

Analyzing Floodplain Reconnection as a Restoration Method ¹

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Abstract: This study characterized the the effect of stream restoration through floodplain reconnection in Southwest Pennsylvania, USA, on sediment and nutrient transport. In these study sites, the aim of restoration was to improve connectivity between the stream channel and its adjacent floodplain by implementing wetland riparian zones, regrading the stream channel, and removing legacy sediments. This design was expected to improve the ecological function of the ecosystem by minimizing the effects that floods have on water velocity and erosion. Three unrestored and six restored study sites with varying drainage areas were analyzed for water storage capacity, sediment transport mechanisms, and nutrient cycling throughout the surface water, pore water, and sediment. The sites were sampled over low, base, and high flow conditions in July and November 2020 and March 2021. Surface water and pore water samples were collected for total suspended solids and nitrogen and phosphorus analysis. Water storage was measured by salt tracer tests that captured channel and vadose zone flow and compared with channel flow. Sediment pit traps were used to collect sediment deposited within the channel which was then analyzed for grain size distribution and nitrogen and phosphorus concentrations. Differences in water storage, sediment grain size, surface water nutrients, and sediment nutrients were assessed between sites based on flow regime, stream size class, and restoration status. In-channel flow rate impacted sediment transport, sediment grain size makeup, and surface water nutrient loading dynamics. Restoration status had a positive influence on the abundance of nitrogen and phosphorus in the sediment as well as the proportion of fine grain sediment. These data enhance a limited collection of assessments on floodplain reconnection. These results can be used to conceptualize the effect of floodplain reconnection in regions that exhibit a similar climate.

Additional Key Words: Streams, headwaters, nutrients, sediment.

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 3. Work reported here was conducted near 39°59'14" N; 80°28'50.6" W.