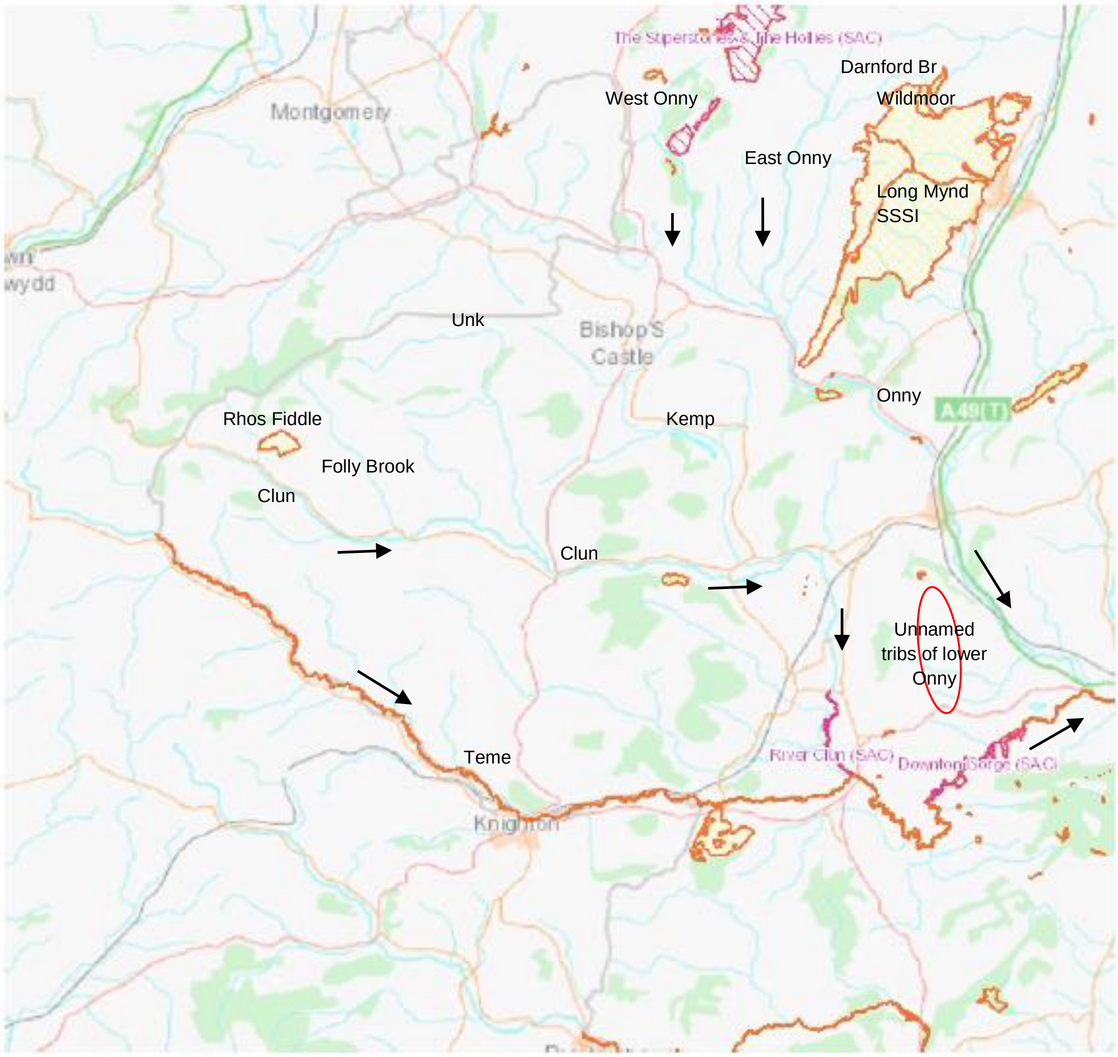
Specialist site visit – Teme tributaries, 8 and 9 June 2016

We visited sites in the Clun and Onny catchments, to get a feel for their potential in terms of beneficial extensions to the River Teme SSSI (particularly in relation to connecting with headwater mires) and mapping priority river habitat, and to characterise and discuss management issues and their resolution.



Map of the Clun and Onny catchments, showing the sites visited (black arrows are direction of flow).

The Clun catchment

In attendance: Chris Mainstone (running waters), Iain Diack (wetlands), Vicki Howden (River Clun SAC RO), Sue Buckingham (River Teme SSSI RO), Gill Walters (EA Biodiversity), Simon Cumming (EA geomorphology)

We drove up from the confluence with the Teme, looking at sites on the lower Clun before driving up the Folly Brook to Rhos Fiddle moor, then back down the River Unk. The Kemp was not considered due to the particularly heavy impacts from arable farming.

At Jay's Bridge (NGR SO 394 497), works have been undertaken to prevent further lateral erosion into the road (Figure 1). Attempts at securing a strategic solution by setting the road back could not secure sufficient land to allow natural processes to continue in parallel with a set-back tree-planting scheme. The result has been significant expenditure on minor road relocation but with conventional rock armouring of the bank. The case highlights the importance of securing a long-term strategic solution so that natural habitat function can be properly restored, for the benefit of both the pearl mussel population and the wider characteristic biological assemblage of the channel and riparian zone.

Figure 1. The Clun looking upstream from Jay's Bridge.

Further upstream, we visited a physical restoration site above the SAC, in the middle reaches of the Clun at Lawn Farm (NGR SO 378 808 to SO 382 814). This site is one of a series of restoration opportunities identified as part of the strategic restoration plan for the Clun SSSI/SAC (Atkins 2012, Jacobs 2013). These strategic plans usually focus on the river within the SSSI/SAC boundary, but given the limited spatial extent of the Clun SAC the plan was extended upstream to capture a longer stretch of the main river. The objective of river SSSI restoration plans is to address physical habitat modifications to restore natural habitat function for the benefit of the whole characteristic assemblage of the river. These plans are intended to work in combination with a range of other remedies, such as the control of diffuse and point source pollution, the alleviation of flow modifications, and the control of non-native species (see the freshwater and wetland habitat narrative for further explanation). In the case of the River Clun, the requirements of pearl mussel need to be seen in the broader context of restoring natural habitat function, although the precarious state of the population requires particular care when planning and implementing restoration measures.

At this site (Figure 2), bankside fencing has been installed prior to determining which in-channel measures would be most appropriate. The site is challenging because the channel has historically been pinned to the side of the floodplain, and perched above the floodplain (Figure 3) to provide head for an old watermill further downstream. The desired long-term strategic option in such circumstances is to restore the channel to its dynamic meandering behaviour within the floodplain, which would generate the characteristic habitat mosaic within which pearl mussels would find their niche (as far as the river at this point would naturally provide for the species).

However, in this instance a mitigation option has been adopted, which because of the perched nature of the channel requires that the planform of the river is fixed (otherwise the channel would erode its retaining bank and drain to the lowest point of the floodplain where it used to be).

Figure 2. Close bankside fencing at Lawn Farm.

Figure 3. The perched channel (left) sitting above the floodplain meadows.

The fencing has been located close to the bank top, with little space for the development of riparian habitat. Large woody material (a fundamental building block of natural river habitat mosaics) has apparently been removed from the channel. A large trunk remains fallen across the channel, which is invigorating the river and creating a scour pool and associated riffle habitat. However, the intention is to modify this so that it presents less resistance to flow.

We inspected Folly Brook approximately halfway up its length. This is reported to be the most naturally functioning headwater of the Clun system, which was apparent at this point (Figure 4). The brook has a good gradient with high riparian tree cover, generating an excellent habitat mosaic dominated by cobble/boulder substrate, exposed tree root systems, good depth variation, exposed sediments, moss-covered boulders and woody material in the channel. A brief kick-sample recorded a good diversity of invertebrates reflecting the swift-flowing nature of the brook: river limpets (*Ancylus fluviatilis*), caseless caddis-flies (*Hydropsyche siltalai* and at least one other Hydropsychid, probably *H. pellucidula; Ryacophila* sp.), cased caddis-flies (Odontocerids, Limnephilids), stoneflies (the predatory *Chloroperla torrentium* as well as Leuctrids, probably a mixture of *L. hippopus* and *L. moselyi)* , mayflies (*Ecdyonurus torrentis, Rithrogena semicolorata, Seratella ignita, Electrogena lateralis*? Baetids), numerous blackfly larvae (Simuliids), freshwater shrimps (*Gammarus* sp.), alder-flies (Sialidae) and Elmid beetles. Some of these species clamp onto larger cobbles and boulders whilst others inhabit the interstices within coarse substrates. The net-spinning Hydropsychid species form part of a known longitudinal sequence of species within the family from source to mouth in large British rivers – other species are typically found upstream of them (*Diplectroma felix* and *H. instabilis*) and downstream of them (*H. contubernalis and Cheumatopsyche lepida*) and may well be present in the Clun/Teme system.

Figure 4. Middle reaches of the Folly Brook.

At the top of the Folly Brook, at the watershed between the brook itself, the upper Clun and other headwaters flowing westwards away from the Clun catchment, Rhos Fiddle is an area of common land (Figure 5) that is recovering from decades of overgrazing and burning an uncontrolled hot burn some years ago. The vegetation across the site is increasingly being recolonized by *Sphagnum* species, which intriguingly are not those of 'wet heath' (which may have been expected given the site's previous appearance as 'dry' heath) but rather those of mires, such as *S. cuspidatum* and *S. fallax*, and some of which are peat-building species, such as *S. papillosum*. It is anticipated that this natural recovery will continue and *Juncus* will be outcompeted by *Sphagnum* will continue to increase in cover over time due to the lack of trampling and grazing pressure. Some historical drains are apparent which need to be blocked to allow full restoration of mire habitat and peat formation.

Figure 5. Rhos Fiddle looking north from the centre.

In the southern area of Rhos Fiddle, hydrological pathways coalesce to form the wettest part of the site (Figure 6), draining into a channel on the southern boundary. Within the site the beginnings of the mire-stream transition appear natural (Figure 7), but at the boundary of the site there is a historical stone structure (Figure 8) marking a transition between the upstream flush habitat and a downstream drainage channel that eventually becomes a natural headwater stream of the upper Clun. This channel, though dominated by coarse substrates (Figure 9), would appear to have been created to drain the valley sides to the south of Rhos Fiddle. It is likely that the natural stream head would form further downstream after a more extended mire-stream transition.

Figure 6. The southeast corner of Rhos Fiddle, looking southeast down the flush which turns right to exit the site near the trees on the right.

Figure 7. The flush heading off towards the trees.

Figure 8. The man-made exit of the flush into the channel.

Figure 9. The channel draining Rhos Fiddle to the south.

The headwaters of the Folly Brook are not surface-connected to Rhos Fiddle due to the topography of the mire. Instead seepages coalesce down the valley side to the east of the mire (Figure 10). These seepages have been drained for grazing.

Figure 10. The Folly Brook catchment, looking eastwards downslope from Rhos Fiddle.

We drove across the top end of the Folly Brook catchment, looking across to the headwaters Long Pike Hollow and Cwm Moch (Figure 11). These streams run through heavily wooded ghylls that appear to be highly natural, although it was not possible to inspect the streams.

Figure 11. The headwaters of the Folly Brook, looking directly up Long Pike Hollow.

We drove eastwards over the watershed into the Unk catchment. Some unsympathetic clear-felling was immediately apparent (Figure 12), adjacent to recent conifer planting on what appeared to one of the only areas of semi-natural vegetation in the area. Further down the system the river appeared to be moderately natural (Figure 13), although there was no time for proper inspection.

Figure 12. Conifer felling and planting at the top of the Unk catchment.

Figure 13. The lower reaches of the River Unk.

Reflections on the Clun catchment

In the lower Clun, considerable tensions are apparent between restoring natural habitat function and protecting the remaining mussels where they are as they continue to decline due to catchment-scale pressures. Decision-making is fraught with difficulty, with considerable stakeholder attention focused on the risks to remaining mussels almost down to the level of individuals. However, whilst compromises are inevitable along stretches where mussels still exist, a focus on restoring natural habitat function is vital in the rest of the river network, including planned restoration sites. There seems no possibility of an early relocation of mussels from the SAC to better quality sites upstream, and the short-medium survival of the population seems dependent on the FBA facilities and the possibility of identifying suitable ark sites in neighbouring catchments. There therefore seems to be no reason to focus physical restoration efforts specifically on the creation of pearl mussel habitat rather than the restoration of natural river habitat function.

The Folly Brook is worthy of its inclusion on the priority river habitat map. It would be worth considering what might be done to improve the connectivity of the brook to Rhos Fiddle by restoring the seepage zones on the valley side. The mire-stream transition at the southern end of Rhos Fiddle could be restored to create a natural transition catering for all wetland elements of the transition zone. This would involve blocking the channel below the boundary line to a point at which natural stream formation is likely, and removing the stone structure. This may be achievable by the use of native large woody material in the channel.

The stream restoration would ideally be done alongside restoration of mire to the south of SSSI in Curney Plantation, which is currently a mosaic of drained Molinia-dominated pasture and drained wet woodland. There are also various drains across Rhos Fiddle SSSI which have not previously been identified or considered a problem. These undoubtedly hasten water loss from the site and need to be blocked and infilled to allow full restoration of the mires within the site, and achievement of favourable condition. A first step would be to map the location of all drains, using a combination of field survey, LiDAR and aerial photography. The drains are not large and could be disabled easily, possibly using Wildlife Trust volunteers. If resource is available though, starting to block the drains we already know about right now would also be desirable.

In the short term, the priority habitat driver provides some impetus for restoring natural habitat function in and around Folly Brook, in addition to the impetus provided by catchment measures to restore the condition of the Clun SAC and existing Teme SSSI (particularly under the DWP remedy). Full restoration of the mire on Rhos Fiddle, and any other remaining mire habitat in the headwaters, should benefit summer flows in the Folly Brook and Upper Clun by providing better catchment water retention, as should resource protection measures applied to agricultural land in the catchment. Clearly strategic resource protection measures need to be applied extensively in the upper Clun catchment to address the nutrient and sediment pressures on the river habitat and pearl mussel population. All of this would improve considerably the chances of successful recovery of pearl mussel populations in the Clun catchment.

Onny catchment

In attendance: Chris Mainstone (running waters), Iain Diack (wetlands), Gavin Measures (pearl mussel adviser) Vicki Howden (River Clun SAC RO), Bernadette Micklewright (Biodiversity 2020 coordinator, West Mercia Team).

We drove up the main Onny from the confluence with the Teme, then up the East Onny and Darnford Brook up to Wildmoor on the Long Mynd. We then drove westwards for a brief inspection of the West Onny.

The lower Onny runs through a floodplain with significant man-made constraints, including a trunk road, a railway line, residential development (Craven Arms, Onnibury) and mineral extraction. Despite this, the river appears to be of reasonable habitat quality. Mineral extraction at the lower end of the river (Figure 14) is increasing, and is a constraint on restoring habitat natural function in terms of planform movement (although at this point the channel seems naturally constrained by woodland). Further up at Craven Arms, an excellent meander feature (Figure 15) has been artificially cut off to reduce erosion pressure on the bank adjacent to the eastern boundary of the town. This bank has been heavily reinforced to protect dwellings (Figure 16), and the river bed is lower than the bed of the cut-off meander (either from associated engineering works or bed incision due to the bank reinforcements). Given the low intensity of the adjacent agricultural use, some strategic restoration of natural river function along this stretch would appear to be feasible. Despite all of this engineering work, the channel exhibits reasonable habitat quality (Figure 17), and even supports isolated beds of *Ranunculus*.

Figure 14. Gravel and sand extraction adjacent to the lower Onny (the river lies beyond the trees).

Figure 15. The meander cut off from the lower Onny by flood defence works.

Figure 16. Concrete bank reinforcement adjacent to the cut-off meander (note the erosion visible under the toe of the reinforcement).

Figure 17. The Onny downstream of Craven Arms.

Some small steep streams running eastwards into the lower Onny (see the red oval on the site map) were briefly inspected (Chris Mainstone only). These are all unnamed on OS maps but flowed out of steep-sided ghylls called Stubbs Coppice, Ferneyhall Dingle and Duxmoor Dingle. The most obviously high quality of these was in Stubbs Coppice (Figure 18), and has an excellent habitat mosaic formed by natural processes, including good interactions with bankside trees and large woody material. A brief kick-sample captured very large numbers of freshwater shrimps (*Gammarus* sp.) and good numbers of caddis-fly larvae, both caseless (*Plectrocnemia* sp, probably *geniculata*, and *Wormaldia occipitalis*) and cased (Glossosomatidae and Limnephilidae). *Plectrocnemia* species are headwater specialists, giving way to *Polycentropus* species further downstream. One stonefly (*Isoperla grammatica*), a water-cricket (Veliidae) and beetle larvae (Hydrophilidae) were also caught. The species found reflect the diversity of the habitat mosaic – *Wormaldia* species favour high current velocities with vertically running water, whereas *I. grammatica* favours riffle habitat and *Plectronemia* species require lower velocities associated with the exit and entry points to pools to maintain the nets they spin. Glossosomatid larvae require cobbles and boulders as attachment surfaces, whilst water-crickets require relatively still water associated with pools on which to skate, and hydrophilid.larvae tend to frequent vegetation and woody debris.

Unfortunately further downstream these streams then flow through intensive arable land before reaching the main Onny, and are heavily physically degraded through these reaches as a result.

Figure 18. The ghyll stream in Stubbs Coppice (NGR SO 447 764), running off the slope down towards the Onny.

The lower sections of the East Onny were somewhat disappointing. The channel has been moved over to the edge of the floodplain and straightened (Figure 19), and lacks any energy or diversity (Figure 20). There is no large woody material in the channel to initiate natural recovery of channel form. As a result the channel substrate is heavily silted and seems unsuitable for characteristic biota.

Further upstream the river retains its natural planform, despite being intertwined with the road, and habitat provision is much improved as a result (Figure 21). Small riparian meadows have also survived along this stretch, generating an excellent habitat mosaic within the river corridor. A brief kick sample revealed a high diversity of invertebrate species, particularly those associated with riffle habitat. This included stoneflies (*Isoperla grammatica, Chloroperla torrentium*), mayflies (E*cdyonurus insignis, Rithrogena semicolorata, Heptagenia sulphurea, Serratella ignita, Baetis* sp, and *Ephemera danica*), caddisflies (the caseless *Hydropsyche siltalai* and *Ryacophila* sp and cased Glossosometidae and Limnephilidae). Gammarid shrimps, Elmid beetles and pea mussels (Sphaeridae) were also present in small numbers, as were Bullhead. The macroalgae *Lemanea* was quite abundant – this is indicative of fast-flowing and circumneutral oligotrophic stream and rivers.

Figure 19. The lower East Onny, straightened against the valley side. Note the outline of a meander cut-off by the historical engineering works.

Figure 20. The straightened lower East Onny.

Figure 21. Upper East Onny, with small riparian meadows.

Above Bridges we inspected the Darnford Brook. This has a more open character, running through improved pasture with scattered trees. The brook is behaving naturally and has reasonable levels of diversity (Figure 22). Looking north westward into the headwaters, the catchment has an appearance of relatively extensive management (Figure 23), although to the west under the Stiperstones sheep grazing is very intensive. Moving up onto Wildmoor, the brook gives way progressively to mire in a natural longitudinal transition (Figure 24). The mire is of excellent quality, with base-rich, neutral and acidic water inputs. This gives rise to an impressive diversity of mire types within the valley system, and overall a large (relative to the others on the hill) and very important relatively natural wetland complex (Figure 25). It also supports a number of stands of the Habitats Directive Annex 2 moss *Hamatocaulis vernicosus*. The more acidic areas, which tend to support abundant soft-rush, appear to be becoming dominated by Sphagna, which is beginning to suppress the rush and *Polytrichum* commune that have dominated following past periods of over-grazing and burning/wildfire. This is returning the vegetation to higher quality mire types, as well as holding back greater volumes of water.

Figure 22. The Darnford Brook upstream of Bridges (note the natural vegetated berm on the right hand bank).

Figure 23. Catchment of the western tributaries of the East Onny.

Figure 24. The upper Darnford Brook looking upstream to Wildmoor, progressively giving way to valley mire.

Figure 25. Mire vegetation at the top of the Darnford Brook on Wildmoor

The main artificial interruption to the natural mire-stream transition is a pond created by the road (Figure 26), either as an aesthetic feature for visitors or for livestock watering. Further up the mire, the brook remains as a small channel cutting through the surface peat (Figure 27), becoming progressively more obscure. It is unclear whether the hydrological pathway at this point would be sufficiently strong to generate a defined channel if the mire were in a completely natural state. There has been some more obvious interference with the mire-stream transition, involving mineral soil bunds set across the nascent valley (Figure 28). It is unclear whether these were established to stabilise the mire, but in the absence of any trees and associated root systems for natural binding they probably perform this function. Some small pools are present in the mire (Figure 29), often behind small bunds rather than as truly natural features resulting from the topography of the land. It is unclear at what point bedrock control of the mire would be established in the absence of the bunds. Some elements of the mire stream transition appear very natural, however (e.g. Figure 30).

Figure 26. Artificial pond in the mire/stream transition on the upper Darnford Brook, at the lower boundary of Wildmoor.

Figure 27. Channel cutting through the peat on Wildmoor.

Figure 28. A bund (bottom of picture) set across the hydrological pathway within the valley mire. Note the bund is now partially cut through.

Figure 29. A pool in the valley mire at the top of Darnford Brook.

Figure 30. Unmodified flush habitat coalescing into open water.

We drove over the Stiperstones to the West Onny, where it was difficult to get an overall impression of the river due to sparse vantage points. Around the river's mid-point (NGR SO 334 294) the channel has been straightened and moved to one side of the narrow floodplain, then shifted across to the other side in a similar manner. Although observed from a distance, this seems to have resulted in heavy physical habitat degradation. This said, given the narrow nature of the floodplain there is considerable scope for restoration.

Further down we were able to inspect the river at close quarters. At this point the habitat mosaic was heavily degraded by intensive cattle grazing, with high densities of livestock having free access to the banks and river bed (Figure 31). However, again the potential for restoring the habitat mosaic seemed high.

Figure 31. Degraded habitat mosaic of the lower West Onny.

Reflections on the Onny catchment

Restoration of the flushes running off the Stiperstones, and addressing the heavy erosion from high intensity sheep grazing below them, would contribute greatly to the ecological integrity and coherence of the East Onny.

The small streams running into the lower Onny require further examination but at least some appear worthy of priority habitat status. Owing to the heavily degraded nature of their channels in their lower reaches it would be difficult to justify extending the river SSSI notification to include them. In the future it would be possible to consider a composite headwater-only SSSI that is associated with, but not directly linked to, the Teme SSSI – this type of notification is allowed for in the revised GB selection guidelines for river habitat.

Chris Mainstone and Iain Diack, July 2016

References and useful reading

Atkins (2012) River Clun SSSI/SAC Restoration Strategy. Produced on behalf of Natural England and Environment Agency.

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