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Minstead Stream, West Sussex

A Project Proposal June 2023

By A. Thomas

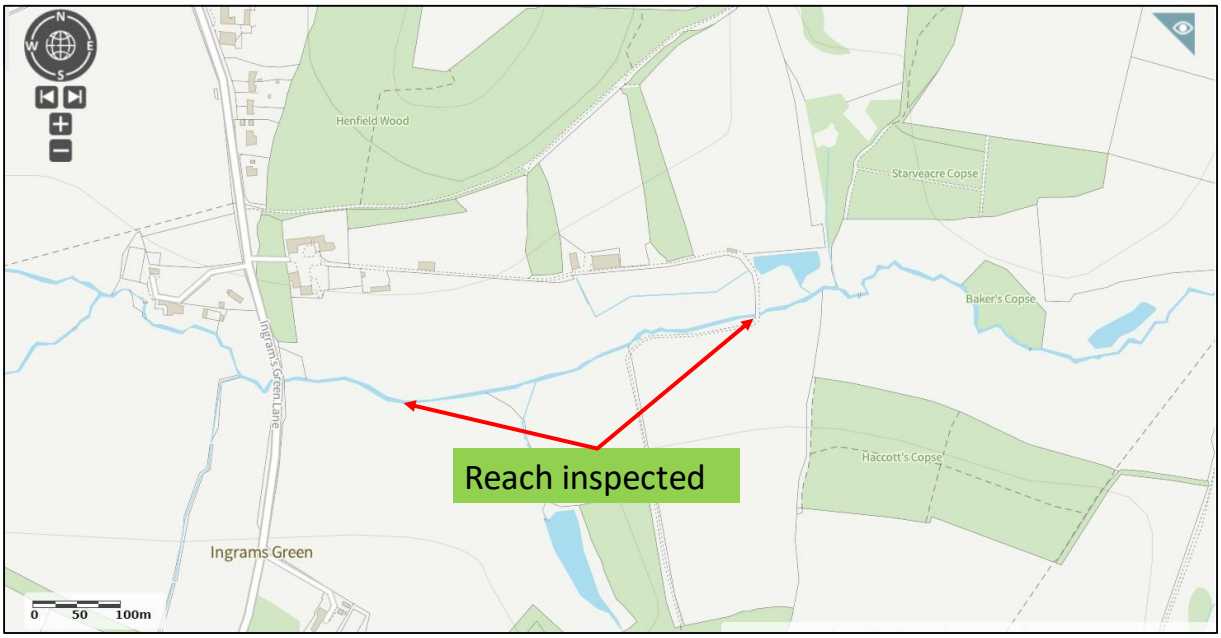
1.0 Introduction

This report is the output of a site visit undertaken in June 2023 by Andy Thomas of the Wild Trout Trust (WTT), to a section of the Minstead Stream, a small tributary of the Western Rother in West Sussex.

The request for the visit came from Angela Ward, a Ranger with the South Downs National Park Authority (SDNPA).

The SDNPA are working with the landowners to identify project opportunities to create improved wet grassland habitat adjacent to the stream. The Minstead Stream is known to support a population of wild brown trout *Salmo trutta* and is known to be an important spawning and nursery stream for sea trout running the Arun and Western Rother system.

Comments and suggestions raised in this report are based on observations made during the site visit and discussions with the landowners. Normal convention is applied with respect to bank identification, i.e. left bank (LB) or right bank (RB) whilst looking downstream. Upstream and downstream references are often abbreviated to u/s and d/s, respectively, for convenience. The Ordnance Survey National Grid Reference system is used for identifying specific locations.



Map 1. Minstead Stream at Brook Farm, Didling.

Table 1. Overview of the waterbody information sourced from:

https://environment.data.gov.uk/catchment-planning/WaterBody/GB10804301800

River	Minstead Stream
Waterbody Name	Minstead Stream
Waterbody ID	GB108043015800
Management Catchment	Arun and Western Streams
River Basin District	South East
Current Ecological Quality	Moderate status
U/S Grid Ref inspected	SU 84462048
D/S Grid Ref inspected	SU 84892058
Length of river inspected	0.5km

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2.0 Catchment Overview

The Minstead Stream forms one of a network of small streams that drain the northern slopes of the South Downs, which subsequently feed into the Western Rother system between Petersfield and Petworth. This particular stream starts off as a characteristically clear chalk-fed stream but as it drops down the gradient, the geology soon changes from underlying chalk to Wealden Greensand and clay, with the lower reaches of the Minstead Stream carrying significant ochre colour, derived from iron-rich groundwater which feeds into the system around the Minstead area.

The lower reaches of the stream support a mixed fish population, but all of these small streams support trout, with many also being important spawning sites for migratory sea trout. It is highly likely that there are significant water level control structures and culverts that limit access for sea trout into the upper reaches of this system, however, the owner has observed large fish spawning on the section at Brook Farm.

The Water Framework Directive data for the Minstead Stream suggests it is currently adversely impacted by high nutrient loadings derived from wastewater and via agricultural diffuse pollution pressures.

3.0 Habitat assessment

An overview of the map confirms that long sections of this stream have in all probability been heavily modified. The target 500m reach at Brook Farm appears to have been straightened and moved south, with the channel deeply incised, in all probability to facilitate improved local land drainage.

Photo 1. A view looking upstream of the tree-line channel. Note the bank height appears to be significantly higher than the lower sections of the adjacent northern meadow to the right of the photo.

Currently the meadows to the south of the stream are still in arable production, with the low-lying northern meadow now in permanent pasture and annually cut for hay. This long strip of meadow has historically been drained and towards the bottom half of the meadow an additional channel (photo 2) picks up ground and surface water and runs parallel to the Minstead Stream before discharging into a pond at NGR SU84892063.

The 500m by 100m strip of meadow flanking the stream is already wet, particulalrly towards the lowest half of the reach but could be much wetter if there were improved hydraulic connectivity via the left bank of the stream. In essence providing an opportunity for the meadow to function for flood storage and improved local biodiversity.

Photo 2. Additional drainage channel running parallel with the Minstead Stream, eventually feeding into a small wildlife pond near the tree line.

The stream channel is heavily shaded with a valuable mixture of bank-top native deciduous trees and shrubs, however, some of the alder (*Alnu glutinosa*) and Ash (*Fraxinus excelsior*) are showing signs of serious disease. The alder trees provide excellent complex habitat with their roots trailing extensively into the water (photo 3). Ash tree roots retained bank strength as they spread laterally along the banks.

At the time of the visit, the stream had a modest flow, with the majority of the reach flowing over a shallow and mainly bare, sediment laden stream bed. Macrophytes were scarce, mainly due to the heavy shading and incised nature of the channel, however the odd clump of sedge (*Carex sp*) was evident where there were ledges for a toe-hold and sufficient sun light. The occasional deeper pool was seen, often created where adjacent root systems were meeting to create a narrow pinch point in the channel width and a corresponding flume of faster water (cover photo), creating some bed scour downstream. The occasional outcrop of bed gravels (photo 4) were observered and were a mix of ironstone and sandstone chips, with occasional areas of eroded greensand. Some flint gravel was also seen and may have gradually trundelled down the stream from the foot of the downs, rather than being eroded out of the stream bed or bank toe. Some of the gravels were glued together with calcium carbonate deposit (tufa). Even with the tufa deposits, the presence of these small gravel riffles is significant and is likely to be a critically important habitat utilised by the trout population for spawning.

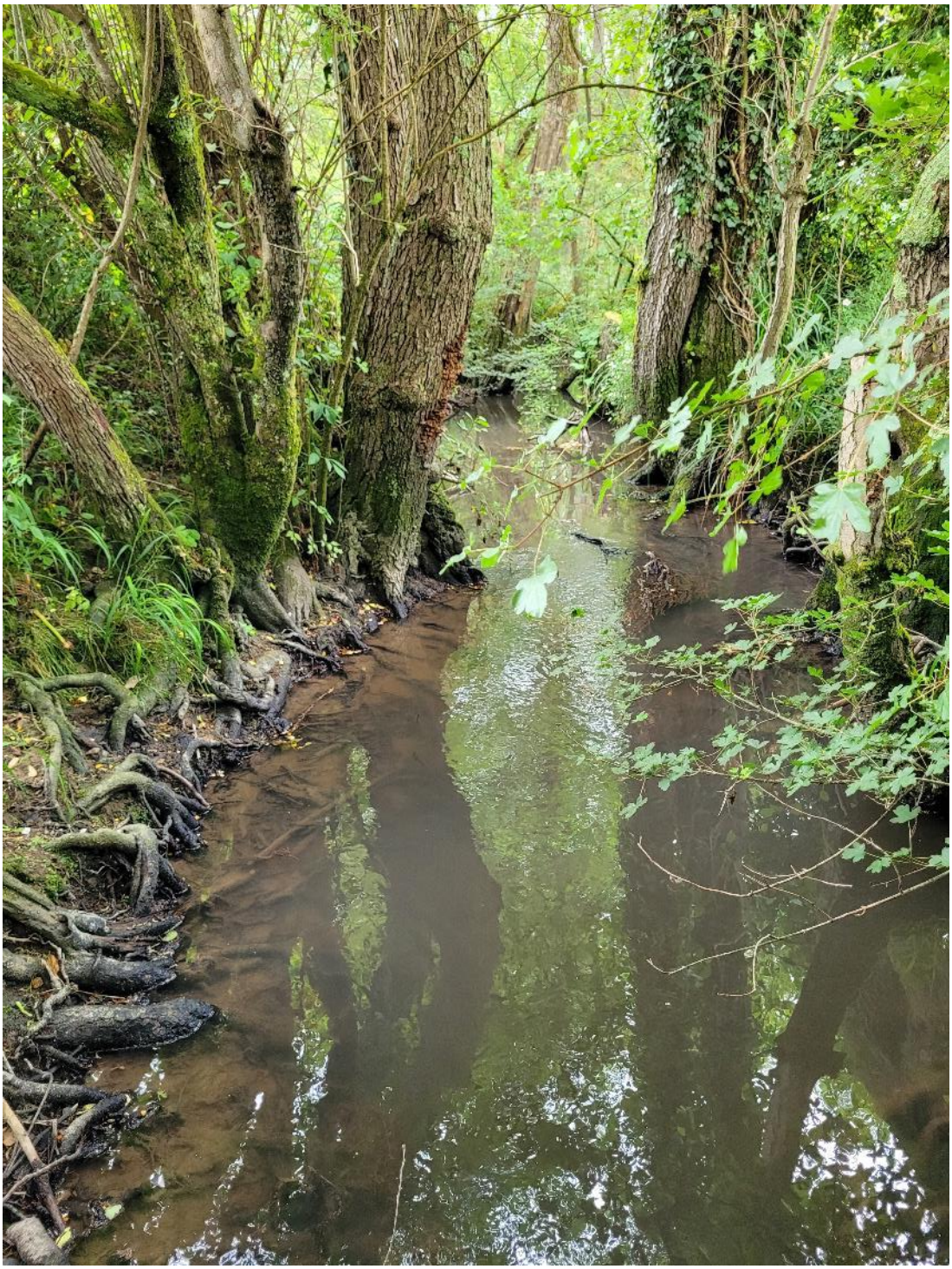

Photo 3. Trees with complex root systems adjacent to a deep pool habitat.

Photo 4. Mixed gravels from the stream bed. Note calcium carrbonate deposite, reflecting the calcium rich source water eminating from the chalk springs at the head of the system.

The bank height was variable and was approximately two metres above bed levels. The steep sided and incised channel means that winter flow velocities are likely to be vigourous following local heavy rainfall and will only subside once the stream spills out of bank. It is assumed that a full "out of bank" flood event is not a routine

occurance, however, the channel width is very narrow in places and any natural woody log jam is likey to encourage the stream to over-top the left bank (lowest bank) after prolonged, heavy rainfall. It is understood the owners have blocked up several land drains in an attempt to improve the botanic divesity of the meadow.

4.0 Project Opportunities

There are several options for stream and flood plain enhancement at Brook Farm. Care is needed to protect valuable habitat that currently exists, including the many important bank top trees and the key areas where outcrops of eroded bed gravels are currently providing spawning opportunities for sea trout.

Taking the tops of peak flow events via improved flood plain connectivity will improve spawning success for sea trout and provide new wet grassland habitat adjacent to the left bank. Improved lateral connectivity is likely to create a more diverse local habitat for a wide range of native species.

The scope of any project will depend on overall site objectives and could range from the simple installation of naturalistic woody log jams to a combination of woody log jams, coupled with strategic lowering of the left bank to facilitate an early inundation of the adjacent meadow during a flood event. Care must be taken to ensure that woody log jams do not become completely occluded with leaf litter and should remain "leaky" and passible for fish on spawning migrations. The location of woody dams also needs to avoid the drowning out of key gravel riffle habitat during normal low and medium flow.

There is also scope for permanent wet ditch creation to improve lateral connectivity with the river, however this will require significant earth works due to the deeply incised nature of the stream. It is understood that water vole are a key target species and permanently wet ditch lines will be required to maintain favourable habitat. Ditches need to have a two-stage profile, with a gently battered bank slope. The water levels of the ditches will be crucial and the junction of the ditch with the stream needs to have an elevated bed invert level set above the ditch bed-level and well above normal stream water levels. This will ensure water spills into the ditch during high flow but is retained in the wet ditches at normal flow conditions. Fine tuning will inevitably be required to create the optimum hydraulic regime.

The site also lends itself to a potentially ambitious "stage zero" restoration scheme, where the stream can be redirected into a new natural form by creating space for the stream to flow north of the existing channel, with the existing channel left as a linear backwater/ditch, or even used to accommodate the spoil removed from the flood plain to provide the new stream corridor. This naturalistic and innovative restoration technique is proving to be popular and can be highly effective.

An example of a stage zero project has recently been completed by the National Trust on farmland and at Hornicottein Somerset. More information is available here:https://www.somersetriversauthority.org.uk/flood-risk-work/sra-annual-report-2021-22/river-aller-stage-zero/

More information on this technique is available from the River Restoration Centre here: https://www.therrc.co.uk/blog/what-stage-zero-approach-river-restoration

5.0 Recommended options

The simplest and cheapest option for increased inundation of the left bank meadow is to build a series of leaky woody log jams using materials won from the bank tops. These can be built using experienced operatives with hand tools, however a tracked machine to create bank notches and help place woody material as recommended.

Additional inundation and the creation of new water vole habitat could be achieved via digging two new ditch lines perpendicular to the existing stream, one towards the top end of the reach and a second towards to lower end.

Estimated cost - £5k for project design, permit application and construction of leaky wood jams. An additional £5k for ditch construction and spoil management.

6.0 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.

7.0 Disclaimer

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