

Black Brook flows through a steep-sided valley in Back Forest near Gradbach, and is a Site of Special Scientific Interest (SSSI) within the Black Brook Nature Reserve. The forest consists of mature woodland comprised predominantly of Oak and Birch with a large number of Japanese Larch interspersed across the southern slopes.

Location: Black Brook, Gradbach Wood
Water course: Black Brook
Sub-catchment: Dane, Upper Weaver-Gow



Ownership:

The woodland on one side of the river is owned by Staffordshire Wildlife Trust (within their Black Brook Nature Reserve) and the other side is privately owned by Gradbach Scout Camp.

Access:

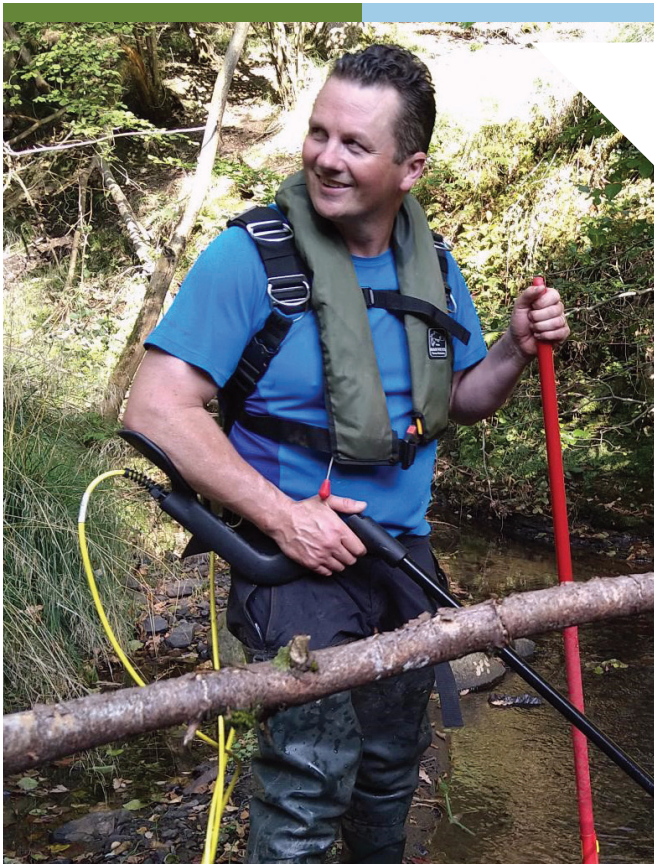
Gradbach Wood can be accessed by public and permissive footpaths. Some of the interventions can be seen from the footpaths.

About the project:

The aim of the project was to restore natural stream processes within the brook. By installing a suite of 19 Large Woody Debris (LWD) log jams along a 1km reach of the watercourse this work slows down the rate at which peak flows travel through the system. In low flows, water passes unimpeded past the woody material in the stream. In times of high rainfall, the woody material provides physical resistance to flow so that peak flood flow further down the catchment is reduced. This woody material not only restores natural resistance to flood peaks, but it also enhances the aquatic habitat for native wildlife too such as invertebrates, fish, riparian birds and mammals.

How it was achieved:

The felling work within Black Brook was designed to mimic natural processes as much as possible. Trees were selected based on a number of criteria with both the aquatic and terrestrial habitats in mind. There was approximately 59 trees felled to create the 19 log jams through the brook. Trees felled were predominately non-native conifers, or where suitable for woodland structure beech and sycamore were used in the jams. Each jam was made up of 3-4 trees. Suitable bankside trees were selected and felled perpendicular to the direction of flow. Each tree was felled on top of the previous tree to create a lattice of interlocking branches and woody material. This interlocking mass creates a heavy, dense structure which doesn't mobilise in high flows. Natural geological pinch points were also used in the valley to ensure a double fail-safe was in place against wash-out. Black Brook flows through a steep sided valley with a downstream 'geomorphic control' - in other words, a naturally narrow pinch point in the valley which is considerably narrower than the length of the selected felled trees. In the unlikely event of the felled trees breaking loose from the jams, this downstream pinch point acts as a debris trap to prevent pieces mobilising further downstream. This work was carried out using training arborists to fell the trees. The technique used here has been described as the 'Chop n Drop' approach which seeks to mimic windblown trees enabling the aquatic habitat to be restocked with woody material. The natural process of LWD in rivers is called the 'Riparian Wood Cycle'. LWD not only helps to reduce peak flows but it also has a crucial ecological role in freshwater rivers and streams.



Nick Mott, River Restoration Manager, Staffordshire Wildlife Trust

Why have you allowed this work in your woodland?

“This type of habitat restoration work is absolutely fantastic for aquatic wildlife. We advocate LWD in rivers so that fish and invertebrates have foraging ground, shelter from predation and protection from high flows during floods. Wood in rivers kick starts so many important and vital processes that make streams healthy. This work has made vast improvements to the riparian habitat in reserve.”

What impacts has it had on the environment and habitat in your woodland?

“The habitat has changed notably since the introduction of large volumes of woody material. There are now a sequence of pools and riffles all the way through the reserve whereby leaf packs form around the jams and provide habitat for invertebrates and fish, as well as slowing down flows. Additionally there is a marked increase in the number of perches for riparian birds such as dippers and grey wagtails.”

Consents:

This work required the following consents:

Land Drainage Consent

Under Section 23 of the Land Drainage Act 1991 permitting works that may impede the flow of a water course. Issued by Staffordshire County Council.

Felling licence

Issued by the Forestry Commission under the Forestry Act 1967 permitting the felling of trees for any purpose that falls outside the exemptions listed by the act. In this case, the felling licence was part of an existing woodland management plan agreed with the Forestry Commission.

Section 28 of the Wildlife and Countryside Act

This act is in place to ensure wildlife, species and habitats are protected against disturbance and habitat degradation. As the work was also within the Peak District National Park consultation with the PDNPA was also required along with consulting other statutory organisations such as Natural England for SSSI consent.

Why was the work needed:

Black Brook had very few naturally occurring LWD jams within the stream and had a fast flow regime through the valley. The installation of LWD log jams improved the habitat for wildlife by introducing the pool and riffle effect. This provides shelter for fish and invertebrates and also suitable spawning and foraging places for aquatic species. Additionally the work was needed to provide a physical barrier in the stream to slow down peaks flows. Bank side felling of non-native conifers also allowed more light to penetrate the forest floor benefiting native ground flora.

Benefits:

LWD log jams have multiple benefits. Firstly, and crucially, log jams reduce flow rates meaning peak flow conveyance is much slower. Secondly, LWD has a localised positive impact on immediate downstream gravels and stones as the flow rate in the immediate vicinity is altered enabling the flushing through of fine silts and cleaning of spawning substrate. Silt and sediment eventually accumulate behind the structures with a leaf-pack. This creates the ‘pool-riffle’ effect above and below log jams. LWD can also divert water during higher flows and allow it to reconnect with the floodplain. This allows silt and sediment to drop out of the water column onto the floodplain, decreasing the total sediment load in the stream. Woody debris also provides a natural habitat for many invertebrates, lower plants and fungi. It provides important refuge and foraging ground for fish and affords shelter for juveniles from high flows and predation. It engineers habitat diversity and biocomplexity.

Construction data:

- 19 LWD log jams
- 1 km of watercourse restored with LWD

Costs:

- 2 days FTE labour, 4 days of arboricultural contractor labour at a total costs of £1400 (ex VAT)
- Number of structures: 19
- Cost per structure: £73.68 (ex VAT)