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Biological processes within the hyporheic zone and their relationship with sediment and riffle-scale hydrology.

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Complex interactions between stream surface water and groundwater in the hyporheic zone, combined with biogeochemical processes, produce a unique and dynamic set of physicochemical conditions that support the hyporheos – a distinct community of invertebrates and microorganisms. While some aspects of these communities are becoming known, for example community composition is influenced by depth-related variables and interstitial water temperature, many others, such as the response of bacteria to different sources of Dissolved Organic Matter, are still poorly understood. Increased understanding is best achieved from a combination of *in situ* sampling together with riffle-scale manipulation experiments. Such an approach has shown that while subsurface flow characteristics strongly influence invertebrate distribution patterns (e.g., at riffle downwelling vs. upwelling regions), microbial assemblages are more influenced by depth and sediment particle size. Further, such correlations appear to change with season, for example in spring invertebrates show a negative correlation with surface water infiltration, but this changes to a positive relationship in summer and autumn. These shifts might be due to temperature-induced changes in hydraulic conductivity of the streambed, or to seasonal variation in aquifer recharge influencing hyporheic exchange flux.