

# Response to “Commentary on ‘A possible trade-off between clean air and clean water’ by Smith et al. (2017)”

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We appreciate the commentary by Robarge et al. (2017) regarding our recent feature article on the potential trade-offs between clean air and clean water (Smith et al. 2017). The purpose of our article was to further the discussion on the causes of the divergent soluble phosphorus (SP) and total phosphorus (TP) loading trends that have been observed in Western Lake Erie Basin tributaries (Baker et al. 2014; Jarvie et al. 2017). In 2014, shortly after the Toledo, Ohio, water crisis, we put together a list of 25 “potential causes” of increased SP loading to Lake Erie, with changing atmospheric deposition chemistry as one of the potential causes listed (Smith et al. 2015). Since the writing of that article, numerous studies investigating several of the “potential causes,” including tile drainage, soil test P levels, nutrient management, and tillage practices, have been conducted. While we acknowledge that many factors have likely contributed to changing SP loading trends, examining the potential impact of individual and combinations of factors, including the effects of changes in atmospheric deposition, will be fundamental to improving P management and equipping producers with the necessary tools to decrease P losses to Lake Erie and other sensitive waterbodies.

We concluded in our article that the data were “insufficient to confirm” that the improved air quality and decreased sulfur (S) deposition impacted SP loadings. We also clearly stated that “based on

our preliminary results, we cannot rule out the possibility” that these observations were associated. The article was intended to be a “discussion starter,” and we are greatly encouraged that this has indeed started robust scientific discussion. It was not meant to serve as a definitive piece on the role of air quality regulations on river water quality, and our feature article and our colleagues’ commentary clearly highlight that there is much more work to be done in this arena.

## REFERENCES

- Baker, D.B., R. Confesor, D.E. Ewing, L.T. Johnson, J.W. Kramer, and B.J. Merryfield. 2014. Phosphorus loading to Lake Erie from the Maumee, Sandusky and Cuyahoga rivers: The importance of bioavailability. *Journal of Great Lakes Research* 40(3):502-517.
- Jarvie, H.P., L.T. Johnson, A.N. Sharpley, D.R. Smith, D.B. Baker, T.W. Bruulsema, and R. Confesor. 2017. Increased soluble phosphorus loads to Lake Erie: Unintended consequences of conservation practices? *Journal of Environmental Quality* 46(2):123-132.
- Robarge, W., O. Duckworth, D. Osmond, J. Smyth, and M. River. Commentary on “A possible trade-off between clean air and clean water” by Smith et al. (2017). *Journal of Soil and Water Conservation* 72(6):97A-98A, doi:10.2489/jswc.72.6.97A.
- Smith, D.R., K.W. King, and M.R. Williams. 2015. What is causing the harmful algal blooms in Lake Erie? *Journal of Soil and Water Conservation* 70(2):27A-29A, doi:10.2489/jswc.70.2.27A.
- Smith, D.R., M. Stephensen, K.W. King, H.P. Jarvie, R. Haney, and M.R. Williams. 2017. A possible trade-off between clean air and clean water. *Journal of Soil and Water Conservation* 72(4):75A-79A, doi:10.2489/jswc.72.4.75A.

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