



**Project Proposal**  
**Lyme Brook**  
**Newcastle-under-Lyme**

**3<sup>rd</sup> July 2015**



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## **1.0 Introduction**

This report is the output of a site visit undertaken by Gareth Pedley of the Wild Trout Trust to Lyme Brook, Newcastle-under-Lyme. The visit was requested as a follow up to a previous visit undertaken by Dr Paul Gaskell of the Wild Trout Trust and the resulting practical project that was implemented at Lyme Valley Park and aims to extend the scope of that previous work.

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left bank (LB) or right bank (RB) whilst looking downstream.

## **2.0 Background and rationale**

As described in the previous report, Lyme Brook lies within an urbanised catchment where straightening and dredging have created a greatly simplified channel with a steepened gradient and a lack of natural substrate. Rock armouring of the banks in many places has prevented the Brook from eroding and naturally increasing its sinuosity, while also removing the Brook's natural mechanism for developing new bed material.

The lack of erosion and scour also creates a channel that is greatly lacking in deeper pool features, and a bed comprised of oversized cobble and rubble on the steeper, narrower sections and fine silt and sand on the lower gradient, wider sections. There is also a general lack of in-channel structure (logs, fallen trees, and trailing branches) within many areas of the Brook, features that are required for both fish and invertebrates to thrive.

Work resulting from the previous report, undertaken by Groundwork West Midlands and the Wild Trout Trust, has greatly improved habitat in the initial section. Upstream log deflectors have created enhanced flow diversity, increased depth and sinuosity (Fig. 1) and, in conjunction with introduced gravels (Figs. 1 & 2), now create potential spawning areas by providing the substrate that is missing from the realigned un-natural channel. The brash berms installed create valuable narrowing in wider sections, again, increasing flow diversity and velocity which will help to maintain the bed free from finer sediments, improving the quality of substrate for fish spawning and invertebrates (Fig 3).



**Figure 1. Upstream flow deflectors increase flow diversity and the scour produced creates areas of deeper water. These deeper areas will be maintained by subsequent high flows. Also note the introduced gravels.**



**Figure 2. Introduced gravels providing excellent potential fish spawning riffles.**



**Figure 3. Brash berm, creating valuable narrowing, flow diversity and cover.**

## **3.0 Proposed measures**

To capitalise on the work already undertaken, Groundwork would like to improve habitat in two further sections of the Brook. These are: The Extension Section (immediately upstream of the previous work) and the New Section (immediately downstream).

### **3.1 Extension Section (upstream of the original section)**

This section is very similar in character to the section already worked upon, being straight and of uniform depth, with relatively coarse substrate (Figs. 4 & 5). The areas are located immediately up and downstream of the footbridge at NGR: SJ8520345183.

It is proposed that an extension to the previous Flood Defence Consent be sought to undertake this work as it would only mean extending the upstream limit of the original works by a few hundred metres. Work would consist of installing upstream facing flow deflectors upstream of the bridge (Fig. 4), with the addition of gravel, if available. Downstream of the bridge, a brash berm and gravel could also be employed to accelerate flows for a short section (Fig. 5).



**Figure 4.** Extension section (upstream of the bridge) flow deflectors (brown) would help to sort bed materials and diversify flows.



**Figure 5.** Extension Section (downstream of the bridge), a brush berm (brown and green hashed 'D') would be beneficial to accelerate flows under the RB canopy and trap fine sediment that can become vegetated.

### **3.2 New Section (downstream of the original section) (NGR : SJ 85526 44940 - SJ 85768 44214)**

In the New section, the prescription is largely the same as in the upstream sections; however, as the channel is wider in many places, and the substrate is generally of a much finer nature (silt and sand), it is recommended to concentrate upon reinstating more natural channel dimensions (narrowing with berms and deflectors) before any gravel introductions are undertaken. Coarser substrate may then be revealed by natural scouring and sorting of the bed materials. In this section, it is also recommended that goat willow (*Salix caprea* - which will grow but stay small as they are a shrub species) and potentially other species (that will not grow) are installed as tree kickers (See Appendix 1). These are a very quick and easy way of pinching the channel to accelerate flows, while the structure in the river margin traps fine sediment.

In some areas, the channel is already starting to recover with bed material accumulating in the river margins, often around existing structure (Fig. 6). These areas could easily be capitalised upon with the aforementioned techniques (berms, deflectors or 'kickers') to further increase deposition in those areas and diversify the channel. Where the channel is already more sinuous, natural substrate berms (bars) are beginning to form, with a definite gradient from the shallow water on the inside of the bend, to deeper water on the outside (Fig. 7). These too could be improved by increasing the channel roughness in those areas to encourage additional deposition that will improve flows maintain the depth of the deeper channel to the outside of the bend. Pinned brash in the margin or a brash berm would work well, as would one medium 'tree kicker' (which would be the quickest option to install).

The impact of a channel with greater geomorphological diversity is already plain to see, with shoals of dace (*Leuciscus leuciscus*) present in those areas, taking advantage of the deeper water pool features (Fig. 8). Accelerating flows to clean and sort the substrate further, in discrete areas, will also benefit the dace, and other coarse fish, as they too require silt free gravels on which to spawn, albeit finer gravels than trout (*Salmo trutta*).



**Figure 6.** Natural deposition in the margin, probably around some rougher structure in the channel. This could be improved upon with further increased structure.



**Figure 7.** Shallowing on the inside of the bend where sediment is beginning to accumulate and take up some of the excess channel capacity (red outline) and a deeper area beginning to form on the outside of the bend (blue arrow).



**Figure 8. A shoal of small dace, taking advantage of the deeper pool areas.**

It is recommended that a Flood Defence Consent is sought to cover the entirety of the 'New Section' (SJ 85526 44940 - SJ 85768 44214), for the installation of pre-agreed habitat improvements including brash berms, log deflectors and 'tree kickers'. This will have to be done through liaison with the consenting officer, but as the techniques are all simple and low impact, and to be undertaken in a low flood risk area, this would be the most efficient way to reduce bureaucracy and maximise the ecological gains. As the consent will be valid for 3 years, it also allows the work to be done in stages, providing that the consenting officer is notified within a week of the work being undertaken.

## 4.0 Summary of Recommendations

	<b>Recommendations</b>	<b>Grid Reference</b>
<b>Extension Section</b>	Seek an extension to the original Flood Defence Consent to install two flow deflectors and brash berms u/s and d/s of the footbridge, within 100m either side. Gravel introduction would also be beneficial around the structures, as in the original section.	SJ8520345183
<b>Downstream Section</b>	Seek a new Flood Defence Consent to install a number of flow deflectors, berms and 'tree kickers' throughout the section. This may require a site visit with the consenting officer to assess the works already undertaken and discuss the exact scope of the work.	SJ8552644940 - SJ8576844214

Refer to the previous report which should be submitted in conjunction with this report as part of the Flood Defence Consent application to highlight the proposed measures for the 'New' and 'Extension' sections.

## 5.0 Disclaimer

This report is produced for guidance only and should not be used as a substitute for full professional advice. Accordingly, no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon comments made in this report.

## Appendix A

### Examples of habitat enhancements



**Figure A. A tree kicker in place on a large river.**



**Figure B. Tree kickers on alternate banks to increase flow diversity and sinuosity within a straight channel.**