Advisory Visit

Tributary of Repton Brook, Derbyshire

July 2017

1.0 Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to a headwater tributary of the Repton Brook, at Daniel Hayes Farm near Smisby, Derbyshire on 31st July, 2017. Comments in this report are based on observations on the day of the site visit and discussions with Andrew Moseley, the landowner.

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 Catchment Overview

This small unnamed stream is a headwater of the Repton Brook which ultimately joins the River Trent near Willington, Derbyshire. It originates from a spring source approximately 500m upstream of Mr. Moseley's ownership. An online lake thought to be a mediaeval fish pond has been restored here (cover picture). In addition, there is another lake upstream of this site and at least two below, all within approximately 1 km.

Under the Water Framework Directive (WFD), the Environment Agency divide river reaches or catchments into management units called waterbodies. The status of a waterbody is derived through classification of several parameters including ecology (fish, invertebrates and plants), chemical water quality, physical channel condition and barriers, invasive non-native species, flows and levels. The overall status is dictated by the lowest score amongst those parameters. Five classes are used for WFD waterbodies: high, good, moderate, poor, and bad; anything ranked below good is classified as a failure. This brook falls within the Repton Brook catchment (Table 1). Through the last two cycles of assessment, it achieved *Good Ecological Status* overall in 2009, and *Poor Ecological Status* more recently in 2016.

In 2016, the classification of *Poor Ecological Status* was based upon an ecological quality of poor, with a chemical quality of good. The ecological quality was *poor* because of a *poor* score for macrophytes and phytobenthos (plants and algae); invertebrates scored *high*. It is important to note that the sampling points used for these classifications may be a considerable distance away from this site hence not reflect local conditions.

River	Tributary of Repton Brook
Waterbody Name	Repton Brook Catchment (trib of Trent)
Waterbody ID	GB104028047390
Management Catchment	Trent Lower and Erewash
River Basin District	Humber
Current Ecological Quality	Overall status of **Poor** ecological status in 2016 assessment cycle; **Good** in 2009 assessment cycle.
U/S Grid Ref inspected	SK3366220348
D/S Grid Ref inspected	SK3357020501
Length of river inspected	~200m in total

Table 1 Water Framework Directive classification information for the Repton Brook Catchment from http://environment.data.gov.uk/catchment-planning/WaterBody/GB104028047390

3.0 Habitat Assessment

The site has been in Mr. Moseley's ownership for about 15 years and the lake was restored 12 years ago by reconstruction of the dam, overspill and restoration of a C19th ram pump. The lake is approximately 2000 m^2 (0.5 acre). The inflow drops over an impoundment which also forms a silt trap (Photos 2 and 3). There have been problems with excessive silt inputs from upstream which have now been resolved, but excess fine sediment is still working its way down the system and the silt trap is emptied on an annual basis. The inflow is impassable to fish moving upstream from the lake into the brook.

The lake outflows through a fixed level overspill in the dam (Photo 4), through a buried culvert pipe approximately 2ft diameter onto a stone

spillway and on into the brook downstream. The culvert is impassable to fish moving upstream because:

- the downstream end is perched a few inches above the shallow spillway, so fish cannot swim or leap into it;
- the flow through the culvert is too shallow and rapid for fish to swim through successfully;
- The upstream end (Photo 4) is not passable to fish in its present form.

High water temperature is usually the limiting factor for trout survival in shallow, lowland lakes, with anything above 20 degrees Celsius being undesirable. The depth (reported to be 4 to 5m in places), constant input of cold spring water and shaded nature of this site indicate that it should be suitable to sustain trout.

The poor connectivity for fish movement between the lake and the brook (along with poor spawning conditions in the brook, see below), make it unlikely that wild brown trout will populate the lake in high numbers: there would simply not be enough trout reaching the lake to recruit to adulthood. There is scope for improving the conditions for wild brown trout in the brook relatively easily (see Recommendations). Improving the connection between the brook and the lake for fish passage would be more complex and require substantial modification of the inflow and/or outflow, but would greatly improve habitat connectivity and the potential for natural trout recruitment.

Wild trout require clean gravel with a good flow of water in order to breed successfully. They breed in the autumn, the female fish cutting a distinctively-shaped nest called a redd (Figure 1, Photo 1) in the gravel and burying the fertilised eggs, which remain there until the following spring, when the fry emerge (www.wildtrout.org/content/trout-lifecycle#alevin).

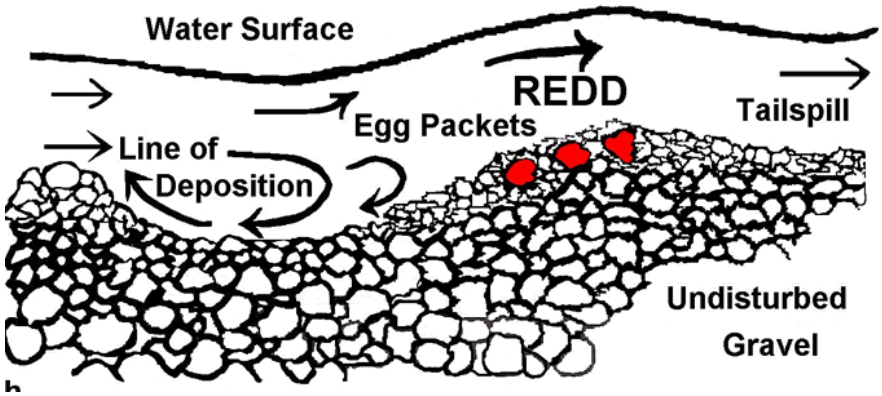

Figure 1 Long profile through a trout redd.

Trout select spawning sites where the river bed steepens, for example at the tail of a pool or head of a riffle, to ensure a flow of water through the gravel throughout the winter, sustaining the developing eggs and embryos. If the gravel becomes clogged, for example with excessive fine sediment, the eggs/embryos can suffocate.

Photo 1 Example of a freshly-made trout redd in a small Lincolnshire stream.

Breeding opportunities for wild trout appear to be very limited in the brook, although upstream of the lake was not inspected, as it is in different ownership. There is little gravel of suitable spawning size (5 – 40 mm diameter), and that present is in very thin layers over a clay bed. The channel has little depth variation, being predominantly shallow glide habitat and lacking in pools and riffles (Photo 5). The volume of fine sediment in the brook could also be a problem by clogging gravels. Despite this, trout have a surprising propensity to reproduce in unpromising conditions and only a small number of redds can sustain a population, particularly in a system with stable flows such as this. Wild brown trout have been reported in this reach of the brook; some relatively straightforward habitat improvements could greatly improve their prospects (see Recommendations).

Native white-clawed crayfish (*Austropotamobius pallipes*) are present in the brook and were observed during the visit, along with remains from moulting / predation which were used to confirm identification (Photo 6). This is the UK's only native species of crayfish and has suffered a severe decline in recent decades, being classified as endangered on the International Union for the Conservation of Nature (IUCN) Red List. The primary reason for the decline is the spread of introduced, non-native crayfish, particularly signal crayfish (*Pacifastacus leniusculus*) and the associated crayfish plague (*Aphanomyces astaci*); this is a fungal disease carried by the non-natives which are resistant, but deadly to the native crayfish.

Crayfish plague can be transferred on any wet surface, so it is important that great care is taken not to import the disease from areas where non-native crayfish exist. Wet footwear and clothing, fishing tackle, nets and tools are all potential vectors. Simple precautionary measures should be taken such as cleaning and drying equipment in sunlight, disinfection (with e.g. FAM30, Virkon, etc.) or having a specific set of equipment for this site. Any fish introduction to the site represents a risk of introducing crayfish plague unless there is certainty that the source is free from contact with non-native crayfish (see below). Prior written consent for fish introduction from the Environment Agency is a legal requirement.

Some sections of the brook have recently been cleared as part of wider works to restore the woodland and coppice (Photo 7). Large woody material in the river channel forms important habitat, so best practice is to leave it in place. The trunks and branches of fallen trees cause localised scour, which

increase the variety of depths in the channel and grades the river bed substrate into different sizes; this provides a variety of habitats for invertebrates and fish, including improved trout spawning conditions and niches for native crayfish. The in-channel structure also traps leaf litter and twigs which are important inputs at the base of the food chain in small streams like this.

There are plenty of materials available from the recent woodland works to use for in-channel habitat improvements, such as large trunks (Photo 8) and brushwood. Techniques are described in the Recommendations section.

Photo 2 Inflow to the restored lake. The stream is spring-fed and the flow varies little from that observed on the day of the visit.

Photo 3 A silt trap is located on the tributary stream and emptied annually. There have been problems with excessive silt inputs upstream which have now been resolved, but it is still working its way down the system.

Photo 4 The outflow from the restored pond. There is also a restored ram pump at the southern end of the dam.

Photo 5 The brook downstream of the lake.

Photo 6 Native white-clawed crayfish (*Austropotamobius pallipes*) are present in the brook. Several live individuals were observed in addition to these remains used to confirm identification.

Photo 7 Some sections of the brook have recently been cleared of fallen trees and woody debris. Such material forms important habitats and should be carefully managed with the emphasis being on its retention.

Photo 8 If trunks fall into the channel, leaving them extending into and across the channel, rather than trimming, is good practice. There is considerable scope for using materials on site to improve the in-stream habitat, for example sliding the end of the above trunk into the channel to form a flow deflector.

4.0 Recommendations

- Ensure practical measures are in place to protect the site from the transmission of crayfish plague, as described above. Further guidance is available here www.nonnativespecies.org/checkcleandry .
- Improve the habitat conditions in the brook downstream of the lake by retaining naturally occurring fallen wood and by introducing features such as those shown in Photos 9 – 16.
- Introduce some structure for crayfish habitat into the lake, for example tree root plates, angular cobbles/boulders or even clay pipes and bricks with holes.
- Consider improving the lake outflow to facilitate upstream fish movement. This would require a survey of the area and measurement of the flow to see if there is a practical solution. The present problems outlined on page 4 would need to be addressed by raising water levels to drown the toe of the culvert, slowing the flow within the culvert using baffles and modifying the overspill structure (Photo 4) by notching. The principle is to provide a solid plume of water over an "adherent nappe" (i.e. with little turbulence or entrained air), through which fish can swim. Further information is available here:

  http://evidence.environment-agency.gov.uk/FCERM/en/SC060065/MeasuresList/M7/M7T1.aspx?pagenum=2

  and in the Environment agency Fish Pass Manual (pages 169 – 175)

  https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/298053/geho0910btbp-e-e.pdf

  Consideration could also be given to improving the lake inlet for fish passage, although there is little room there given its proximity to the boundary of ownership.

Photo 9 A cross-channel log, keyed into the bank and set at or just above bed level, with a narrow channel excavated (yellow arrow) beneath to promote bed scour. Excavated material is placed at the sides against the bank.

Photo 10 Log positioned to pinch the channel and create bed scour. The bank is re-profiled behind the log along with excavated material from the river bed (from red dashed area). Flow away from camera.

Photo 11 Logs positioned in the channel to pinch the flow, in this case without bank re-profiling. Some bed excavation near the apex of the log.

Photo 12 Woody structure pinned to the river bed promoting bed scour and sorting of clean gravel suitable for fish spawning. In the very small stream at Daniel Hayes, large enough trunks would be secure without the need for pinning.

Photo 13 Simple bank re-profiling to pinch the channel. The front edge of the new bank could be defined with brushwood bundles before re-profiling.

Photo 14 Marginal ledges made from stakes, battens and packed with brushwood could be used to achieve a similar channel narrowing effect, in addition to providing good crayfish habitat.

Photo 15 Introduced gravel in combination with channel pinching could be used to create some trout spawning areas.

Photo 16 Simply hinging suitable bankside trees over into the channel creates good habitat structure (like hedge laying).

5.0 Fish stocking

The introduction of fish to the lake was discussed. Fish introductions require prior written consent from the Environment Agency (under Section 30 of the Salmon and Freshwater Fisheries Act 1975) and EA advice should be sought prior to any application. **Any introduction of fish from another site represents a risk of introducing unwanted disease or parasites and careful consideration should be given to this, particularly with the presence of native crayfish on the site; transfer of crayfish plague during fish movements is a possibility if the source water is in contact with non-native crayfish.** Regular fish introductions (for example if trout were being removed by put-and-take angling) increase the risk. The lowest risk option is to encourage natural reproduction of existing fish stocks *in situ.*

Other points that should be carefully considered before embarking upon any fish introduction include:

- Only a small number of adult trout could be sustained in a small pond such as this, probably in the order of 10 – 15 fish of 12 – 14" length. As the pond is directly connected to the brook, it is likely that only infertile triploid trout would be permitted under EA rules.
- Larger trout will predate upon smaller fish and also crayfish, which could limit the numbers and size of fish which would be permitted.
- If coarse fish were introduced, a species mix of tench, rudd and crucian carp would be suited to a small pond. Sourcing such fish from a hatchery of known provenance (where fish are bred on site), rather than transfer from another pond or lake poses less risk.
- As the pond is directly connected to the brook, a mandatory health check would be required on the source fish. This would only detect parasites and does not provide any protection against the transmission of bacterial, viral or fungal diseases.

6.0 Making it Happen

Further assistance from the Wild Trout Trust is available in the form of:

- Helping obtain the necessary consents for carrying out in-stream works, from either the local authority or Environment Agency (depending upon whether the brook is designated main river or not).
- A practical visit from a WTT Conservation Officer to demonstrate the habitat improvement techniques outlined above. This enables recipients to obtain on the ground training in the appropriate use of conservation techniques and materials, including Health & Safety, equipment and requirements. This will then give projects the strongest possible start leading to successful completion of aims and objectives. Recipients will be expected to cover travel expenses of the WTT attendees.

The WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:

www.wildtrout.org/content/library

The Wild Trout Trust has also produced a 70 minute DVD called 'Rivers: Working for Wild Trout' which graphically illustrates the challenges of managing river habitat for wild trout, with examples of good and poor habitat and practical demonstrations of habitat improvement. Additional sections of film cover key topics in greater depth, such as woody debris, enhancing fish stocks and managing invasive species.

The DVD is available to buy for £10.00 from our website shop www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

7.0 Acknowledgement

The WTT would like to thank the Environment Agency for supporting the advisory and practical visit programme in England, through a partnership funded using rod licence income.

8.0 Disclaimer

This report is produced for guidance; no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other

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