# The River Peffery Restoration Project

PHASE TWO, 2012

Marcus Walters of the Moray Firth Sea Trout Project reports

The Peffery Restoration Project is a highly collaborative project that is bringing together Cromarty Firth Fisheries Trust (CFFT), Cromarty Firth District Salmon Fishery Board (CFDSFB), Moray Firth Sea Trout Project (MFSTP), Area Advisory Group (AAG), Scottish Environment Protection Agency (SEPA), Scottish Water, Moray Firth Partnership (MFP), Landowners, Forestry Commission, Dingwall Environment Group (DEG) and Trust for Conservation Volunteers (TCV) to work towards the restoration of the entire River Peffery catchment.

Commercial forestry plantation on the banks of the Upper Peffery

## UPPER CATCHMENT

The upper half of the River Peffery (above Achterneed) drains the slopes of Ben Wyvis through an area of intensive coniferous plantation owned by the Forestry Commission Scotland. The Cromarty Firth Fisheries Trust is negotiating with the Forestry Commission to block forestry drains that are a source of fine sediment and to pull back conifers creating a buffer strip and increasing the space along the banks. In 2012 the Forestry Commission provided native saplings that CFDSFB staff, funded by SEPA Water Environment Fund, planted along the banks to act as a buffer strip from the commercial conifers. These works will help reduce sediment and acidic runoff into the Peffery. Reduced crowding and shading, augmented with planting, will allow native vegetation and trees to regenerate, stabilising river banks, increasing organic inputs (native leaf litter) and creating better habitat and species diversity.

## MIDDLE TO LOWER CATCHMENT

The middle and lower reaches of the Peffery had a range of invasive, non-native species (INNS) of plants along the banks including Japanese knotweed, Himalayan balsam,

Willow saplings being planted on the banks of the Lower Peffery

Scottish Water weir to be made passable for migratory fish in 2013

Paired V logs in situ (installed 2011). Note there is no upstream impoundment and the structure focuses flow in the centre of the channel excavating a deeper pool and cleaning gravel

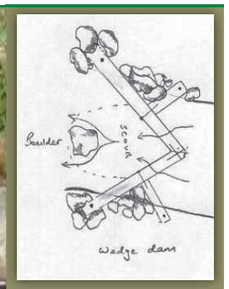



**DIAGRAM A: Paired V logs**
The upstream pointing V logs focus the force of the flow into the centre of the stream which excavates a pool providing cover while also creating a small gravel bank immediately downstream which is excellent for spawning. The logs are tied into the bank which is reinforced with boulders to ensure the structure doesn't cause bank side erosion or get washed away. The structure is constructed from locally sourced wood and stone.

rhododendron and giant hogweed. As part of a large scale Rivers and Fisheries Trusts Scotland (RAFTS) project, funded by the SEPA Water Environment Fund, most of the INNS have been removed and monitoring and treatment is ongoing to ensure they do not return. These invasive plants, if allowed to spread, create large stands that block out light and crowd out other riparian bank-side vegetation limiting biodiversity, greatly reducing winter bank-side cover and leaving banks vulnerable to erosion.

Due to historical land management practices, much of the riparian zone has been left without native bank-side tree cover. Furthermore INNS have crowded out native species leaving, following treatment, large areas of bare and unstable banks. Funding secured by the MFSTP and CFFT from the SEPA Water Environment Fund has enabled DEG volunteers and TCV teams to plant extensive areas of Peffery banks with local willow cuttings and alder saplings. 3,000 willow cuttings were planted in 2012 and more planting went ahead in the winter of 2013.

Migratory fish passage along the Peffery is impeded by a Scottish Water gauging weir at the Strathpeffer Sewage Treatment Works. The weir hinders upstream migration and reduces access to the most diverse and natural habitat that exists in the upper middle and upland reaches of the catchment. The CFFT and SEPA have reached agreement with Scottish Water that access over this barrier will be eased for migratory fish in 2013, greatly increasing the available habitat and potential productivity.

As highlighted in Wild Trout Trust (WTT) and River Restoration Centre (RRC) reports, much of the middle and lower reaches of the Peffery have been historically straightened and constrained within artificial embankments. This has resulted in a straight channel with little habitat diversity or opportunity for natural river processes. The channel has a very limited depth range (predominantly shallow), lacks larger sizes of bed sediments (boulders and cobbles) and has poorly-sorted bed sediments; all these factors adversely affect the ecology and fish habitat quality of the river. Where large woody debris (LWD) has collected in the river some natural river processes are operating within the limits of the flood banks, but most LWD is removed by local landowners due to perceived risks of flooding. Using in-stream restoration the project aims to build on these natural processes and help encourage the river to regain a more natural profile and associated habitat diversity without increasing risks of flooding to local land. However, the work to improve habitat and morphology has had to be accepted by the many owners and users of the river and adjacent land. As result, restorative solutions have had to be pragmatic and involve some compromise compared with preferred idealistic ecological or morphological solutions. Some improvement on the existing state is a positive step, certainly in the medium term, even if it is not restoring fully functioning, natural river processes.

## IN-STREAM HABITAT RESTORATION WORK

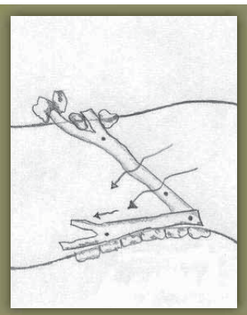
Following the Wild Trout Trust Advisory Visit in 2009, the MFSTP arranged a WTT demonstration day in 2010 that was funded by the SEPA Restoration Fund to trial some in-stream restoration techniques. Following the success of this demonstration and trial, the techniques were developed and deployed along a 600-m stretch in September 2011 by MFSTP, CFFT & CFDSFB. Having secured funding from the SEPA Water Environment

Fund in 2012 this work was extended over another 1km. During two weeks in September 2012 MFSTP, CFFT, CFDSFB, DEG & TCV successfully installed a further 15 structures to improve in-stream habitat; this involved a total of 30 staff days and 91 volunteer days of fieldwork. The structures were constructed from sycamore trees felled on the banks by CFDSFB staff and from field stone sourced from a local estate. All work was done under CAR Licence from SEPA and was completed by hand with no machinery used ensuring there was minimal impact to in-stream and bank-side habitat. This initial section of river was used because the landowner, Cromartie Estates, is very supportive of the project. The section will be used as a demonstration site for other local landowners and tenants to allay concerns about the project and show that this type of work does not increase flood risk to their land.

• **In-stream structures**

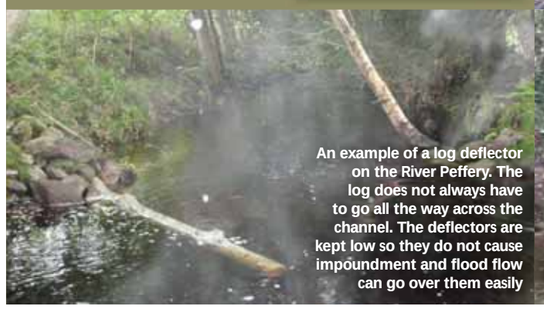
Due to the constraints of land use and landownership and following the advice of the Wild Trout Trust it was decided that the best method of in-stream habitat restoration was to pin LWD structures into the bed of the river (Diagrams A and B). The structures are installed at bed level and cause minimal impoundment or flood risk. Rather they will help the river by encouraging natural processes, helping create natural sinuosity and pool-riffle structure. Locally the structures will increase water velocity, scouring and gravel sorting, helping to create spawning gravels and deeper refuge areas. The structures are essentially acting as LWD would if it fell in the river naturally. By pinning the structures into the river bed and banks and constructing them with bank protection we are ensuring they are neither causing erosion nor flooding and, unlike LWD, will not be removed by local landowners.

**DIAGRAM B: Deflectors**
Mimicking naturally occurring large woody debris, logs can be pinned into the bed and bank to help increase bed scour and create depth and cover. Angled upstream the flow is deflected at right angles to the log. Another log or rocks are used along the adjacent bank to stop bank erosion and provide cover. The structure is made from locally sourced sycamore trees and field stone.



TCV volunteers finishing of a V log structure

Photograph: Elspeth Lawson, TCV



An example of a log deflector on the River Peffery. The log does not always have to go all the way across the channel. The deflectors are kept low so they do not cause impoundment and flood flow can go over them easily

TCV volunteers building the last structure – two log deflectors

Photograph: Simon McKelvey, CFFT

Naturally occurring large woody debris (LWD) in the Peffery. The in-stream structures are imitating the LWD helping the river to regain some natural processes and improve habitat while ensuring there is no risk of flooding or bank erosion

Log being pinned by TCV volunteer

Photograph: Elspeth Lawson, TCV

## STRUCTURES INSTALLED SEPTEMBER 2012

| Structure No. | Metres from A834 bridge | Channel Width (m) | Type of structure |
|---|---|---|---|
| 10 | 25 | 3.5 | Paired V Logs (Diag A) |
| 11 | 63 | 3.5 | V Logs (Diag A) |
| 12 | 90 | 3.5 | 3X Alternating stone deflectors (Diag B) |
| 13 | 110 | 3.5 | Paired V Logs (Diag A) |
| 14 | 130 | 3.5 | 3X Alternating log deflectors (Diag B) |
| 15 | 175 | 3.5 | Paired V Logs (Diag A) |
| 16 | 190 | 3.5 | Paired V Logs (Diag A) |
| 17 | 221 | 3.5 | Paired V Logs(Diag A) |
| 18 | 239 | 3.5 | 3X Alternating log deflectors (Diag B) |
| Weir | | | |
| 19 | 455 | 4 | 3 stone deflectors (Diag B) |
| 20 | 550 | 4 | Paired V Logs (Diag A) |
| 21 | 570 | 4 | Paired V Logs (Diag A) |
| 23 | 600 | 4 | Paired V Logs (Diag A) |
| 24 | 620 | 4 | Paired V Logs (Diag A) |
| 25 | 640 | 4 | 2 x alternating log deflectors (Diag B) |

Rock armouring being built up TCV volunteers

Photograph: Elspeth Lawson, TCV

## CONSTRUCTION METHODOLOGY

1 Restoration area mapped out by CFFT & MFSTP detailing habitat type and selecting structure site and type.
2 Sites labelled on river bank to ensure accurate placement and appropriate materials delivered.
3 Logs felled from bank side, cut to length and installed in river bed.
4 Logs dug into bank then drilled and pinned into river bed with re-bar pins.
5 Stones built up around base of logs to protect bank and constrict flow in centre of channel.
6 Compacted bed (within structure footprint) loosened with leaf blower (funded by Patagonia, World Trout Initiative) to assist hydraulic action of river.
7 Structures monitored to ensure stability and that they are not causing flood or erosion risk.

**NOTE**

• Logs are pinned in at bed level so they do not cause a flood risk or impoundment.
• End of log in the middle of river is set lower than the end in river bank to focus flow in middle and maintain low flow depth in centre of river.
• Rock armouring built up around log and against bank to stop erosion and focus flow in centre of channel.
• Armouring maintained low enough to ensure flood flow can pass over without impediment.

This project was coordinated, managed and delivered by the Moray Firth Sea Trout Project (MFSTP) and Cromarty Firth Fisheries Board and Trust (CFFB &CFFT) with much of the work done by Dingwall Environment Group and Trust for Conservation Volunteers. The project was only made possible by funding from The SEPA Environment Fund & Patagonia World Trout Initiative. We are very grateful for the permission to trial these techniques on Cromartie Estates Land and for the guidance and support provided by the Wild Trout Trust.

### STRUCTURE 10

METRES FROM BRIDGE: 25
TYPE OF STRUCTURE:
Paired V-logs (Diagram A)

Structure 10 before works

Structure 10 straight after construction

Structure 10 after one month. Note deep pool and sorted gravel downstream

### STRUCTURE 12

METRES FROM BRIDGE: 90
TYPE OF STRUCTURE:
THREE ALTERNATING STONE DEFLECTORS

Structure 12 before construction

Structure 12 after 1 month (looking DS). Note sinuous flow, narrower channel and increased velocity and depth