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Environmentally effective and cost-efficient sediment management at impoundments

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Aim of the project

1. Raise awareness in the hydro sector of basic river geomorphological processes including (a) the ecological importance of sediment continuity to rivers and of the environmental risks of not properly addressing this in permit applications; and (b) the commercial risks posed by climate change-related increases in the rate of sediment delivery to hydro and water supply impoundments (Figure 1).
2. Improve understanding and raise awareness of the cost effectiveness of different sediment management options available to address these risks.

The project builds on a previous CREW project that provided a first-of-its-kind assessment of the impacts on sediment continuity of run-of-river (RoR) hydropower structures (Williams *et al.*, 2022).

Background

Dams and weirs on rivers are used to impound a pool of water upstream, allowing a controlled amount of river flow to be diverted. The diverted flow may be used for various purposes, including to generate power and supply water for domestic, agricultural, industrial or transportation needs. Impoundments are often critical to permit these uses, but they can also reduce or prevent the natural continuity of movement of river sediment (predominantly silt, sand, gravel, and cobbles) from upstream to downstream. Where this occurs, the build-up of sediment behind the dam can pose a risk to the intended use of the impoundment while, downstream, the reduction in sediment often has adverse ecological consequences, for example, in causing a loss of aquatic habitat for fish.

Key Findings

Using knowledge exchange activities with the hydro-power community, this project developed various initiatives to raise awareness of the commercial and environmental risks associated with disruptions to sediment movement caused by river impoundments. A **video** and **infographic** (Figure 2) were produced to communicate (i) the importance of sediment continuity for good river health, (ii) potential implications for sediment management resulting from a changing climate and (iii) the importance of best-practice sediment management to prevent or minimise disruptions to sediment continuity. A **guidance framework** was also designed to assist operators and regulators plan appropriate sediment management activities when making applications for hydropower scheme permits or reviews.

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To access the outputs for this project, please visit: crew.ac.uk/publication/hydro-impoundments-sediment-management

A **cost-benefit analysis** was undertaken to evaluate the environmental and commercial effectiveness of various catchment sediment management options that could be applied to reduce the risk of sediment build-up at hydropower and water supply impoundments. Catchment sediment management measures (for example, planting trees alongside rivers, restoring peatland, and tree planting more broadly across the catchment) are aimed at reducing the amount of sediment that gets into rivers, thus slowing the rate of sediment build-up in river impoundments. Commercially, this reduces the frequency with which sediment needs to be excavated from behind the dam to allow hydro operations to continue. The analysis was conducted based on the overall economic good to Scottish society based on an on-line questionnaire survey of people's preferences and willingness-to-pay for improvements, completed by nearly 1,000 people. For all the tested scenarios, planting trees alongside rivers and peatland restoration delivered a positive economic benefit. For most scenarios, catchment tree planting also generated positive benefits. SEPA and NatureScot have key leadership roles in disseminating these findings to hydropower community and as part of managing rivers more broadly.

The project demonstrated that there is a desire within the hydropower community for further discussion and knowledge exchange activities regarding best practice activities. If this can be achieved, it would likely maintain or improve river health and make this industry, and river catchments, more resilient in the face of expected climate changes.

Please see the main report for full details on the project findings and recommendations.

Figure 1 – Hydro impoundment (Photograph courtesy of Richard Williams).

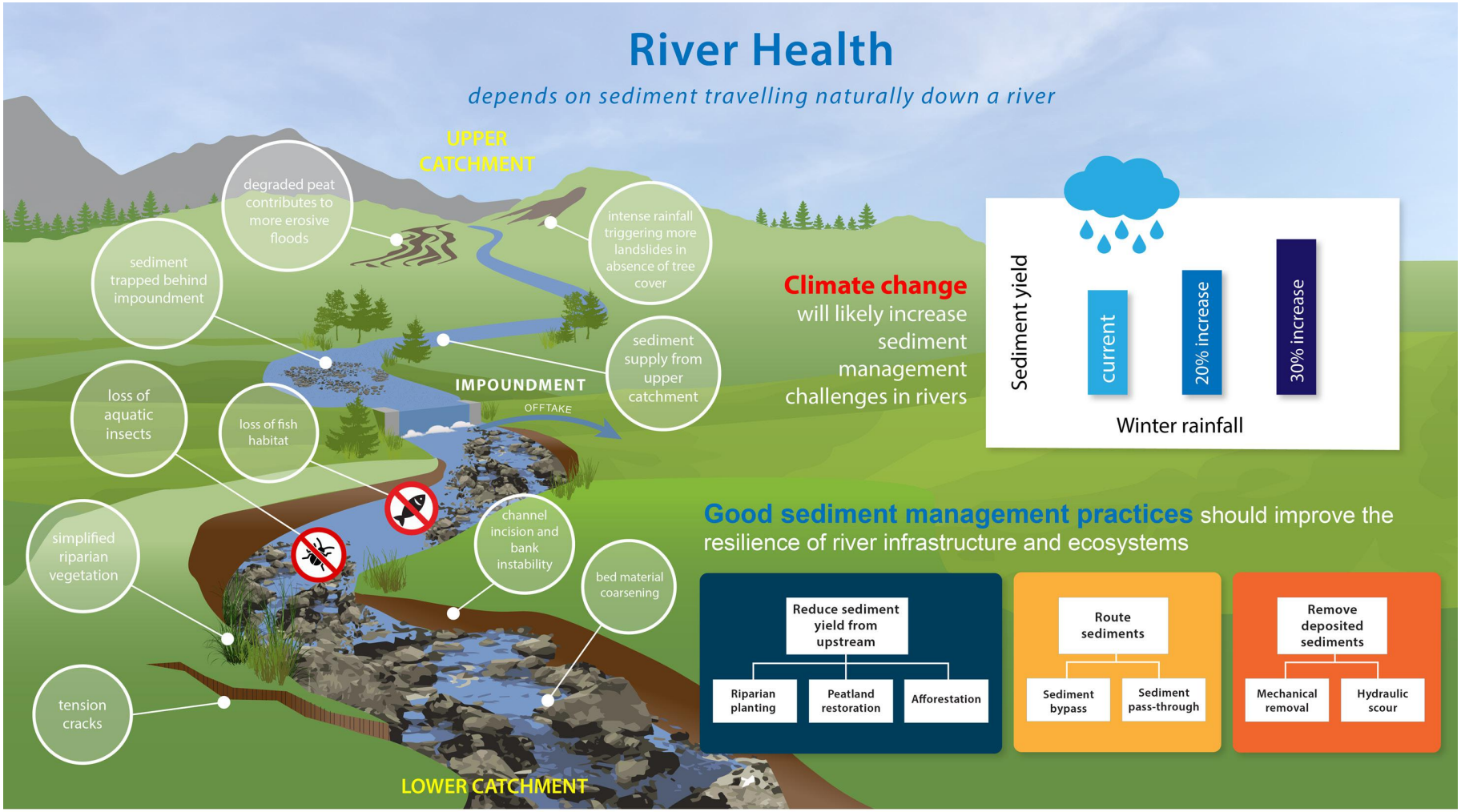

Figure 2 – River Health Infographic.

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