



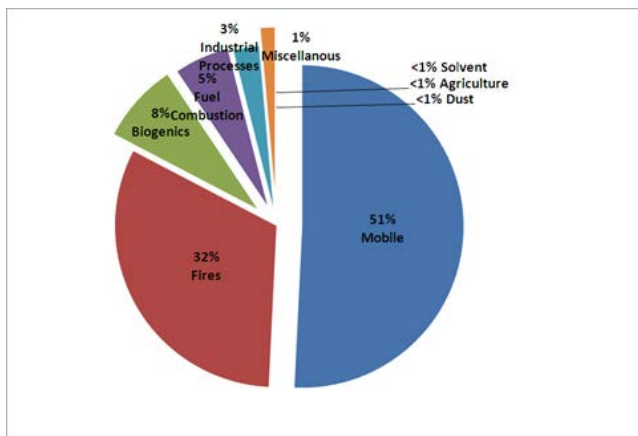
# 2013 Carbon Monoxide Summary

New Jersey Department of Environmental Protection

## NATURE AND SOURCES

Carbon monoxide (CO) is a colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely. It is a by-product of motor vehicle exhaust, which contributes over 51 percent of all CO emissions nationwide. Non-road engines and vehicles, such as construction equipment and boats, are also significant sources of CO. Other sources of CO include industrial processes, fuel combustion in sources such as boilers and incinerators, and natural sources such as forest fires. Figure 1 shows the national average contributions of these sources.

Figure 1  
National Summary of CO Emissions by Source Category 2011

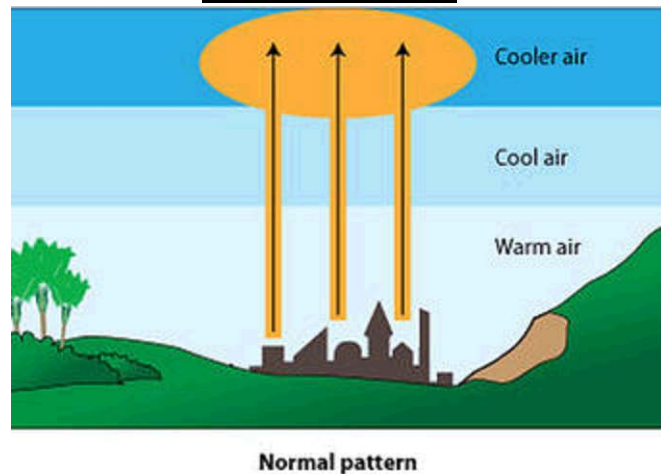


Source: United States Environmental Protection Agency  
[www.epa.gov/air/emissions/co.htm](http://www.epa.gov/air/emissions/co.htm)

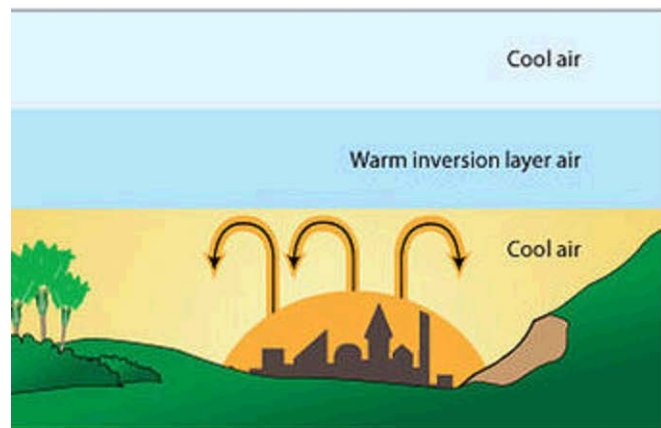
Atmospheric inversions, which usually occur overnight when cooler air is trapped beneath a layer of warmer air, allow CO levels to accumulate near the ground. The inversion acts like a lid, preventing pollution from mixing in the atmosphere and effectively trapping it close to ground level (see Figure 2). Figure 3 shows that CO levels are slightly higher in the winter, probably because inversions are more frequent during the winter months. Also, high CO levels often coincide with morning and afternoon rush hours, and this diurnal variation is displayed in Figure 4.

Figure 2  
Effect of Atmospheric Inversion of Pollution

[www.sciencelearn.org.nz](http://www.sciencelearn.org.nz)



Normal pattern



Thermal inversion

Figure 3  
 2013 Carbon Monoxide Average Concentrations - New Jersey  
 Monthly Variation, Parts Per Million (PPM)

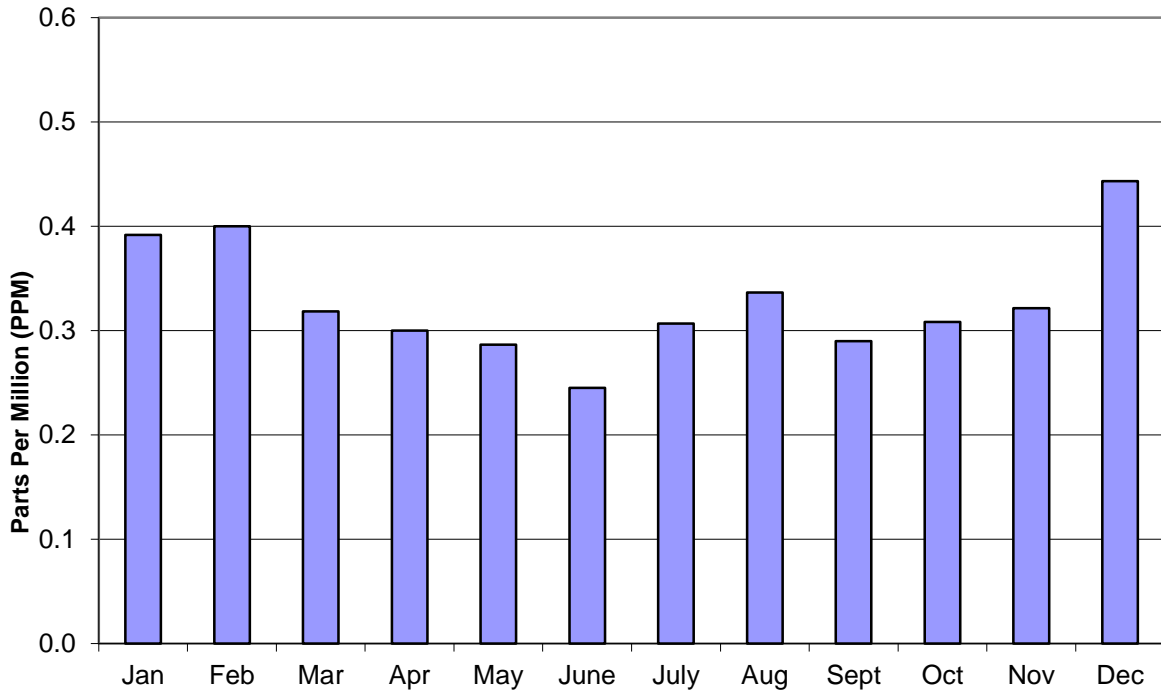
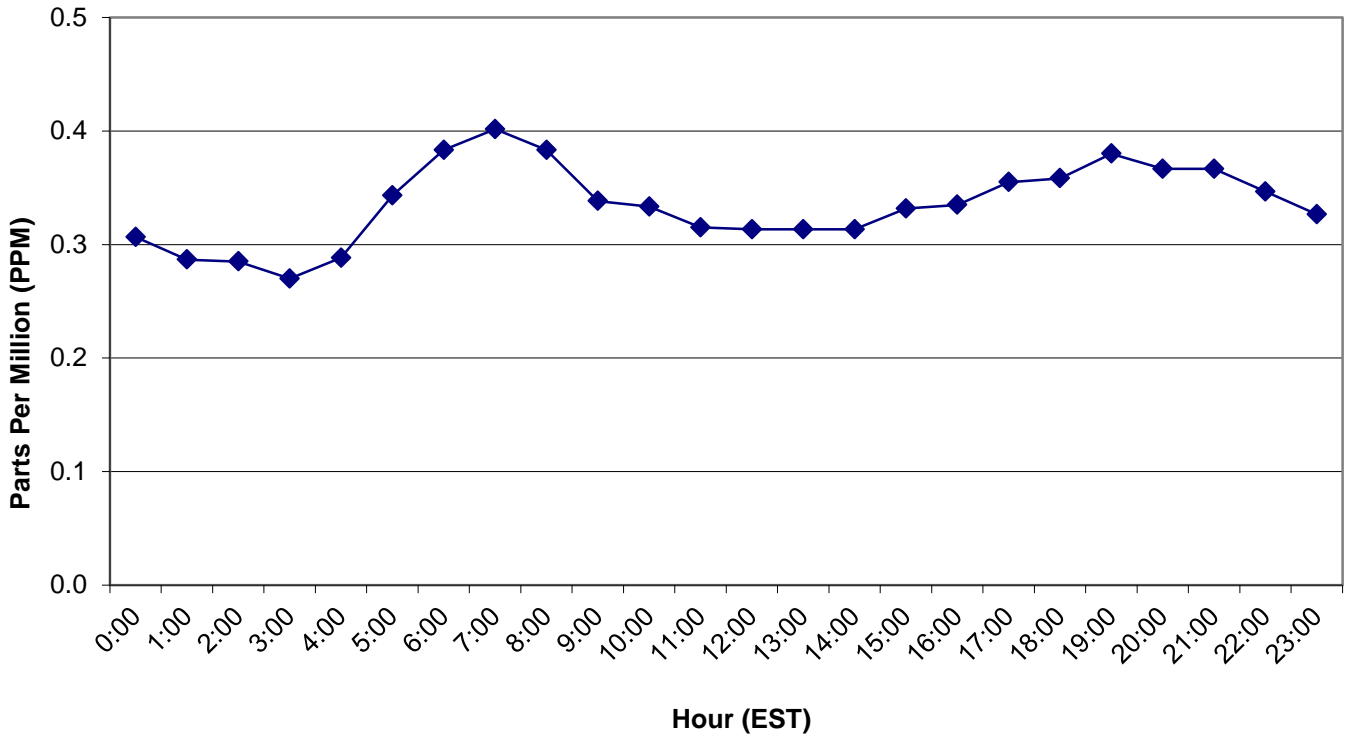


Figure 4  
 2013 Carbon Monoxide Average Concentrations-New Jersey  
 Hourly Variation, Parts Per Million (PPM)



## HEALTH AND ENVIRONMENTAL EFFECTS

Carbon monoxide enters the bloodstream and reduces the body's ability to distribute oxygen to organs and tissues. The most common symptoms associated with exposure to carbon monoxide are headaches and nausea. The health threat from exposure to CO is most serious for those who suffer from cardiovascular disease. For a person with heart disease, a single exposure to CO at low levels may cause chest pain and reduce that individual's ability to exercise. Healthy people are also affected, but only at higher levels of exposure. Elevated CO levels are also associated with visual impairment, reduced work capacity, reduced manual dexterity, decreased learning ability, and difficulty in performing complex tasks.

## STANDARDS

There are currently two national primary, or health based standards for carbon monoxide in ambient air. They are set at a 1-hour average concentration of 35 parts per million (ppm), and an 8-hour average concentration of 9 ppm. These levels are not to be exceeded more than once in any calendar year. There are no national secondary, or welfare based standards for CO at this time. The national standards are commonly known as National Ambient Air Quality Standards (NAAQS). New Jersey also has standards for CO, and they are based on different units (milligrams per cubic meter as opposed to parts per million), and the state standards are not to be exceeded more than once in any 12-month period. The state has set secondary standards for CO at the same level as the primary standards. The standards are summarized in Table 1.

**Table 1**  
**National and New Jersey Ambient Air Quality Standards for Carbon Monoxide**

mg/m<sup>3</sup> = Milligrams Per Cubic Meter  
ppm = Parts per Million

Averaging Period	Type	New Jersey	National
1-Hour	Primary	40 mg/m <sup>3</sup> (35 ppm)	35 ppm
1-Hour	Secondary	40 mg/m <sup>3</sup> (35 ppm)	----
8-Hour	Primary	10 mg/m <sup>3</sup> (9 ppm)	9 ppm
8-Hour	Secondary	10 mg/m <sup>3</sup> (9 ppm)	----

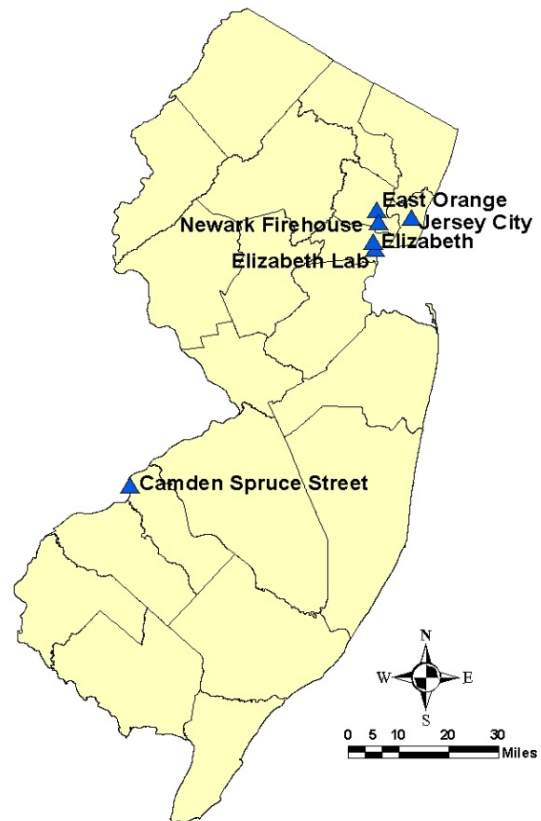
## MONITORING LOCATIONS

The New Jersey Department of Environmental Protection (NJDEP) operated 6 CO monitoring stations in 2013. These sites are shown in the map in Figure 5. The Newark Firehouse station measures CO concentrations at trace levels as part of the U.S. Environmental Protection Agency's (EPA) National Core (NCore) monitoring network. Trace level CO concentrations are measured and reported to the hundredth of a ppm. The Camden Spruce Street site began monitoring for CO in April 2012. The NJDEP is planning to establish a new CO monitoring location in Fort Lee by January 1, 2014.

## CO LEVELS IN 2013

None of the monitoring sites recorded exceedances of any CO standards during 2013. The maximum 1-hour average CO concentration recorded in 2013 was 5.27 ppm at the Newark Firehouse station. The highest 8-hour average CO concentration recorded was 2.4 ppm at the East Orange station. Summaries of the 2013 data are provided in Table 2, Figure 6 and Figure 7.

Figure 5  
2013 Carbon Monoxide  
Monitoring Network



**Table 2**  
**Carbon Monoxide Data - 2013**  
**1-Hour and 8-Hour Averages**

Parts Per Million (PPM)  
1-hour standard= 35 PPM  
8-hour standard= 9 PPM

Monitoring Sites	Maximum 1-Hour Average	2 <sup>nd</sup> Highest 1-Hour Average	Maximum 8-Hour Average	2 <sup>nd</sup> Highest 8-Hour Average
Camden Spruce St.	1.8	1.8	1.3	1.1
East Orange	3.5	3.4	2.4	1.9
Elizabeth	2.4	2.4	2.1	1.7
Elizabeth Lab	2.3	2.0	1.7	1.3
Jersey City	2.8	2.7	2.2	1.8
Newark Firehouse	5.27	3.17	2.06	1.91

Figure 6  
 Highest and 2<sup>nd</sup> Highest 1-Hour Averages  
 Of Carbon Monoxide in New Jersey-2013  
 Parts Per Million (PPM)

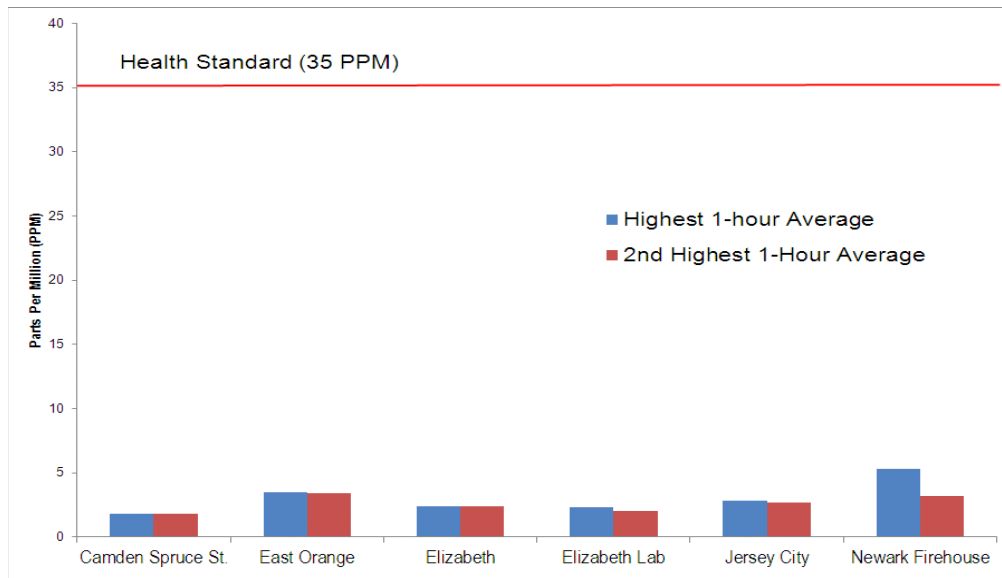
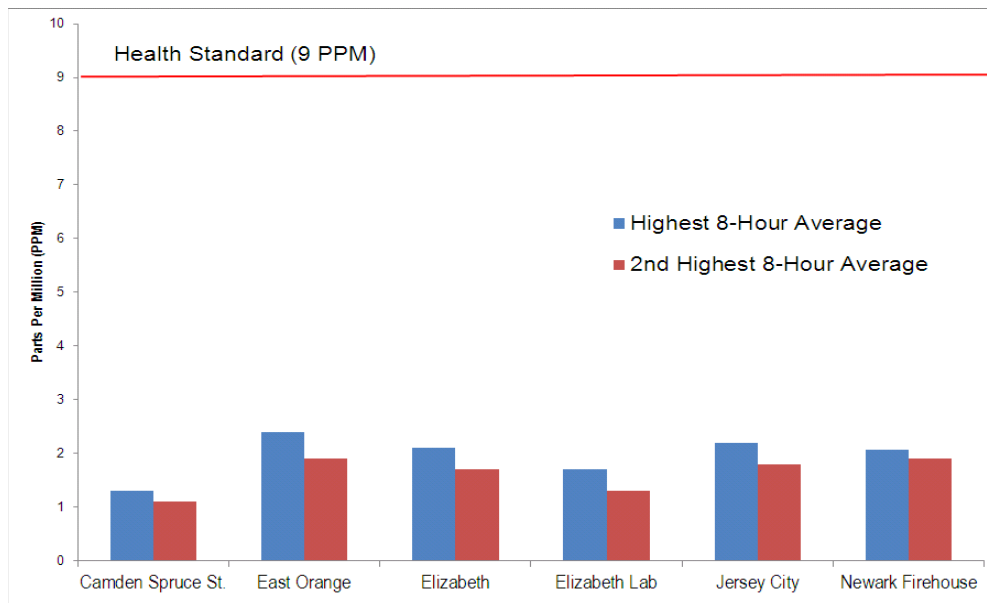


Figure 7  
 Highest and 2<sup>nd</sup> Highest 8-Hour Averages  
 Of Carbon Monoxide in New Jersey-2013  
 Parts Per Million (PPM)



## TRENDS

Carbon monoxide levels have improved dramatically over the past 20 years. A trend graph of CO levels showing the concentrations recorded in each year since 1975 of the highest site, average of all sites and lowest site is provided in Figure 8. The graph depicts the second highest 8-hour value recorded since this is the value that determines if the health standard is being met (one exceedance per site is allowed each year). The last time the CO standard was exceeded in New Jersey was in January of 1995 (Figure 9), and the entire state was officially declared as having attained the CO standard on August 23, 2002. At one time, unhealthy levels of CO were recorded on a regular basis. The reduction in CO levels is due primarily to cleaner running cars, which are by far the largest source of this pollutant.

Figure 8  
Carbon Monoxide Air Quality, 1975-2013  
2<sup>nd</sup> Highest 8-hour Average  
Parts Per Million (PPM)

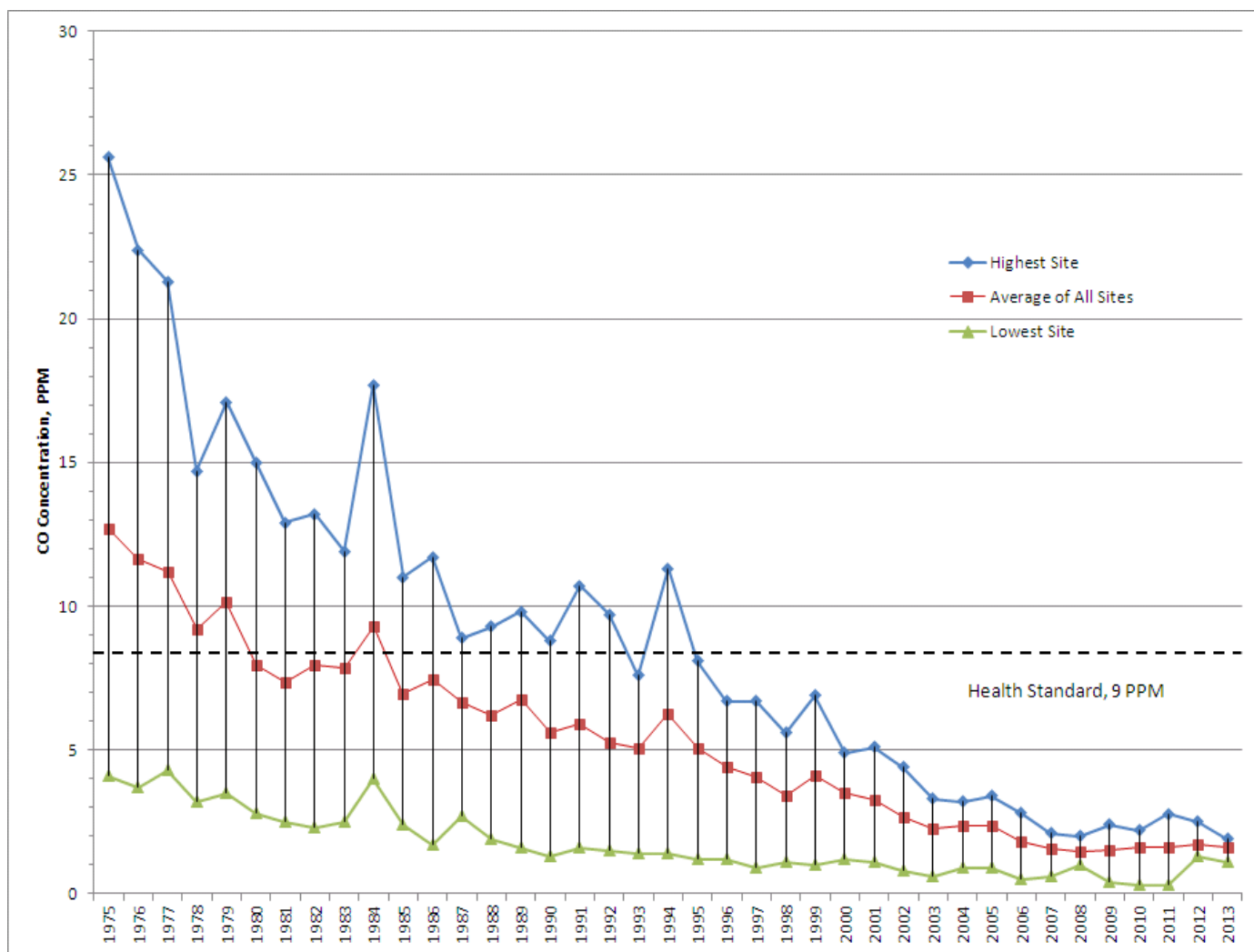
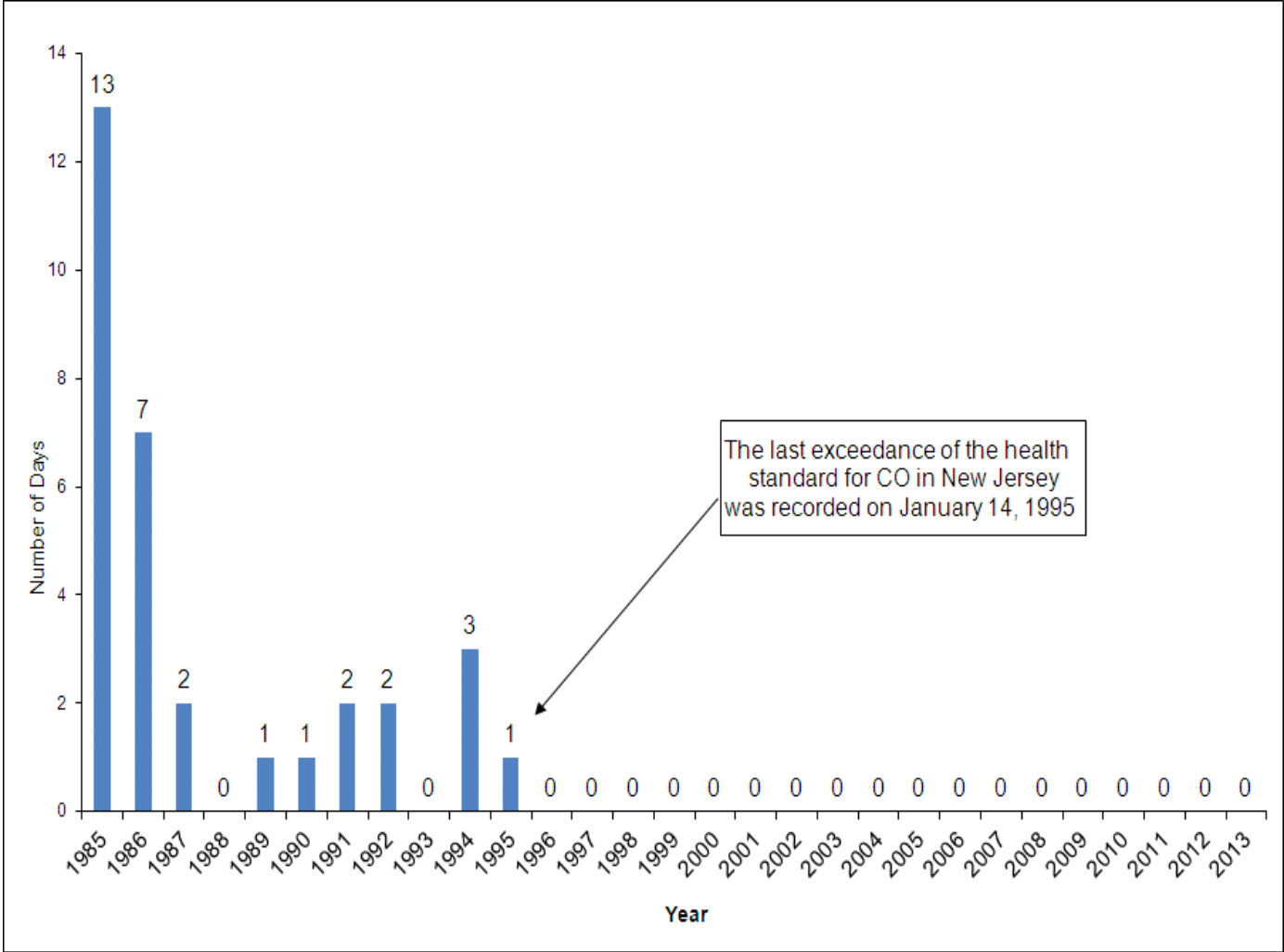


Figure 9  
Carbon Monoxide  
Unhealthful Days 1985-2013



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