

# Results from Yellowstone National Park Winter Air Quality Study: 2006-2007

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## Summary statistics

The air quality at both the monitoring stations in Yellowstone National Park remained well below the national standards for carbon monoxide (CO) and particulate matter that was 2.5 micrometers or less in size (PM2.5). The winter of 2006-2007 had CO values that were nearly the same as the last few years. The maximum hourly CO at the West Entrance was slightly higher but the longer averages of 8-hours and for the season were down. The PM2.5 was close to values seen in the last three years.

The CO and PM2.5 data at Old Faithful are harder to interpret because the winter vehicle parking and the monitoring station moved because of construction. The lower PM2.5 could be because the monitoring station is now farther from conflicting local sources. The CO concentrations are down slightly. This may be due to a different orientation of the monitoring station to the parking area or to a fewer number of vehicles parking near the temporary visitor center.

Table 1. Statistical comparison of CO (ppm) between Yellowstone NP winter monitoring stations.

Location →	Old Faithful					West Entrance				
Winter season → Statistic CO	2006- 2007 #	2005- 2006	2004- 2005	2003- 2004	2002- 2003	2006- 2007	2005- 2006	2004- 2005	2003- 2004	2002- 2003
Max 1-hr	<b>0.9</b>	1.6	1.6	2.2	2.9	<b>3.7</b>	2.1	2.8	6.4	8.6
% of Std	<b>3%</b>	4%	4%	6%	8%	<b>11%</b>	6%	8%	18%	25%
Max 8-hr	<b>0.4</b>	0.5	0.8	0.9	1.2	<b>0.8</b>	0.9	1.0	1.3	3.3
% of Std	<b>4%</b>	6%	7%	10%	13%	<b>9%</b>	10%	11%	14%	37%
Average	<b>0.27</b>	0.18	0.12	0.26	0.24	<b>0.19</b>	0.23	0.24	0.26	0.57
90th percentile	<b>0.19</b>	0.26	0.29	0.5	0.5	<b>0.27</b>	0.40	0.43	0.5	1.3

# The visitor parking and the monitoring station moved because of construction at Old Faithful.

Table 2. Statistical comparison of PM2.5 (ug/m<sup>3</sup>) between Yellowstone NP winter monitoring stations.

Location →	Old Faithful					West Entrance				
Winter season → Statistic PM2.5	2006- 2007 #	2005- 2006	2004- 2005	2003- 2004	2002- 2003	2006- 2007	2005- 2006	2004- 2005	2003- 2004	2002- 2003
Max 1-hr	<b>20</b>	56	38	151	200	<b>40</b>	44	21	29	81
Max Daily ( 24-hr)	<b>6.6</b>	9	6	16	37	<b>8.8</b>	7	6	8	15
98th percentile <sup>&amp;</sup>	<b>6.4</b>	9	9	9	21	<b>8.7</b>	6	6	7	17
% of Std	<b>18%</b>	13%	14%	14%	33%	<b>25%</b>	10%	9%	11%	26%
Average	<b>3.3</b>	3.5	4.0	4.9	6.9	<b>2.1</b>	1.9	2.9	4.0	8.2

& Based on NAAQS standard at the time of the measurement (65 ug/m<sup>3</sup>)

# The visitor parking and the monitoring station moved because of construction at Old Faithful.

Table 3. Ambient Air Quality Standards (AAQS) for carbon monoxide (CO) and particulate matter less than 2.5 micrometers (PM2.5).

<b>Standard</b>	<b>Pollutant</b>	<b>1-hr CO (ppm)<sup>1</sup></b>	<b>8-hr CO (ppm)<sup>1</sup></b>
National AAQS	CO	<b>35</b>	<b>9</b>
Montana AAQS	CO	<b>23</b>	<b>9</b>
Wyoming AAQS	CO	<b>35</b>	<b>9</b>

<b>Standard</b>	<b>Pollutant</b>	<b>24-hr PM<sub>2.5</sub> 98<sup>th</sup> percentile (µg/m<sup>3</sup>)<sup>2</sup></b>
National AAQS	PM 2.5	<b>65</b>
New NAAQS <sup>3</sup>	PM 2.5	<b>35</b>
Montana AAQS	PM 2.5	<b>65</b>
Wyoming AAQS	PM 2.5	<b>65</b>

1 Not to be exceeded more than once per year.

Link to EPA NAAQS standards: <http://www.epa.gov/air/criteria.html> ; WY DEQ <http://deq.state.wy.us/aqd/standards.asp> ; MT DEQ <http://www.deq.state.mt.us/AirMonitoring/citguide/appendixb.html>

2. The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 µg/m<sup>3</sup>. The winter 98<sup>th</sup> percentile is given only to demonstrate the improvement between winter seasons. Comparison with the annual standard is not shown. For consistency, the 24-hour day is used to average the hourly PM2.5.

3. Revised by EPA Oct. 2006.

Several of the charts have been updated to include the 2006-2007 winter data and traffic volumes. While winter traffic was up slightly, the CO remained nearly the same. PM2.5 was a little higher at the West Entrance. On the last graphic (figure 4), the winter 2006-2007 traffic and concentration data is plotted on the prediction graph from the previous year. The concentrations are close to what is expected from the small winter traffic increase.

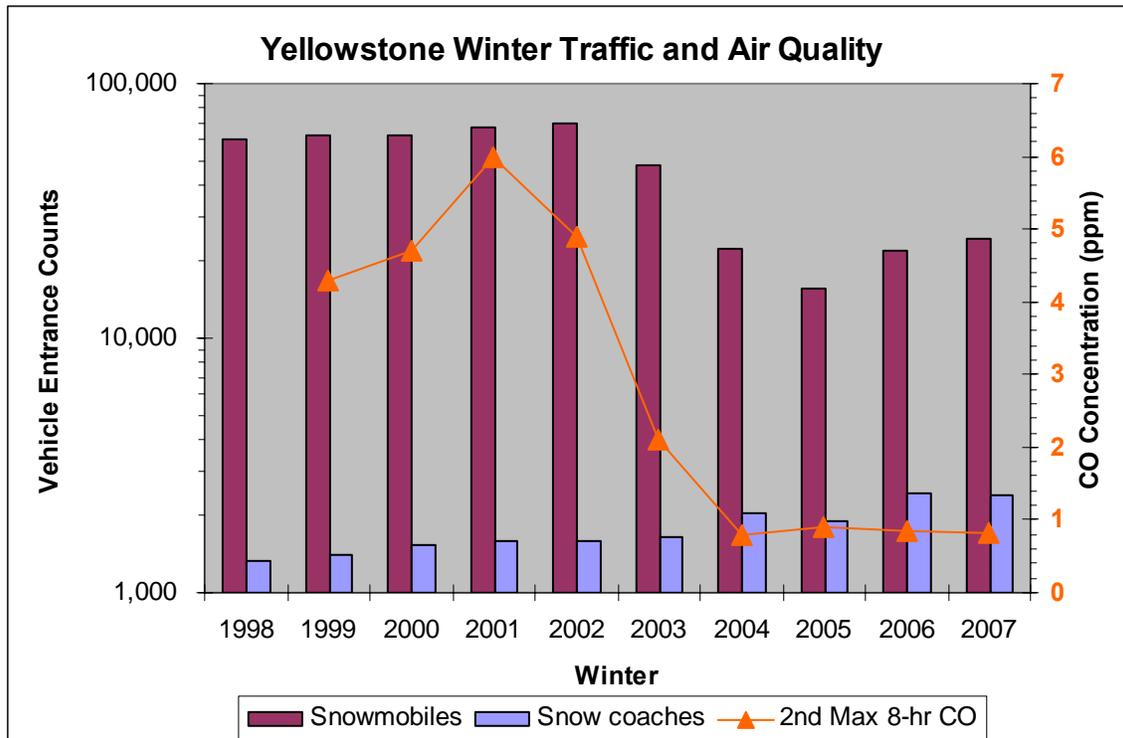


Figure 1. The maximum hourly CO concentration for the winter periods are compared here to the traffic counts of snowmobiles and snowcoaches at the West Entrance. Note the log scale on the traffic count axis.

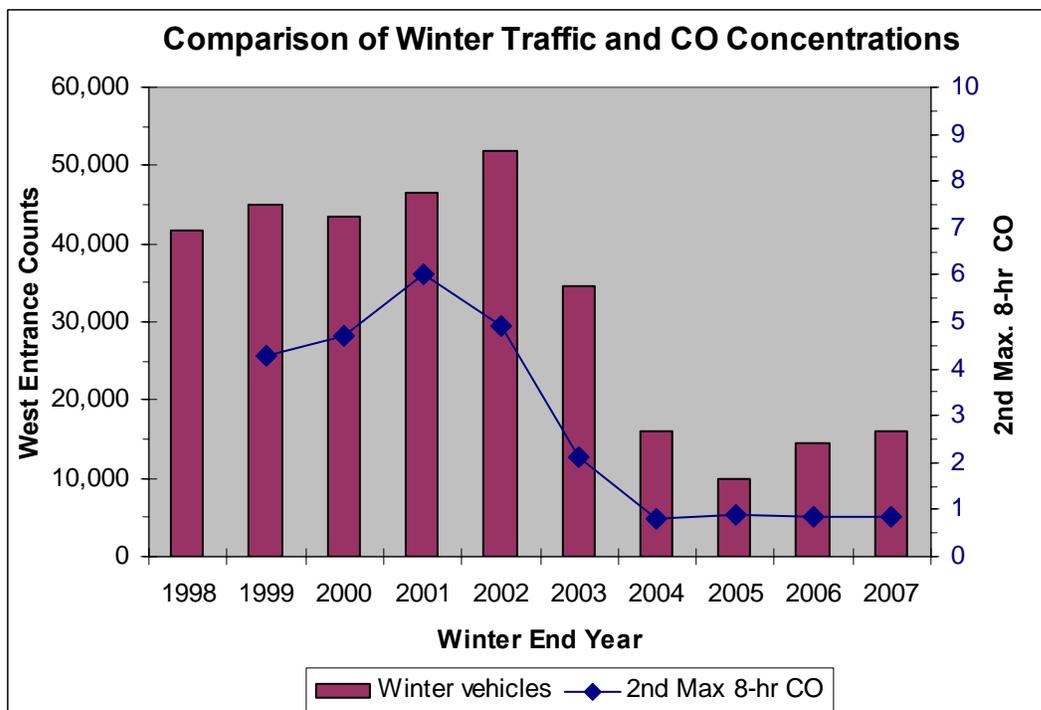


Figure 2. The second highest 8-hour average concentration for the winter season relates most closely to the National Standard for CO. The measured CO and traffic counts at the West Entrance are compared by year.

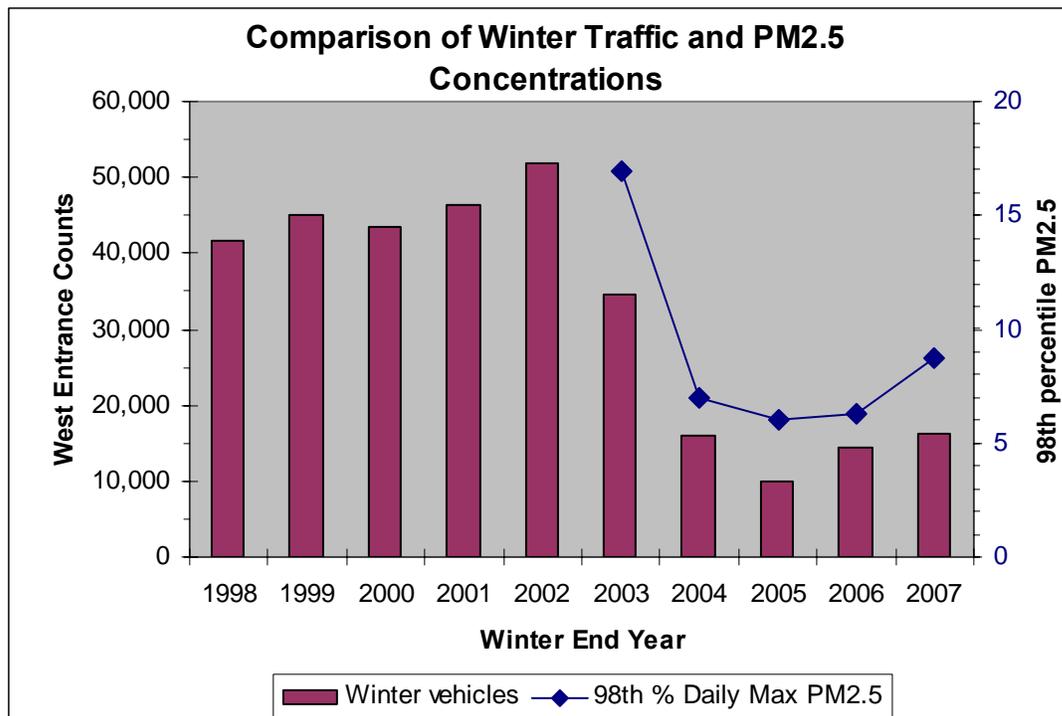


Figure 3. The relationship between the 98<sup>th</sup> percentile of daily PM2.5 and West Entrance traffic counts are compare here by year.

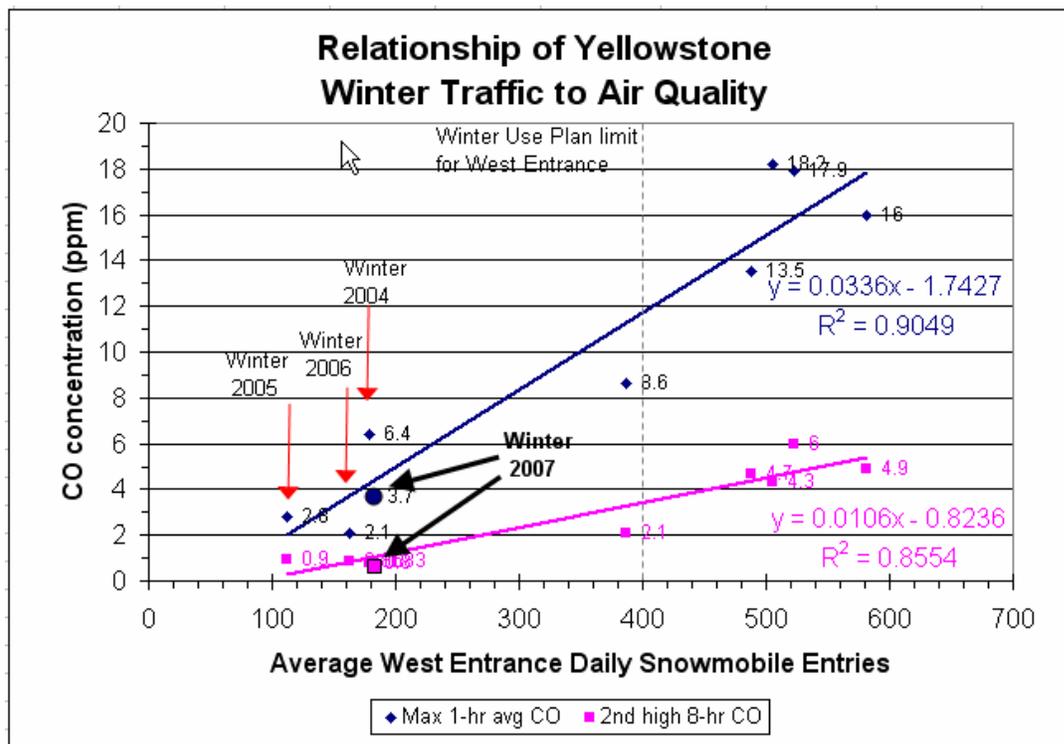


Figure 4. The estimated relationship between the number of winter vehicles per day entering the West Entrance and the maximum CO concentration is reproduced here from the 2005-2006 report. The values for winter 2006-2007 fit very close to the prediction lines.