Specialist site visit to Kent Downs streams 5 June 2015

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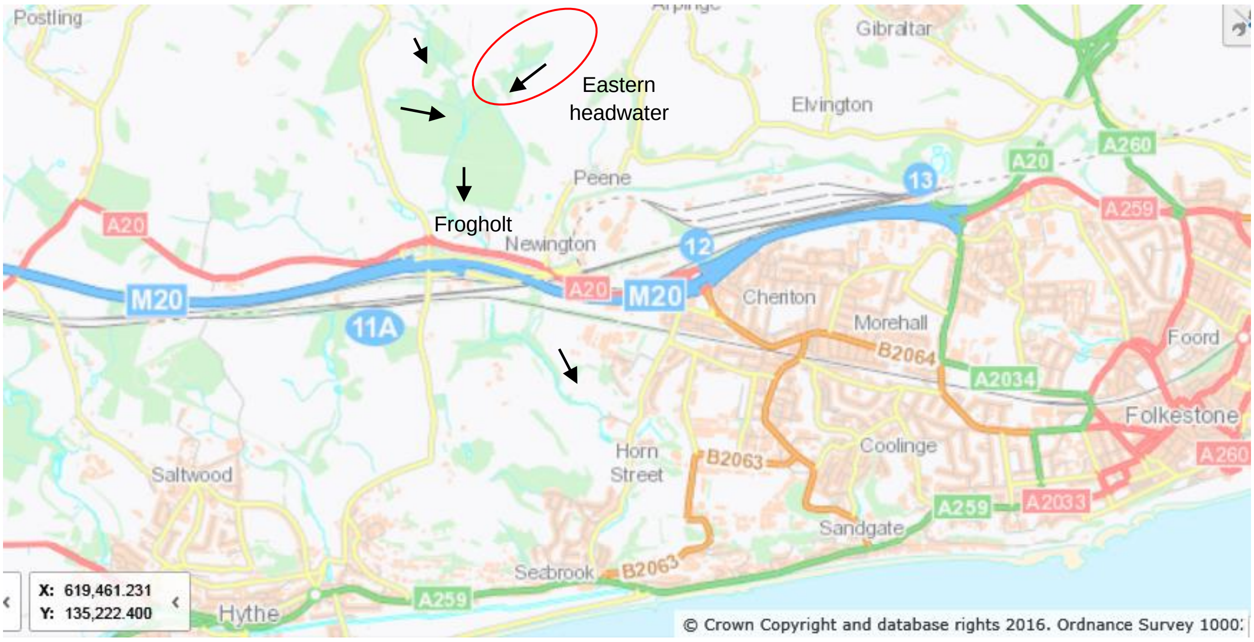
Preamble

The visit focused on the Seabrook stream as the only known example of a naturally functioning headwater stream system running off the Kent Downs. Brief visits were also made to the upper Nailbourne and a headwater of the River Len, although these were speculative visits to sites that local staff thought may retain some natural stream function.

1. Seabrook Stream

The headwaters of the Seabrook Stream run southwards off the scarp slope of the Downs, converging into the Seabrook Stream proper which runs down to the south coast at Seabrook (see map below). We walked up the eastern headwater, up the eastern arm to its source at TQ 183 389, then over to the western arm from its source at TQ 180 390 downstream to the railway embankment. We then drove to the main Seabrook Stream at Frogholt to look for native crayfish.



The topographical catchment of the headwaters may be unique in the North Downs in consisting of semi-natural vegetation: low-intensity grassland and woodland. The groundwater catchment will be more extensive and subject to wider pressures from arable farming and rural development. Further downstream, the Seabrook Stream is impacted by development associated with the Channel Tunnel, M20 and urban development.

Figure 1. The topographical catchment of the headwaters of the Seabrook Stream.

The eastern arm showed particularly high levels of physical naturalness. Good patchy cover from riparian woodland (mainly ash), generating high levels of woody debris in the channel but with sufficient light to support abundant riparian vegetation (Figure 2)

Figure 2. The eastern arm of the eastern headwater.

The only evidence of significant physical modification was a concrete impounding structure (Figure 3), apparently associated with a historical domestic abstraction. This has been abandoned and is not now greatly affecting channel morphology because the centre of the structure is open down to the current bed level – it presumably had wooden slats to control water levels, which have rotted away.

The stream is quite strongly tufa forming, and this provides the majority of the coarse substrate in the channel, mixed in with finer organic and mineral material but moderately sorted by variation in current velocities generated by the woody debris. Relatively low levels of leaf litter were apparent, perhaps because of the dominance of ash trees in the riparian zone. Some of the ash is exhibiting signs of die-back consistent with Chalara infection, which over time will have a major effect on the extent of riparian trees along the stream.

Figure 3. Concrete impounding structure on the eastern arm.

The channel cross-section is very shallow, providing good hydrological continuity with the riparian zone and allowing wetland vegetation to develop (*Apium nodiflorum, Rorippa nasturtium-aquaticum, Veronica beccabunga*), interspersed with bare substrates. Woody debris rarely forms into significant debris dams, which limits the plan form variation and hence development of meso-scale habitat variation. This seems to be a natural result of the low stream power typical of chalk stream headwaters when running over chalk – hydraulic energy is insufficient to shift woody debris in ways that generate localised accumulation into jams.

Figure 4. A rare example of a debris dam on the eastern arm, generating natural bed-raising upstream.

The eastern arm rises in a spring set in a steep chalk bank (Figures 5 and 6), surrounded by liverwort (*Pellia* sp). The spring and upper section of the stream were dry at the time of the visit.

Figure 5. The upstream end of the eastern arm, with the spring head in the background.

Figure 6. The spring head of the eastern arm.

An *ad hoc* composite macroinvertebratre sample was taken on the flowing sections the eastern arm. The fauna was dominated by freshwater shrimps (*Gammarus pulex*), Scirtid beetle larvae and caddis fly larvae from a number of families,,mainly Limnephilidae (cased) but also Glossosomatidae (*Glossosoma* sp. cased) and Polycentropididae (caseless). Scirtid beetles only use water for the larval stage of development, the adult beetles requiring damp marginal soils and vegetation. Polycentropid caddis species are net-spinning and require current velocities within a relatively narrow range to support their nets. Also present in smaller numbers was the stonefly *Nemoura cambrica*, which feeds on particulate organic matter often generated by shredding leaf litter. Mayflies nymphs were also present (Baetids and the burrowing nymphs of the Ephemeridae) as well as burrowing pea mussels (Pisidium sp.) and blackfly larvae utilising the more stable hard substrates. As a whole the fauna reflect the diversity of meso-scale habitats provided by the naturally functioning stream, including a range of substrates and current velocities.

The upstream end of the western arm was more open in parts, with greater abundance of riparian vegetation including *Scrophularia* (Figure 7). Leaf litter seemed to be more prevalent (possibly more riparian hazel than on the eastern arm?).

Figure 7. Upstream end of the western arm.

Further downstream, the channel widens and jams of large woody debris are evident (Figure 8), helping to create greater morphological diversity than in the eastern arm.

Figure 8. Woody debris dam on the western arm.

Further downstream still, the western and eastern arms meet and stream gradient shallows as the stream flows out of the steep scarp slope. The riparian zone becomes considerably wetter, with a consequent increase in the extent of wetland vegetation (Figure 9). Abundant

Apium nodiflorum, along with *Veronica beccabunga*, *Myosotis* (presumably *scorpiodes*), and opposite-leave golden saxifrage (*Saxifraga oppositifolia*). The softer margins have created greater scope for planform movement, with the greater meso-scale habitat diversity that brings to the channel (Figure 10). However, it also brings greater vulnerability to livestock trampling. Although livestock densities are very low, herding around the water margins has generated heavy localised pressure (Figure 11).

Figure 9. Extensive wet margins below the confluence of the two arms.

Figure 10. Planform movement brought about by shallower gradient and finer and softer riparian substrates. Note exposed sediments accumulated as point bars.

Figure 11. Heavy localised livestock trampling.

Physical impacts on the western arm include artificial crossings, one made from woody debris (Figure 12) and another built from stone (Figure 13). The woody debris crossing is essentially mimicking a natural woody debris dam, including undershot flow, and does not appear to be a major issue although undesirable. It is not clear whether the crossing is still used. The stone built structure is of more concern, generating a significant artificial barrier and morphological impact. The small-diameter pipe through the wall is heavily silted and must generate an impounding effect under high flows. The structure appears to have no on-going use.

Figure 12. Artificial crossing created by fallen and cut wood.

Figure 13. Stone wall built across the stream, and the small diameter pipe intended to take the streamflow.

At the railway embankment, the stream runs into a further artificial impoundment that drops the stream into a scour hole immediately before the culvert under the railway (Figures 14 and 15). It is not clear to what extent this impoundment is responsible for the extensive wet and soft riparian margins that were evident at the time of the visit.

Figure 14. Riparian zone immediately upstream of the railway impoundment and culvert (impoundment is located at the fence line on the left).

Figure 15. The fall from the impoundment into the culvert under the railway.

An *ad hoc* composite macroinvertebratre sample was taken on the western arm upstream and downstream of the confluence with the eastern arm. This was less diverse than the sample from the eastern arm, with a greater dominance of freshwater shrimps and scirtid beetles. Only one caddis fly larva was caught (Limnephilidae). The reason for the lower diversity is unclear – it could be linked to greater substrate disturbance and channel modification, or might simply be a result of the non-standard sampling employed.

Downstream of the railway embankment, the stream flows through woodland. There was insufficient time to follow the stream through this section. Further downstream still, the stream runs through Frogholt (Figure 16). This section supports a healthy population of white-clawed crayfish, protected from signal crayfish and plague to a considerable degree by the isolation of the Seabrook Stream as a coastal stream with a hydrologically isolated catchment (although vulnerable to accidental or deliberate release of signals). Two adult crayfish were caught in a 15 minute handsearch (Figure 17). Natural habitat was somewhat lacking in this stretch, with few large cobbles, concretion of the substrate by tufa formation, and no large woody debris. The strength of the population here may be linked to the dry stone walling of the banksides, or else upstream habitat.

Figure 16. The Seabrook Stream at Frogholt.

Figure 17. White-clawed crayfish at Frogholt.

It is not possible to characterise impacts on water quality and flow regime from this sort of visit. There is likely to be nitrogen enrichment due to groundwater pollution from intensive agriculture. There are no obvious nutrient enrichment effects evident in the stream channel, though tufa formation may mask any impact. The pressure on the aquifer from abstraction is not known – the flow regime of the Seabrook stream system may be affected.

Recommendations

1. Include the Seabrook Stream above the railway line in local refinements to the national priority river habitat map.

2. Through the NE notification strategy, include river habitat as a formal notified feature of the Seabrook Stream SSSI.

3. Plan for loss of ash trees in the riparian zone – consider replacement species that are most characteristic of the landscape. Alder or willow would be suitable ecologically.

4. Completely remove the abandoned impounding structure on the eastern arm of the eastern headwater to maximise naturalness.

5. If there is no on-going use, remove the stone and woody debris crossings on the western arm to restore natural stream function.

6. Consider modifications to the impoundment and culvert associated with the railway embankment. It may be possible to remove the impoundment entirely and restore water and bed levels.

7. Consider options for controlling the heavy localised livestock trampling on the western arm. Although riparian fencing is undesirable and hinders any management of the riparian zone, some targeted set-back fencing and provision of troughs may alleviate the problem. There still needs to be allowance for livestock access through any fencing where needed to maintain a mosaic of sward height and some bare ground.

8. If not already known, commission a crayfish survey to ascertain distribution and meso-scale habitat utilisation within the Seabrook stream system. To include consideration of the impact of artificial structures on distribution and the extent to which natural habitat provision could be restored.

2. Upper Nail Bourne

We inspected the stream near its source, within the village of Lyminge around TQ 161 400. The stream was highly artificial at this point (Figure 18) and not suitable for inclusion on the priority river habitat map or for consideration as SSSI. After inspection we decided not to drive downstream into the Elham Valley. The middle section of the Nail Bourne is known to be dry in most years, running on average 1 year in seven. This is too infrequent to be considered an ecologically important winterbourne.

Figure 18. The upper Nail Bourne at Lyminge.

3. Len headwaters

We walked to a headwater stream suggested by Tom Cook, south east of Maidstone and just outside of Broad Street at TQ 822 562. The immediate catchment is dominated by arable crops (Figure 19), although the upper section of stream runs through a block of dense woodland. There was insufficient time to venture into the woodland to examine the stream. Downstream of the woodland, the stream immediately runs into a ditch bordering an arable field and continues in this character downstream (Figure 20). It seems unlikely that the short section of stream running through the woodland block would warrant inclusion on the priority river habitat map.

Figure 19. The catchment of the Len headwater.

Figure 20. Ditched stream running between woodland and arable land, into which the stream running through the woodland discharges.

Reflections on the headwaters streams of the Kent Downs

In comparison to the South Downs, the general impression of the landscape in the North Downs of Kent is one of greater development, both agriculturally and in terms of population. There appears to be a greater amount of arable farming and a greater density of villages. The scope for identifying highly natural headwater streams, of a level of naturalness that is commensurate with inclusion in the priority river habitat map, seems more limited. However, the North Downs has not been subject to the type of structured headwater surveying undertaken in the South Downs, so this is just a perception.

Naturally functioning headwater streams provide critical habitat for a range of riverine species, and have high continuity with the springs and flushes that feed them. This spring/flush/stream mosaic, which would naturally be associated with broadleaved woodland, provides an abundance of habitat niches for characteristic species, many of which are restricted to headwater streams (Mainstone and Hall 2014). Naturally functioning headwater streams are also essential to the health of the downstream river system, and provide a range of ecosystem services that are too often taken for granted. These services include nutrient processing, water cooling (in association woodland or riparian trees) and flow regulation, the latter in relation to moderating peak flows and supporting base flows in dry weather.

There is considerable benefit to be had from taking a strategic approach to the conservation of headwater streams of the Kent Downs, and the North Downs more widely, recognising the importance of natural stream habitat function. In the highly permeable landscape of the North Downs the density of the headwater stream network is comparatively low compared to other landscapes, so each individual stream becomes more precious. Damaged streams and stream sections can and should be restored to higher levels of natural habitat function, with all of the biodiversity and societal benefits that brings. Headwater streams are too easily forgotten by the decision-making processes that govern water management (including the Water Framework Directive) and so greater reliance needs to be placed on biodiversity drivers (protected sites and priority habitat) to make sure they receive the attention they deserve (Mainstone and Hall 2014).

All the streams running off the North Downs (both natural and impacted ones) should be treated as a network, and a set of common key messages should be provided to landowners to promote their management as naturally functioning headwater stream systems. Messages to include:

- Maintain or restore continuity of natural water-related habitat from valley mires, through flushes and springs to stream channels. This may involve selective in-filling of ditches to restore water retention in defined land areas, which are likely to be small given the incised topography of the downland fringes.
- Minimise physical interventions to stream channels and their margins.
- Maintain tree cover (and increase to patchy cover where needed) and retain fallen trees and woody debris unless there is a significant safety risk – woody material is an essential element of natural stream/mire function.

- Be aware of water resource and water quality pressures in the catchment and raise awareness of the need to control these pressures to protect natural ecosystem function. In particular, spring heads and their associated flushes, and the natural winterbournes they feed, are destroyed by over-abstraction.

In addition, a local initiative to find or develop definitive names for all of the streams would be a positive step for stream conservation in the Downs. The lack of names (or at least well-known names) seems symptomatic of a lack of societal value assigned to the streams. It would help focus greater attention on them and their conservation importance, encourage greater care over activities affecting them, and foster public engagement.

The work of the Sussex Wildlife Trust in the South Downs (Holmes 2010) provides an excellent example of the approach that can be taken to screening and surveying of sites for naturalness. This is the starting point for a strategic approach to their conservation.

Beyond the Seabrook Stream there is probably limited potential for SSSI notifications for stream habitat and associated flushes and springs. However, it is possible that highly natural streams are present in terrestrial SSSIs and waiting to be properly recognised. Potential SSSI notifications for stream habitat, including associated flushes and springs, constitute one facet of a wider perspective on SSSI notifications in this landscape, which includes terrestrial habitats (particularly ancient broadleaved woodland) and rare species such as bryophytes. An integrated approach to notifications is necessary to ensure that the links between these features, and the dependency of characteristic species on natural ecosystem function, is properly captured. This needs to be supported by appropriate use of priority habitat mapping, to ensure that valuable sites not selected for SSSI notification receive the recognition (and the drive for restoration where necessary) that they deserve.

References and further reading

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