Can stream restoration remedy the nutrient pollution problem?

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Abstract. Eutrophication of aquatic systems – excessive nutrient concentrations and subsequent accelerated primary production – is a pressing water quality problem in the U.S. and around the world. Stream restoration has been suggested as a potential approach for improving water quality by enhancing the natural nutrient removal and retention capabilities of lotic systems. This presentation summarizes results from a literature review aimed at assessing current understanding of the effectiveness of various stream restoration strategies for enhancing nutrient removal. Generally, many stream restoration strategies can enhance nutrient processing by increasing hydraulic retention time, promoting hyporheic exchange, and creating conditions conducive to denitrification and overbank deposition. However, quantitative results on the efficacy of these restoration strategies are scarce, as are their cumulative impacts on in-stream water quality. To help address this lack of quantitative analysis, we examined two issues in more detail: streambank phosphorus content and streambed denitrification rates. Streambank phosphorus concentrations are highly variable and have implications for nutrient loading from bank erosion. Denitrification is an important nitrogen removal pathway in aquatic systems. We examined factors explaining variability in: (1) total bank phosphorus content and bioavailability and (2) denitrification rates both within and between streams. In both cases, the selected analytical methods were significant predictors of variability between studies. We then explored how inherent natural variability and this issue of consistent analytical methodology complicates quantification of nutrient retention and removal and the implications of this for assigning nutrient removal credits for stream restoration.