

Phosphorous deposition to roadside soils: contributions to a unique biogeochemical environment

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Throughout the 20th century increased phosphorous (P) cycling has made eutrophication in surface waters commonplace. While agricultural P sources are well characterized, loadings of P to near-road areas are poorly understood, despite the widespread use of P in vehicular fuels and lubricants and P content in asphalt. Diesel and gasoline contain PO⁴ and lubricating oils contain P-based additives, therefore substantial P inputs to roadside soils result from vehicle exhaust. This study synthesizes P concentration data in roadside soils across multiple cities, including a metropolitan-scale analysis of southern California and a roadside transect scale study of Pittsburgh, Pennsylvania. At both scales, total soil P increases closer to the roadside. Furthermore, soil molar P/Sb ratios become increasingly similar to literature P/Sb values for vehicular exhaust near the road edge. These patterns in soil chemistry suggest that roadside soils receive substantial loadings of P from the roadway. Specifically, preliminary results suggest that soils less than 30 m from the road in the Los Angeles Metropolitan Area have accumulated hundreds of kilograms of P per hectare, a substantial mass comparable to estimated accumulations of P in global agricultural soils. This P loading, together with substantial reactive nitrogen and metal loadings to these roadside areas, create a unique biogeochemical environment in roadside soils with important implications for surrounding natural systems.