Changes in Eastern US NOx Emissions and IMPROVE Fine Nitrate Concentrations
2002-2021

Scott Copeland
IMPROVE Steering Committee
10/17/2023
1. Strong evidence that past NOx reductions are linked to lower particle nitrate concentrations broadly across the Eastern US.
2. The resulting changes in measured fine nitrate concentrations are not necessarily reflected in Most Impaired Day (MID) composition, but still affect MID dv, which is the metric.
3. Simulated data suggests that past NOx reductions have improved current MID dv and that future NOx reductions will reduce measured nitrate concentrations, and consequently reduce MID dv.
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Eastern State 5-Year Average NOx Emissions by Sector TPY

https://www.epa.gov/air-emissions-inventories/2air-pollutant-emissions-trends-data (CAPS Trends)
NOx emission reductions were quite consistent across the East, between 50% and 75% reductions.
Annual average of all samples, not MID.
66% reduction in eastern US NOx results in 32% reduction in annual mean fine NH4NO3 concentrations.

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A majority of sites experienced a significant shift in the seasonality of MID, with the broader trend being more MID in the winter and fewer MID in the summer.

-> This is the cause of increased nitrate concentrations on the MID, even at sites when winter nitrate concentrations decreased.
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3. Simulated data suggests that past NOx reductions have improved current MID dv and that future NOx reductions will reduce measured nitrate concentrations, and consequently reduce MID dv.
We can use the MID algorithm to simulate past and future conditions

Past: 66% reduction in eastern US NOx results in 32% reduction in annual mean fine NH4NO3 concentrations.

Results in 5.6 Mm-1 more nitrate and 0.39 dv 5-year average increase in MID compared to no reduction in NH4NO3

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We can use the MID algorithm to simulate past and future conditions.

Future: “Zeroing out” eastern US NOx, and extrapolating previous trend yields 22% additional reduction in annual mean NO3 concentrations.

Results in 2.6 Mm-1 less nitrate and 0.58 dv 5-year average improvement in MID compared to no reduction in NH4NO3

*Annual mean of all samples, not MID.
Thank you

View of Western North Carolina from Clingmans Dome
Jim Renfro, NPS