

Optimising the scale and targets of stream restoration activities to enhance likelihood of success

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Dealing with multiple interacting stressors is a major challenge in stream restoration. Moreover, failure to account for the scales at which stressors operate may be a main cause of restoration disappointment. Here, using pre-treatment data from nine one km reaches of the Canterbury Waterway Rehabilitation Experiment (CAREX), we define the scales at which the three main stressors affecting these lowland agricultural streams operate over and identify interactions between stressors. Variance components analysis of the nested random effects revealed important reach- and stream-scale deleterious effects of legacy fine sediment on invertebrate communities. These patchy negative effects were exacerbated by weed macrophytes which increased sediment deposition. Thus, combinations of stream-scale and reach-scale targeting of sediment and weed problems were deemed the highest priority. In general, nutrient pollution varied on large scales with few discernible direct influences on invertebrate communities, indicating the most important solutions to nutrient problems lie on land and will require improvements in other stressors before benefits are realised. Nevertheless, some very high point sources of nitrate associated with nutrient hotspots like tile drains were detected and will be important targets for rehabilitation. Overall, elucidating the scales of multiple stressor influence has helped direct the location and timing of restoration efforts and has better defined expectations in the CAREX project.