Designing a fishway for sea trout (Salmo trutta) in a small river in South-Eastern Norway using an adaptive strategy approach

During the third and fourth semesters of my Master's program, I conducted my thesis research with financial support from Vannforeningen. The project aimed to restore sea trout connectivity in Unnebergsbekken, a small stream near Sandefjord. A natural bedrock waterfall in the river had been historically modified for sawmill and later hydropower use, ultimately creating a total upstream migration barrier. Although the main facility was removed, the altered site remained impassable to sea trout, blocking access to approximately 51% of the river's mapped suitable spawning habitat. Modelling suggested that constructing a fishway at this site could increase smolt production by 62–75%, depending on the method applied. A close-to-nature step-pool fishway was therefore designed and built, following strategic adaptive management principles. The primary functional improvement was achieved by increasing the water level below the barrier, reducing the elevation difference and increasing plunge pool depth—key for enabling upstream passage. The project also included mapping and prioritisation of potential river barriers and suitable spawning habitats, assessment of juvenile and spawning populations, and development of a monitoring and evaluation program to guide future management. Despite remaining limitations and uncertainties, early post-construction assessments confirmed improved structural passability for adult sea trout. The detection of spawning activity upstream of the fishway indicates preliminary ecological success, long-term monitoring will be essential to fully assess the river restoration's effectiveness.

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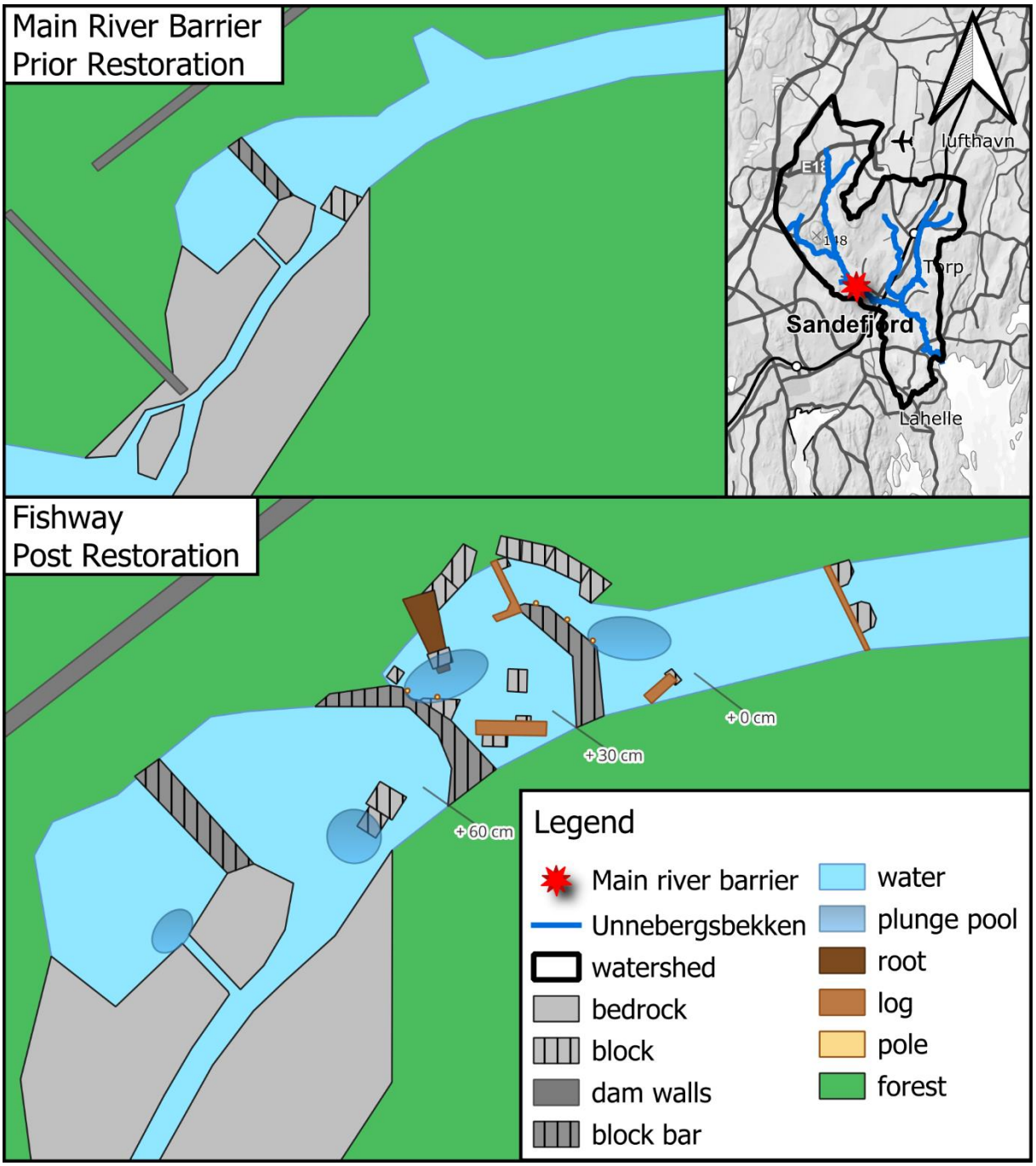

Figure 1 The main river barrier and the step-pool fishway. Map: Topografisk Norgeskart gråtone © Kartverket.

Figure 2 Measuring the main river barrier.

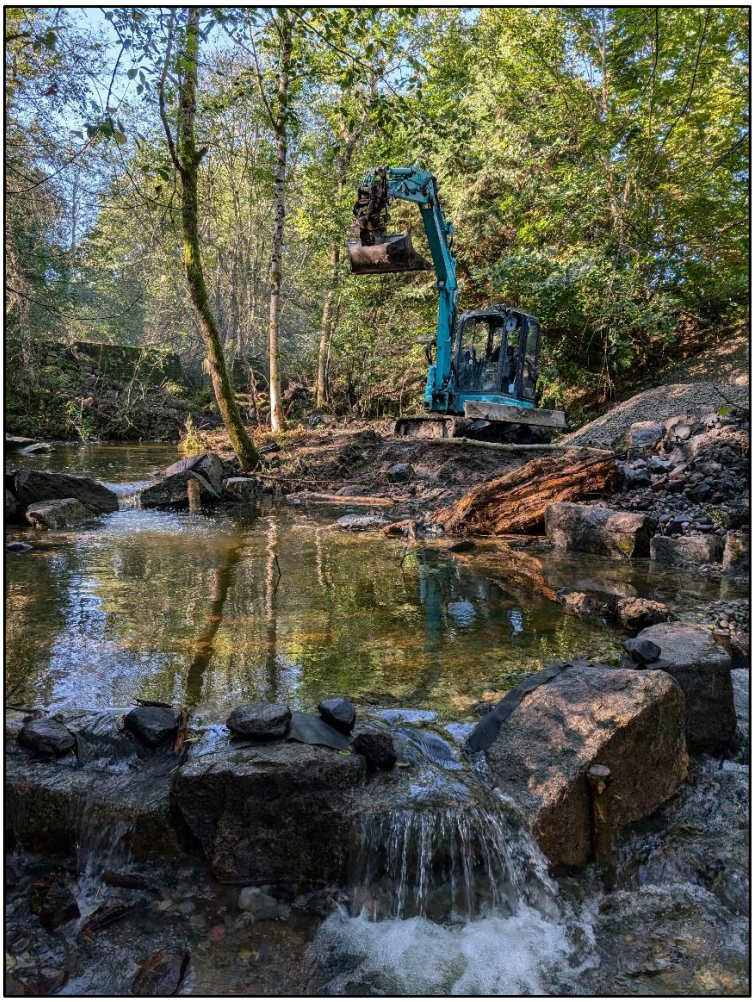

Figure 3 The fishway under construction.

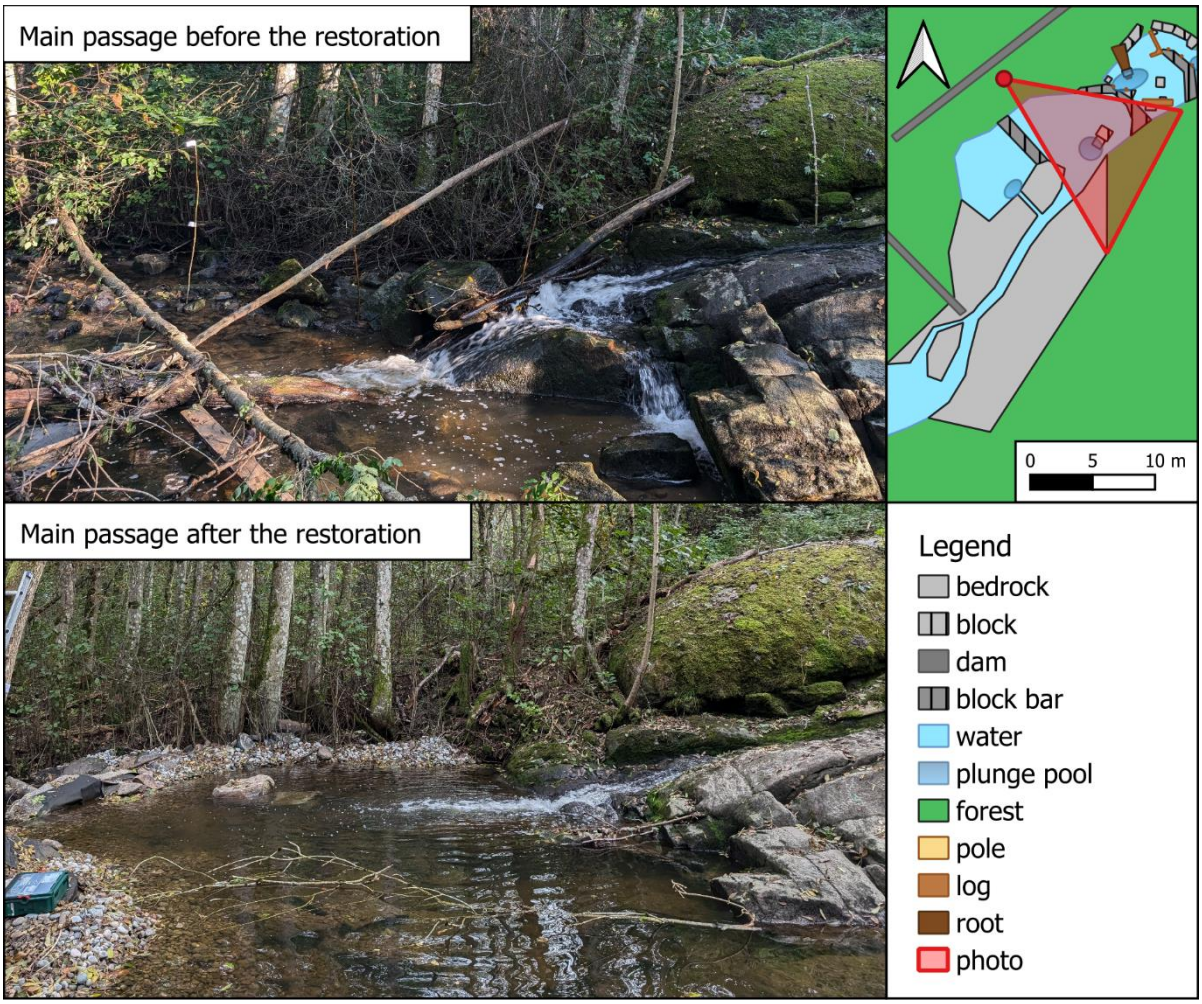

Figure 4 Photos of the water level below the main river barrier before and after the restoration.

Figure 5 Mapping sea trout spawners upstream of the fishway during night time with torches.