Specialist site visit – The streams of St Leonards Forest, East Sussex

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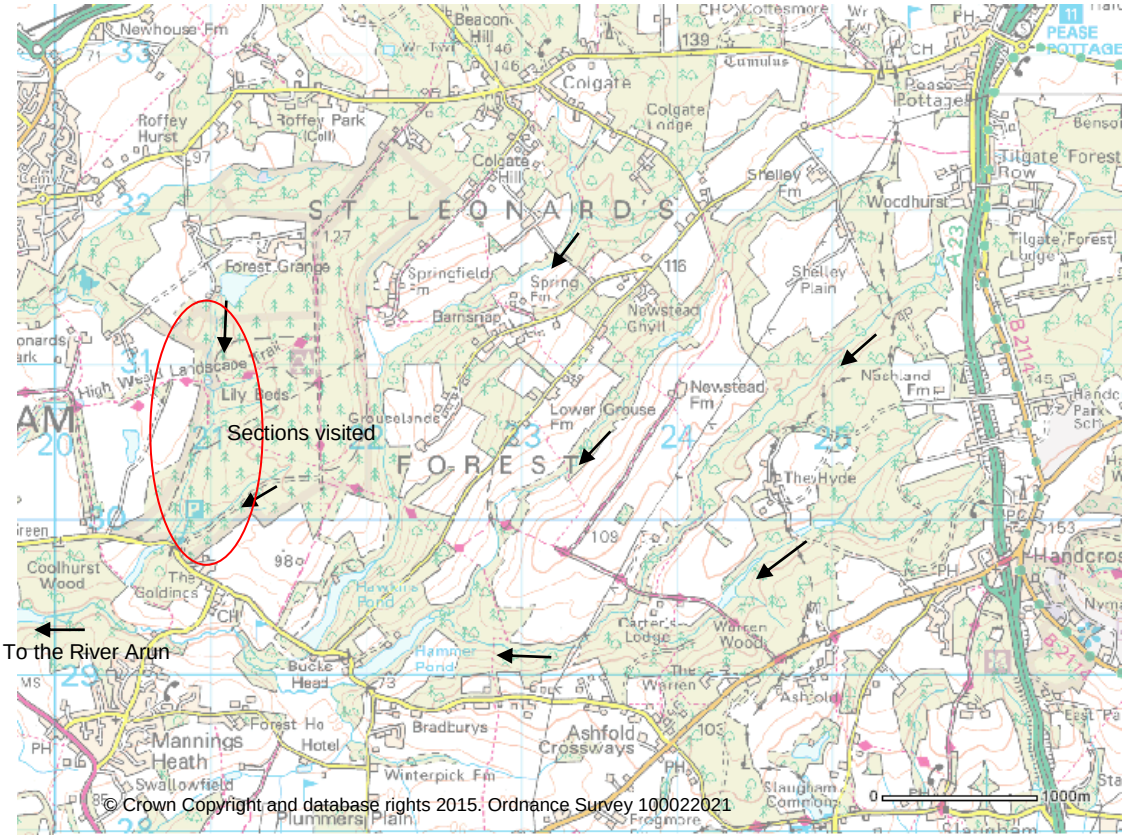
The ghyll streams of St Leonards Forest flow south and eastwards off the sandstones of the High Weald, feeding into the top end of the River Arun (see map below).



Map of River Arun headwaters in and around St Leonards Forest.

We walked from the Forestry Commission car park at TQ 208 297 across Inholms Ghyll and up Sheepwash Ghyll to the area supporting Lily of the Valley (around TQ 211 307).

The waterfall at the downstream end of Inholms Ghyll appeared artificial in origin at first sight (Figure 1). After further familiarisation with the site it appears that this is a natural bedrock feature, but with perfectly horizontal bedding plains and regular vertical fracturing that give it the appearance of a constructed feature.

Figure 1. Waterfall on Inholms Ghyll.

Walking up Sheepwash Ghyll, the extent of bed rock control soon became apparent. The majority of stream length that we walked contained little or no unconsolidated substrate (e.g. Figure 2). Longitudinal drops in streambed elevation generally occur in discrete falls caused by breakthrough of successive bedding plains (e.g. Figures 3 and 4), with interludes of very low stream gradient. Although we visited at a time of low flow, it is likely that the hydraulics of the stream system in winter are quite extreme given the incised nature of the headwater catchment. This would scour out unconsolidated sediments.

Figure 2. Bedrock channel at the downstream end of Sheepwash Ghyll within the forest.

Figure 3. Bedrock control of stream gradient.

Where trees have fallen across the channel, or smaller woody debris collects into debris dams, unconsolidated sediments and leaf litter accumulate (Figure 4). This provides greater opportunities for a significant invertebrate fauna to develop.

Figure 4. Sediment and leaf litter accumulation associated with woody debris in the channel.

Further upstream, the stream cuts through layers of chalk and clay drift and creates are more classic High Weald ghyll appearance. The incised nature of the ghyll (Figure 5) provides an ideal environment for the development of a diverse lower plant flora (e.g. Figures 6, 7 and 8).

Figure 5. The stream sitting within the incised ghyll.

Figure 6. Ferns dominating the banks of Sheepwash Ghyll.

Figure 7. Good combination of fern-rich bankside flora and in-channel habitat mosaic created by debris dams.

Figure 8. Bryophytes on the steeper banks of the ghyllstream.

The dense tree canopy along some sections, combined with the apparently heavy public use of the streamsides for recreation, inhibits the development of riparian ground flora (Figure 9). However, where holes in the canopy allow more light then higher plants appear (Figure 10).

Figure 9. Undeveloped flora under dense tree canopy.

Figure 10. Higher plant flora establishing on the stream banks as the tree canopy is broken.

Flushes feed into the main stream at intervals, dominated by *Sphagnum* (Figure 11), interspersed with birch, alder and other trees. These flushes are undrained and intact and provide excellent natural continuity between mire and stream habitat. In places, trees and fallen wood in these flushes create a complex habitat mosaic, with runnels cutting through the mire (Figure 12). Pools also form, adding standing water habitat interest (Figure 13).

Figure 11. Flush feeding into Sheepwash Ghyll.

Figure 12. Flush with fallen and decaying tree across it adding habitat interest.

Figure 13. Pool formation within flushes.

In some places mire vegetation is dominated by tussock-forming grasses and sedges, adding habitat diversity (Figure 14).

Figure 14. Variation in mire vegetation associated with Sheepwash Ghyll.

There are relatively few signs of adverse human impacts on the stream and mire system. The most obvious influences are from public recreation along the stream banks (particularly the lower sections of Sheepwash Ghyll), unsympathetic culverting of the stream for forest tracks (Figure 15) and some Rhododendron invasion of the springheads.

Figure 15. Culverting of Sheepwash Ghyll.

An *ad hoc* composite sample of aquatic macroinvertebrates was taken as we walked up Sheepwash Ghyll. The bedrock sections provide limited habitat, but Simuliid larva (blackfly) take advantage of the firm anchorage provided (they form colonies on stable substrates and filter material from the water). Nemourid stoneflies (*Nemoura cinerea*) can be found behind debris dams where leaf litter and fine organic sediment accumulate. In the swifter following sections with coarse substrates, the predatory stonefly *Isoperla grammatica* is common alongside mayfly nymphs (Baetidae and Leptophlebidae) and freshwater shrimps (*Gammarus pulex*). Pea mussels (Pisidium sp.) are present in the finer sediment.

The red gelatinous alga *Batrachospermum* is also present, which favours cool, low-nutrient streams particularly near their spring sources.

Key messages

Overall, the streams of St Leonards Forest are highly natural and provide excellent stream/mire habitat mosaics that are a natural characteristic of the landscape. The intact flushes at the head of the streams are rare in lowland England and are of high conservation interest. The site should be seen as part of a series of natural stream/flush/mire systems running off the High Weald that should be conserved in an integrated way.

1. Notified features

River/stream habitat, including the connected flushes, should be a notified feature of the site, as part of a natural stream/flush/mire habitat mosaic. Thought should be given to seeing the SSSI woodland/mire/stream systems running off the High Weald as a local SSSI network with common management principles.

2. Objectives

Natural ecosystem function should be the principal objective for stream habitat. This concept is embedded in Common Standards Guidance for river habitat and in guidance on priority river habitat (Mainstone *et al*. in press).

3. Priority habitat mapping

These streams should be included in the 2014 map of priority river habitat that is now subject to on-going local refinement.

4. Management issues

Trees and woody debris - The importance of the interaction between standing and fallen wood and mire and stream habitat is clear here as it is elsewhere in the headwater stream systems visited in Sussex and Kent. Fallen trees across mire and stream habitat should be left in place to generate characteristic habitat mosaics and provide dynamism in the stream/mire system. Debris dams should be allowed to develop and decay

naturally. It may be that woody debris needs to be large (fallen trunks) to resist high winter flows, at least in sections where bedrock is most extensive.

Forest tracks – Depending on the nature and frequency of use, widespan bridges or fords should be used instead of culvert pipes. The extensive bedrock within the stream channel provides excellent opportunities for fording points.

Canopy cover – Natural tree fall is important in generating glades within the woodland which can be exploited by higher plants associated with streams and their riparian zone. It is worth considering whether the age structure and management of the woodland allows for natural glade creation, or whether natural tree fall needs to be mimicked to generate these conditions. However, care needs to be taken to avoid the loss of riparian trees whose root systems are interacting with the stream channels, or are stabilising mires and flushes feeding the stream system. These trees are essential to the full expression of the characteristic stream/mire habitat mosaic.

Rhododendron – Some clearance work is necessary to avoid invasion of the spring heads and loss of characteristic flora.

5. High Weald streams as a network

The headwater streams of the High Weald, including their associated spring and flush habitat, constitute a highly important habitat resource. There are many fine naturally functioning examples of stream habitat, most of which are still connected to intact flush and spring habitat. Their association with ancient woodland, and rare species such as mosses, adds to the biodiversity importance of the landscape. Whilst these streams have high conservation value in their own right, they are also critical to the health of downstream river systems, and when functioning naturally they provide a range of ecosystem services that are too often taken for granted. These services include nutrient processing, water cooling (in association with woodland or riparian trees) and flow regulation, the latter in relation to moderating peak flows and supporting base flows in dry weather.

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 *et al.* in press).

The St Leonards Forest headwater stream system should be seen as part of a series of headwater systems of high conservation value running off the High Weald that should be conserved in an integrated way based on naturally ecosystem functioning. These streams (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. Key messages to include:

- Maintain or restore continuity of natural water-related habitat from valley mires, through springs to stream channels.
- Minimise physical interventions to the channel and its 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 addition, a local initiative to find or develop definitive names for all of the streams in the High Weald would be a positive step for headwater stream conservation. The lack of names (or at least well-known names) seems symptomatic of a lack of societal value assigned to headwater streams. A naming initiative would help focus greater attention on them and their conservation importance, encourage greater care over activities affecting them, and foster public engagement.

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

Mainstone, C.P., Skinner, A., Peters, S. and Rogers, M. (2015) Refining the priority river habitat map for England: a report on recent revisions and proposals for on-going refinement. Natural England joint publication JP012.

Mainstone, C.P., Laize, C., Webb, G. and Skinner, A. (2014) Priority river habitat in England – mapping and targeting measures. Natural England joint publication JP006.

Mainstone, C.P., Hall, R. & Diack, I. (in press). A narrative for conserving open freshwater and wetland habitats in England. Natural England Research Report NERR064. Natural England, Sheffield.

Mainstone, C.P., Laize, C. and Webb, G. (Awaiting publication) Review of the river SSSI series in England. To be published as a Natural England Research Report.

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