

3.0 DESCRIPTION OF CURRENT CONDITIONS

3.1 Air Quality Standards

The NAAQS and the ambient air quality standards (AAQS) for Montana and Wyoming are summarized in **Table 3-1**.

Table 3-1
Applicable Ambient Air Quality Standards¹

Pollutant	Annual ²		24-hour ³		8-hour ³		3-hour ³		1-hour ³	
	($\mu\text{g}/\text{m}^3$)	(ppmv)	($\mu\text{g}/\text{m}^3$)	(ppmv)	($\mu\text{g}/\text{m}^3$)	(ppmv)	($\mu\text{g}/\text{m}^3$)	(ppmv)	($\mu\text{g}/\text{m}^3$)	(ppmv)
NO ₂	100	0.05	---	---	---	---	---	---	564	0.30 ⁴
SO ₂	60	0.02 ^{4,5}	260	0.10 ^{4,5}	---	---	1,300	0.50	1,300	0.50 ⁴
PM ₁₀	50 ⁶		150 ⁷		---	---	---	---	---	---
PM _{2.5}	15 ⁶		65 ⁸		---	---	---	---	---	---
CO	---	---	---	---	10,000	9	---	---	26,000	23 ⁴
									40,000	35

Note: ppmv=parts per million by volume

¹ NAAQS unless otherwise noted.

² Annual arithmetic mean not to be exceeded, unless otherwise noted.

³ Not to be exceeded more than once per year, unless otherwise noted.

⁴ Montana AAQS, which more stringent than NAAQS.

⁵ Wyoming AAQS, which more stringent than NAAQS.

⁶ Expected annual arithmetic mean averaged over a 3-year period.

⁷ Annual 99th percentile concentration averaged over a 3-year period

⁸ Annual 98th percentile concentration averaged over a 3-year period.

3.2 Meteorological Conditions

Wyoming and Montana are noted for windy conditions, and much of the study area is characterized as high plains that gets very little rainfall. **Figure 3-1** presents annual wind roses for selected cities within the modeling domain, and shows that while winds are most frequent from the northwest, west or southwest, there is still a great deal of variability across the PRB, strongly influenced by the local terrain. There is an evident westerly wind prevalence over the region, with the predominant wind directions ranging from southwest through northwest at the indicated sites. This wind pattern is typical of sites in the PRB.

Nighttime cooling under the frequent clear skies enhances the formation of stable air, or temperature inversions, during the late night and early morning. The stable air promotes light winds and inhibits air pollutant mixing and transport from sources located along the valley drainages. The worst-case localized impacts from the low-level sources tend to occur during these periods. Dispersion potential improves along ridge and mountain tops, especially during winter-spring weather transition periods and summer convective heating periods.

Topography. The study area focuses on the PRB of the northwestern Great Plains Steppe in northeastern Wyoming and Montana. The topography of the project area varies from foothills and canyons in the western portions, to rolling plains and tablelands of moderate relief (with occasional valleys, canyons, and buttes) throughout the PRB. Elevations generally range from approximately 3,000 to 5,000 feet above mean sea level (amsl), with mountain peaks rising to over 10,000 feet west of the project area. **Figure 3-2** provides a broad topographic map of the region. The PRB study area generally slopes toward the east, with the clear features of the Big Horn Mountain Range to the west of the study area and the Black Hills toward the east. Although these features may influence the upper level flow, the higher terrain could show slightly higher impacts from distant sources, due to potential plume impaction on those features. The Black Hills receptors may be more susceptible because the prevailing wind would tend to advect emissions from the PRB toward the east.

Climate and Meteorology. Because of the variation in elevation and topography throughout the project area, climatic conditions vary considerably. Most of the area is classified as a semi-arid cool steppe, where evapo-transpiration is equivalent to precipitation, with relatively short warm summers and longer cold winters. On the plains, wintertime average daily temperatures typically range from daily lows of 5 to 10 degrees Fahrenheit (°F) to daily highs of 30 to 35 °F, and between 55 to 60 °F (low) and 80 to 85 °F (high) in mid-summer. The frost-free period generally occurs for 120 days between late May and mid-September. The annual average total precipitation ranges between 12 and 16 inches, with 36 to 60 inches of total annual snowfall. Temperatures generally are cooler, frost-free periods shorter, and both precipitation and snowfall greater at higher elevations, including the mountains along the western margin of the project area.

3.3 Air Quality Conditions

Air quality conditions generally are good in the study area, as characterized by limited air pollution emissions sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches), and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations. However, the potential exists for localized pockets of high concentrations of PM₁₀, SO₂, and NO₂, due to the large number of minor sources in the area.

Background values are not inserted into the modeling results for this study, because the purpose of this effort is to ascertain current conditions and evaluate potential changes due to sources in the study area. Existing air quality conditions were developed from the available State and Local Air Quality Monitoring System (SLAMS) data base. Results from recent years of monitoring are provided in graphical form.

Nitrogen Dioxide

For NO₂, an annual standard of 100 µg/m³ (or 0.053 parts per million [ppm]) applies in both Wyoming and Montana. Results are shown in **Figure 3-3** for sites in the Wyoming PRB. In 2002, the annual NO₂ concentration at the one site that was monitored, Thunder Basin, was 0.003 ppm, which is approximately 6 percent of the standard. The data show that the base year (2002) air quality was well within the NO₂ standard.

Montana has a state-only NO₂ standard (0.30 ppm or 564 µg/m³) for 1-hour.

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Particulate Matter

The study examined emissions of inhalable particulate matter (PM₁₀). Two standards are in place for PM₁₀, one for a 24-hour period and an annual average period. **Figures 3-4** and **3-5** show the measurements of the second highest concentrations at 3 sites in the PRB, including the Black Thunder Mine, the North Rochelle Mine, and the North Rochelle Site East. As can be seen in **Figure 3-4**, the second-highest 24-hour levels were well above the standard, for 2002. **Figure 3-6** compares the annual average PM₁₀ levels for the North Rochelle sites to the standard. The figure shows that in 2000 and 2001, there were measured exceedances of this standard, but in 2002, the annual average levels decreased.

An examination of recent observations in the USEPA Aerometric Information Retrieval System (AIRS) database indicates that exceedances of the 24-hour PM₁₀ standard occasionally are observed within the study area (see **Table 1-1**). In 2002, the maximum second-highest 24-hour average of 211 µg/m³ (which is an exceedance of the 150 µg/m³ standard) was observed in Campbell County, Wyoming, and the next second-highest 24-hour average of 198 µg/m³ (96 percent of the AAQS) also was observed in Campbell County. Therefore, the existing air quality may be quite good in much of the modeling domain; however, near to or adjacent to the larger mines, there is evidence that pollutant concentration levels approach, or occasionally exceed, the applicant standards. A total of 13 exceedances of the 24-hour standard were monitored in Campbell County, Wyoming at five separate stations. In Montana, there was one exceedance of the 24-hour standard in Rosebud County.

While Montana has recorded some exceedances of particulate standards in the far northwestern portion of the state, they were well outside the study area and the modeling domain. It may be that there is less development in the Montana portion of the study area (and therefore no high values), or perhaps there are few, if any, monitors in that portion of the state (which would mean that the potential for a problem might exist, but it has not been measured).

Detailed descriptions of monitored levels at other sites in the PRB are provided in the technical support document (ENSR 2005b).

Sulfur Dioxide

The highest measured 3-hour SO₂ levels in the PRB are shown in **Figure 3-7**. Results indicate that in 2002, the ambient air quality was well below the standard for SO₂.

3.4 Visibility

Current visibility conditions in the Class I areas have been monitored at several locations. Visibility may be impacted by a wide range of conditions, including both natural and man-made. The IMPROVE monitoring system has collected data that depict the extinction coefficient for each of three separate areas near the PRB study area. Data represent the average 24-hour extinction for each site. These data have been tabulated to represent the 10 percentile (10 percent cleanest), median, and 90 percentile (10 percent highest extinction) levels for three sites. Two sites were analyzed for this study to depict changes across the PRB.

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Figure 3-8 shows the annual data for the Bridger WA, indicating that over the 7-year monitoring period, there has been little change in the distribution of measured extinction. **Figure 3-9** provides the annual percentiles for the Badlands National Park in South Dakota. As expected, the extinction generally is higher in this region, due in large part to the higher humidity and perhaps a secondary prevailing wind flow from the more intense agricultural areas and industrial areas to the east and south of the park. Generally, however, the 7-year trend appears to be fairly stable for this area as well. No data for later periods are available in summary format. (This study does not include development of trends from raw data.)

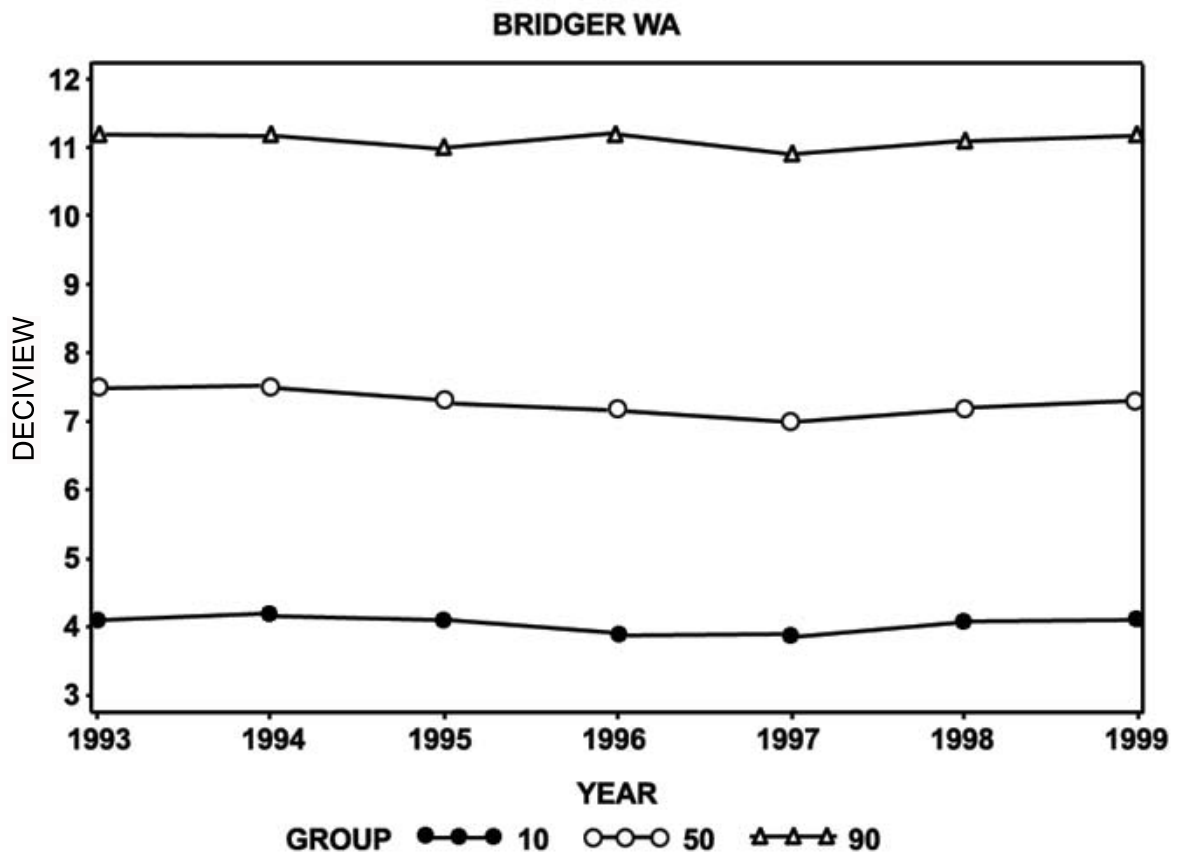


Figure 3-8 Deciview Trend Analysis of Percentile Distribution for Bridger National Park

Source: Internet web site: <http://vista.circa.colostate.edu/Improve/Data/GraphicViewer/Trends.html>

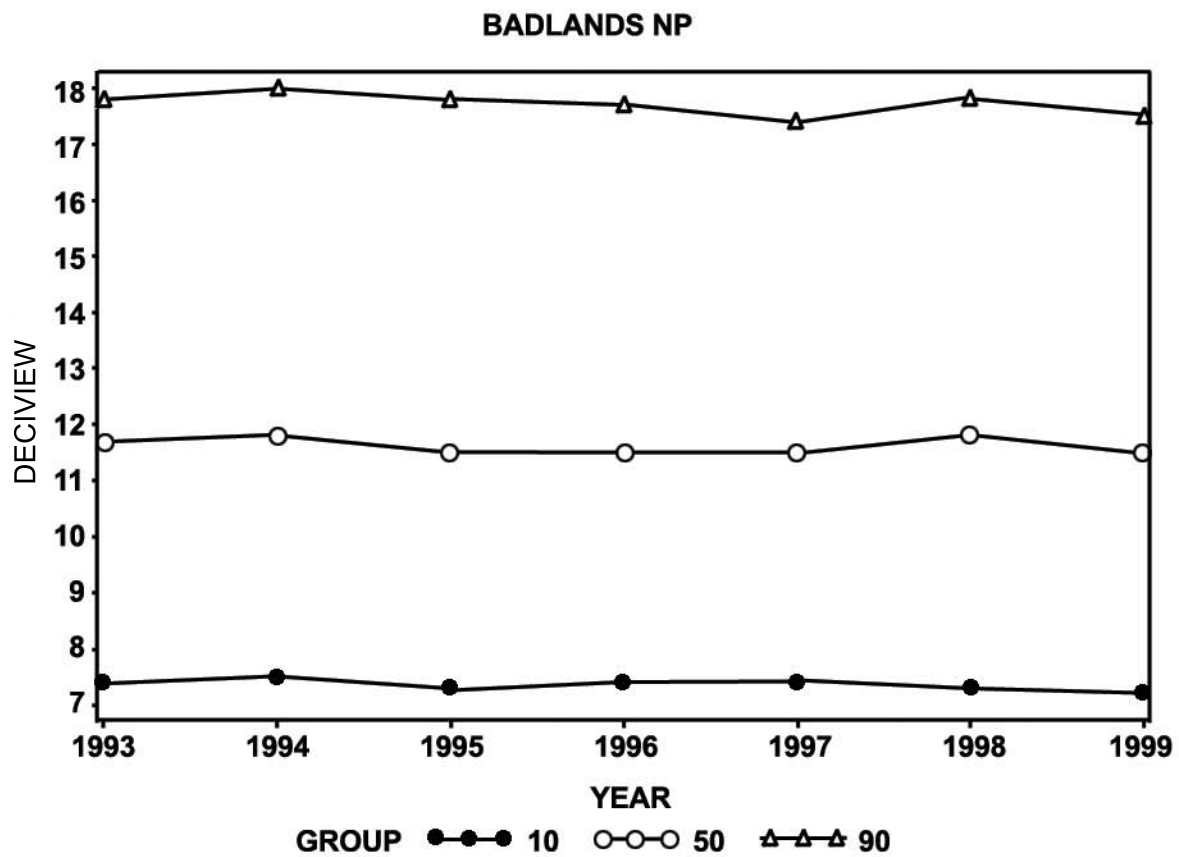


Figure 3-9 Deciview Trend Analysis of Percentile Distribution for Badlands National Park

Source: Internet web site: <http://vista.circa.colostate.edu/Improve/Data/GraphicViewer/Trends.html>