Repeated fine sediment pulses may impact stream restoration projects

What we know

Resource managers responsible for protecting New Zealand's freshwater environments are particularly focused on managing the impacts of fine sediment. While previous research has proven increased levels of deposited fine sediment have negative impacts on stream ecosystems, much of this research has focused on the impacts of a single addition of fine sediment. As rivers and streams are ever-changing environments, fine sediment levels are expected to vary with time, potentially altering stream ecosystem responses to this variation. Our research aimed to explore how past fine sediment conditions and continued fine sediment loading impacted stream communities.

What we did

- Conducted an eight-week streamside mesocosm experiment in North Otago to investigate the impacts of repeated fine sediment pulses on stream invertebrates.

How we did it

- Water from the Kauru River was pumped through our mesocosms (diameter 25 cm), which were set up to replicate conditions in small real-world streams.
- Sediment pulses were added to mesocosms at up to three points in time to mimic ongoing increases in fine sediment (due to runoff during rain).
- Sampling occurred after each sediment pulse, capturing stream invertebrates that left the mesocosms ("drifting") due to the unfavourable conditions.

Stream invertebrates

- The presence of certain invertebrates tells us a lot about the health of streams.
- Some invertebrates dislike fine sediment, actively avoiding or moving away from streams high in fine sediment (sensitive invertebrates).
- Some invertebrates are tolerant of fine sediment.
- In our experiment, the type of drifting invertebrates indicated how stream health responded to repeated fine sediment pulses.

What we found

- After the first fine sediment pulse, a significant number of sensitive stream invertebrates drifted away from our mesocosms due to fine sediment creating unfavourable conditions. Far fewer stream invertebrates drifted after the second sediment pulse.
- Interestingly, the third fine sediment pulse saw a similar proportion of stream invertebrates drift as the first pulse, leaving nearly no sensitive stream invertebrates remaining in the mesocosms.

Conclusion

- Within a real-world stream, these results suggest two influential thresholds for sediment-sensitive stream invertebrates, the first after one fine sediment pulse and a second after three pulses.
- As stream restoration relies on invertebrates coming from elsewhere in the catchment, if fine sediment within a catchment exceeds the equivalent of three pulses, stream restoration may be unsuccessful.
- This research stresses the importance of ensuring fine sediment does not exceed levels where future stream restorations are negatively impacted.

Research conducted by PhD student Noah Davis, with Christoph Matthaei at the University of Otago, supported by a grant from the Department of Conservation.

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A scientific paper based on this research will be published but contact Noah (davno1996@gmail.com) or Christoph (christoph.matthaei@otago.ac.nz) in the interim.

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