



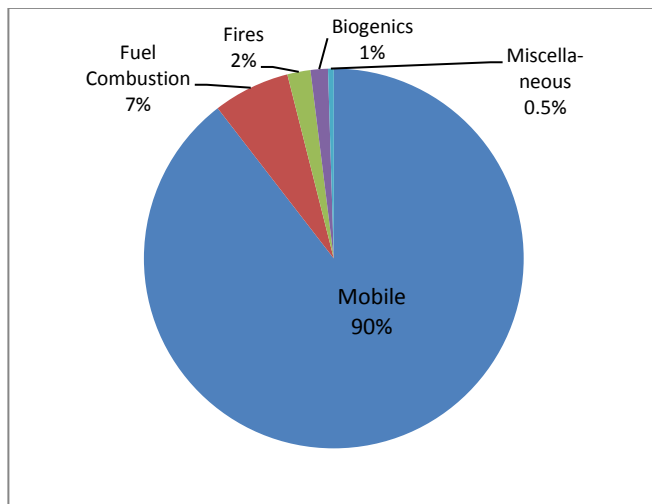
# 2015 Carbon Monoxide Summary

New Jersey Department of Environmental Protection

## SOURCES

Carbon monoxide (CO) is a colorless, odorless gas that is formed when carbon in fuels is not burned completely. It is a by-product of motor vehicle exhaust, which contributes over 51% of all CO emissions nationwide, and 90% in New Jersey. In addition to cars, trucks and buses, mobile sources include non-road vehicles like construction equipment and boats. CO is also emitted from fuel combustion in boilers and incinerators, natural sources such as forest fires, and various industrial processes. Figure 1 shows the average contributions of these sources in New Jersey for 2011 (the most recent year available).

Figure 1  
2011 New Jersey CO Emissions  
by Source Category



[www.epa.gov/air/emissions/index.htm](http://www.epa.gov/air/emissions/index.htm)

When cooler air is trapped beneath a layer of warmer air, which usually occurs overnight, the result is an atmospheric inversion. The inversion acts like a lid, preventing pollution from mixing in the atmosphere and effectively trapping it close to the ground (see Figure 2). This can allow CO to accumulate at ground-level. Figure 3 shows that CO concentrations 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; 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)

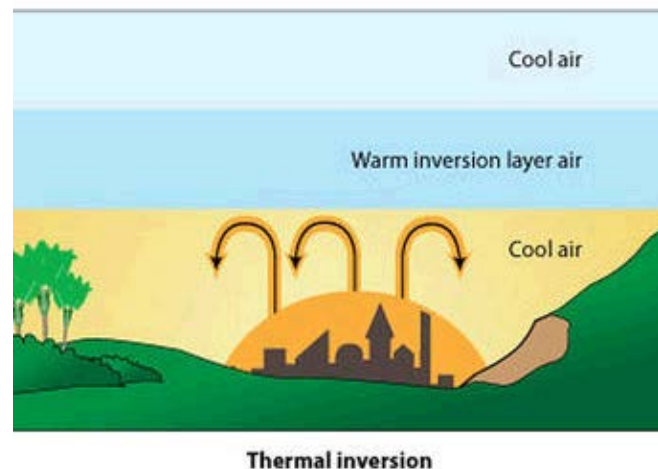
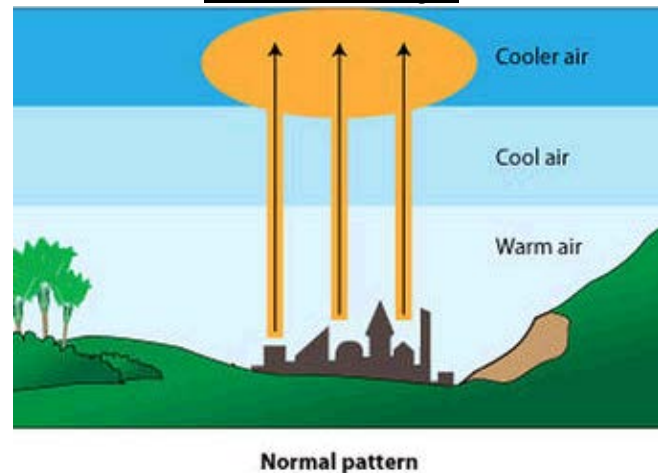


Figure 3  
Carbon Monoxide Concentrations in New Jersey  
2015 Monthly Variation

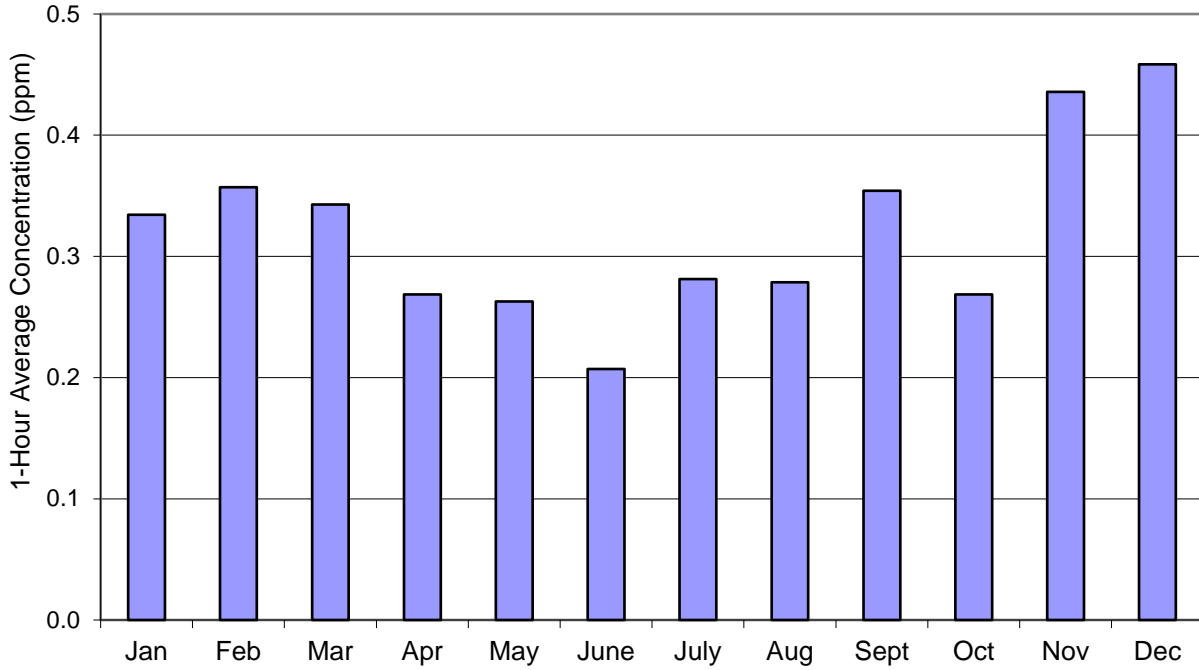
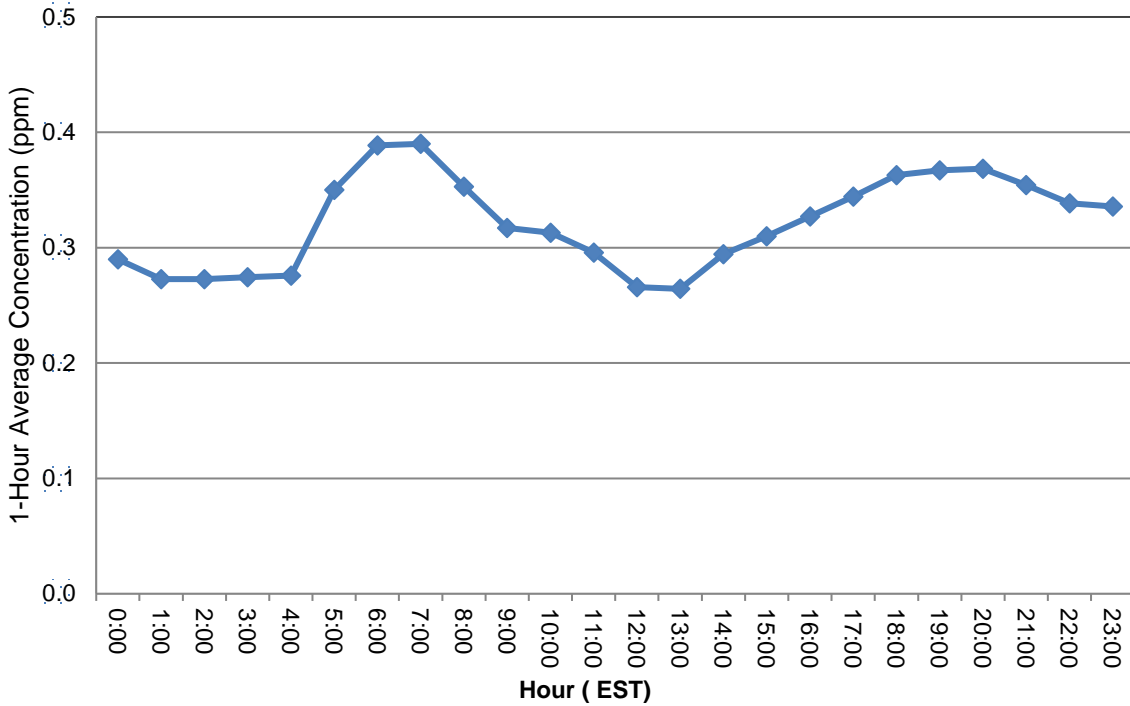


Figure 4  
Carbon Monoxide Concentrations in New Jersey  
2015 Hourly Variation



## HEALTH EFFECTS

Carbon monoxide reduces the oxygen-carrying capacity of blood, therefore reducing the distribution of 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 may reduce that individual's ability to exercise. Healthy people are also affected by CO, but only at higher levels of exposure. Elevated CO levels are associated with visual impairment, reduced work capacity, reduced manual dexterity, decreased learning ability, and difficulty in performing complex tasks. At extremely high levels, CO can cause death.

## AMBIENT AIR QUALITY STANDARDS

There are currently two national primary (health-based) standards for carbon monoxide in ambient air. They are 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). 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  
**Parts per Million (ppm)**  
**Milligrams per Cubic Meter (mg/m<sup>3</sup>)**

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

## MONITORING LOCATIONS

The New Jersey Department of Environmental Protection (NJDEP) operated seven CO monitoring stations in 2015. These sites are shown in the map in Figure 5. The Newark Firehouse station is part of the U.S. Environmental Protection Agency’s (USEPA) National Core Multipollutant Monitoring Network (NCore). It measures and reports CO concentrations at trace levels, down to a hundredth of a ppm.

## CO LEVELS IN 2015

None of the New Jersey monitoring sites recorded exceedances of any CO standards during 2015. The maximum 1-hour average CO concentration recorded in 2015 was 3.6 ppm at the Elizabeth station. The highest 8-hour average CO concentration recorded was 2.2 ppm at the Elizabeth station. Summaries of the 2015 data are provided in Table 2, Figure 6 and Figure 7.

Figure 5  
2015 Carbon Monoxide  
Monitoring Network

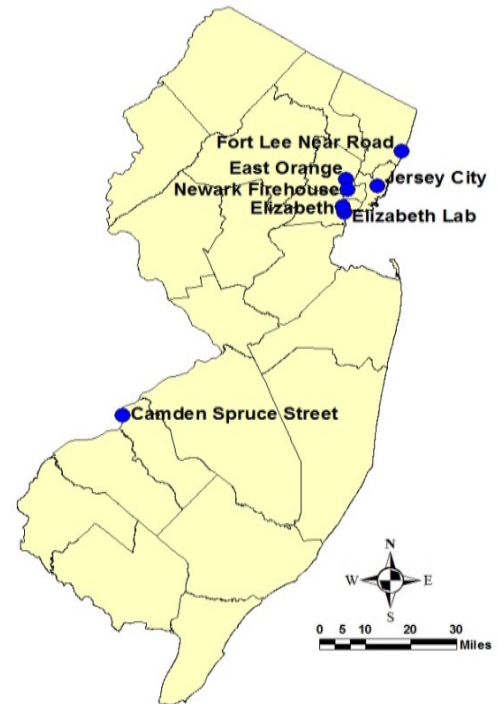


Table 2  
2015 Carbon Monoxide Concentrations in New Jersey  
1-Hour and 8-Hour Averages  
Parts per Million (ppm)

Monitoring Site	1-Hour Average Concentrations		8-Hour Average Concentrations	
	Highest	2nd-Highest	Highest	2nd-Highest (NOL*)
Camden Spruce St.	2	1.9	1.7	1.5
East Orange	3	2.9	2.1	2.1
Elizabeth	3.6	2.6	2.2	1.7
Elizabeth Lab	2.8	2.4	1.6	1.6
Fort Lee Near Rd.	2.2	1.9	1.6	1
Jersey City	3.4	2.1	1.6	1.6
Newark Firehouse	2.86	2.72	2.04	1.9

\*NOL – Non-overlapping 8-hour periods

Figure 6  
 2015 Carbon Monoxide Concentrations in New Jersey  
 Highest & 2<sup>nd</sup>-Highest 1-Hour Averages  
 Parts per Million (ppm)

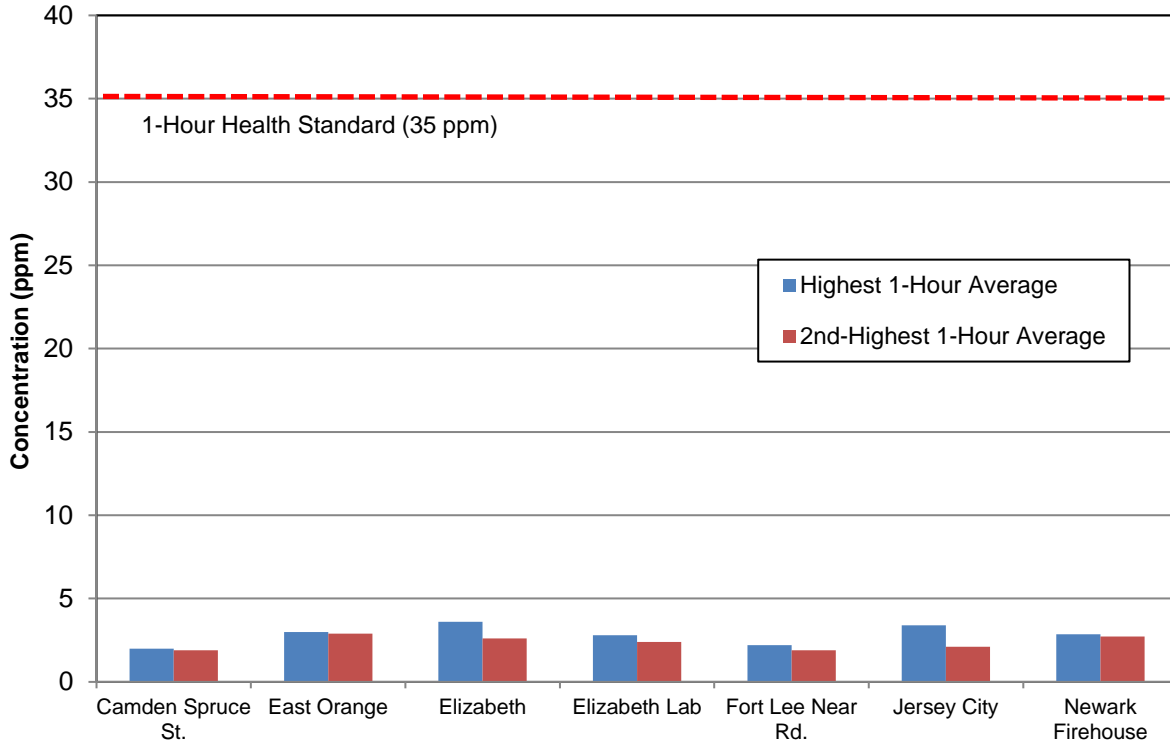
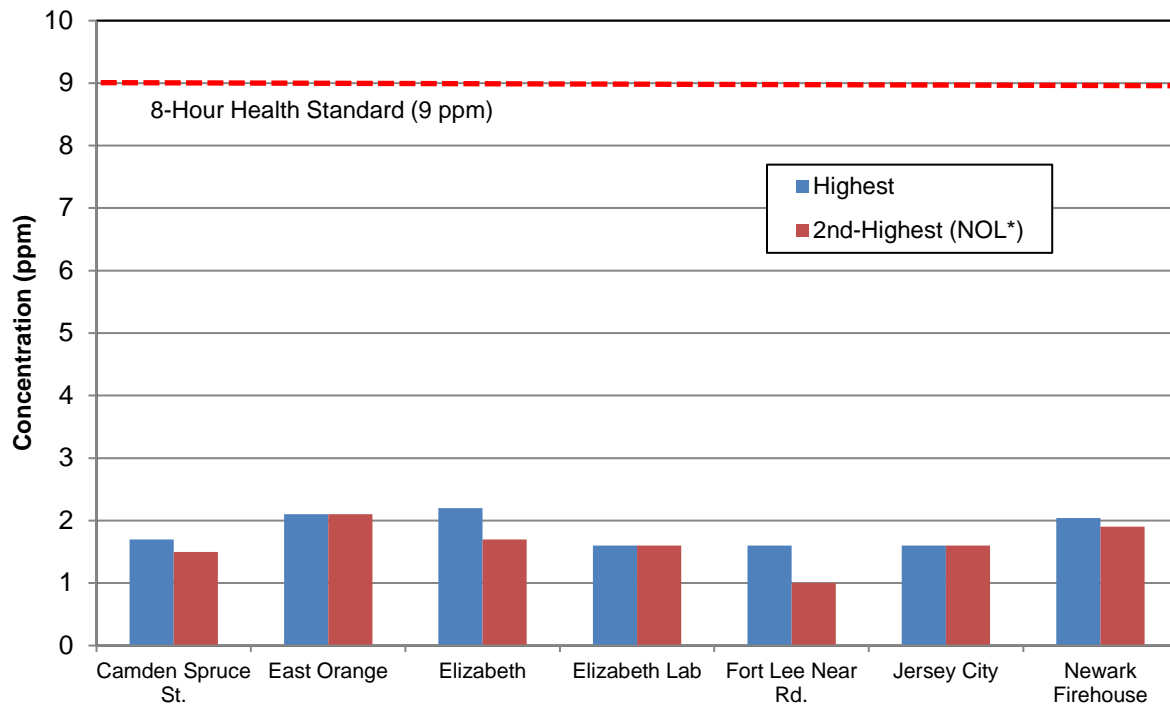


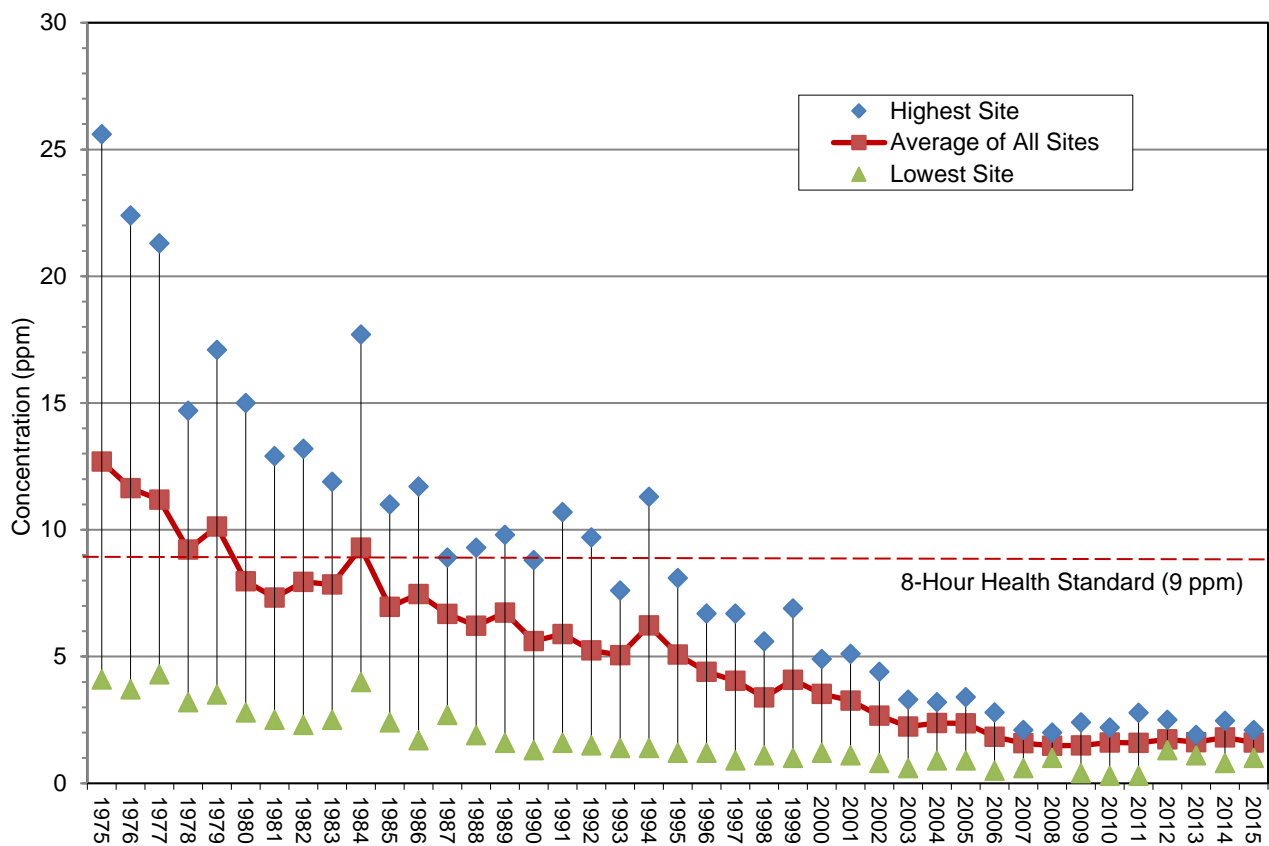
Figure 7  
 2015 Carbon Monoxide Concentrations in New Jersey  
 8-Hour Averages  
 Parts per Million (ppm)



## CO TRENDS

Carbon monoxide levels have improved dramatically over the past thirty-nine years. Figure 8 presents the trend in CO levels since 1975, showing the 8-hour average concentrations recorded each year for the highest site, average of all sites, and lowest site. The graph actually shows the second highest 8-hour value recorded, because this is the value that determines if the NAAQS are being met (one exceedance per site is allowed each year). The last time the 8-hour CO standard was exceeded in New Jersey was in January 1995. The entire state was officially declared to have attained the CO standards as of August 23, 2002. Decades ago, 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 Concentrations in New Jersey, 1975-2015  
2<sup>nd</sup> Highest 8-hour Average  
Parts per Million (ppm)



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