Ozone Pollution in the Rural United States and the New NAAQS

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Recent medical and epidemiologic data indicate that prolonged exposure to moderately high ozone (O_3) concentrations can have deleterious health effects (*1*). The U.S. Environmental Protection Agency (EPA) has thus proposed a new National Ambient Air Quality Standard (NAAQS) for O_3 (*2*, *3*). Under the current NAAQS, an area is in nonattainment and is required to control pollutant emissions if the daily, maximum, 1-hour averaged O_3 concentration exceeds 0.12 part per million (ppm) more than three times in 3 years. The proposed new standard would require that the third highest, 8-hour averaged O_3 concentration (averaged over 3 years) not exceed 0.08 ppm. Analysis of rural O_3 data suggests that this new standard will transform our perceptions of air pollution in the rural United States and the policies used to manage this pollution.

Ground-level O_3 is produced from the photochemical oxidation of volatile organic compounds in the presence of sunlight and nitrogen oxides (NO_x) (*4*). However, NO_x emissions have a complex effect, first depleting O_3 and then catalyzing its production. In urban areas, which have large NO_x sources, O_3 levels have a large diurnal variation. They typically rise sharply to a short-lived afternoon maximum and drop to near zero at night. In rural areas, which are removed from large NO_x sources, O_3 levels are less variable. The afternoon maximum is smaller but there is a larger minimum in the morning and at night. Thus, whereas nonattainment of the current 1-hour NAAQS occurs mostly in urban and suburban areas, rural nonattainment becomes more likely as the standard changes to a smaller concentration averaged over a longer time period.

An analysis of data from the Aerometric Information Retrieval System (AIRS) monitoring network showed that the new NAAQS would almost triple the number of nonattainment counties in the United States (*5*). However, the AIRS monitoring sites are mostly urban and suburban, and thus this earlier analysis did not address the issue of rural pollution. More appropriate are the Southern Oxidants Study Spatial Ozone Network (SON) (*6*) and EPA's Clean Air Status and Trends Network (CASTNet) (*7*), which are designed to characterize rural air quality. Extrapolation of data from these networks from April through September 1995 (*8*) indicates that although only 6 of the 85 sites were in nonattainment under the current NAAQS, 41 would have been in nonattainment of the proposed 8-hour standard (Fig. 1).

Although it is limited to 1 year's data, this analysis suggests that (i) the health effects of ground-level O_3 pollution are far more ubiquitous than indicated under the current NAAQS, and (ii) the new standard will bring large parts of the rural eastern United States into nonattainment. Addressing rural nonattainment will necessitate a major change in the nation's pollution control strategies. Because current O_3 nonattainment is largely urban, control strategies have justifiably focused on emission controls within the nonattainment area. However, O_3 levels at any given rural location are probably affected by emissions from multiple urban areas as well as from local and distant rural sources. Thus, rural nonattainment will require regional control strategies. The economic impacts of this change, both in terms of total costs and on the sectors of the economy that bear these costs, could be significant.

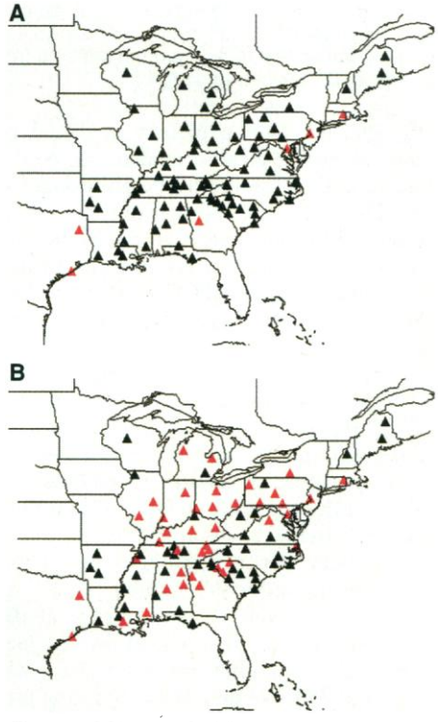

Fig. 1. SON and CASTNet monitoring sites in attainment (black triangles) and nonattainment (red triangles) under (**A**) the current NAAQS and (**B**) the proposed 8-hour NAAQS.

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8. Attainment statistics are normally compiled over 3 years. Because climatic conditions over the eastern United States during the summer of 1995 were not anomalous (*9*), extrapolation of 1995 data should yield representative statistics. A preliminary analysis of 1993–1995 O_3 data from rural sites in the AIRS network yields results similar to those presented here.
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