

# On the road to predicting aquatic food web responses to restoration

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Freshwater ecosystems are subjected to a range of ecological stressors, and many remediation projects have been carried out in an attempt to improve their ecological state. Many of these restoration projects rely on the Field of Dreams hypothesis, which implies that if you remove the stressor, the system will improve, eventually returning to an un-impacted condition. However, many of these systems have internal inertia and species interactions that may prevent a successful return to its original form or function. In order to advance the field of freshwater restoration, we need to test predictions made regarding restoration outcomes. The Bellevue mine adit is an abandoned site on the West Coast, South Island which drains into Cannel Creek, and has a proposed remediation project. We made predictions based on projected water quality parameters for two restoration scenarios (best- and worst-case), for two sites. We predicted which taxa (algae, macroinvertebrates, and fish) would be present based on the improved water quality parameters. Using these lists of taxa, we then predicted food web interactions based on a cumulative species interaction matrix. Understanding food web structure is an important aspect in determining a system's robustness and resilience to current and future environmental perturbations. Both sites had 2-3x the number of taxa predicted in the best-case scenarios compared to the worst-case. Fish are predicted to be entirely absent at both sites under worst-case conditions. Likewise, the predicted food webs in the worst-case scenario contained many fewer links and were more highly connected, making them more vulnerable to future perturbations. These predicted taxa lists and corresponding food web metrics give us testable hypotheses when evaluating the effectiveness of the remediation activities once the project is completed.