Particle Pollution

EPA has set national standards to protect against the health and welfare effects associated with exposure to fine and coarse particles. Fine particles are generally considered to be less than or equal to 2.5 micrometers (μm) in aerodynamic diameter, or $PM_{2.5}$. Coarse particles are those between 2.5 and 10 μm in diameter. PM_{10} is the indicator used for the coarse particle standard.

Trends in $PM_{2.5}$ Concentrations

There are two national air quality standards for $PM_{2.5}$: an annual standard (15 μg/m³) and a 24-hour standard (35 μg/m³). Nationally, annual and 24-hour $PM_{2.5}$ concentrations declined by 24 and 28 percent, respectively, between 2001 and 2010, as shown in Figure 10.

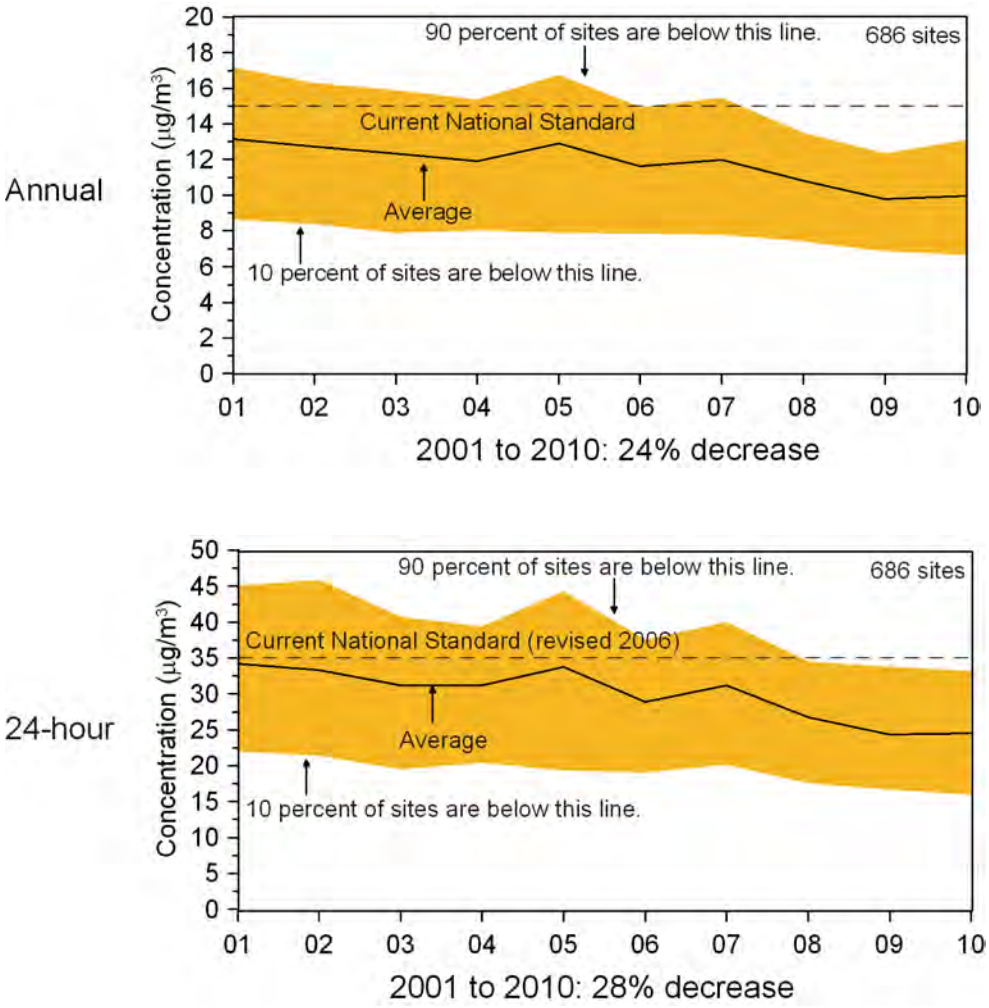

Figure 10. National $PM_{2.5}$ air quality trends, 2001-2010 (annual average concentration and 98th percentile of 24-hour concentration in μg/m³).

In 2010, the highest annual average $PM_{2.5}$ concentrations were in California, Indiana, Pennsylvania and Hawaii, as shown in Figure 11. The highest 24-hour $PM_{2.5}$ concentrations were in California and Alaska.

Some sites showed high 24-hour $PM_{2.5}$ concentrations but low annual $PM_{2.5}$ concentrations. Sites that show high 24-hour concentrations but low or moderate annual concentrations exhibit substantial variability from season to season. For example, sites in the Northwest generally show low concentrations in warm months but are prone to much higher concentrations in the winter. Factors that contribute to the higher levels in the winter are extensive woodstove use coupled with prevalent cold temperature inversions that trap pollution near the ground. Nationally, more sites exceeded the level of the 24-hour $PM_{2.5}$ standard than the annual $PM_{2.5}$ standard, as indicated by yellow and red dots on the maps below. Of the 6 sites that exceeded the annual standard and 43 sites that exceeded the 24-hour standard, 4 sites exceeded both.

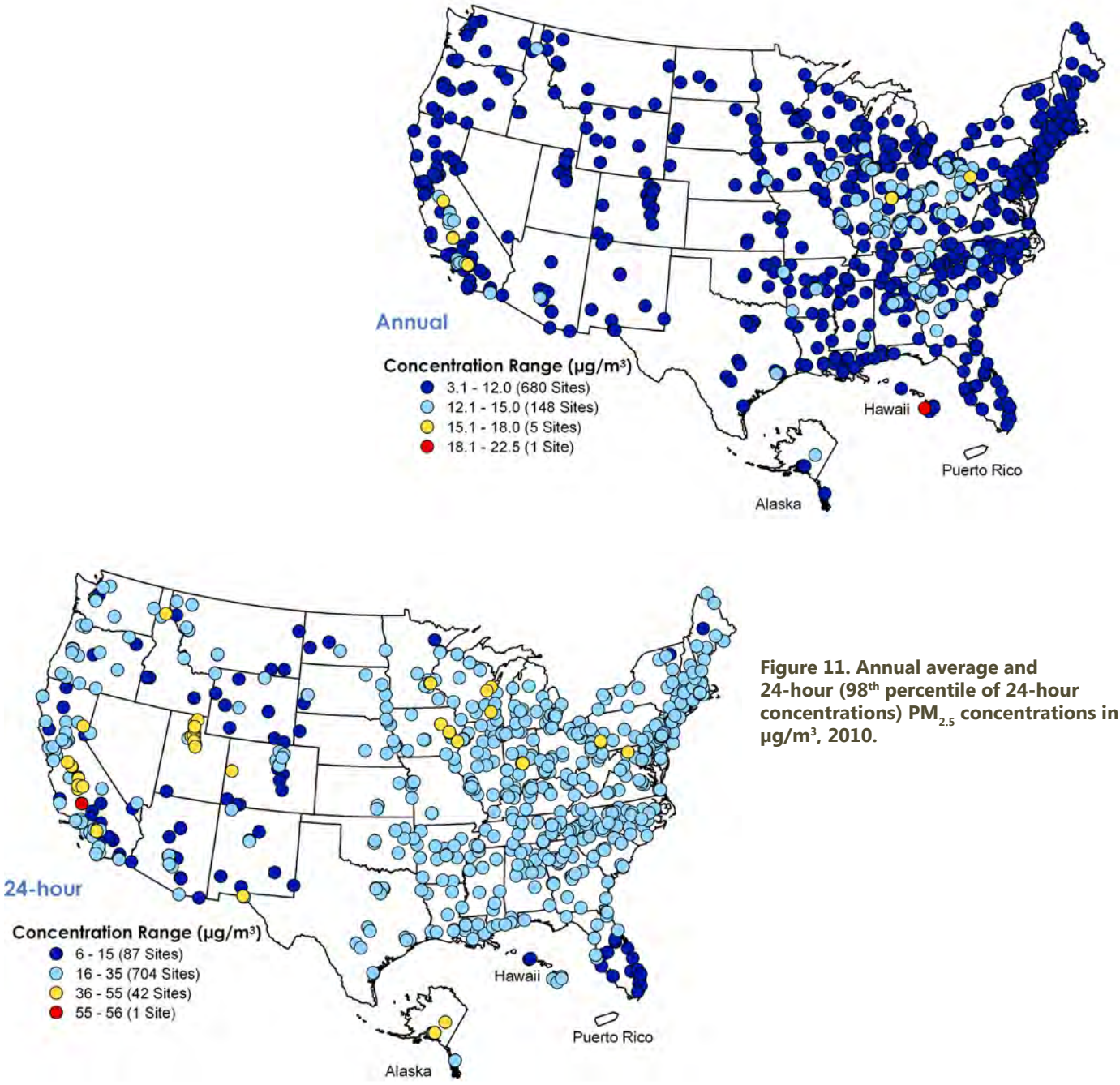

Figure 11. Annual average and 24-hour (98th percentile of 24-hour concentrations) $PM_{2.5}$ concentrations in µg/m³, 2010.

Weather Influences $PM_{2.5}$

In addition to emissions, weather plays an important role in the formation of $PM_{2.5}$. $PM_{2.5}$ tends to be dominated by different components at different times of the year (e.g. sulfates in the summer and nitrates in the winter), so the statistical model adjusting the $PM_{2.5}$ trend for weather is split into a 'warm months' trend running from May to September and a 'cool months' trend encompassing the remaining months of the year. The two trends were combined to form the annual trend using a weighted average.

Figure 12 shows trends in $PM_{2.5}$ from 2001 to 2010, averaged across 145 selected sites before and after adjusting for weather. The warm months trend is characterized by a large decrease in average $PM_{2.5}$ between 2008 and 2010, while the cool months trend shows a slow but steady decrease in $PM_{2.5}$ over the past decade. Overall, average $PM_{2.5}$ concentrations in the U.S. have declined steadily since 2005 after removing the effects due to weather indicating improvement based on recently enacted emissions reduction programs.

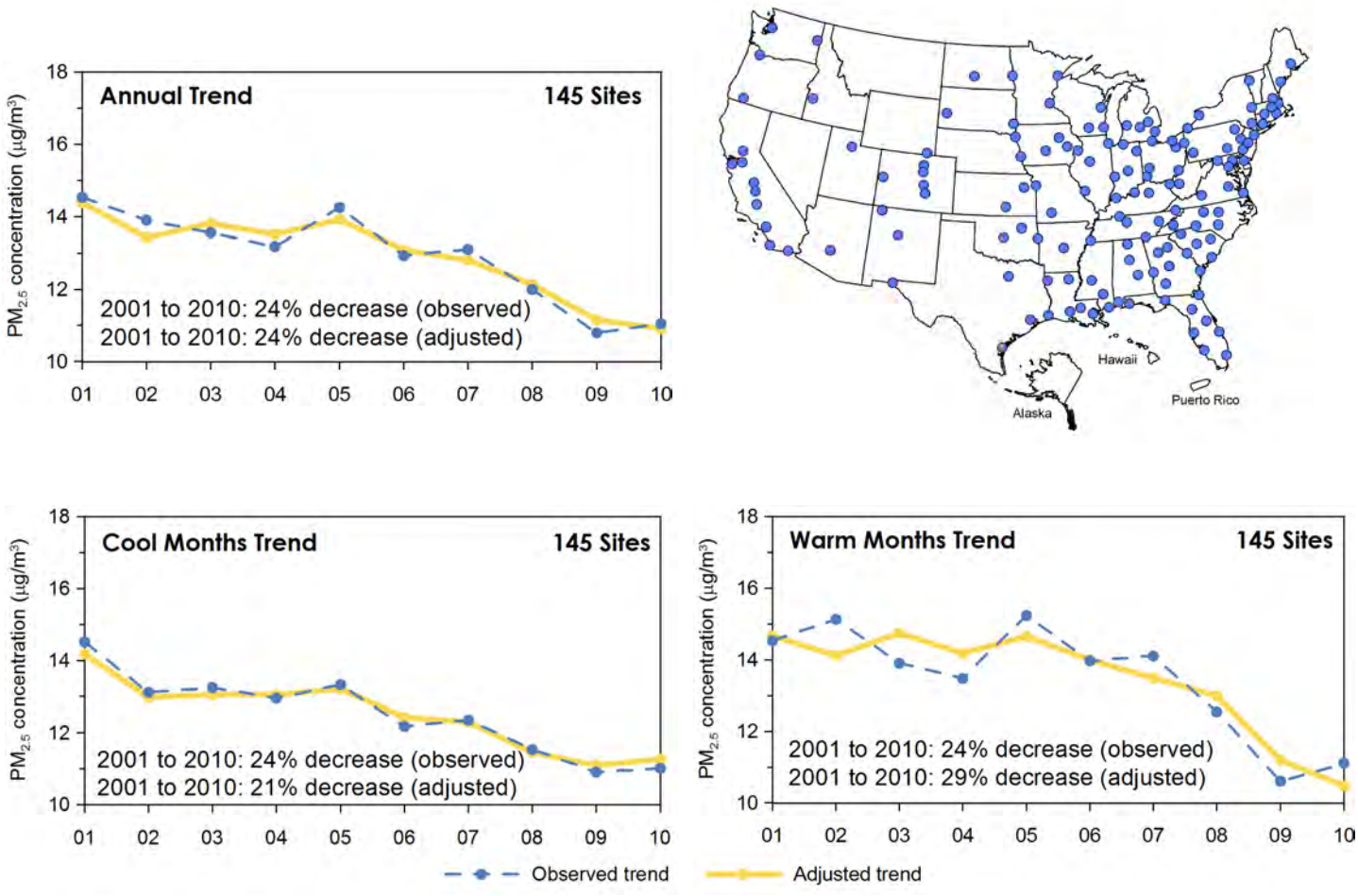

Figure 12. Trends in annual, cool-month (October–April) and warm-month (May–September) average $PM_{2.5}$ concentrations in µg/m³ (before and after adjusting for weather), and the location of monitoring sites used in the average.

Trends in PM_{10} Concentrations

Nationally, 24-hour PM_{10} concentrations declined by 29 percent between 2001 and 2010, as shown in Figure 13.

Figure 14 shows that in 2010, the highest PM_{10} concentrations were located in California, Utah, Colorado and New Mexico. However, within these same states some sites showed a decline greater than 50 µg/m³. Highest concentrations are largely located in dry and/or industrial areas with a high number of coarse particle sources.

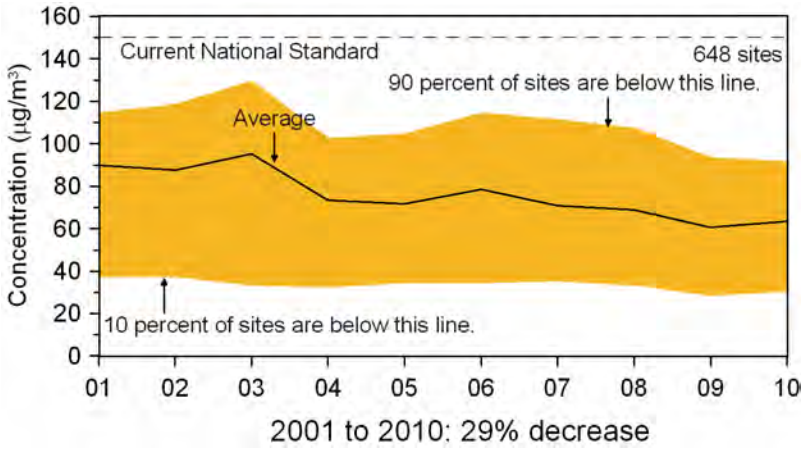

Figure 13. National PM_{10} air quality trend, 2001-2010 (second maximum 24-hour concentration in µg/m³).

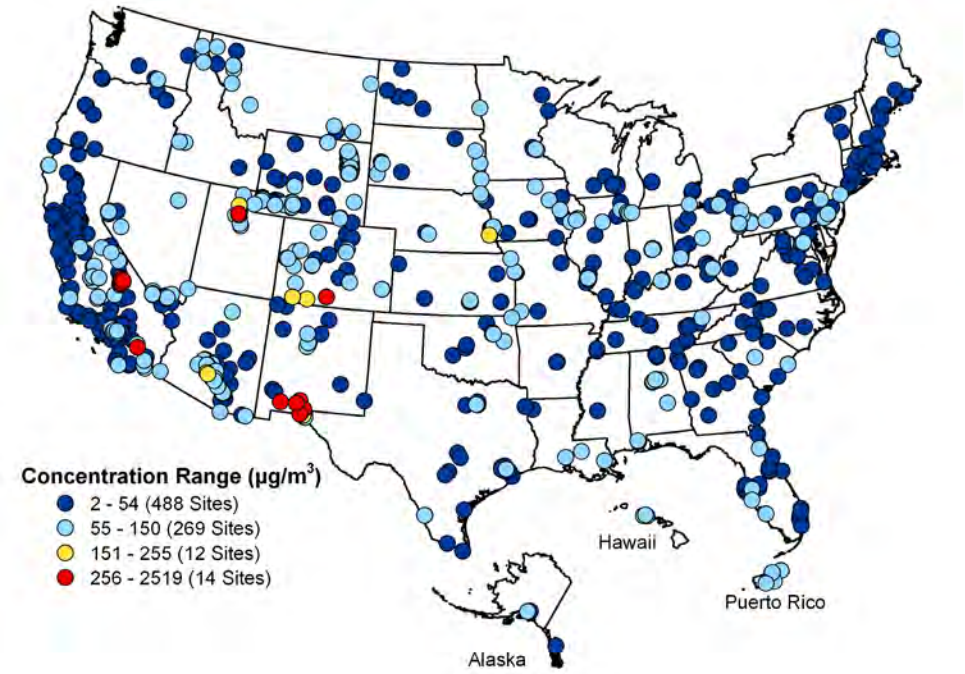

Figure 14. PM_{10} concentrations in µg/m³, 2010 (second maximum 24-hour concentration).