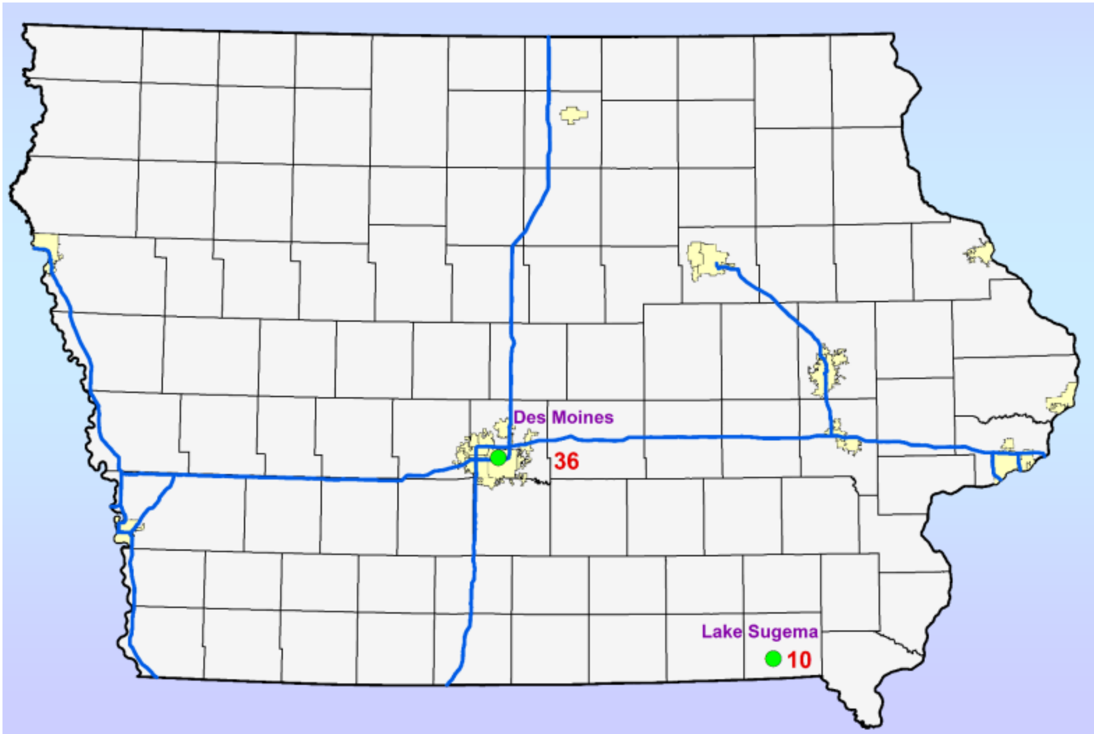
2020-2022 NO_2 One-Hour Design Values



2019-2021 NO_2 One-Hour Design Values



2018-2020 NO_2 One-Hour Design Values



2017-2019 NO_2 One-Hour Design Values

Section 7: Lead Design Values

The current lead NAAQS took effect in January 2009[58]. Trends and maps of lead design values over the past years are provided below. The lead design value at a monitoring site is the maximum 3-month rolling average over a period of 3 calendar years. A monitoring site must have a design value less than 0.155 µg/m^3 to attain the NAAQS.[59]

The only lead monitor in Iowa is located in Council Bluffs near Griffin Pipe, and was started in 2009. The site recorded levels above the National Ambient Air Quality Standard (NAAQS) for lead in 2010 and 2012. The area around Griffin Pipe was declared a non-attainment area by EPA late in 2011.[60] The Griffin Pipe Plant was closed indefinitely in May of 2014, after acquisition of Griffin Pipe by American Pipe.[61] The DNR submitted a State Implementation Plan (SIP) in January 2015 that provides for ongoing attainment of the lead NAAQS by establishing federally enforceable permit limits at Griffin Pipe and a nearby facility, Alter Metal Recycling. [62] EPA re-designated the area as attainment on 10/4/2018.[63]

Startup issues with new samplers installed in December of 2021 caused a loss of all but one December sample. The problems encountered in December 2021 impacted the data completeness calculations for the 2019-2021, 2020-2022, 2021-2023, and 2022-2024 periods. No exceedances of the standard were measured over the 2019-2024 period and the site is currently considered attainment. The most recent but incomplete data from the site indicates a design value of 0.12 µg/m^3 or 80% of the standard for the 2022-2024 period.

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[58] *Federal Register* entry: http://www.gpo.gov/fdsys/pkg/FR-2008-11-12/html/E8-25654.htm.

[59] Information on the lead NAAQS is available at https://www.epa.gov/lead-air-pollution/national-ambient-air-quality-standards-naaqs-lead-pb.

[60] Federal Register Lead Designations

[61] Foundry Magazine Article Griffin Pipe

[62] Iowa Lead SIP

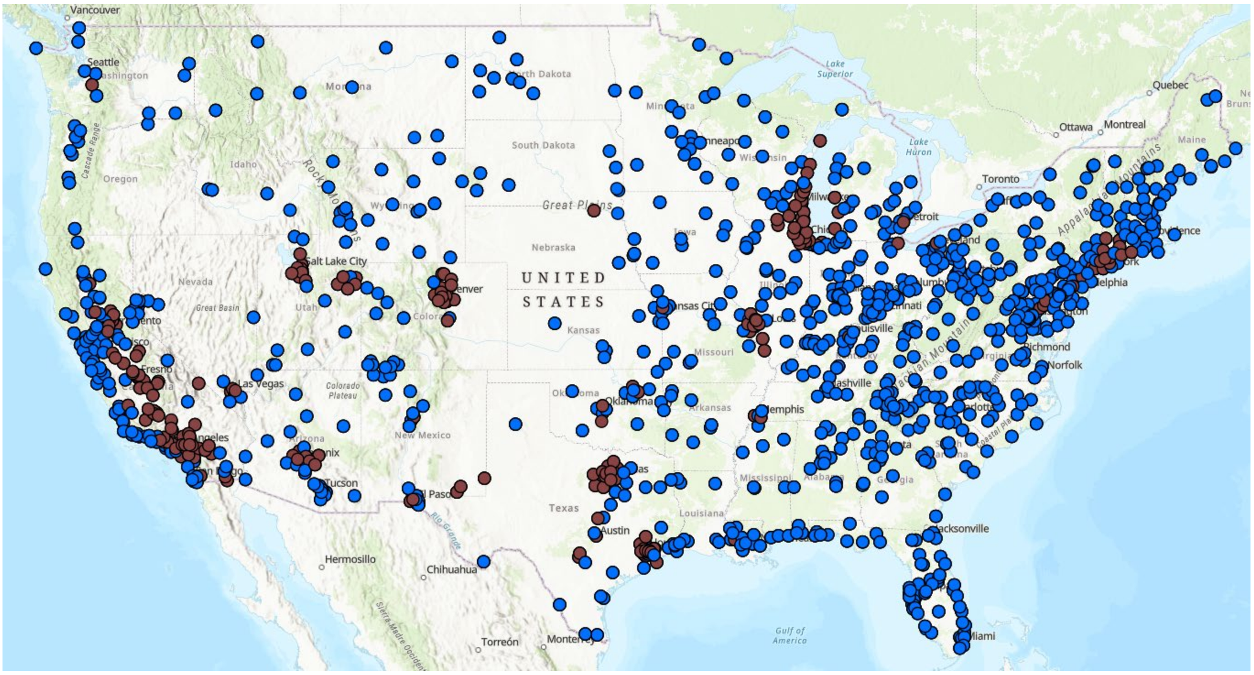
[63] EPA Iowa SIP Status

Lead Design Values 2017 – 2023 ($\mu g/m^3$)
NAAQS is 0.15 $\mu g/m^3$

Years	Council Bluffs, Griffin Pipe 191550011
2017-2019	0.08
2018-2020	0.08
2019-2021	n/a
2020-2022	n/a
2021-2023	n/a

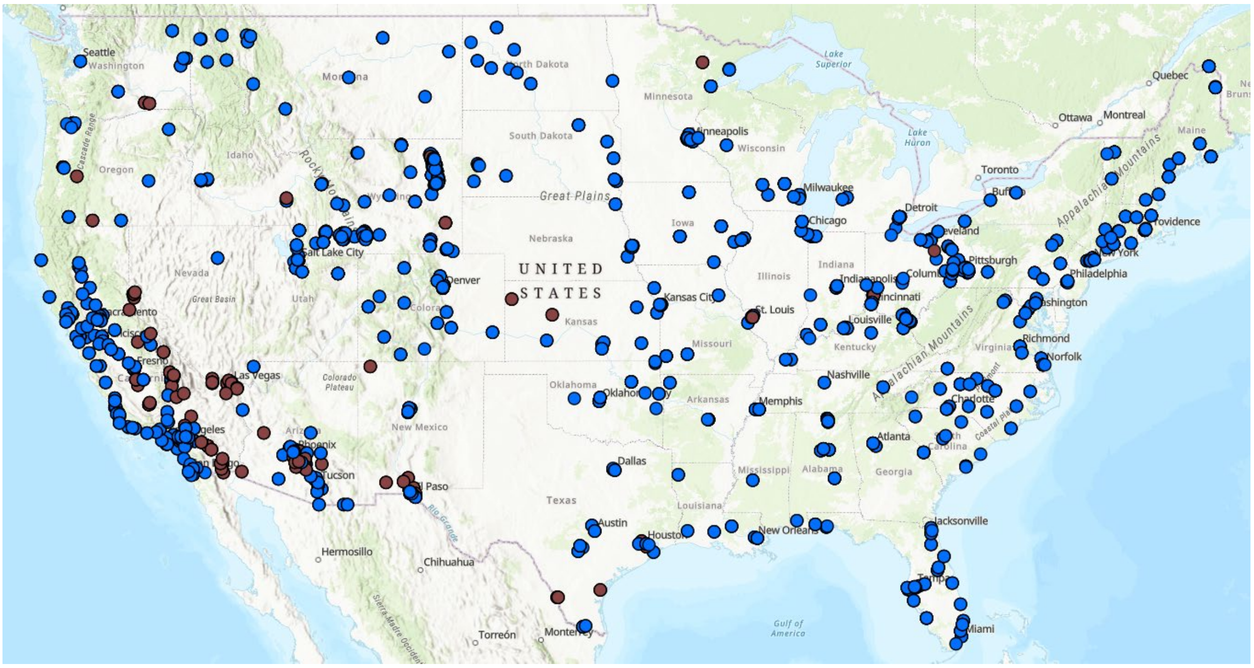
Section 8: Monitors Violating the National Ambient Air Quality Standards (2021-2023)

EPA placed the 2021-2023 design values for monitors eligible for NAAQS comparisons in an online geographic information system.[64] Maps of the location of monitors where design values exceed the NAAQS have been generated from this portal and are shown below. (There were no design values for nitrogen dioxide or carbon monoxide that exceeded the NAAQS.)

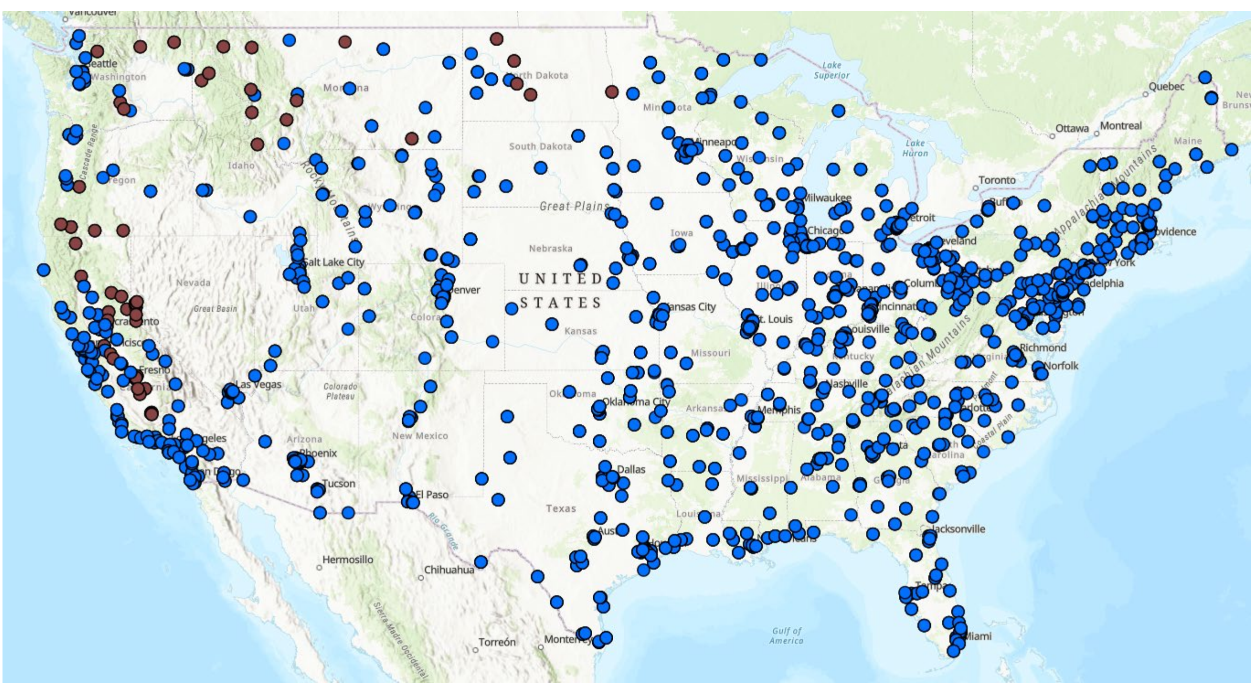


Monitors violating the 8-hour Ozone NAAQS are represented as red points.

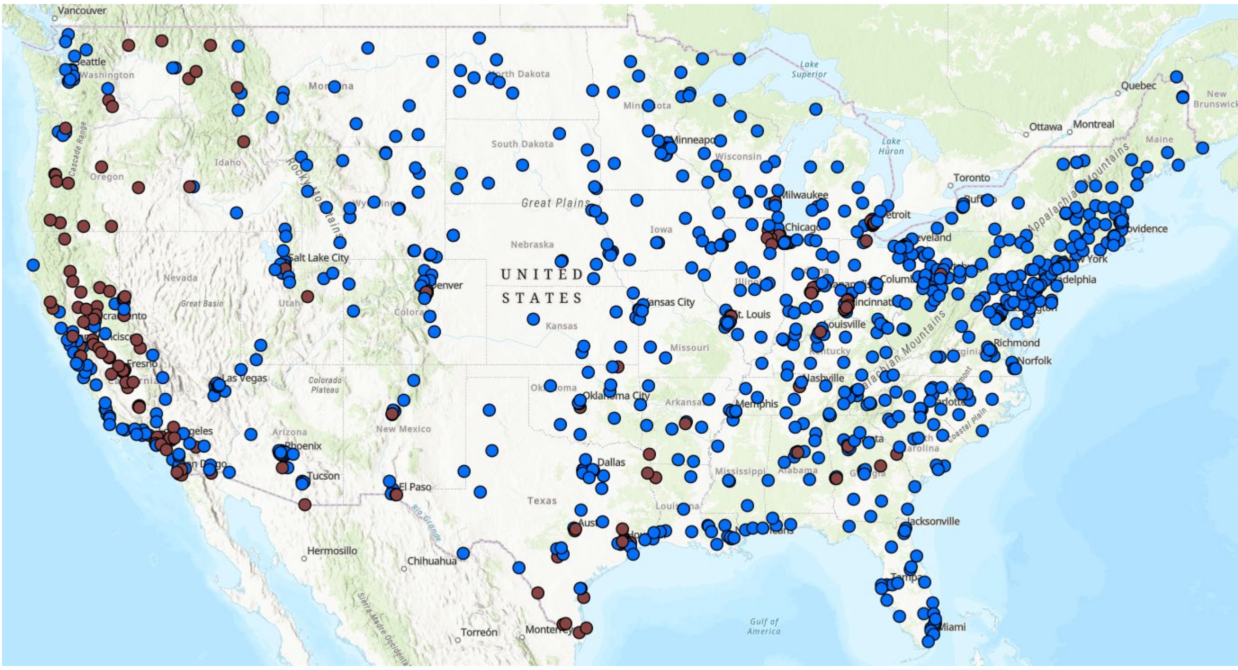
[64] https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=bc6f3a961ea14013afb2e0d0e450b0d1#



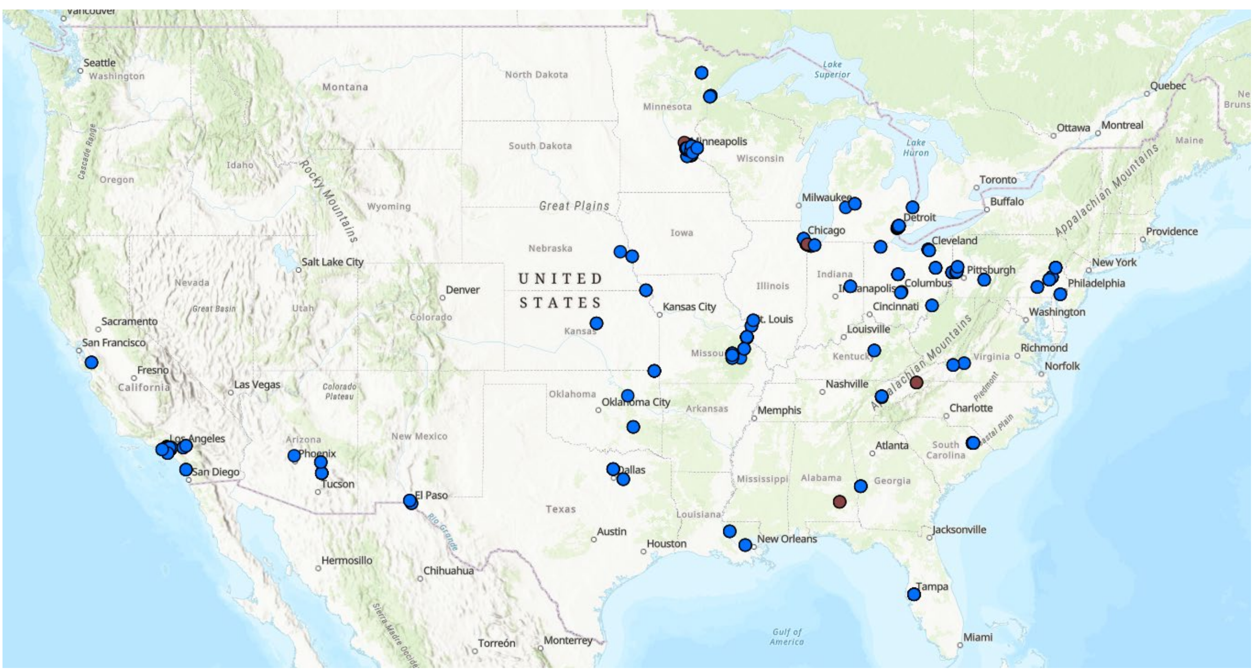
Monitors violating the 24-hour PM_{10} NAAQS are represented as red points. One violating monitor in Alaska is not shown.



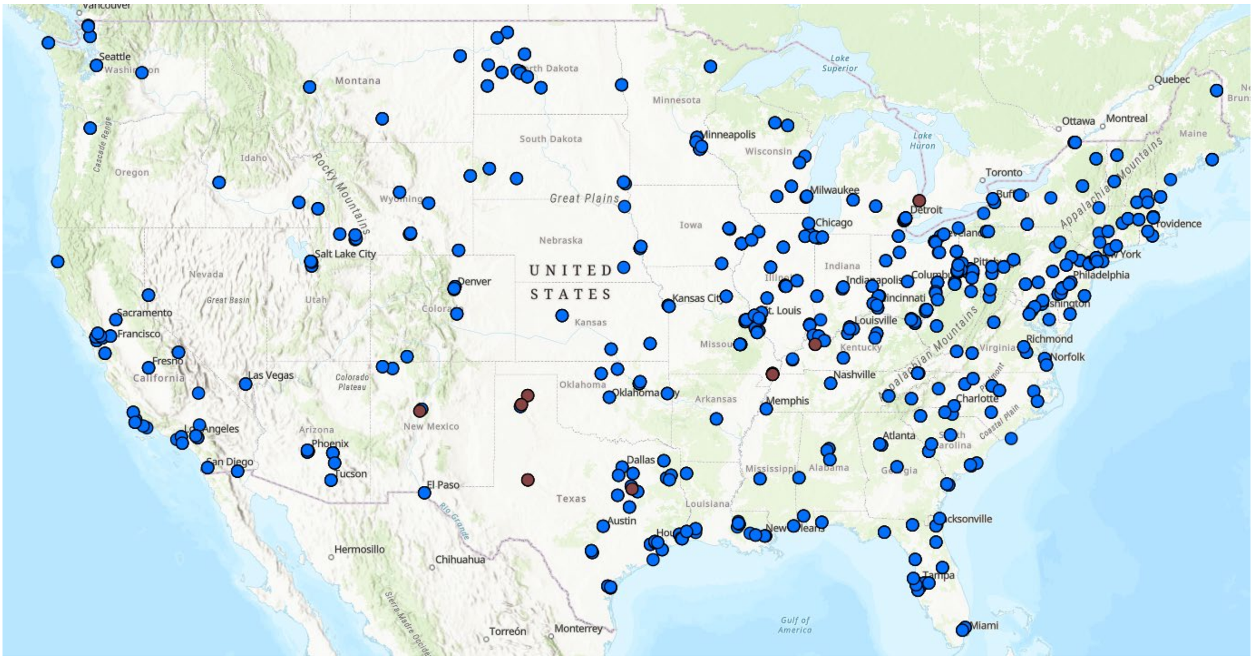
Monitors violating the 24-hour $PM_{2.5}$ NAAQS are represented as red points. Three violating monitors in Alaska are not shown.



Monitors violating the 9.0 ug/m3 Annual $PM_{2.5}$ NAAQS are represented as red points. Three violating monitors in Alaska in are not shown.



Monitors violating the Lead NAAQS are represented as red points. One violating monitor in Puerto Rico in not shown.



Monitors violating the 1-hour SO_2 NAAQS are represented as red points. Two violating monitors in Hawaii are not shown.

Appendix J: Iowa MSA’s

Table of Contents

Section 1: Summary

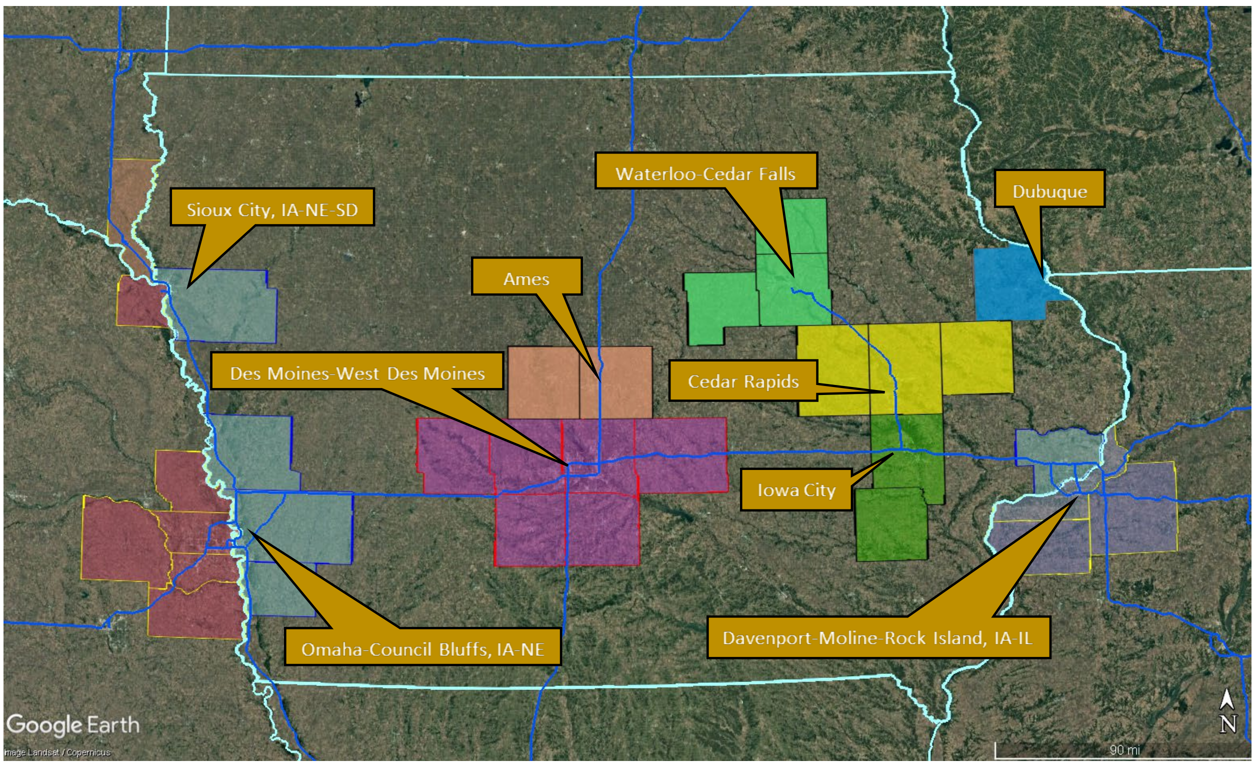
In order to protect human health, an important objective of an ambient air monitoring network is to quantify air pollution levels in heavily populated areas. Federal ambient air monitoring regulations contain minimum monitoring requirements for Metropolitan Statistical Areas (MSA's). About 62% of Iowa's population is concentrated in its MSA's, and about 58% of Iowa's primary monitors are located in these areas.

Section 2 defines the counties in Iowa and other states that comprise these MSA's. Section 3 provides estimates of the total population of the MSA's along with the number of Iowans living in the MSA's. State and Local Air Monitoring Stations (SLAMS) monitors are important, long-term components of the state's air monitoring network. Section 4 indicates the minimum number of SLAMS monitors required by EPA for each MSA, and the number of SLAMS monitors in each MSA. Section 5 enumerates total number of Iowa monitors (SLAMS and non-SLAMS) in each MSA.

Section 2: Metropolitan Statistical Areas in Iowa

The federal Office of Management and Budget establishes and maintains the definitions of Metropolitan Statistical Areas (MSA's). Each MSA includes at least one urbanized area of 50,000 or more population. Each MSA may include adjacent counties that have a minimum of 25 percent of workers commuting to the central counties of the metropolitan statistical area.

According to the U.S. Census Bureau[65] , Iowa has 9 MSA's made up of twenty-two Iowa counties and ten counties from other states, as indicated in the map and table below:



MSA's in Iowa

[65] United States Census Bureau maps of Metropolitan Statistical Areas are available online at: https://www.census.gov/programs-surveys/metro-micro/geographies/reference-maps.html

MSA 's Containing Iowa Counties

MSA	Iowa Counties	Counties Outside of Iowa	MSA label (Largest Iowa City)	Abbreviation
Omaha-Council Bluffs, NE-IA	Harrison, Mills, Pottawattamie	NE: Cass, Douglas, Sarpy, Saunders, Washington	Council Bluffs	OMC
Des Moines-West Des Moines, IA	Dallas, Guthrie, Madison, Polk, Warren, Jasper	-	Des Moines	DSM
Davenport-Moline-Rock Island, IA-IL	Scott	IL: Henry, Mercer, Rock Island	Davenport	DMR
Cedar Rapids, IA	Benton, Jones, Linn	-	Cedar Rapids	CDR
Iowa City, IA	Johnson, Washington	-	Iowa City	IAC
Waterloo-Cedar Falls, IA	Blackhawk, Bremer, Grundy	-	Waterloo	WTL
Sioux City, IA-NE-SD	Woodbury	NE: Dakota SD: Union	Sioux City	SXC
Ames, IA	Story, Boone	-	Ames	AMW
Dubuque, IA	Dubuque	-	Dubuque	DBQ

Section 3: Population Estimates for Iowa MSA's

The U. S. Census Bureau provides updated population estimates each year. These estimates are utilized in the table below to provide estimates of the Iowa percentage of the population in multi-state MSA's. The table also contains the percentage of Iowa's total population that resides in each MSA.

MSA	Total Population of MSA	Iowa Population of MSA	Iowa Percentage of MSA	Percent of Iowa's Total Population Residing in MSA
Des Moines, IA	753,913	715,806	100%	22%
Cedar Rapids, IA	278,677	278,677	100%	9%
Iowa City, IA	182,711	182,711	100%	6%
Davenport, IA	381,801	175,601	46%	5%
Waterloo, IA	170,081	170,081	100%	5%
Sioux City, IA	145,994	107,257	73%	3%
Council Bluffs, IA	1,001,010	122,872	12%	4%
Ames, IA	129,227	102,498	100%	3%
Dubuque, IA	99,242	99,242	100%	3%
Totals	3,142,656	1,954,745	62%	61%

Population of Iowa Metropolitan Statistical Areas (2024)

Section 4: SLAMS Monitoring Requirements[66] and Distribution of Monitors in MSA's

MSA Label	$PM_{2.5}$	PM_{10} FRM	Ozone	SO_2	CO	NO_2	Pb
Ames	0	0	0	0	0	0	0
Cedar Rapids	1	1-2	1	0	0	0	0
Council Bluffs	3	2-4	2	1	0	1	0
Davenport	1	1-2	2	0	0	0	0
Des Moines	2	1-2	2	0	0	0	0
Dubuque	0	0	0	0	0	0	0
Iowa City	1	0	0	0	0	0	0
Sioux City	1	0	1	0	0	0	0
Waterloo	1	0	1	0	0	0	0

Required Number of SLAMs Sites in MSA's

[66] 40 CFR Part 58 Appendix D specifies the minimum number of SLAMS (State and Local Air Monitoring Stations) monitors for ozone, $PM_{2.5}$, and PM_{10} based on both population and the concentrations of these pollutants. This table represents minimum monitoring requirements based on population and concentration, using 2024 census data and concentrations collected up to and including 2024. Near Road requirements for the Omaha - Council Bluffs MSA are not included in the above table, since they are based on population and traffic counts, rather than population and concentrations. It should be noted that these requirements change with time. 40 CFR Part 58 Appendix D, section 3 requires each State to operate at least one NCore site. NCore sites must measure, at a minimum, $PM_{2.5}$ particle mass using continuous and integrated/filter-based samplers, speciated $PM_{2.5}$, PM10-2.5 particle mass, O_3, SO_2, CO, NO/NO_Y, wind speed, wind direction, relative humidity, and ambient temperature. Monitors in the NCORE suite are SLAMs monitors, but the NCORE requirements are not included in this table.

MSA Label	$PM_{2.5}$ (FRM)	Ozone	$PM_{2.5}$ Cont.	PM_{10} (FRM)	SO_2	$PM_{2.5}$ Spec.	CO	Lead	NO_2	PM_{10} Cont.
Ames	0	0	0	0	0	0	0	0	0	0
Cedar Rapids	1	1	0	1	0	0	0	0	0	0
Council Bluffs	1	2	4	0	2	1	2	1	0	3
Davenport	2	3	2	2	1	1	1	0	1	1
Des Moines	1	2	1	1	0	0	0	0	0	0
Dubuque	0	0	0	0	0	0	0	0	0	0
Iowa City	0	0	0	0	0	0	0	0	0	0
Sioux City	0	1	0	0	0	0	0	0	0	0
Waterloo	1	1	0	0	0	0	0	0	0	0

SLAMS Sites operated by Iowa and Surrounding States in MSA's in January 2025 (Note that in the table above and the two tables below the total number of sites for an MSA will typically be less than the total for each row, since measurements for more than one pollutant are often taken at the same site.)

MSA Label	$PM_{2.5}$ (FRM)	Ozone	$PM_{2.5}$ Cont.	PM_{10} (FRM)	SO2	$PM_{2.5}$ Spec.	CO	Lead	NO_2	PM10 Cont.
Council Bluffs	0	0	0	0	0	0	0	1	0	0
Davenport	2	2	1	2	1	1	1	0	1	1
Sioux City	0	1	0	0	0	0	0	0	0	0

SLAMS Sites operated by Iowa in Multi-State MSA's

MSA Label	$PM_{2.5}$ (FRM)	Ozone	$PM_{2.5}$ Cont.	PM_{10} (FRM)	SO_2	$PM_{2.5}$ Spec.	CO	Lead	NO_2	PM_{10} Cont.
Council Bluffs	1	2	4	0	2	1	2	0	0	3
Davenport	0	1	1	0	0	0	0	0	0	0
Sioux City	0	0	0	0	0	0	0	0	0	0

SLAMS Sites Operated by Surrounding States in Multi-State MSA's[67]

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[67] §58.16 of the 40 CFR Part 58 establishes that data collected during the period November 1 to December 31 does not have to be uploaded to EPA's Air Quality System (AQS) until March 31. Given this provision in federal monitoring rules, and anticipating some reasonable additional delays, it is difficult to precisely

Section 5: Total Iowa (SLAMS and other than SLAMS) Sites Operated by Iowa in MSA's in January 2025

MSA Label	PM2.5 FRM	Ozone	PM2.5 Cont.	PM10 (FRM)	SO2	PM2.5 Spec.	CO	Lead	NO2	PM10 Cont.	Toxics
Ames	0	0	0	0	0	0	0	0	0	0	0
Cedar Rapids	1	2	1	1	1	0	0	0	0	0	1
Council Bluffs	1	1	0	0	0	0	0	1	0	0	0
Davenport	2	2	1	2	1	1	1	0	1	1	1
Des Moines	2	2	2	1	0	0	0	0	0	0	1
Dubuque	0	0	0	0	0	0	0	0	0	0	0
Iowa City	1	0	1	0	0	0	0	0	0	0	0
Sioux City	1	1	0	0	0	0	0	0	0	0	0
Waterloo	1	1	1	0	0	0	0	0	0	0	0
Inside MSA	9	9	6	4	2	1	1	1	1	1	3
Outside MSA	8	4	5	1	4	0	0	0	1	0	2
Entire State	**17**	**13**	**11**	**5**	**6**	**1**	**1**	**1**	**2**	**1**	**5**

Number of Iowa Sites by MSA

establish if monitors were shut down at the end of 2024 or are still operating. This table contains best estimates of sites operating in January 2025 based on review of the AirNow, Air Data, and AQS EPA databases. Network plans and other publicly available information on state websites have also been used to establish these counts.

MSA Label	PM2.5 FRM	Ozone	PM2.5 Cont.	PM10 (FRM)	SO2	PM2.5 Spec.	CO	Lead	NO2	PM10 Cont.	Toxics
Ames	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cedar Rapids	6%	15%	9%	20%	17%	0%	0%	0%	0%	0%	20%
Council Bluffs	6%	8%	0%	0%	0%	0%	0%	100%	0%	0%	0%
Davenport	12%	15%	9%	40%	17%	100%	100%	0%	50%	100%	20%
Des Moines	12%	15%	18%	20%	0%	0%	0%	0%	0%	0%	20%
Dubuque	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Iowa City	6%	0%	9%	0%	0%	0%	0%	0%	0%	0%	0%
Sioux City	6%	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Waterloo	6%	8%	9%	0%	0%	0%	0%	0%	0%	0%	0%
Inside MSA	53%	69%	55%	80%	33%	100%	100%	100%	50%	100%	60%
Outside MSA	47%	31%	45%	20%	67%	0%	0%	0%	50%	0%	40%

Percentage of Iowa Sites by MSA

Appendix K: Distribution of Groups Sensitive to Air Pollution by County and MSA

Table of Contents

Section 1: Summary

The Clean Air Act[68] specifies that the primary National Ambient Air Quality Standards are set to protect public health with an adequate margin of safety. This protection includes groups that are sensitive to the effects of air pollution including the elderly, children, and individuals suffering from respiratory ailments. EPA has minimum monitoring requirements that apply to large urban areas, known as Metropolitan Statistical Areas (MSA's).[69] The analysis contained in this section shows that a significant fraction of the individuals that are sensitive to the effects of air pollution reside in these MSA's.

Section 2 contains maps of populations of the elderly and children in Iowa counties. The data was obtained from the 2023 U.S. Census estimates.[70] Section 3 contains maps of the populations of individuals in Iowa counties suffering from specific respiratory illnesses. The data was obtained from the American Lung Association.[71] Section 4 consolidates data from the 2023 U.S. Census estimates, and the data from the American Lung Association to provide a breakdown of groups known to be sensitive to air pollution by Metropolitan Statistical Area (MSA).

About 62% of Iowa's population lived in MSA's in 2023. Of the groups sensitive to the effects of air pollution, 63% of children under 5, 55% of adults over 65, 62% of children with asthma, 62% of adults with asthma, 59% of individuals with COPD which includes chronic bronchitis and emphysema, and 62% of individuals with lung cancer live in MSA's.

This relationship holds for individual MSA's; the ratio of the population in any MSA to the total state's population is roughly equivalent to the ratio of the population of any sensitive group in that MSA to the total population of that sensitive group in the state.

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[68] See Section 109(b)(1) of the Clean Air Act available at: https://www.epa.gov/clean-air-act-overview/clean-air-act-title-i-air-pollution-prevention-and-control-parts-through-d.

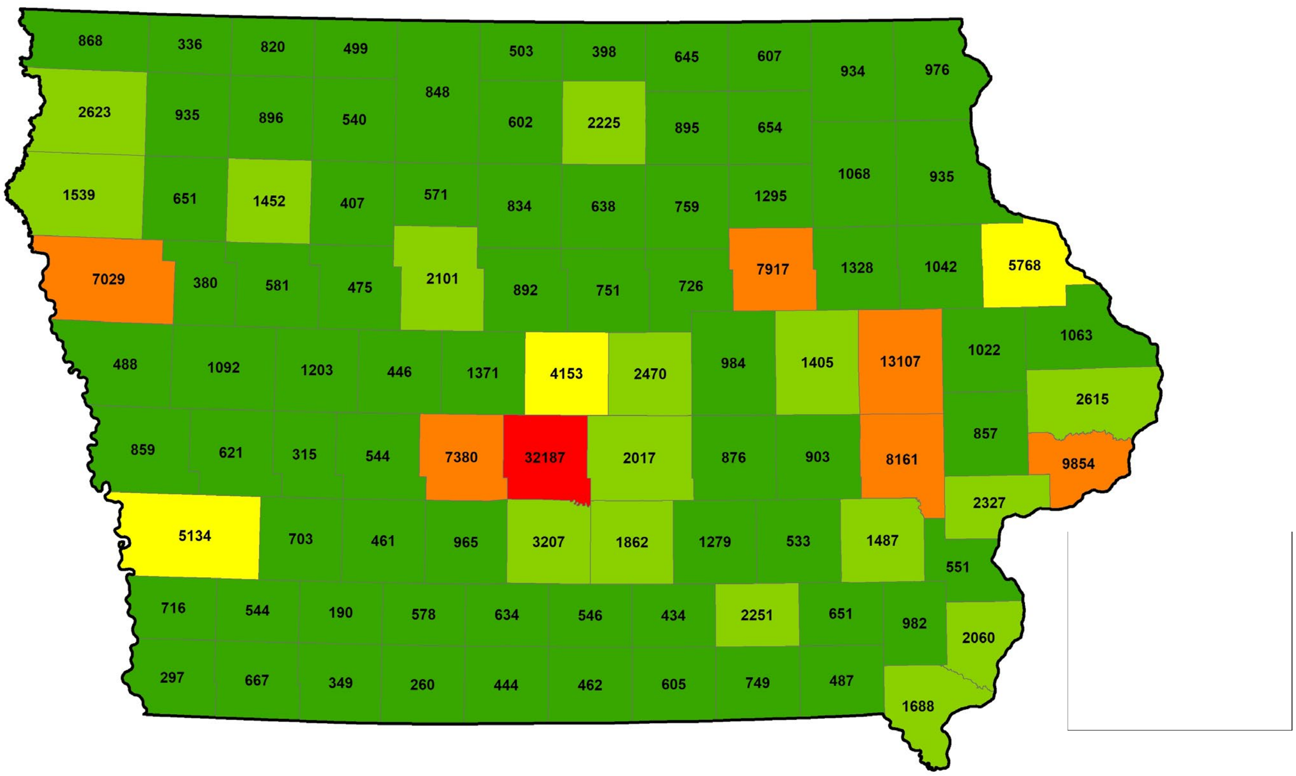
[69] 40 CFR Part 58 Appendix D available at: https://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr58_main_02.tpl.

[70] 2023 U.S. Census Data is available at: https://www.census.gov/programs-surveys/popest/data/tables.html

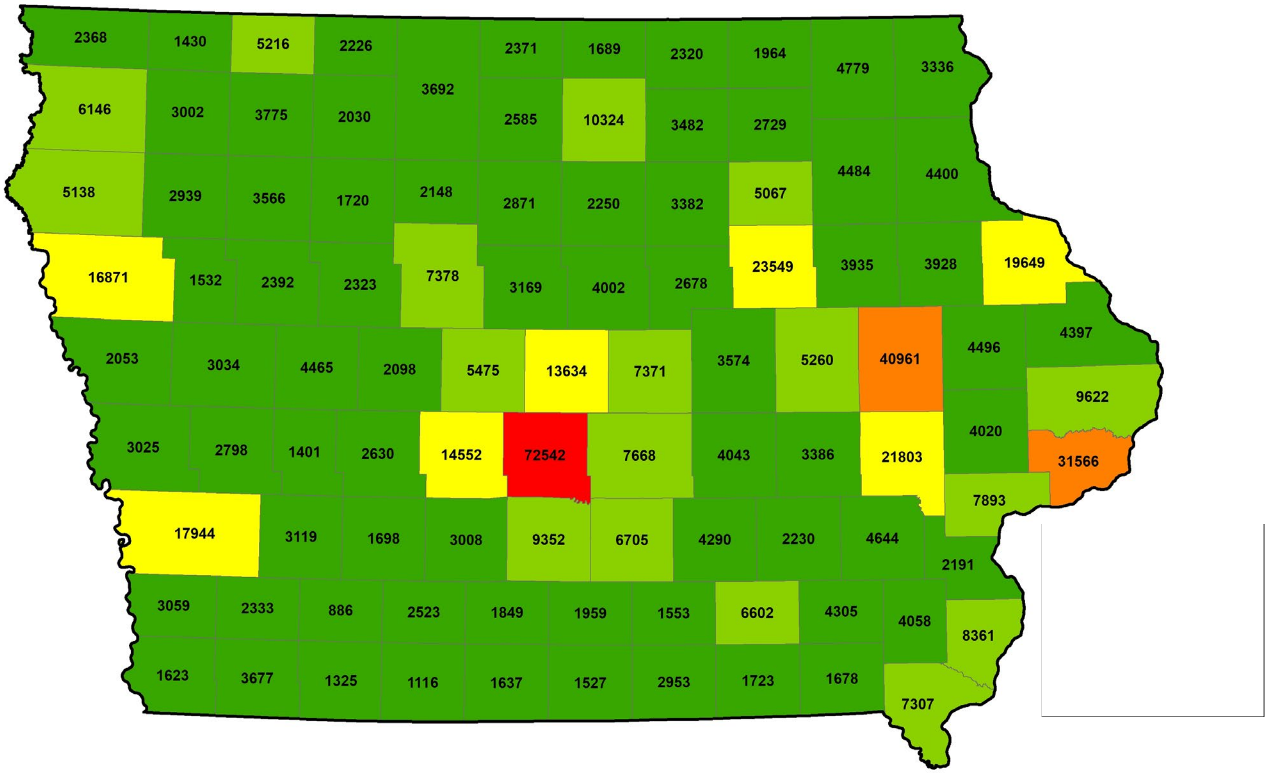
[71] *Estimated Prevalence and Incidence of Lung Disease by Lung Association Territory* available from the American Lung Association at: https://www.lung.org/research/state-of-lung-cancer/states

Section 2: Children and the Elderly

The 2023 U.S. census estimates data contains demographic breakdowns of the population including defined age groups. Among those groups are children under the age of five and adults over 65 years of age. These two age groups represent those individuals in the population who are at greater risk of health issues related to poor air quality. The distribution of these groups is displayed in the maps below:



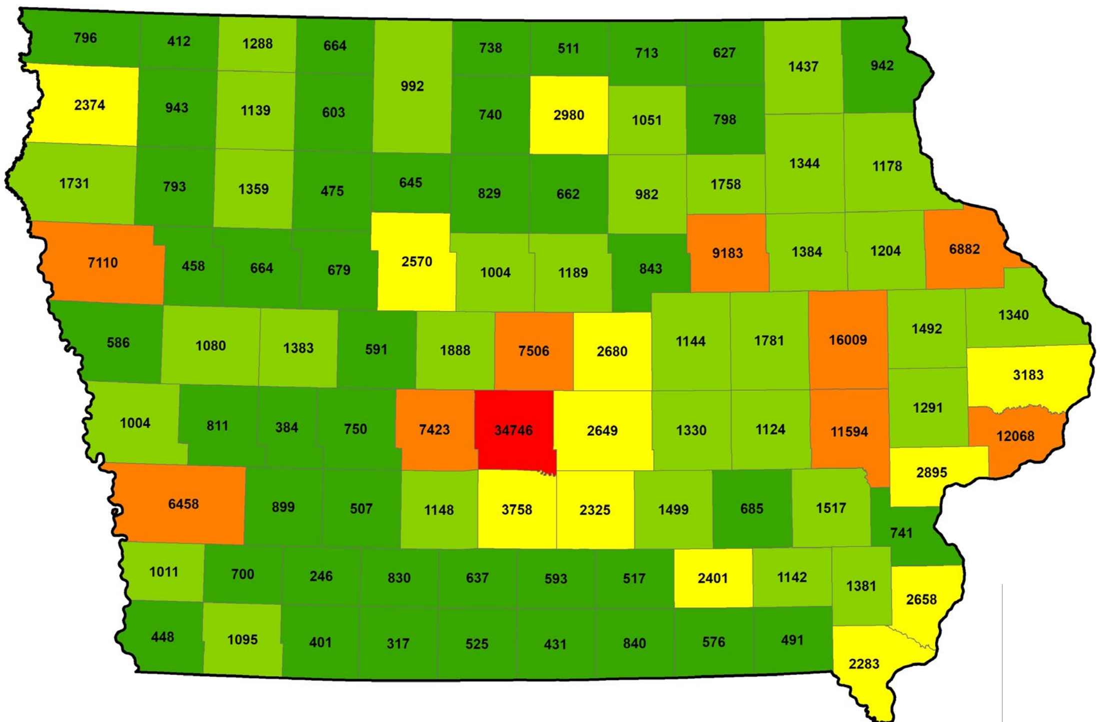
Iowa Population Under the Age of 5 by County – 2023



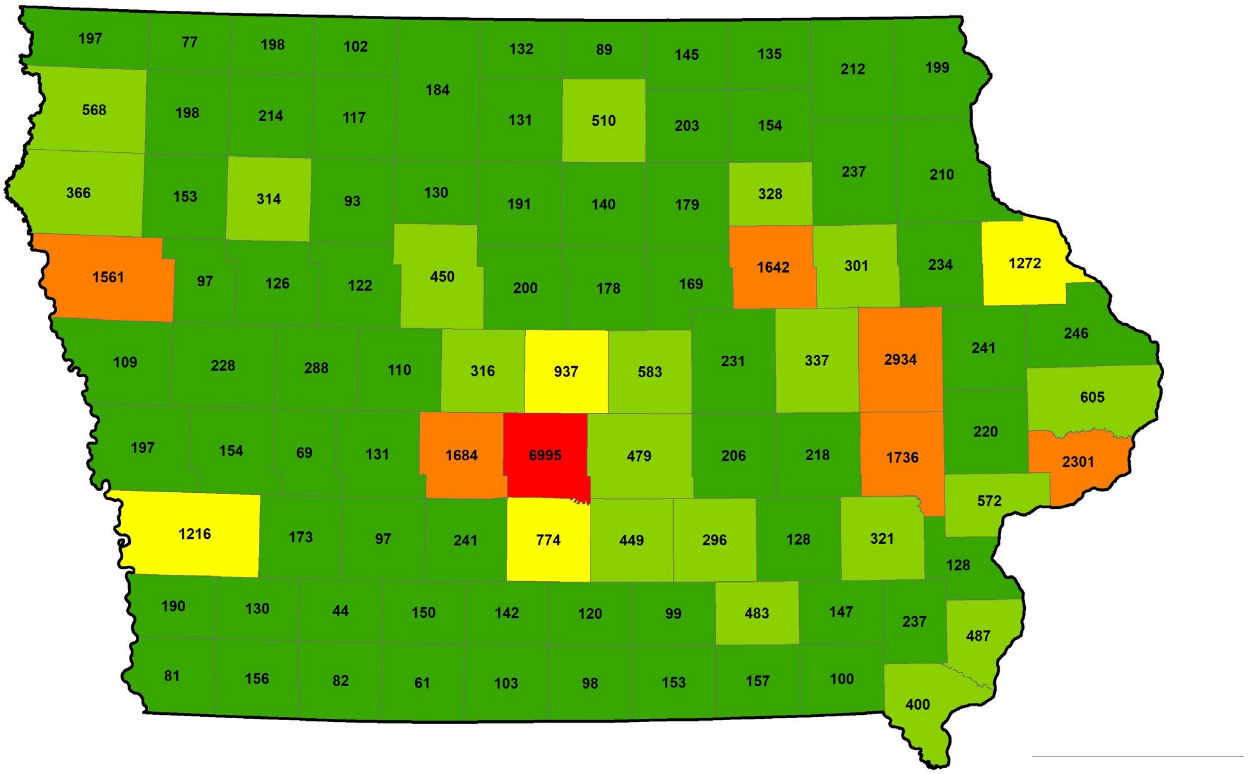
Iowa Population Age 65 and Older by County – 2023

Section 3: Respiratory Diseases

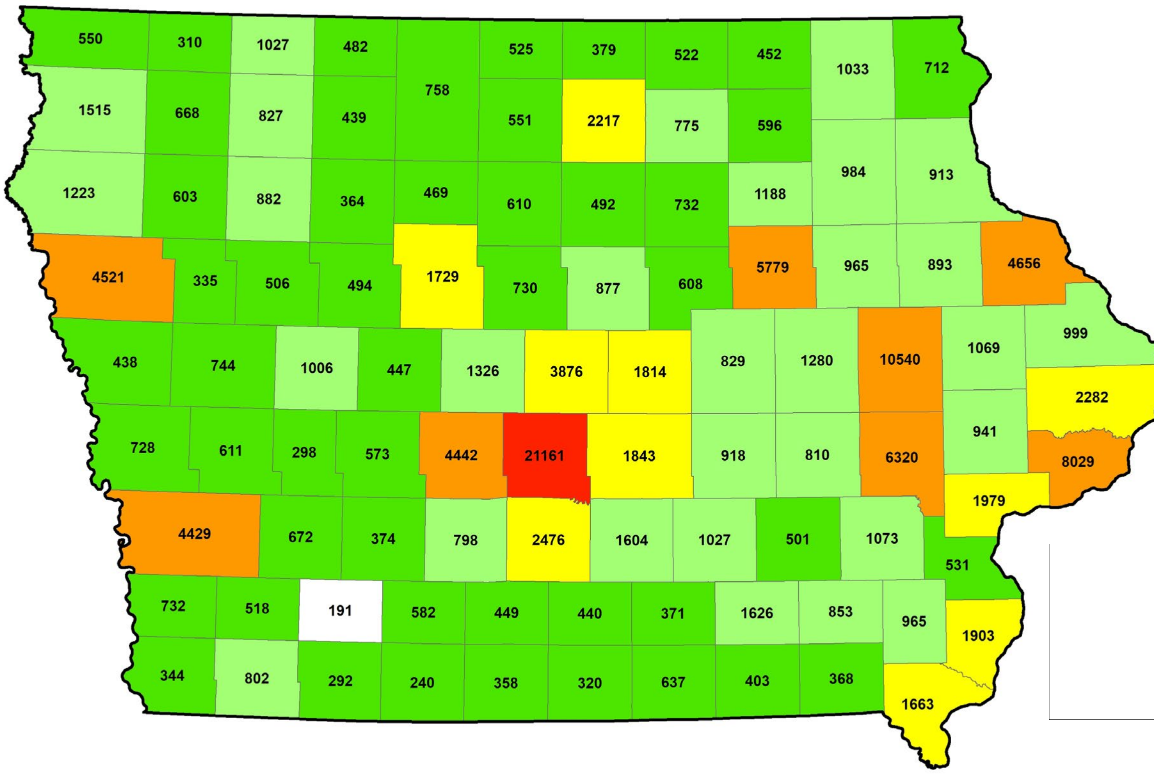
The maps below are based on data reported by the American Lung Association, and estimates of the incidence of lung diseases at the county, state, and regional levels. The county estimates are used in the following maps to display where large numbers of individuals with respiratory diseases reside.



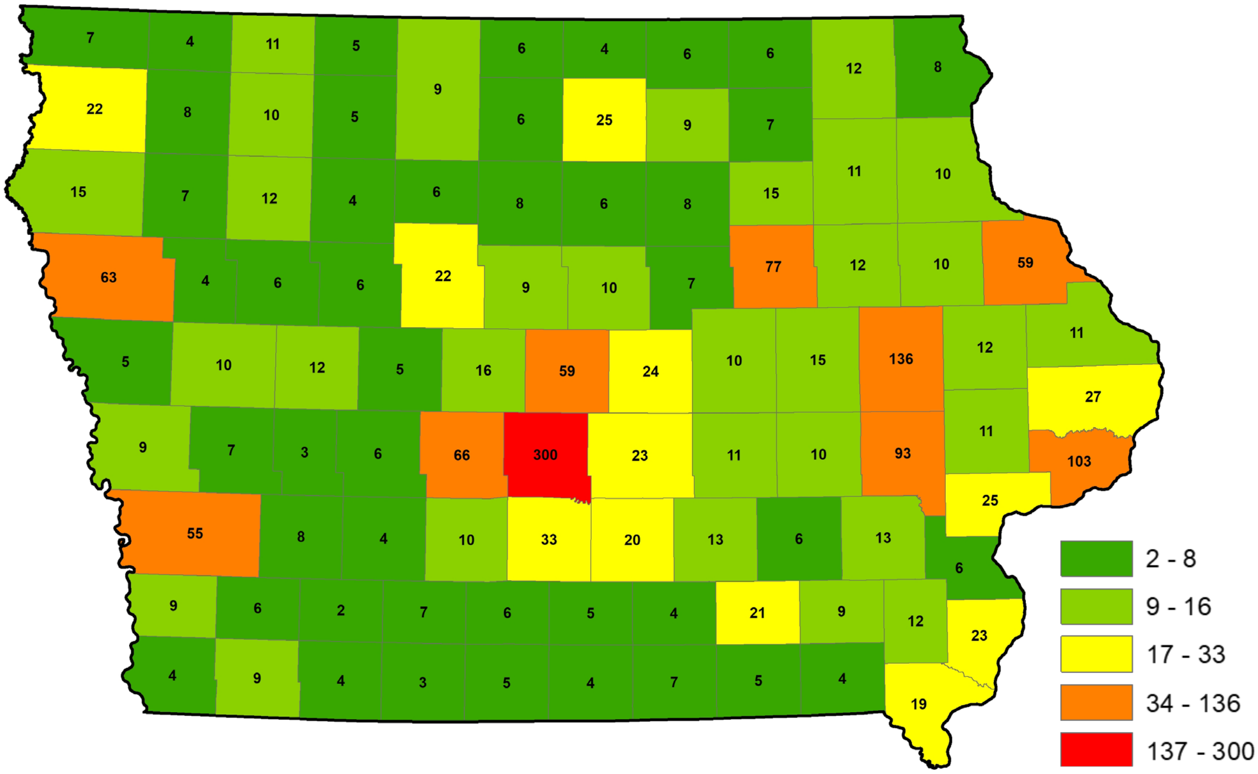
***Number of Adult Asthma Cases by County* - 2023**



***Number of Pediatric Asthma Cases by County* -2023**



Number of COPD (Includes Chronic Bronchitis and Emphysema) Cases by County - 2023



***Number of Lung Cancer Cases by County* - 2023**

Section 4: Breakdown of Groups Known to be Sensitive to Air Pollution by MSA

MSA's	MSA Label*
Ames, IA	Ames
Cedar Rapids, IA	Cedar Rapids
Dubuque, IA	Dubuque
Davenport-Moline-Rock Island, IA-IL	Davenport
Des Moines-West Des Moines, IA	Des Moines
Iowa City, IA	Iowa City
Omaha-Council Bluffs, NE-IA	Council Bluffs
Sioux City, IA-NE-SD	Sioux City
Waterloo-Cedar Falls, IA	Waterloo

*In multi-city MSAs, the largest Iowa City has been used to label the MSA

Iowa Metropolitan Statistical Area Labels

MSA Label	Population 2023	Population Under 5	Population Over 65	Pediatric Asthma	Adult Asthma	COPD	Lung Cancer
Ames	125,156	5,524	19,109	1,253	9,394	5,202	75
Cedar Rapids	275,668	15,534	50,717	3,512	19,282	12,889	163
Davenport	174,270	9,854	31,566	2,301	12,068	8,029	103
Des Moines	737,164	46,300	109,752	10,304	50,474	31,293	438
Dubuque	98,887	5,768	19,649	1,272	6,882	4,656	59
Iowa City	180,088	9,648	26,447	2,057	13,111	7,393	106
Council Bluffs	122,482	6,709	24,028	1,603	8,473	5,889	73
Sioux City	105,951	7,029	16,871	1,561	7,110	4,521	63
Waterloo	168,162	9,938	31,294	2,139	11,784	7,575	99
Inside MSAs	**1,987,828**	**116,304**	**329,433**	**26,002**	**138,578**	**87,447**	**1,179**
Outside MSAs	**1,219,176**	**69,735**	**266,404**	**16,026**	**83,888**	**60,289**	**723**
Entire State	**3,207,004**	**186,039**	**595,837**	**42,028**	**222,466**	**147,736**	**1,902**

Iowa Population in MSA's

MSA Label	% Population 2023	% Population Under 5	% Population Over 65	% Pediatric Asthma	% Adult Asthma	% COPD	% Lung Cancer
Ames	3.9%	3.0%	3.2%	3.0%	4.2%	3.5%	3.9%
Cedar Rapids	8.6%	8.3%	8.5%	8.4%	8.7%	8.7%	8.6%
Davenport	5.4%	5.3%	5.3%	5.5%	5.4%	5.4%	5.4%
Des Moines	23.0%	24.9%	18.4%	24.5%	22.7%	21.2%	23.0%
Dubuque	3.1%	3.1%	3.3%	3.0%	3.1%	3.2%	3.1%
Iowa City	5.6%	5.2%	4.4%	4.9%	5.9%	5.0%	5.6%
Council Bluffs	3.8%	3.6%	4.0%	3.8%	3.8%	4.0%	3.8%
Sioux City	3.3%	3.8%	2.8%	3.7%	3.2%	3.1%	3.3%
Waterloo	5.2%	5.3%	5.3%	5.1%	5.3%	5.1%	5.2%
Inside MSAs	62.0%	62.5%	55.3%	61.9%	62.3%	59.2%	62.0%
Outside MSAs	38.0%	37.5%	44.7%	38.1%	37.7%	40.8%	38.0%

Percent of Iowa Population in MSA’s

Appendix L: Population Trends

Table of Contents

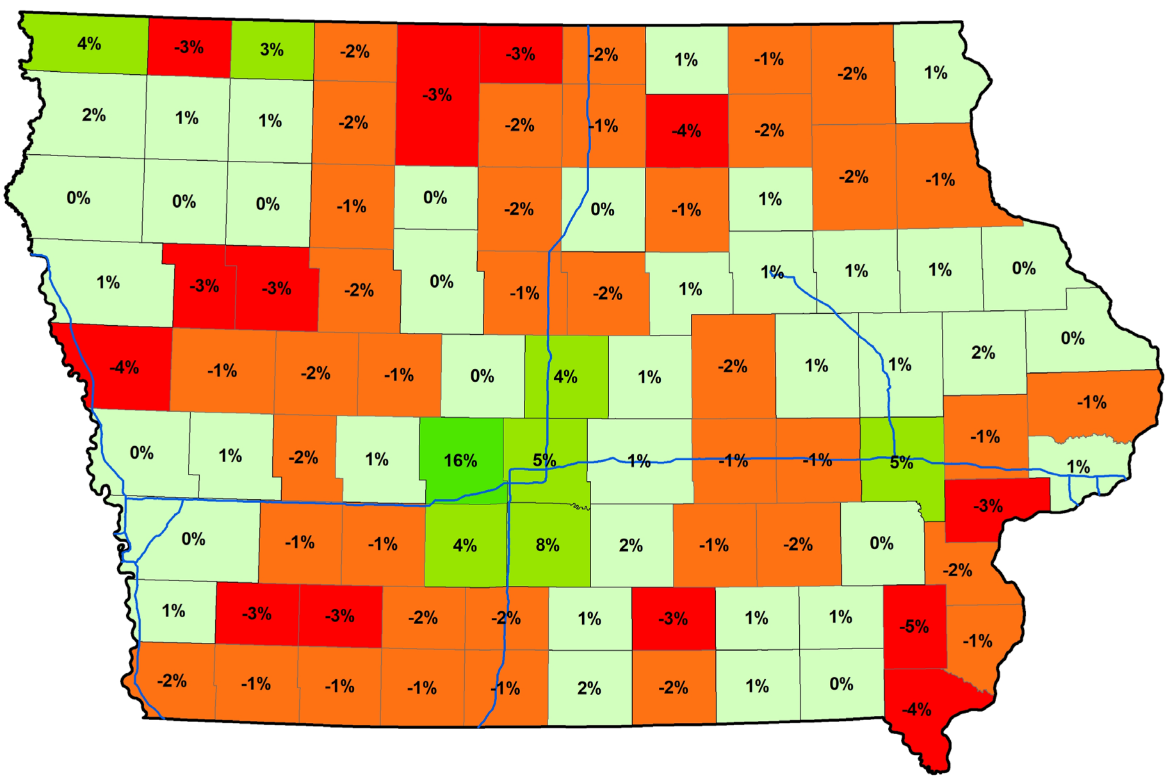
Section 1: Summary

The U.S. Census is conducted every ten years. For the years between actual censuses, the U.S. Census Bureau provides population estimates.[72] The map in Section 2 below shows the population change in each county from 2020-2024. Over this period, populations around Iowa's major cities (associated with MSA's) have increased, and populations in most rural areas have decreased. Section 3 contains population changes for counties at the national, Midwest and Iowa levels.

[72] The data summarized in Section 2 of this appendix is from the U.S. Census Bureau and is available at: https://www.census.gov/programs-surveys/popest/data/tables.html.

Section 2: Iowa Population Change by County Map

The map below is derived from US Census estimates and indicates the difference between the county population estimates for 2020 and 2024. Many of the counties containing large cities (Des Moines, West Des Moines, Ames, Iowa City, Cedar Rapids, Dubuque, and Davenport) and their surrounding counties showed increases in population over this period. Most of the declines were noted in rural counties.



Percent Population Change of Iowa Counties from 2020 to 2024

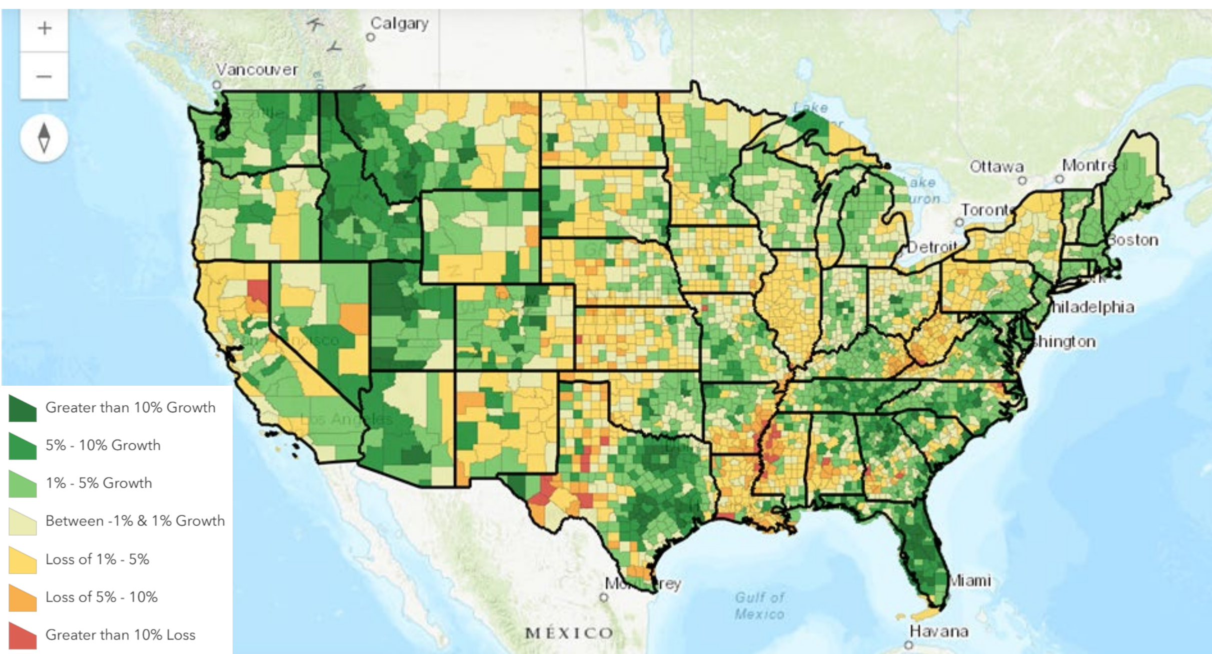
Section 3: Maps of Changes in National and Midwestern Populations from 2020 to 2024

The maps below from the U.S. Census Bureau[73] show population changes within counties at national, Midwest and Iowa levels.

Nationally, there was considerable growth in the west, including significant growth in a large number of counties in Arizona, central California, Washington, Idaho, parts of Oregon, Nevada, Utah, and Colorado. In the south, significant growth was experienced in Houston, San Antonio, Austin, Dallas, and in most of Florida. Throughout the rest of the southeast, the larger MSA's tended to experience significant growth with slight losses in rural areas; in contrast to the northeast and upper Midwest, where significant growth in the larger MSAs was often accompanied by declines in many rural areas.

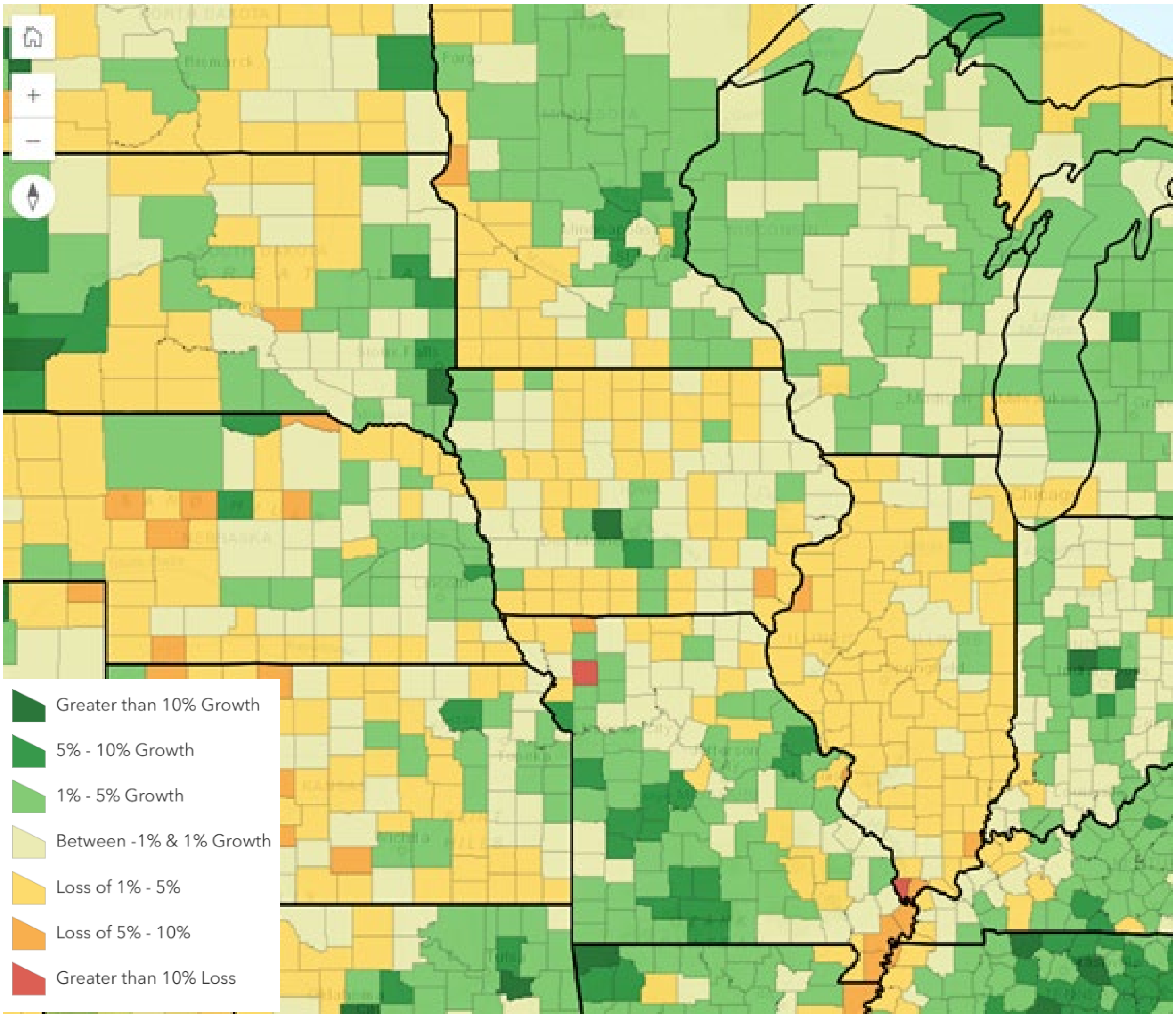
In Iowa and surrounding states, the general trend was toward slight declines in rural counties and increases in larger urban counties. There was considerable growth in one or more counties in the Kansas City KS-MO, Saint Louis MO-IL, Omaha NE-IA, Lincoln NE, Des Moines IA, Madison WI, Minneapolis MN-WI MSAs, and significant declines in many rural counties in the majority of Illinois.

There was considerable growth in Iowa in Des Moines and surrounding counties, and in the counties around Omaha, Nebraska. There was also moderate growth in counties on the Iowa border in South Dakota. There were moderate to considerable declines in Iowa in counties along and on both sides of the Southeast Iowa border.

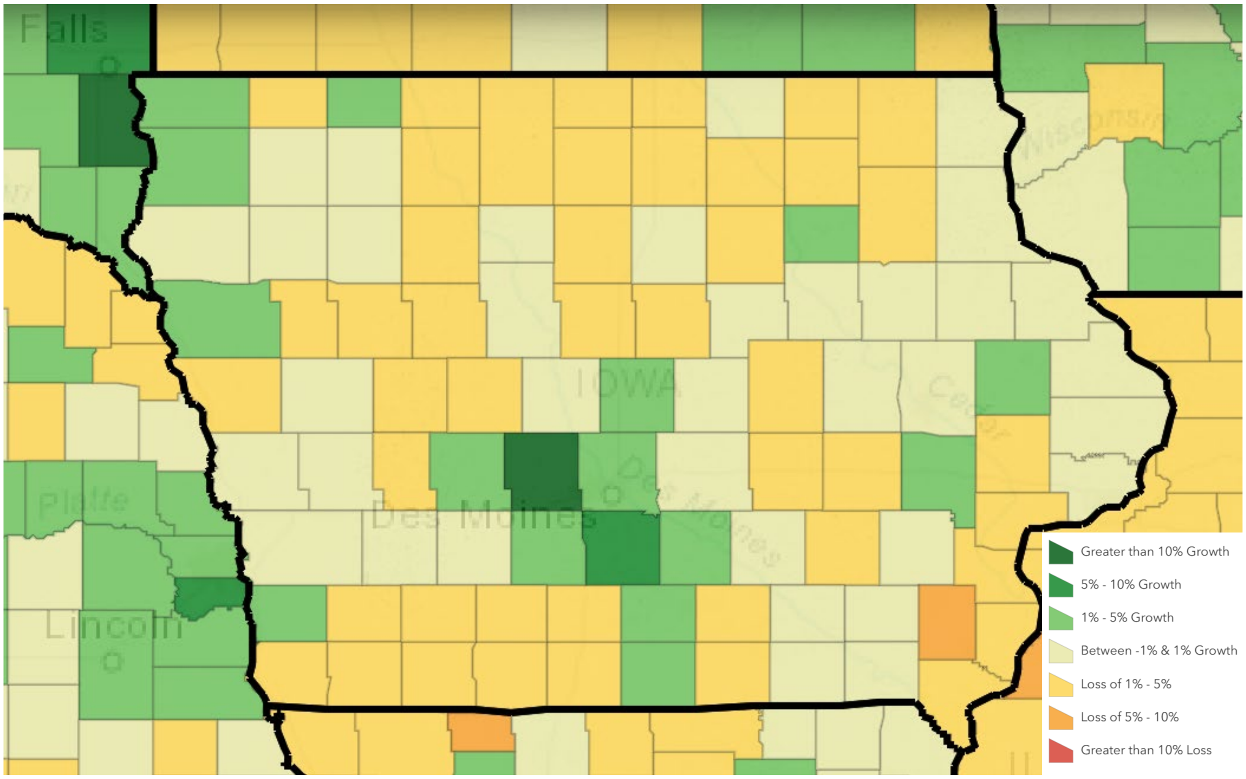


National Population Change by County 2020-2024 (U.S. Census)

[73] https://thearp.org/blog/reference/population-estimate-shifts/



Midwestern Population Change by County 2020-2024



Numeric Population Change by County 2020-2024