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Attenuation of Diffuse Phosphorus Transfers within an Agricultural Karst Spring Zone of Contribution

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This study investigated the apparent contradiction of good water quality (as determined from phosphorus (P) concentrations) and relatively intensive agriculture and high soil P status in a 32 km2 karst spring zone of contribution where groundwater vulnerability mapping had indicated high and extreme risk of pollution. Phosphorus attenuation potential was investigated along the nutrient transfer continuum based on soil P buffering, depth to bedrock and retention within the aquifer. Surface karst features such as enclosed depressions, were reclassified based on P attenuation potential in soil at the base. New techniques of high temporal resolution monitoring of P loads in the emergent spring made it possible to estimate P transfer pathways and retention within the aquifer. For one major winter flow event, an estimated 56% of both total P (TP) and total reactive P (TRP) were transported via small-medium fissure flow, and 15.5 kg (36%) of TP and 11.0 kg (42%) of TRP was retained in the limestone aquifer. A revised groundwater vulnerability assessment was used to produce a specific P susceptibility map and the definition of critical source areas in karst landscapes was demonstrated.