

Ground-Level Ozone

Ground-level ozone, or photochemical smog, is a secondary pollutant. It is not emitted directly to the atmosphere but rather is formed in the atmosphere by the reactions of other pollutants. Ground-level ozone forms during the summer months, when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) combine and react in the presence of sunlight and warm temperatures. Nitrogen oxides come from burning fossil fuels at power plants, industrial boilers, and motor vehicles. VOCs are emitted from a variety of sources, including motor vehicles, chemical plants, refineries, and natural (biogenic) sources. Changing weather patterns contribute to yearly differences in ozone concentrations. Ozone and the precursor pollutants that cause ozone also can be transported into an area from pollution sources located hundreds of miles away. Ground-Level Ozone is a strong irritant to the eyes and upper respiratory system. It hampers breathing and also damages crops and man-made materials such as monuments and statues.

In July 1997, EPA promulgated a new 8-hour primary ozone standard to protect against longer exposure periods that are of concern for both human health and environmental welfare. The 1-hour ozone standard stays in effect until an area has met the standard for three consecutive years. The secondary standard (welfare-based) was set identical to the 8-hour primary standard. The secondary standard highlights the concerns associated with effects on vegetation. As a way of focusing on this effect, DEP has contracted with Pennsylvania State University's Department of Plant Pathology to monitor ozone at five rural sites: Moshannon State Forest, Clearfield County; Tiadaghton, Lycoming County; the Department of Conservation and Natural Resources Penn Nursery facility, Centre County; State College, Centre County; and a site between Mansfield and Williamsport, Tioga County.

In addition to the established surveillance monitoring sites, DEP continued monitoring begun by the North American Research Strategy for Tropospheric Ozone (NARSTO). The Holbrook site (Greene County) is primarily designed to study ozone transport in the Northeast.

Since the 1-hour ozone standard still applies in areas that have not attained compliance with the

standard, this report presents both 1- and 8-hour ozone data. The ozone- monitoring season in Pennsylvania begins each year on April 1st and ends on October 31st.

Ambient ground-level ozone trends are erratic by nature. Changes in meteorological conditions, population growth, and changes in emissions (VOCs and NO_x) influence ozone concentrations. Figure 2-22 shows the 1995-2004 statewide (DEP sites only) average second daily maximum 1-hour ozone concentrations. Weather conditions were not favorable for ozone formation in 2004. The solid line is at the primary 1-hour air quality standard of 125 parts per billion (ppb).

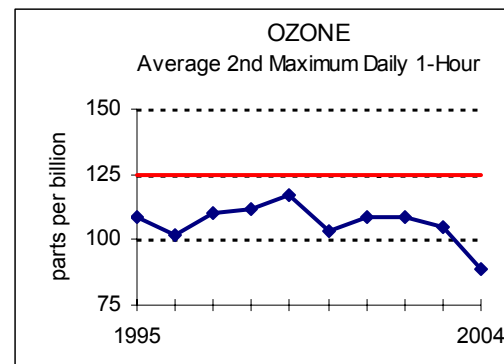


Figure 2-22. Trend in average second daily maximum 1-hour ozone concentrations, 1995-2004.

The map in Figure 2-23 presents the highest second daily maximum 1-hour ozone concentration by county in 2004. There were no exceedances of the 1-hour air quality standard in 2004. All ozone monitoring sites are included in the representation, with the exception of those monitors operated by Allegheny and Philadelphia counties.

The map in Figure 2-24 presents the fourth highest daily maximum running 8-hour ozone concentration by county in 2004. All ozone monitoring sites are included in the representation, with the exception of those monitors operated by Allegheny and Philadelphia counties.

For the 12 air basins and Altoona, Montoursville, and Farrell sites, Figure 2-25 shows the 10-year trend (1995 to 2004) of the average second daily maximum 1-hour ozone concentration during the ozone season for DEP monitoring sites. Figure 2-26 shows the 10-year trend (1995 to 2004) of the 3-

year average of the fourth highest daily 8-hour running ozone mean. All sites, with the exception of the Montoursville site, have been close to or exceeded the 8-hour standard of 0.08 parts per million (ppm). The solid line in both figures indicates the 1- or 8-hour standard level.

Montoursville has been the only area consistently below the ozone air quality standards.

Appendix A, Table A-13a summarizes the 1-hour ozone data during the ozone season of 2004 for all monitoring sites. Appendix A, Table A-13b summarizes the 8-hour ozone data during the ozone season of 2004 for all monitoring sites.

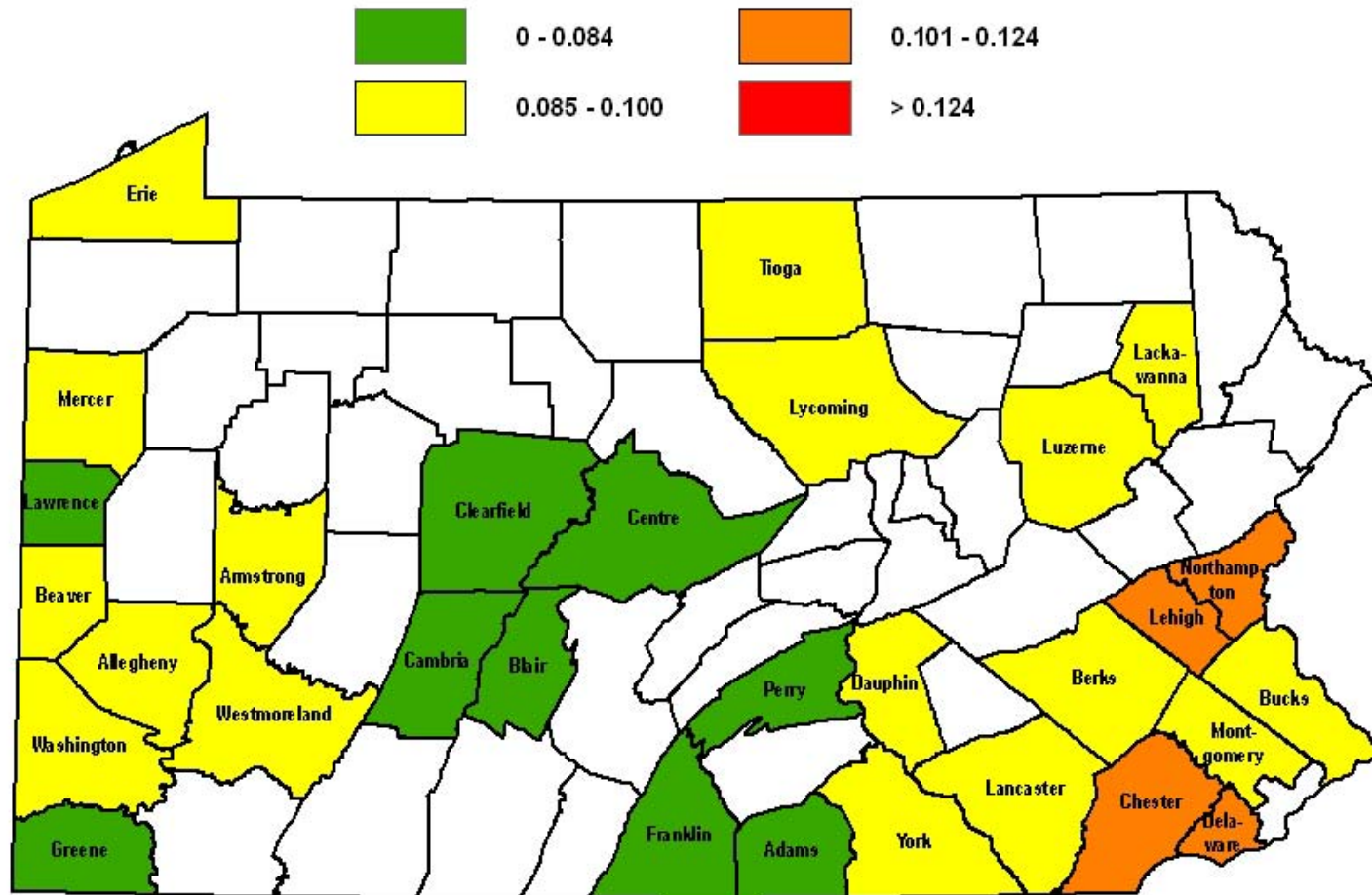
Appendix A, Table A-14 lists the days on which the 1-hour ozone air quality standard was exceeded in 2004 at all sites in Pennsylvania.

Appendix A, Tables A-15 and A-16 summarize the 1-hour and 8-hour data over the last three years (2002 - 2004). These tables include monitoring sites operated by DEP, the Allegheny County Health Department, Philadelphia Department of Public Health, Air Management Services, and the Pennsylvania State University.

Historical 1-hour data for ozone from 1995 to 2004 is contained in Appendix A, Table A-17 for all DEP sites that operated during the ozone monitoring season in 2004 with at least 50 percent valid data. To demonstrate that the 1-hour ozone NAAQS is achieved and maintained, a site can have no more than three exceedances of the 0.12 parts per million (ppm) standard over the last three years. Only two sites, located in the Southeast Pennsylvania air basin, have more than three exceedances in the last three years.

Figure 2-23. Ozone Concentrations

Highest Second Maximum Daily 1-hour Concentrations (by County, for 2004)
(Parts per Million)



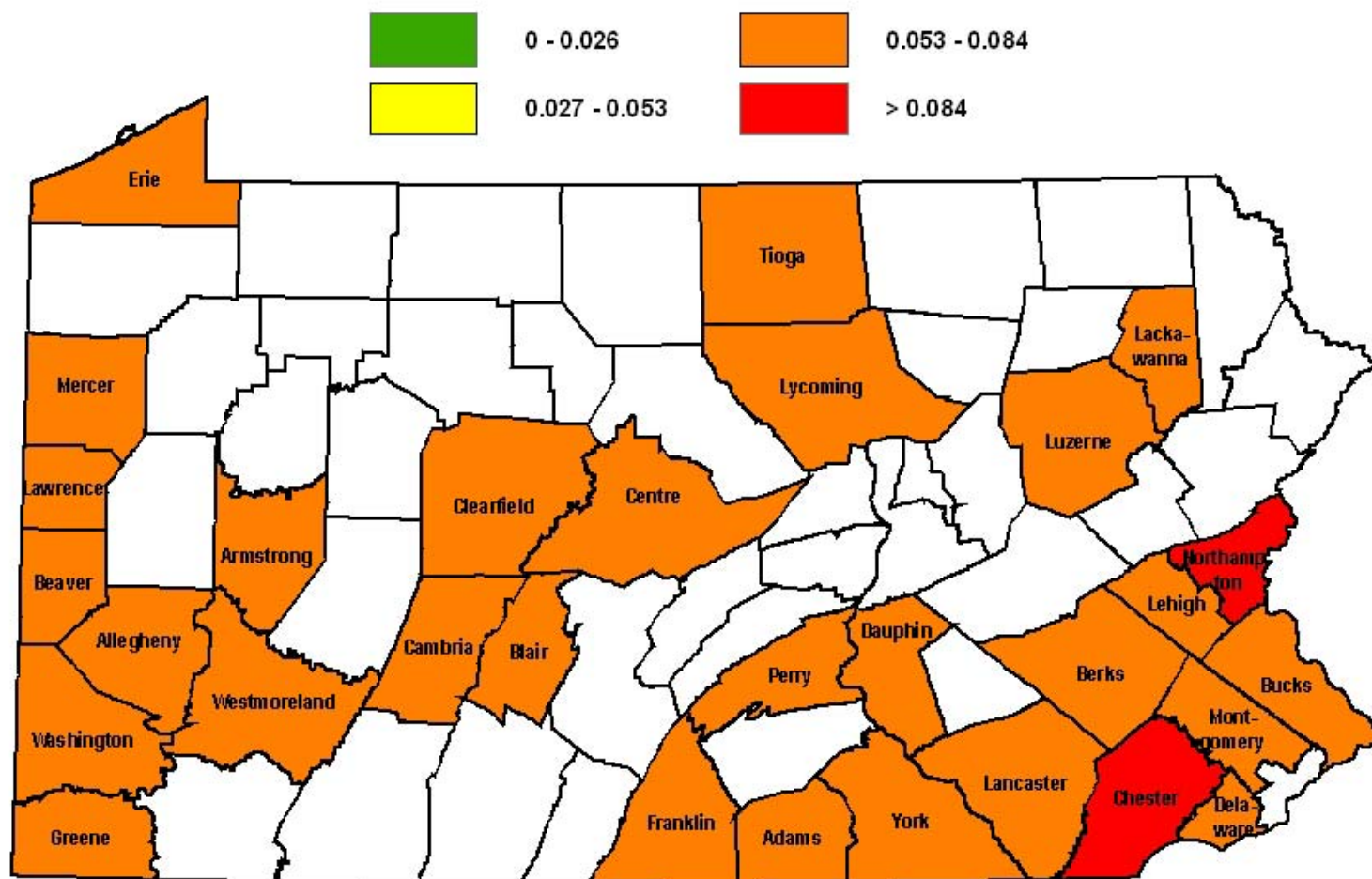
Primary and Secondary National Ambient Air Quality Standard for Ozone
Maximum Daily 1-Hour Average = 0.12 parts per million (not to be exceeded more than once per year)

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Figure 2-24. Ozone Concentrations

Fourth Maximum Daily 8-hour Concentrations (by County, for 2004)

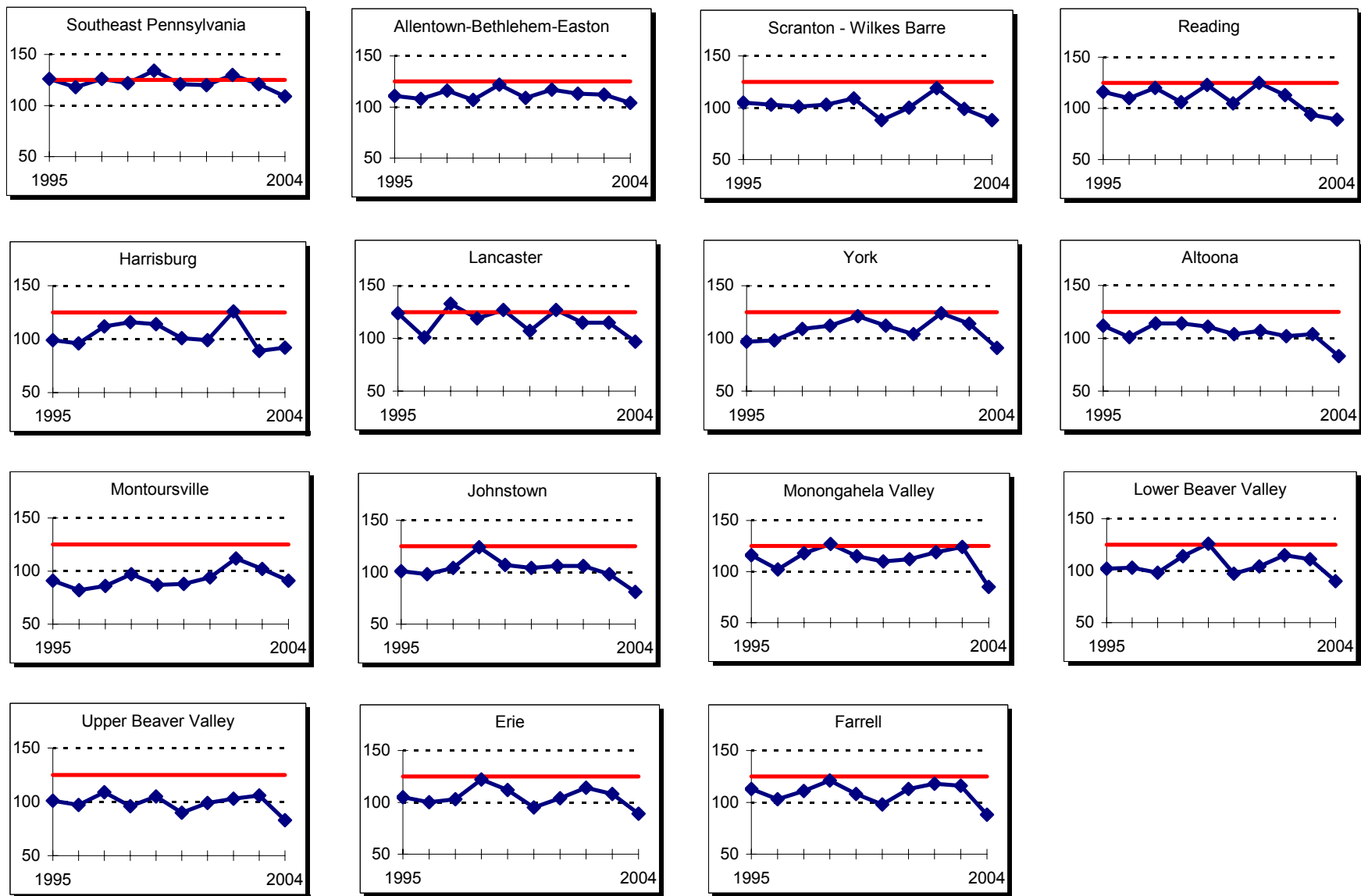
(Parts per Million)



Primary and Secondary National Ambient Air Quality Standard for Ozone
Fourth-highest daily maximum 8-hour average = 0.08 parts per million
(Data are displayed for single calendar year, but standard is based on a 3-year average)

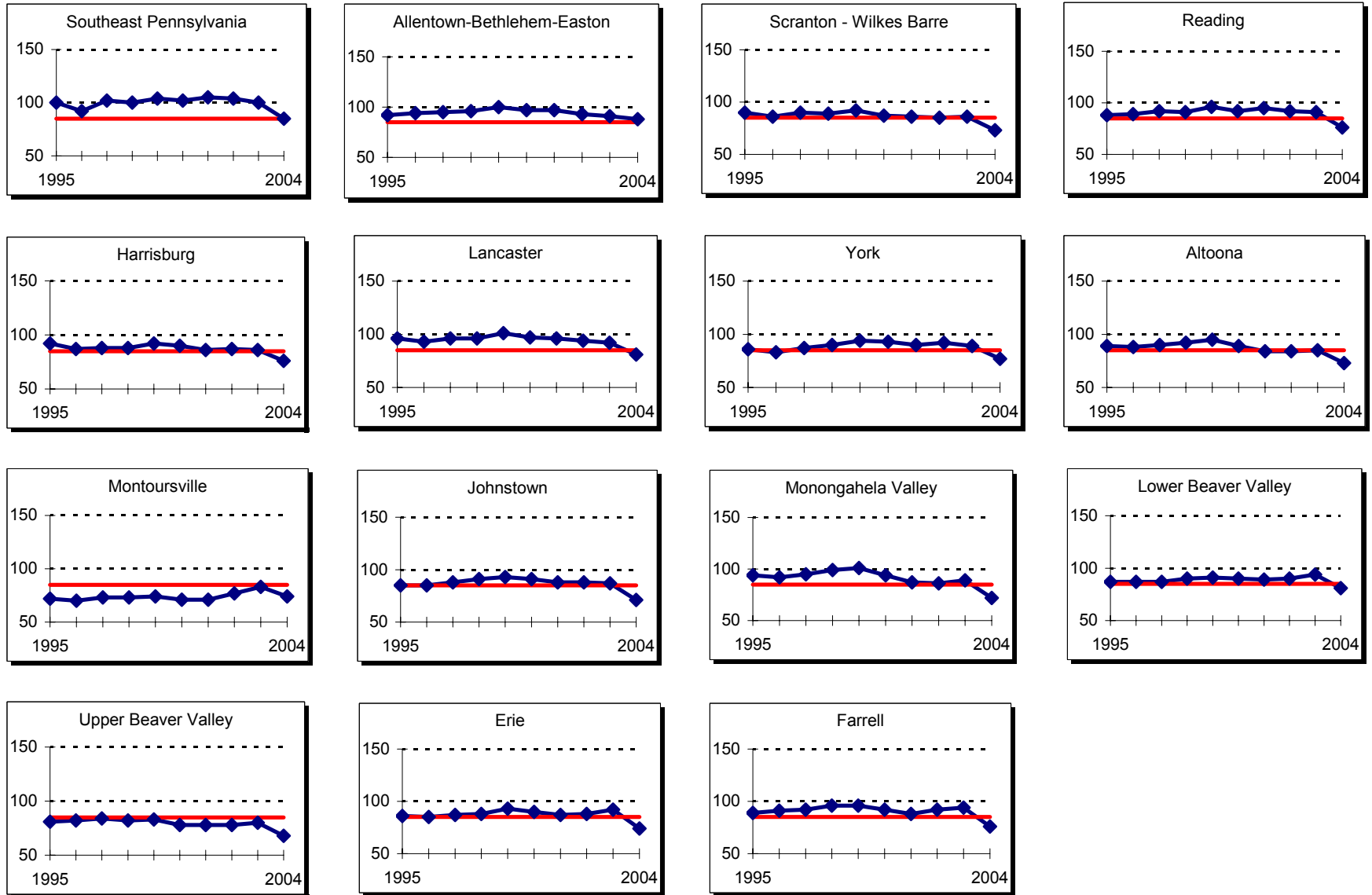
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Figure 2-25. 10-Year Ozone Trend in Pennsylvania 1995 to 2004
Average Second Daily Maximum 1-Hour (parts per billion)



Daily Maximum 1-Hour National Ambient Air Quality Standard is 125 parts per billion

Figure 2-26. 10-Year Ozone Trend in Pennsylvania 1995 to 2004
 3-Year Average of 4th Daily Maximum 8-Hour Mean (parts per billion)



The eight-hour Ozone National Ambient Air Quality Standard is the average of the yearly 4th daily maximum 8-hour values over 3 years. The standard is exceeded when the 3-year average is greater than 84 ppb.