Advisory Visit

Anston Brook, South Yorkshire

September 2011

1.0 Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to the Anston Brook, Anston, near Worksop on 29th September, 2011. Comments in this report are based on observations on the day of the site visit and discussions with David Newborough, Environment Officer, Environment Agency (EA).

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

2.0 Overview

The Anston Brook is a headwater of the River Ryton, a tributary of the River Idle located in the catchment of the River Trent. The section visited was in and upstream of Anston Stones Wood, a Site of Special Scientific Interest (for limestone woodland habitat) and Local Nature Reserve (LNR). A local management committee of volunteers looks after the LNR and carries out maintenance work. The section of the brook inspected lies between approximate grid references SK 51551 84330 (upstream) and SK 52550 83722 (downstream). The visit was at the request of David Newborough of the Environment Agency to discuss options for river habitat improvement within the context of Water Framework Directive (WFD) targets.

The WFD waterbody ID is GB104028058210 (Anston Brook from Source to River Ryton). The current overall status is poor (very certain); ecological status is poor because of poor invertebrate status which is attributed to poor water quality (high levels of ammonia, phosphate and poor dissolved oxygen).

Anston sewage works has recently been closed and a pumping station now operates to take effluent to another plant for treatment.

3.0 Habitat Assessment

A small headwater stream like the Anston Brook should support a fish community comprising brown trout, bullhead, and brook lamprey (stone loach may also be present, although an abundance of these indicates organic enrichment). The three former species are indicative of good water quality and good habitat. Good in-stream habitat relies on *diversity* – of depth, flow patterns, and size of particles on the river bed. These are the important factors that influence each of these:

- Diversity of depth

The natural tendency for rivers and streams to have bends (meanders) creates deep and shallow areas. The natural processes of erosion and deposition occur respectively on the outside and inside of bends, creating pools (deep areas) and riffles (shallow areas) (Figure 1).

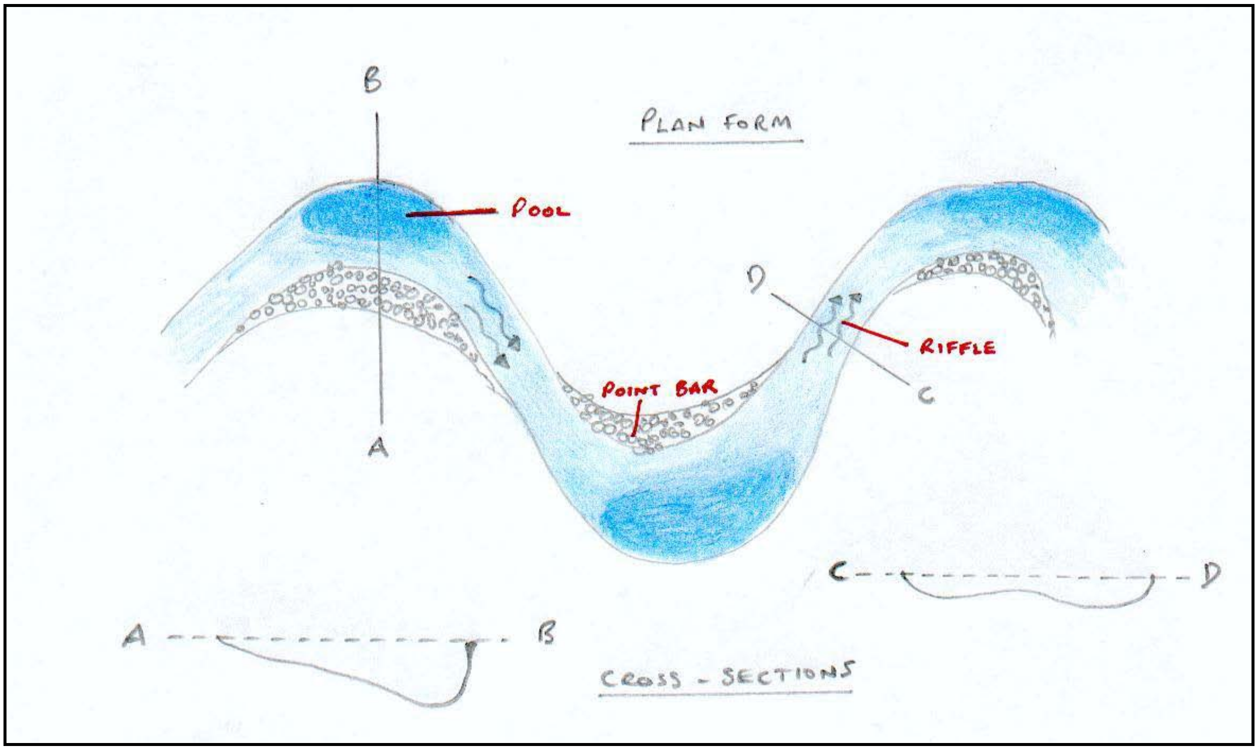

Figure 1

Deep areas are important refuge habitat for larger adult fish (such as trout). Often pools coincide with more resistant areas of the bank where tree roots are present; this creates excellent adult fish habitat with a combination of deep water and submerged cover. Shallow riffle areas are important for smaller species (such as bullhead) and as spawning areas for all species.

The pattern of pools and riffles can be disrupted by engineering of the river channel and by weirs or dams. River engineering (for drainage or flood protection) tends to create an artificially straight channel of a uniform depth (usually shallow) which lacks the diversity necessary to support a healthy fish community. Weirs and dams impound the river and interrupt the natural sediment transport process, causing sediment to build up behind the weir and creating shallow areas. Weirs are also barriers to fish movement, preventing migration between habitats for spawning, feeding or refuge and having a detrimental effect on fish populations.

The Anston Brook has some good areas with pools and riffles present, typically upstream of the road bridge; here there are some deeper pools bordered by tree roots and adult brown trout were observed in these areas (Photo 1). There are also shallow gravel riffle areas suitable for fish spawning. In other parts of the brook, there is a poorer diversity of depths and habitat is less favourable (Photos 4, 10). There are some relatively straight reaches with little depth variation which suggest the stream course may have been straightened in the past. Small dams are present just downstream of the road bridge (Photo 3), and upstream of the bridge, where concrete sleepers have been used to impound the river to feed a pond-dipping area (Photo 2).

- Diversity of flow patterns

In addition to the pool-riffle sequence described above, variation in flow also occurs on a smaller scale, typically caused by fallen trees and branches (known as large woody debris or LWD). LWD is very important in a river because:

- ➢ it provides good habitat for fish, invertebrates and mammals
- ➢ it traps organic matter like leaf litter which supports the aquatic food chain
- ➢ it creates localised bed scour which creates variation in depth and helps to grade river bed sediments (see below)
- ➢ it helps regulate flood flows by increasing the travel time of water across a catchment and providing flood storage.

There was a general lack of woody debris in the Anston Brook, with one or two exceptions (Photos 5, 6). When trees and branches fall into a watercourse, the tendency is to remove them and “tidy up”. However, the default position when managing woody debris should be to leave it alone.

Some very useful information on woody debris and its management can be found in the booklet www.staffs-wildlife.org.uk/files/documents/1298.pdf .

- Diversity of particle size

The grading of river bed sediments into different sizes has been mentioned above. This is important because many species of fish and invertebrates have very specific requirements ("niche habitats") when it comes to sizes of pebbles, stones, sand and silt. For example, when trout spawn they select gravel of between 10 and 40 mm in diameter in fast flowing water. They cut a redd (nest) in the gravel and deposit their eggs which stay buried in the gravel from November until they hatch the following April; the gravel must be free of fine sediment to allow water to flow between the gravel particles and supply oxygen to the developing eggs.

Like trout, brook lamprey spawn on clean gravel in fast water in the spring. However, their juveniles (known as ammocoetes) spend several years living buried in areas of fine silt, feeding on organic detritus. Again, the grading of sediments is required to form these areas and the pool-riffle sequence and presence of woody debris are vital.

There are numerous other examples for invertebrate species like mayflies, caddis flies and stoneflies. Having well-sorted, graded bed sediments favours biodiversity compared to a "cake mixture" of many different sediment sizes.

The degree of sorting of bed sediments on the Anston Brook is variable. There are long sections where sorting is poor and the bed is comprised of an unsorted mixture of particle sizes; these are generally in the straight sections (Photos 4). Where pool and riffle structure is found, there is some evidence of sorting and gravel shoals and side bars are present (Photos 6, 7). The two dams seen have impounded the river upstream and interrupted natural sediment sorting (Photos 2, 3).

<u>Other observations</u>

Vegetation on the banks of the brook had been recently strimmed along some sections; this had been done right up to the edge of the brook (Photos 4, 10). It would be beneficial to leave an un-cut margin (around 2 metres wide) of vegetation alongside the brook. "Shaggy" margins are a very important component of river and stream habitat, providing good cover for fish and invertebrates.

The non-native invasive plant species Himalayan balsam and Japanese knotweed are present at this site (Photo 9). Both are undesirable because of their propensity to spread and diminish native plant biodiversity. Balsam can be tackled with herbicide (with appropriate EA permission) or by hand-pulling before it flowers and seeds; the former method is useful for tackling large stands which can then be followed up with hand-pulling. Volunteer working parties could be used for hand-pulling. Japanese knotweed is more problematic because of its tenacity and ability to spread from tiny fragments. A specialised approach such as stem injection of herbicide is probably the most effective approach, which needs to be tackled by appropriately trained personnel. It is recommended that the knotweed is tackled whilst the stands are relatively small, before it becomes a much larger problem.

Photo 1 A deep pool with submerged tree roots makes great adult fish habitat (foreground).

Photo 2 Weir impounding water to supply pond dipping area. This structure should be removed and the water supply to the pond reconfigured.

Photo 3 Low weir downstream of the road. Structures like this interfere with natural river dynamics and sediment transport and are barriers to fish movement.

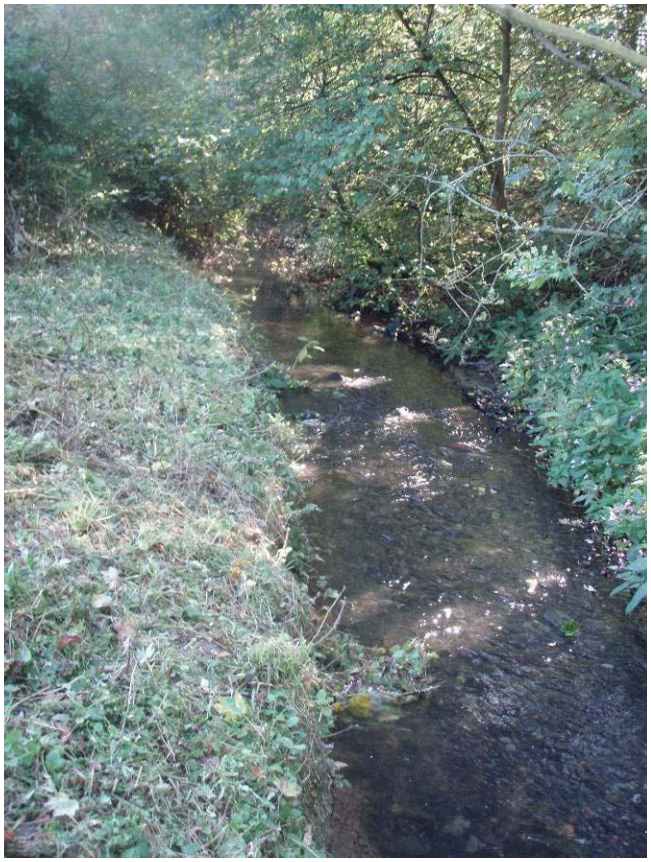

Photo 4 A straight section of the brook, lacking diversity of depth and with poorly sorted bed material. Such areas would benefit from introduction of flow deflector logs. The left bank has also been strimmed too close to the brook.

Photo 5 Woody debris forming some excellent low cover – just the place which would be used by fish for refuge.

Photo 6 Some good habitat – logs within the channel are promoting sorting of bed material and an accumulation of woody debris in the foreground.

Photo 7 An example of sorting or river bed material, creating a gravel bar.

Photo 8 An example of really nice habitat: a deep pool on a bend, with a shallow gravel riffle below and well-vegetated banks.

Photo 9 A stand of Japanese knotweed. Control it now before it becomes a bigger problem.

Photo 10 A straight section of brook which would be improved by the introduction of flow deflectors and retention of an un-cut marginal strip.

4.0 Recommendations

- Remove the weirs / dams to restore natural river dynamics. Consider using the brook itself for “bugs and grubs” dipping with children. This could be done in conjunction with a “Mayfly in the Classroom” project (see www.mayflyintheclassroom.org).
- Leave an un-cut strip of marginal vegetation along the river bank when strimming (Photo 12).
- Retain large woody debris in the river channel wherever possible. Woody structure could be introduced to the straighter sections in the form of small log deflectors or brushwood bundles (Photo 11).
- Control invasive non-native plants by hand-pulling Himalayan balsam (with volunteer working parties) and using specialist techniques for getting rid of Japanese knotweed; the Council may be able to assist with the latter if they have had experience of dealing with it elsewhere.

Please note, it is a legal requirement that all the works involving introduction of structures to the river require written Environment Agency (EA) consent prior to undertaking any works, either in-channel or within the floodplain.

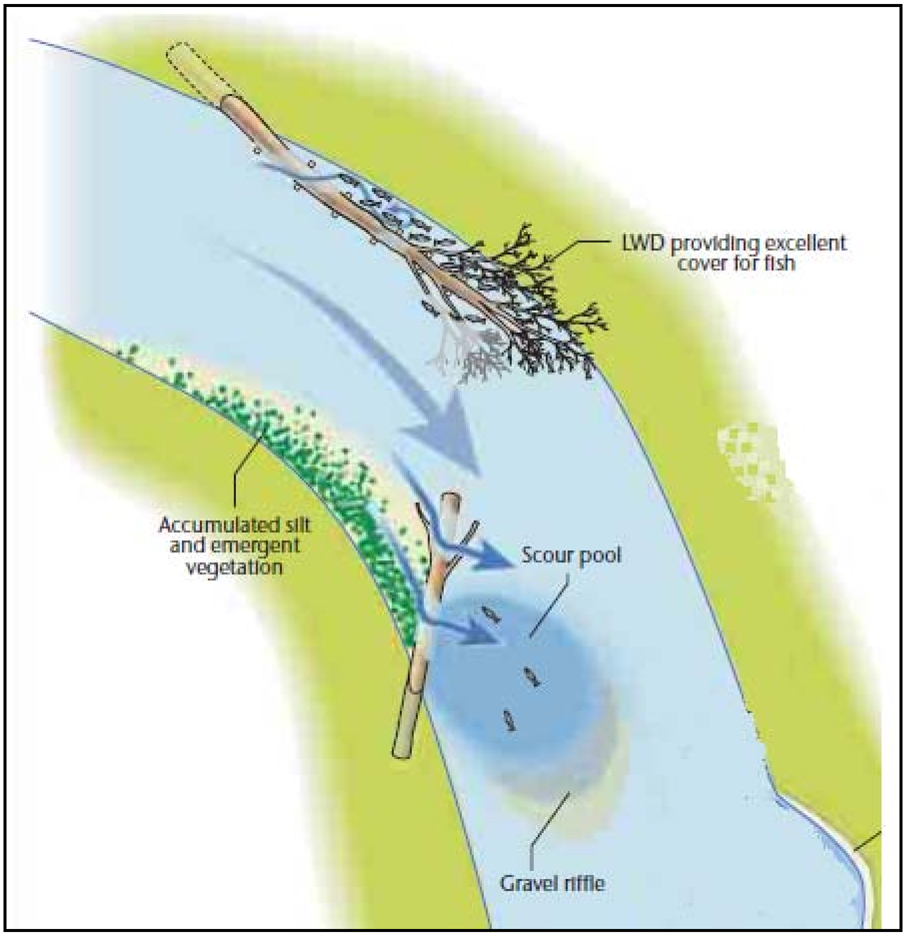

Figure 2 Effects of woody debris – creating depth variation and sorting bed materials.

Photo 11 Small log deflectors installed on the River Wandle, London.

Photo 12 Marginal vegetation left “shaggy” – great habitat.

5.0 Disclaimer

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