Minnesota Pollution Control Agency

Minnesota Air Quality Index

2009 Summary

Air Quality Index (AQI)

The Air Quality Index, or AQI, was developed by the U.S. Environmental Protection Agency (EPA) to provide a simple, uniform way to report daily air quality conditions. Minnesota AQI numbers are determined by hourly measurements of four pollutants: fine particles ($PM_{2.5}$), ground-level ozone (O_3), sulfur dioxide (SO_2), and carbon monoxide (CO). The pollutant with the highest value determines the AQI for that hour. The pollutants that drive the AQI most often are $PM_{2.5}$ and ozone.

Air quality is ranked as good, moderate, unhealthy for sensitive groups (USG), unhealthy for all, or very unhealthy. If it is suspected through forecasting or monitoring that one of the four pollutants may be unhealthy for sensitive groups or higher, the Minnesota Pollution Control Agency (MPCA) issues an Air Pollution Health Alert to the news media and to individuals who have signed up to receive the alerts by e-mail.

AQI Monitoring Network

The MPCA reports the AQI for nine regions across the state. The number and type of monitors vary from region to region, with the most monitors in the Twin Cities metropolitan area. Figure 1 describes the network of air monitors the MPCA operates to collect hourly air quality data.

The MPCA did not make any modifications to the AQI monitoring network in 2009. For more information on MPCA's air-monitoring network, see the Air Monitoring Network Plan at www.pca.state.mn.us/air/monitoringnetwork.html.

2009 AQI Network
Figure 1

Region	Sites	Monitors				Totals
		O_3	$PM_{2.5}$	CO	SO_2	
Brainerd	2	2	1			3
Detroit Lakes	1	1	1			2
Duluth	4	2	1	1		4
Ely	1	1	1			2
Grand Portage	1		1			1
Marshall	1	1	1			2
St. Cloud	2	1	1	1		3
Rochester	1	1	1			2
Twin Cities	12	6	6	2	1	15
Totals						
9	25	15	14	4	1	34

O_3 Ozone

$PM_{2.5}$ Fine Particles

CO Carbon Monoxide

SO_2 Sulfur Dioxide

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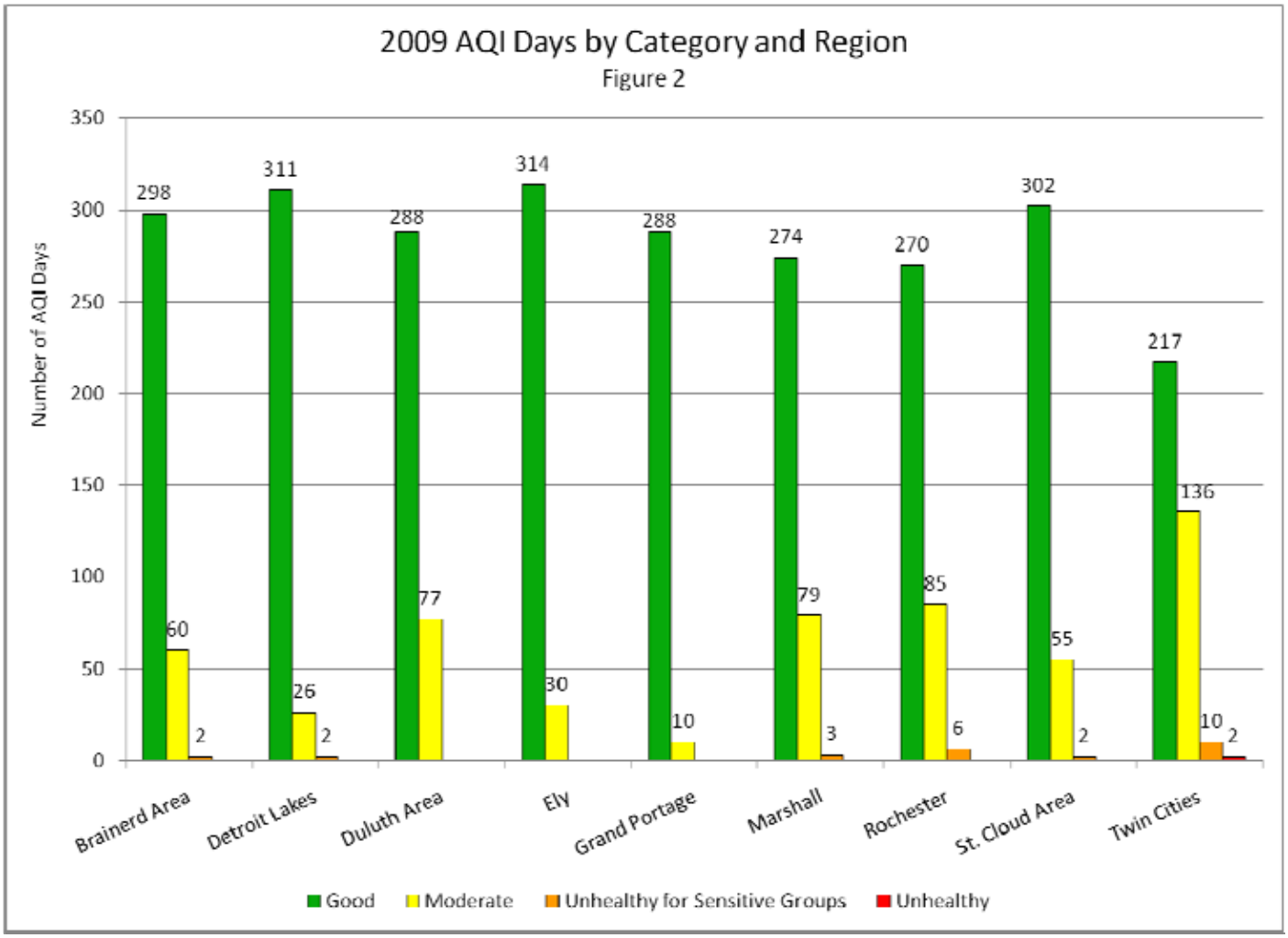
2009 AQI Days by Category and Region

Figure 2 summarizes the number of days in each of four health categories (good, moderate, unhealthy for sensitive groups, and unhealthy) in each of the nine AQI reporting regions (Brainerd Area, Detroit Lakes, Duluth Area, Ely, Grand Portage, Marshall, Rochester, St. Cloud Area, and the Twin Cities). Each day's AQI is calculated by using the highest hourly AQI value that day for all sites and measured pollutants in a particular region. Some regions do not show a total of 365 days due to monitoring problems or because their monitors were not operating.

Due to differences in the way the MPCA calculates fine particle AQI values, the distribution of days in each AQI category reported here may differ from other reporting sources, such as the EPA. The MPCA's counting method, which considers the peak rolling 24-hour fine particle concentration for a given day, rather than the end-of-day, 24-hour concentration, will typically lead to an increase in the number of moderate and higher days. Additionally, while the EPA made changes to the National Air Quality Standard (NAAQS) for fine particles in 2006, the corresponding changes to the AQI breakpoints have yet to be established. To ensure public health protection, the MPCA has adjusted the fine particle AQI breakpoints to reflect the 2006 NAAQS changes. As a result, utilizing the MPCA AQI calculation method will lead to a greater number of Unhealthy for Sensitive Group and Unhealthy days than EPA calculations.



Overall, regional air quality continued to show improvements in 2009, as made evident by an increase in the percent of good AQI days and a corresponding percent decrease in moderate AQI days in all reporting regions from 2008 to 2009. However, while the number of unhealthy for sensitive group days in most regions showed little change from 2008 to 2009, the number of unhealthy for sensitive group days in the Twin Cities doubled over that period. Additionally, the Twin Cities experienced two days when air quality was considered unhealthy for everyone.

The variability of the AQI readings across the nine reporting regions is described in Figure 3 in terms of the ratio of good to moderate days, annual average AQI, and annual median AQI. With the exception of Duluth, which experienced a small (0.2 day) decline, the ratio between good and moderate AQI days increased across all reporting regions from 2008 to 2009. The annual average and median AQI values declined across all reporting regions, indicating a general improvement in air quality.

2009 AQI Variability
Figure 3

Region	Good-to-Moderate Ratio	Average AQI	Median AQI
Brainerd Area	4.97	36	33
Detroit Lakes	11.96	32	31
Duluth Area	3.74	39	36
Ely	10.47	30	29
Grand Portage	28.80	13	10
Marshall	3.47	40	39
Rochester	3.18	43	39
St. Cloud Area	5.49	37	35
Twin Cities	1.60	52	46

2009 Days with an AQI Greater than 100

Figure 4 summarizes the days the AQI exceeded 100 in 2009. As was the case in 2008, all high AQI days in 2009 were due to fine particle pollution. Consistent with the nature of fine particle formation and transport, the 2009 high AQI days can be described as five individual multiday air pollution events. While the duration of these events varies, consecutive days of poor air quality are typically the result of persistent environmental conditions such as air stagnation, wind direction and speed, and temperature.

2009 Days with an AQI Greater than 100
Figure 4

	Brainerd Area	Detroit Lakes	Duluth Area	Ely	Grand Portage	Marshall	Rochester	St. Cloud Area	Twin Cities
1/22/2009									127
1/23/2009							102		137
3/5/2009		110				102		102	
3/6/2009	105	112						112	110
7/5/2009									124
7/6/2009									102
11/20/2009									105
11/21/2009									107
11/23/2009							110		115
11/24/2009							132		154
11/25/2009							127		152
12/18/2009	110					122	124		124
12/19/2009						127	124		122
Totals	**2**	**2**	**0**	**0**	**0**	**3**	**6**	**2**	**12**