

Upper Spey – Large Woody Structure Installation

This project was supported by the Scottish Government Nature Restoration Fund administered by NatureScot



1. Project Summary

The aim of this project was to improve in-stream habitat in the headwaters of the River Spey, upstream of Spey Dam on Glenshero Estate. The project focussed on a reach of the river between Garva Bridge and the Shesgnan Burn confluence, characterised by substantial areas where habitat is suboptimal for many aquatic species. There is currently a lack of diversity and complexity of habitat structure, and the relatively uniform nature of the river substrate and morphology is partly attributable to historic loss of riparian woodland and deadwood input. The objective was to install Large Woody Structures (LWS) which mimic the function of natural deadwood to ‘kick-start’ and enhance natural fluvial processes, and promote flow diversity and geomorphic heterogeneity by altering spatial patterns of erosion and deposition. This encourages formation of a greater diversity of high quality physical habitat suitable for the different life stages of salmonid fish, important for breeding success, as well as supporting invertebrates and other river life. The LWS will also boost resilience to the impacts of climate change by providing refuges from high water temperatures and flood flows, both of which are predicted to become more frequent and severe in upland watercourses.

2. Project Delivery

2.1 Pre-construction

Project planning commenced in 2021 with detailed discussion with the landowner of Glenshero Estate, Jahama Highland Estates (part of the GFG Alliance). The project was a good fit with JHE's corporate objectives and growing commitment to environmental stewardship of their assets. The scope of the project and roles of each partner in management and delivery were agreed.

Concepts from an initial walkover survey by Spey Catchment Initiative (SCI) and Spey Fishery Board (SFB) staff were developed by Cbec Eco-engineering Ltd who were engaged to undertake a detailed walkover survey and fluvial audit. Detailed, GIS referenced maps of strategically selected placement locations for LWS were produced, prioritised for where they would have most positive effect. Sources of trees and ballast materials for the LWS construction were identified and agreed with the estate's forester and other staff. A timetable for works was agreed to fit around estate activities whilst avoiding the fish breeding season and other environmental sensitivities.

As the site is within the Spey SAC and SSSI, a Habitat Regulations Assessment was completed and full consent was obtained from NatureScot. Confirmation was obtained from SEPA that the project would not require a CAR licence and had their support.

Shortly before implementation, a pre-works survey was carried out for otter as a SSSI qualifying species.

2.2 Construction

Following competitive tendering, local contractors GS Campbell were engaged to undertake all groundworks. Works took place over three weeks during September 2022 and were completed on time and within budget to a high standard. Daily on site supervision was undertaken by SFB/SCI.

Whole trees with root plates intact were extracted from several mature conifer plantations close to the river. They were transported to the previously mapped sites and installed into the banks or bed of the river following established procedures. Burying approximately 4-9m length of the tree trunk and placing boulders around and on top of the LWS ensures they are secure and resistant to moving under high flow conditions.

At all stages care was taken to minimise ground disturbance in the riparian zone, in tree felling areas and between the river and access track, as well as controlling sediment release during the in-channel works.



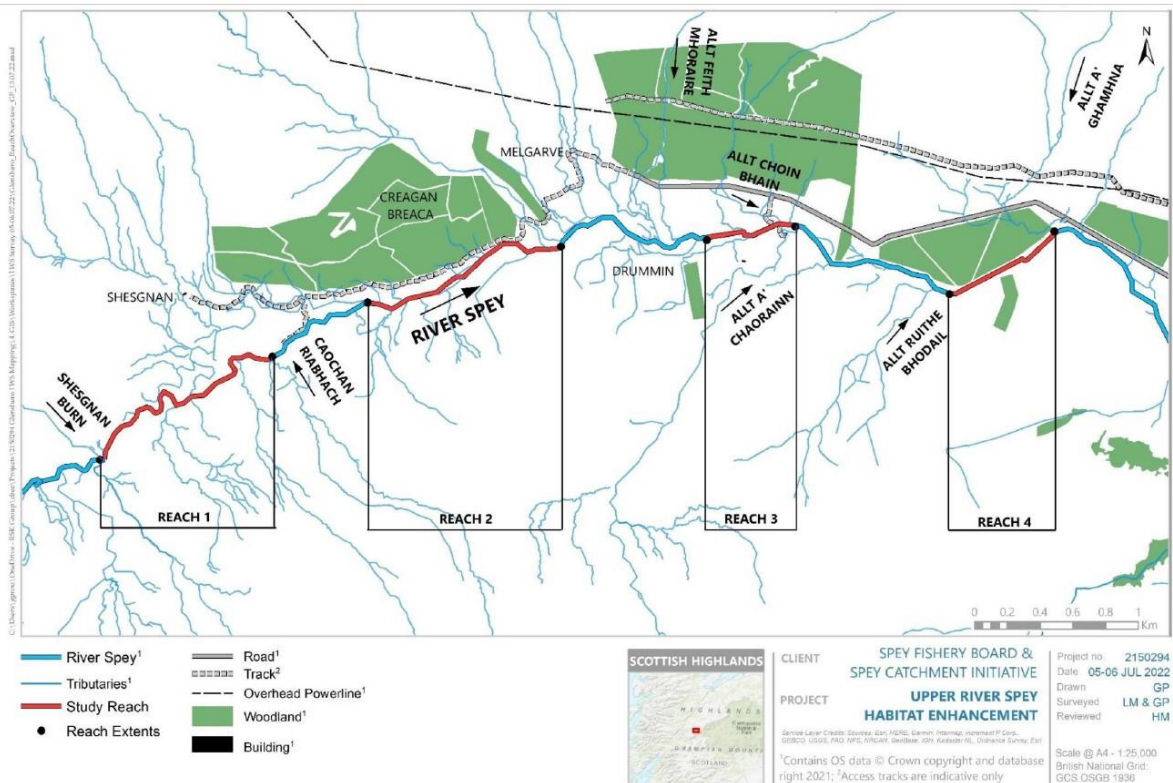
3. Outputs

Outputs	Quantity
Length of project reach	Approx. 7km
Total length of reaches where LWS installed	4.67 km
Number of LWS installed	65
Estimated area of river channel habitat enhanced	2.34 ha

The locations of the LWS reaches are shown in Fig 1. LWS were installed in Reaches 2, 3 and 4 and in the sections of river between these three reaches.

Reach 1 was mapped for potential LWS sites but was excluded from the project due to cost, time and practicability considerations. Access upstream of reach 2 for machinery is much more difficult than for reaches 2-4, and after discussion it was judged that the potential habitat benefits of LWS in reach 1 and between reaches 1 and 2 were proportionately less significant compared to the downstream reaches. This is largely due to the channel here being slower flowing, less dynamic and dominated by a fine sediment substrate, mainly due to the smaller supply of gravel and cobbles upstream of the confluences of the bigger tributaries with the Spey.

Figure 1 – LWS installation reaches (cbec Eco-engineering ltd)



3.1 Summary of LWS installation locations

Reach	Upstream NGR	Downstream NGR	Length (km)	No. LWS installed
2	NN 4508 9518	NN 4626 9552	1.3	22
Between 2 and 3	NN 4626 9552	NN 4715 9556	1.05	4
3	NN 4715 9556	NN 4769 9564	0.5	11
Between 3 and 4	NN 4769 9564	NN 4863 9523	1.12	13
4	NN 4863 9523	NN 4927 9561	0.7	15

3.2 Photographic record



Typical uniform reach pre-project



Shortly after LWS installation



A few weeks after installation



7 months after installation showing gravel deposition downstream of LWS



Development of depositional features around LWS 4 months after installation.



4. Monitoring and maintenance

Monitoring was put in place before and immediately after project implementation as detailed below, and will be continued in order to measure the impact of the project for a minimum of ten years.

Installation of the LWS is designed to avoid any on-going maintenance requirements, however locally based estate staff will inspect the project reach regularly and any issues will be dealt with by the estate, SCI or SFB as appropriate.

Parameter	Initial survey	On-going frequency	Responsibility
Electrofishing (juvenile salmonids)	August 2022	annual	SFB
Redd counts	Nov 2022	Every 2 years	SFB
Invertebrates (4 sample sites located close to LWS sites)	October 2022	2023 then every 2 years	SCI (sample collection and sorting), specialist contractor (detailed identification and interpretation)
Fixed point photography	Nov 2022	Annual	SCI
Aerial UAV drone photographic survey (geomorphological changes)	Oct/Nov 2022	Annual	SFB/SCI
Water temperature (5 loggers installed around one LWS)*	Oct 2022	Continual recording. Data download every 6 months	SFB
Visual checks of LWS	Oct 2022	At least weekly	Glenshero estate head keeper and staff

* In addition there are also three water temperature loggers installed along the project reach as part of the Scottish River Temperature Monitoring Network. These will continue to be run by Marine Scotland Science to collect long term water temperature data which is available to SCI on request.

5. Publicity and promotion

As it has progressed, the project has been publicised via social media (SCI, Jahama/Alvance and other partners), local and environmental/fisheries sector press coverage. A guided site visit for GFG Alliance staff and representatives was run shortly after project completion, and further visits for interested parties will be organised (though the remoteness of the site imposes practical constraints). A short video explaining the project has been produced and widely promoted by SCI and Jahama (https://www.youtube.com/watch?v=tjFRAah4YCc&ab_channel=SpeyCatchmentInitiative) and the project was featured on BBC Alba TV and BBC radio in April 2023. It is anticipated that publicity will be on-going for a number of years, and that the project will form a useful case study, with full details available on the SCI website, for others engaged in river restoration.

6. Fulfilment of aims and outcomes

The project was delivered on time and under budget and there were few major challenges. The objectives were achieved as planned, with the exception that, as explained above, the number of LWS installed was reduced from an estimated 80-100 to 65 due to cost-benefit factors and practical constraints.

From visual observations it is already clear that during the seven months since LWS installation, significant scour and deposition around the LWS has formed deep pools on the upstream sides of many and gravel bars and other alluvial features downstream of them. Future repeat aerial surveys and fixed point photography will allow more accurate quantitative and qualitative assessment of the geomorphological changes around the structures. Any changes in long term trends in fish productivity and invertebrate diversity and abundance are likely to only become apparent over a longer period, and the influence of other factors such as climate change, riparian woodland creation at Glenshero, and improvements to fish passage at Spey Dam will also need to be taken into account.

7. Further Works

The landowner has become increasingly engaged with the project throughout its implementation and is keen to build on its success and carry out further habitat restoration and enhancement work at Glenshero.

SCI is in discussions with the estate's forester and management regarding options to maximise riparian woodland creation along the upper Spey. The Long Term Forest Plan for Glenshero is currently under review and there may be an opportunity for SCI to be involved in delivery of riparian and/or wider catchment woodland elements falling outside Forestry Grant Scheme eligibility. In addition, the estate are interested in exploring options for interventions to slow runoff and expand wetter areas in the upper glen for habitat and biodiversity gain and Natural Flood Management benefits.

The project is well understood by the management of Alvance, the sister company to Jahama which operates Spey Dam, and the expectation of the improved habitat in the upper Spey has served to reinforce their commitment to continued work with SEPA and SFB to improve fish passability at the dam. To this end they are partnering with SFB to run a detailed salmon smolt tracking programme during spring 2023.

With thanks to Jahama Highland Estates, NatureScot, Spey Fishery Board and all other partners who made this project possible.

Penny Lawson, SCI Project Officer, April 2023.