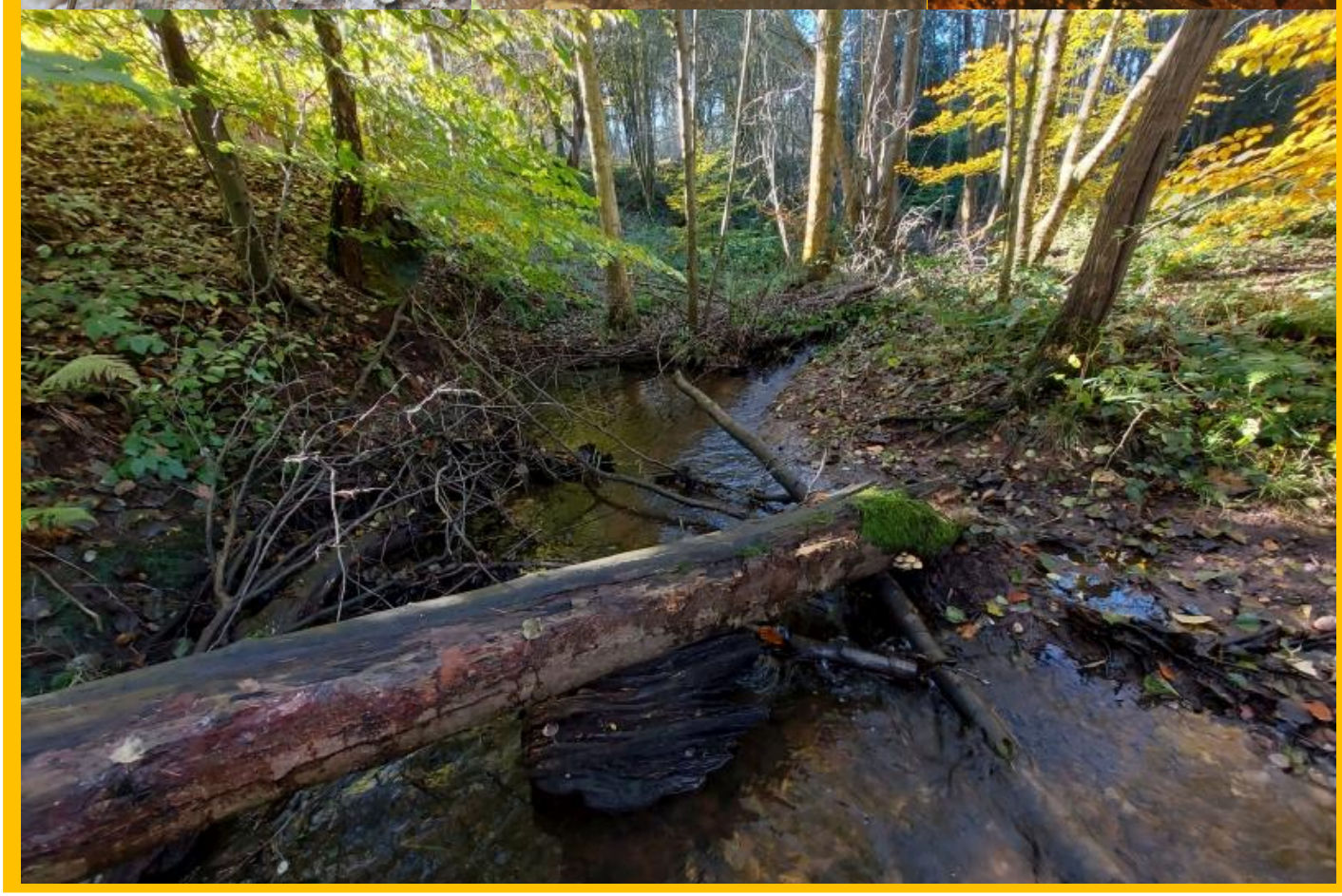
A Survey of the Aquatic Invertebrates of Cannock Chase's Forest Streams in Staffordshire, 2023-24, including assessments of water and habitat quality, and future management recommendations.



Report prepared for:	**Cannock Chase National Landscape**
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Date:	**February 2025**
Title:	**'A Survey of the Aquatic Invertebrates of Cannock Chase's Forest Streams in Staffordshire, 2023-24, including assessments of water and habitat quality, and future management recommendations'**

Summary

- Cannock Chase National Landscape commissioned Staffordshire Wildlife Trust (SWT) to undertake aquatic macroinvertebrate surveys at 18 sites along 11 forest streams.
- The 18 surveys were undertaken in autumn 2023 and repeated in spring 2024.
- Strict biosecurity disinfection routines were observed for the duration of the fieldwork to guard against the transmission of fish diseases and crayfish plague or the accidental movement of non-indigenous species.
- A standardised methodology for 'kick sampling' was used for the surveys.
- Baseline surveys have previously been undertaken at 11 of the 18 survey sites between 2014 and 2022.
- Collected samples were identified by professional biologists at Aquascience Consultancy.
- Results confirm Cannock Chase as nationally important for the globally-endangered White-clawed Crayfish. Several nationally scarce invertebrate species were also recorded.
- Results were analysed using biometric fingerprinting to determine overall species richness, water quality and any negative pressures including low flows, pesticide signatures, silt burdens or nutrient loading.
- Where possible, comparisons were made between individual baselines and the 2023-24 surveys to assess trends over time.
- The results and analysis have been used to inform management recommendations for key sites, watercourse reaches and sub-catchments. These are included in Section 5.
- Full survey results for autumn 2023 and spring 2024 and the analysis by Aquascience Consultancy are included in the two appendices.

Contents

A British endemic species: the Orange-striped Stonefly (Perlodes mortoni)

A Survey of the Aquatic Invertebrates of Cannock Chase's Forest Streams, Staffordshire, 2023-24

1. Introduction & Aims

The 'forest streams' at Cannock Chase's flow from its ancient, undulating plateau in a radial drainage pattern.

Several of these streams are associated with medieval and post-medieval industrial works, when water provided the principal source of power (Taylor & Deane, 2015). On-line pools can be found along these streams which date back to these periods of activity. Further disruption (that is from an ecological standpoint), modifications, impoundments, diversions and culverting of forest streams were carried out at various points as a result of rural estates' landscaping (including the creation of online ornamental lakes and duck decoys), mining activities, the construction of World War I training camps (with associated roads, water pipes, effluent pipes, pump houses, sewage treatment beds, boreholes and fire pools), forestry (drainage, plantations, roads and tracks), agriculture (additional drainage, straightening and deepening), new roads, rail lines and golf courses.

Despite these modifications many forest streams at Cannock Chase are fascinating and unusual in terms of their hydrology. They are fed by groundwater moving through bands of gravels deposited at the end of the last ice age. Following periods of prolonged and heavy rain there is often a lag-time of several days before the streams 'respond'. The springs are strengthened as additional groundwater travels through the gravels and areas of deposited peat resulting in a 'pulse' of elevated flow down through the system. In more natural, less unmodified, reaches this pulse will be energetic enough to 'lift' leaves, twigs, small branches and fine sediment and 'drift' them a short way downstream to accumulate at the next gradient break, typically a fallen tree, embedded branch, root plate or debris dam.

The middle reaches of the Stony Brook

The upper reaches of the Sher Brook

Due to a lack of information about the ecological health of these streams, this study was devised to investigate the status of the aquatic invertebrates -as prime 'indicator species' of biological health- at 18 sites along 11 forest streams across the National Landscape.

The main aims of the forest streams' study were to:

- Assess the health of the main watercourses at Cannock Chase;
- Benchmark against previous surveys carried out between 2014 and 2022;
- Generate further records of aquatic invertebrates;
- Identify rare, scarce and specialist species;
- Complete an analysis of water quality pressures (silt burdens, pesticides, nutrient loading, low flows, etc.) through biometric fingerprinting;
- Recommend priority actions for the future management of these watercourses between 2025-30, and beyond.

2. Methodology

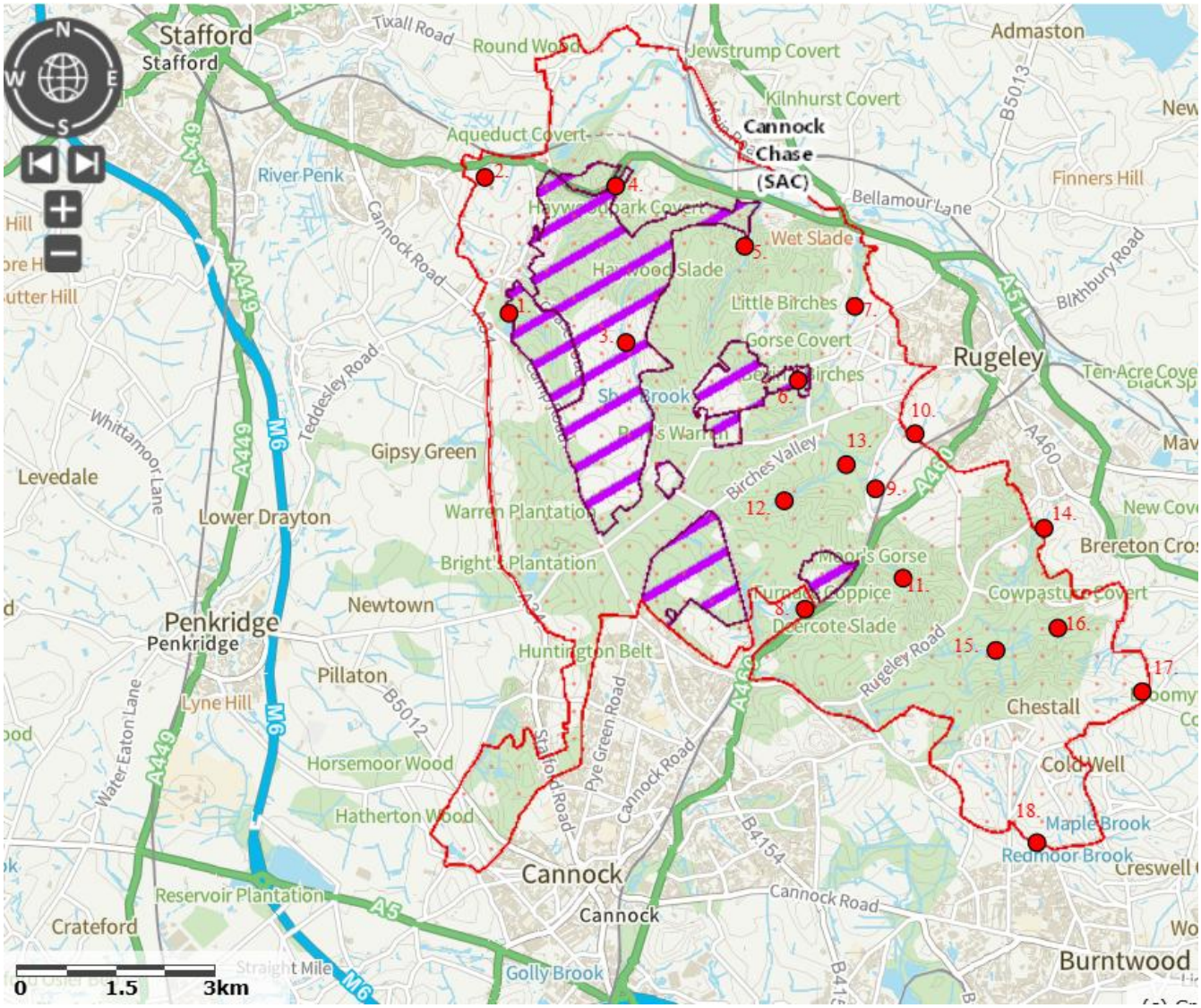
Macroinvertebrates sampling was undertaken at each site by Nick Mott of Staffordshire Wildlife Trust using the standard three minute kick-sweep and one minute hand search protocol employed by the Environment Agency (Environment Agency, 1997). This survey technique requires areas of shallow, flowing water (riffles). Macroinvertebrate samples were preserved *in-situ* during the field survey work in 70% Industrial Denatured Alcohol (IDA) and delivered to the Aquascience Consultancy laboratory for identification and for analysis.

3. Site Selection

Forest stream survey sites were selected to give a good representation of the habitats present along individual reaches of each watercourse (see the map and table below).

Forest Streams' survey sites: CCh1 - CCh12

Forest Streams' survey sites: CCh13 - CCh18



Location Map for the 18 Survey Sites at Cannock Chase National Landscape, 2023-24. The SAC is labelled.

Site Number	Site	Watercourse	Grid Reference	Survey Date Autumn'23	Survey Date Spring'24
CCh1	Brocton	Oldacre Burn	SJ 96990 18880	17/11/2023	03/05/2024
CCh2	Milford Hall	(Oldacre Burn) Cressel Brook	SJ 96526 20955	14/11/2023	03/05/2024
CCh3	Cherry Slade	Upper Sher Brook	SJ 98703 18408	25/10/2023	25/04/2024
CCh4	Alder Carr	Lower Sher Brook	SJ 98560 20860	17/11/2023	25/04/2024
CCh5	Abraham's Valley	Old Brook	SK 00551 19942	01/11/2023	04/05/2024
CCh6	Bevin's Birches	Upper Stafford Brook	SK 01450 17820	10/01/2023	04/05/2024
CCh7	Stafford Brook SSSI	Lower Stafford Brook	SK 02226 19043	31/10/2023	04/05/2024
CCh8	Furnace Coppice	Upper Rising Brook	SK 01440 14310	01/11/2023	24/04/2024
CCh9	Sheepwash Farm	Central Rising Brook	SK 02500 16120	31/10/2023	19/04/2024
CCh10	Slitting Mill	Lower Rising Brook	SK 03150 17070	31/10/2023	19/04/2024
CCh11	Seven Springs	Upper Fallow Stream	SK 03051 14740	31/10/2023	19/04/2024
CCh12	Fairoak	Upper Stony Brook	SK 01120 15980	11/11/2023	23/04/2024
CCh13	Birches Valley	Lower Stony Brook	SK 02053 16557	11/11/2023	23/04/2024
CCh14	Brereton	Brereton Brook	SK 05160 15670	14/11/2023	04/05/2024
CCh15	Hare's Hill	Lower Shropshire Brook	SK 05419 14014	11/11/2023	01/05/2024
CCh16	Beaudesert Old Park	Upper Shropshire Brook	SK 04480 13700	11/11/2023	01/05/2024
CCh17	Piggot's Bottom	Ben Brook tributary	SK 06620 13070	10/11/2023	15/04/2024
CCh18	Gentleshaw Common	Redmoor Brook	SK 05100 10710	10/11/2023	01/05/2024

4. Biosecurity

'Check, Clean, Dry' was strictly observed for these survey visits. Prior to commencing the aquatic invertebrate sampling all equipment and footwear was thoroughly dried and disinfected (using 'Virkon Aquatic') to safeguard against the transmission of crayfish plague (and amphibian and fish diseases). All survey work was carried out from the upstream working downstream to avoid the likelihood of carrying crayfish plague spores past barriers such as culverts, weirs, sluices and natural falls. The disinfection routine was repeated at the end of the downstream survey section reach. All equipment was also allowed to dry after disinfection. Separate waders, nets, trays and buckets were used for survey sites in side streams or different sub-catchments visited on the same day. Individual kits were separated in the back of the vehicle in sealed, waterproof, labelled containers. The majority of the surveys were completed by a single surveyor to help reduce biosecurity risks and to minimise disturbance to these sensitive habitats.

5. Survey Results & Analysis

- ***The full set of results and analysis are in the two appendices.***
- ***The biometric fingerprinting analysis is summarised below.***

Biometric Fingerprinting:

Aquatic invertebrates are the ultimate indicators of the biological health of watercourses. The presence -or absence- of particular species can reveal a great deal about the water quality, habitat quality and any adverse pressures they have been enduring. Some species, like the Stonefly *Dinocras cephalotes*, are highly sensitive to any changes to their underwater world and will be one of the first to disappear. Other invertebrates, like red blood worms (non-biting midge, *Chironomidae* larvae), can endure quite extreme negative pressures and continue to exist.

Aquatic invertebrates employ a fascinating variety of life strategies. They live in the running water (with some stonefly, mayfly [e.g. the Green Drake *Ephemera danica*] and dragonfly species developing as nymphs for up to two years before hatching out as adults) and need the habitats, water quality, water flows, water chemistry and water temperature to stay within a particular set of parameters and conditions during this time for them to survive and develop all the way through. Some mayfly species (like the Blue-winged Olive *Serratella ignita*) lay their eggs into the stream gravels where they overwinter before continuing to develop the following spring. Of course, these eggs are extremely vulnerable to pollution or disturbance during this period.

Adult male Blue-winged Olive Mayfly

Adult male Green Drake Mayfly

By feeding in the results of the aquatic invertebrate surveys into a series of metrics, it is possible to identify any negative pressures (for example: nutrient loading, silt burdens, low flows, or pesticides) affecting the overall health of the watercourse reach and its inhabitants. It is also possible to benchmark the survey results against baseline surveys, or with other sites where the same methodology has been used.

Metrics:

CCI, LIFE, PSI, SPEAR, TRPI and the Saprobic index all interrogate a combination of trait-based characteristics for aquatic invertebrates at species, genus and family level to assign particular scores, which are weighted by abundance (actual or logarithmic scales), and use particular mathematical calculations which have been tested against measured parameters.

Autumn 2023 Results

Site	Brocton	Milford	Cherry Slade	Alder Carr	Abraham's Valley	Bevin's Birches	Stafford Br. SSSI	Furnace Coppice	Sheepwash Farm	Slitting Mill	Seven Springs	Fairokak	Birches Valley	Brereton	Hare's Hill	Beaudesert Old Park	Piggot's Bottom	Gentleshaw Common
Watercourse	Oldacre	Cressel (Oldacre)	Sher	Sher	Old	Stafford	Stafford	Rising	Rising	Rising	Fallow	Stony	Stony	Brereton	Shropshire	Shropshire	Ben trib.	Redmoor
Code (CCh)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
BMWP	77	94	150	126	106	88	97	90	162	102	80	67	103	69	44	79	62	47
ASPT	6.42	6.27	7.14	7.00	6.63	6.29	6.06	6.00	6.48	5.67	6.15	6.09	5.72	5.75	6.29	7.18	6.20	5.22
WHPT	81.3	101.6	179.2	164	132.8	124	121.7	90.6	186	130.1	101	89.3	119.5	84.5	50	82.8	81.5	51.7
WHPT ASPT	6.78	6.35	7.47	7.13	6.99	6.89	6.41	6.04	6.89	6.20	7.21	6.38	6.29	6.50	6.25	6.90	6.79	5.74
Number of Taxa	12	15	21	18	16	14	16	15	25	18	13	11	18	12	7	11	10	9
Riverfly - species	11	9	17	14	14	9	10	9	15	13	9	5	10	9	3	6	7	4
Riverfly - numbers	73	57	143	241	107	39	116	40	107	137	76	40	71	127	3	50	226	60
CCI	6.00	4.36	10.28	15.31	19.13	9.00	5.10	5.20	11.53	8.95	7.09	17.50	7.00	11.25	1.25	6.00	11.88	8.57
LIFE	8.07	8.07	8.32	8.14	8.42	7.88	8.56	7.82	8.12	8.09	7.73	8.44	8.24	7.94	8.33	8.27	8.27	7.63
PSI	82.61	88.00	80.85	76.19	73.68	60.00	83.33	66.67	77.78	60.42	72.41	73.68	78.79	77.78	53.85	66.67	73.08	75.00
SPEAR	45.47	38.61	57.82	60.39	57.11	40.77	41.68	33.26	46.91	31.69	34.60	43.61	38.77	43.22	8.81	42.05	34.51	24.64
TRPI	89.00	93.00	96.00	94.00	95.00	92.00	97.00	66.67	95.00	88.89	95.00	92.00	98.00	88.00	65.00	90.00	90.00	87.00
Saprobic	1.94	1.99	1.71	1.84	1.75	1.79	1.94	1.99	1.79	2.10	1.85	1.50	1.88	1.85	2.05	1.90	1.89	2.00

Good, or only slightly impacted, scores are Green; Moderate scores are Amber; Poor scores are highlighted in Red

Metric	Name / Meaning	Measures	Scores for a Healthy Watercourse
BMWP	**B**iological **M**onitoring **W**orking **P**arty score	Scores, mostly at family level, invertebrate sensitivity to organic pollution. Looks at invertebrate presence but not abundance.	**≥71**
ASPT	**A**verage **S**core **P**er **T**axa	Calculated by dividing the BMWP score by the Number of Taxa (Ntaxa)	**≥6**
WHPT	**W**alley **H**awkes **P**aisley **T**rigg index	As BMWP but using a greater number of Taxa (families)	Requires RIVPACS O:E (observed to expected) for a particular British watercourse
WHPT ASPT	**W**alley **H**awkes **P**aisley **T**rigg **A**verage **S**core **P**er **T**axa	Calculated by dividing the WHPT score by the Number of Taxa (Ntaxa)	Requires RIVPACS O:E (observed to expected) for a particular British watercourse
Number of Taxa	(or NTaxa)	The number of individual species	**≥35**
Riverfly -species	Mayfly, stonefly and caddisfly species	The number of 'Riverfly' species	**≥20**
Riverfly -numbers	Total mayfly, stonefly and caddisfly	The number of individual 'Riverflies'	N/A
CCI	**C**ommunity **C**onservation **I**ndex	The community richness and relative rarity of its species	**≥15**
LIFE	**L**otic **I**nvertebrate **F**low **E**valuation	Indicates the flow velocity	**≥7**
PSI	**P**roportion of **S**ediment-sensitive **I**nvertebrates	Indicates the level of sedimentation	**61-100**
SPEAR	**Spe**cies **A**t **R**isk	Indicates the level of pesticides, herbicides and complex chemicals	**≥33**
TRPI	**T**otal **R**eactive **P**hosphurus **I**ndex	The level of nutrient enrichment	**61-100**
Saprobic	Organic enrichment	The amount of degradable organic material	**2.29-1.0**

Credit: Aquascience Consultancy

- 13 sites were of good-moderate quality. Three sites were of moderate-poor quality. Two sites were of poor quality.
- Poor water quality was recorded at both the Shropshire Brook (CCh15, Hare's Hill) and the Redmoor Brook (CCh18, Gentleshaw Common). Both were impacts from suspected pesticide pollution incidents.

Spring 2024 Results

Site	Brocton	Milford	Cherry Slade	Alder Carr	Abraham's Valley	Bevin's Birches	Stafford Br. SSSI	Furnace Coppice	Sheepwash Farm	Slitting Mill	Seven Springs	Fairoak	Birches Valley	Brereton	Hare's Hill	Beaudesert Old Park	Piggot's Bottom	Gentleshaw Common
Watercourse	Oldacre	Cressel (Oldacre)	Sher	Sher	Old	Stafford	Stafford	Rising	Rising	Rising	Fallow	Stony	Stony	Brereton	Shropshire	Shropshire	Ben trib.	Redmoor
Code (CCh)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
BMWP	124	96	135	145	139	82	96	119	139	176	100	160	151	143	105	118	97	42
ASPT	7.29	6.00	6.43	6.59	8.18	7.45	6.40	5.90	6.95	7.04	6.25	7.27	7.19	7.15	6.56	6.56	5.71	4.67
WHPT	138.3	99.8	161.2	185.4	158.5	103.6	98.1	140.1	166	197.3	109.9	186.8	169	161.1	115.9	133.4	111.4	49.2
WHPT ASPT	7.68	6.24	7.01	6.87	8.34	7.40	6.54	6.37	7.55	7.31	6.87	7.47	7.35	7.32	6.82	6.67	6.19	4.92
Number of Taxa	23	20	29	36	21	16	20	32	29	37	20	34	35	29	17	25	20	14
Riverfly - species	18	11	16	20	18	10	13	20	19	23	11	21	19	10	9	14	9	6
Riverfly - numbers	169	120	326	130	154	630	224	213	420	261	252	280	184	71	23	188	264	34
CCI	10.00	14.00	9.52	10.00	10.00	10.00	5.57	13.70	13.39	14.00	11.92	13.72	15.05	11.11	12.83	18.67	4.36	16.10
LIFE	8.20	7.83	7.96	7.80	8.30	7.71	8.00	8.06	8.50	8.25	7.94	8.26	8.41	8.44	8.27	8.10	7.94	7.44
PSI	84.62	68.57	73.33	58.93	81.08	69.57	82.14	60.38	84.21	76.12	75.00	84.75	85.71	85.42	73.08	65.00	60.53	55.56
SPEAR	42.61	58.55	59.72	58.87	67.76	61.79	39.31	49.49	61.57	41.18	48.78	57.43	53.22	27.02	33.63	42.46	37.78	27.67
TRPI	98.00	83.33	88.89	97.90	99.10	94.67	95.00	71.43	99.00	85.00	97.00	92.00	98.23	96.00	93.45	71.43	72.72	81.00
Saprobic	1.75	1.90	1.63	1.88	1.56	1.91	1.75	32.00	1.60	1.96	1.76	1.55	1.85	1.85	1.99	1.79	1.79	2.03

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Saprobic	Organic enrichment	The amount of degradable organic material	**2.29-1.0**

Credit: Aquascience Consultancy

- 15 sites were of good-moderate quality. Three sites were of poor quality.
- Poor water quality was detected on the Upper Rising Brook at CCh8 Furnace Coppice with organic enrichment.
- Further pesticide pollution signatures were recorded on the Brereton Brook at CCh14 and again on the Redmoor Brook at CCh18 Gentleshaw Common.

Further Analysis of the Combined Survey Results

- Out of 11 watercourses surveyed six are rated good-moderate (Oldacre, Sher, Old, Stafford, Fallow, Stony), four are rated moderate-poor (Rising, Shropshire, Brereton and Ben), and one is rated poor (Redmoor).

- The main factor causing moderate watercourse scores is sedimentation. Other likely causes are habitat fragmentation due to culverts and on-line pools resulting in reduced species' abundance and diversity.

- The factors causing poor watercourse scores are pesticides, herbicides and/or complex chemicals, and organic enrichment.

- When measured against the various baselines undertaken between 2014-22, the results of the 2023-24 surveys highlighted improvements in the aquatic species community conservation composition (CCI) for some sites including Oldacre Burn (Brocton), the Lower Sher Brook (Alder Carr), the central Rising Brook (Sheepwash Farm) and the Ben Brook tributary (Piggot's Bottom). All of the sites exhibited variable fortunes for rarer aquatic species' composition during this study period and highlighted both the fragile nature of these watercourses and the crucial need for ongoing protection and sensitive management. Further analysis is presented in Section 6 and in the appendices.

- Several scarce, rare and endangered invertebrate species were recorded during the 2023-24 surveys and are discussed in Section 6 (see 'key species') and in the two appendices.

- White-clawed Crayfish (globally endangered) were recorded at six sites during the Autumn 2023 and Spring 2024 surveys. Additional surveys and monitoring was carried out by SWT from July-October 2023 and July-October 2024 (to coincide with the approved crayfish survey season) to confirm the presence of White-claws at three additional sites (Fallow Stream at Seven Springs, Oldacre Burn at Brocton and the Ben Brook tributary at Piggot's Bottom). Taken together, these populations are of national importance. They are, however, highly threatened by the spread of both American Signal Crayfish and crayfish plague.

(Left) Adult female American Signal Crayfish; (Right) Adult male White-clawed Crayfish

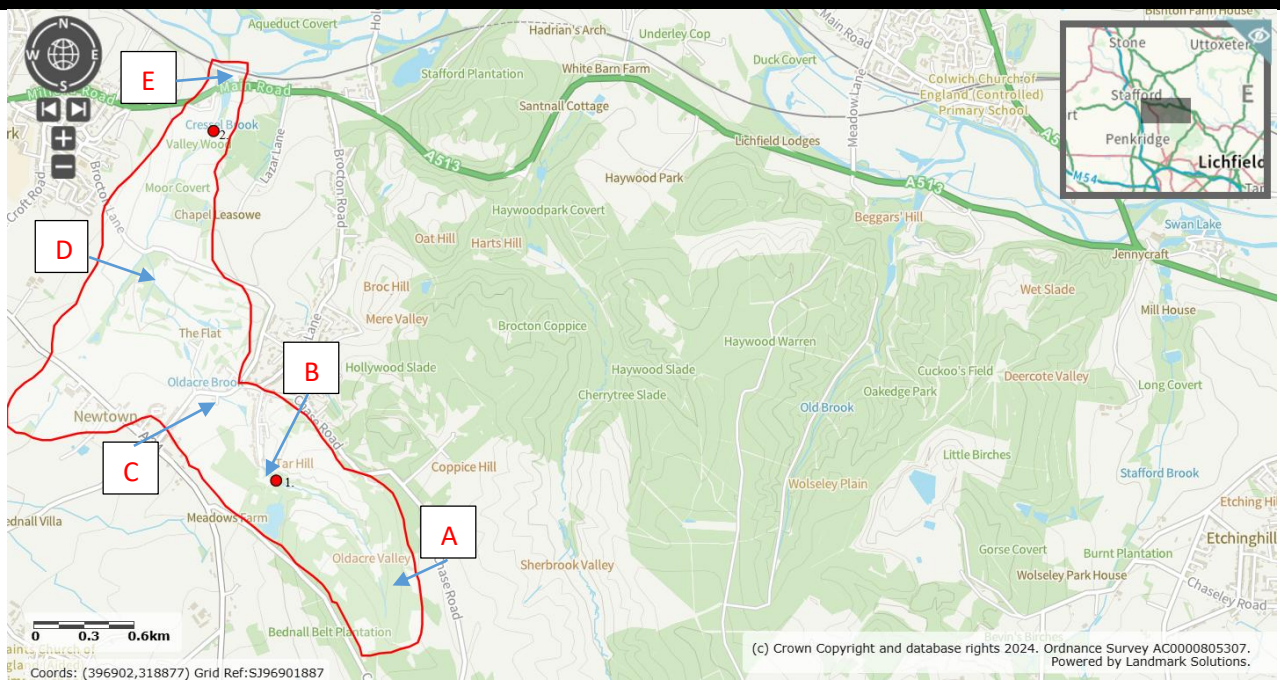

(Left) The Yellow Splinter Cranefly Lipsothrix remota larva in saturated wood, and (middle) emerging as an adult

The Nationally scarce Logjammer Hoverfly Chalcosyrphus eunotus. Female laying eggs into saturated wood at Sher Brook

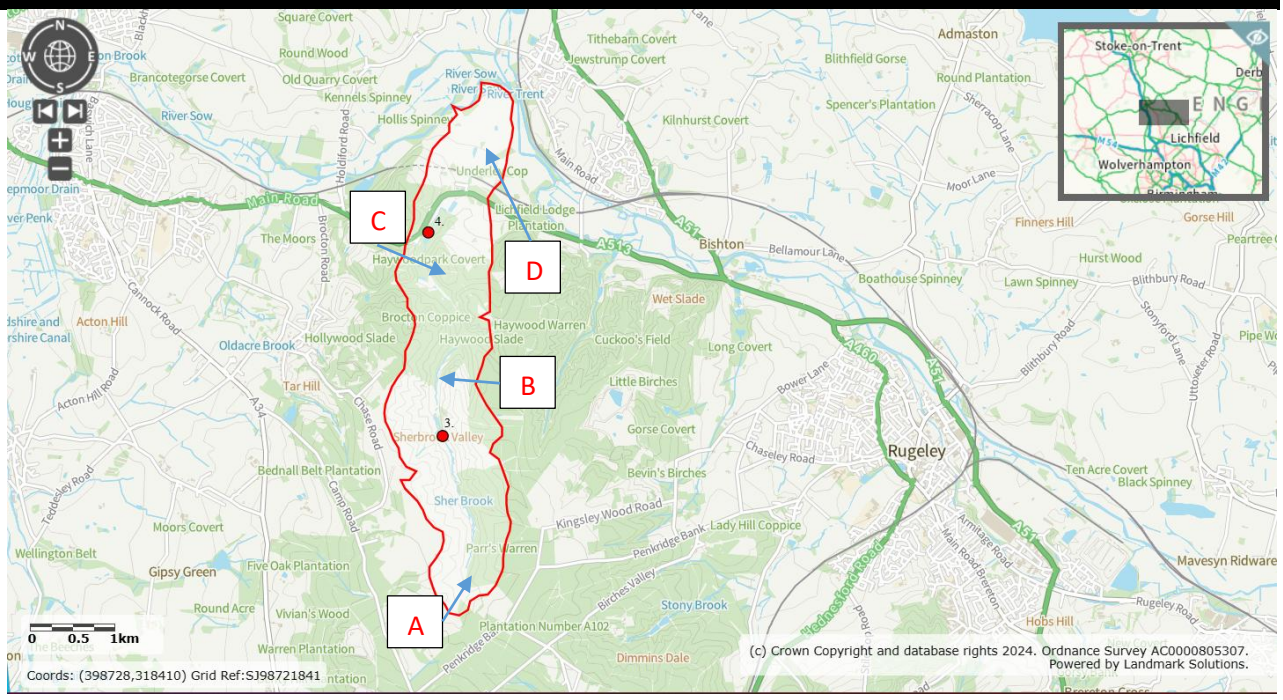

The Orange-striped Stonefly Perlodes mortoni. A sentinel species for clean and cold streams. (Left) nymph; (Right) adult

6. Recommendations. Action Plans

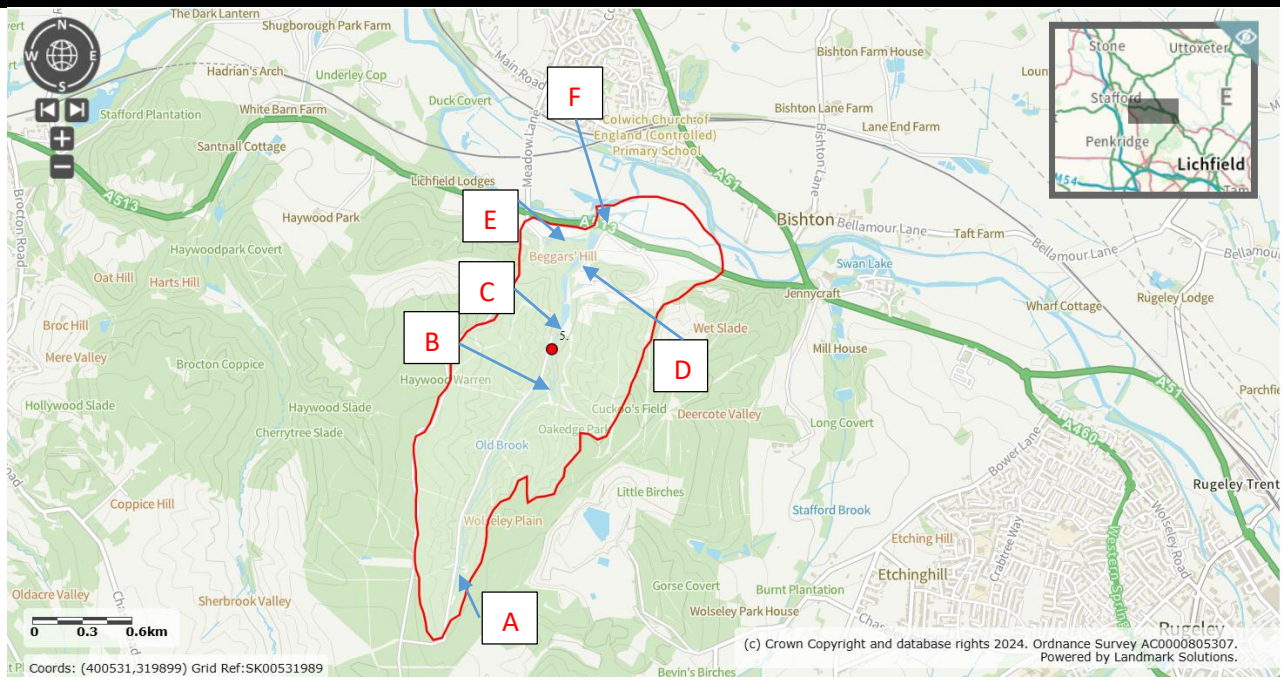
Watercourses	**Oldacre Burn / Cressel Brook** is a spring-fed watercourse that rises at the head of Oldacre Valley at Cannock Chase SAC. It runs through valley mire and wet heath habitats, then through the village of Brocton, Brocton Hall golf course and the Milford Hall estate before discharging into the River Sow at Milford.
Survey Sites	**1.Brocton, 2. Milford Hall**
Baselines	Site 1 was previously surveyed in spring 2021.
Water quality / Pressures?	The spring 2021 at Site 1 results were potentially impacted by a pesticide signature (possibly flea treatments from dog collars). The repeat surveys saw a marked recovery at this site.
Habitat quality / Impacts?	The headwaters are in a near natural state. The remainder of the stream has been drastically modified: in Brocton it has been straightened and runs in a concrete lined channel; at Brocton Hall Golf course the majority of its length has been straightened and often reinforced; at Milford Hall it has been previously straightened but is now largely fenced with a buffer strip and is re-naturalising. It then runs through two online pools and a culvert before reaching the River Sow.
Key Species	White-clawed Crayfish are found in the headwaters of Oldacre Burn, Brocton Pool LNR and at the Milford Hall estate. Caddis *Lype reducta* at site 1 and the stonefly *Isoperla grammatica* at site 2.
Recommended Actions	➢ A: Investigate and analyse changes to the hydrology and vegetation in the valley mire and the wet heath areas. Seek to re-wet using nature-based solutions (NE, SCC) ➢ A-E: Protect, enhance and link the White-clawed Crayfish habitats (SWT) ➢ Promote biosecurity through Check, Clean, Dry to all visitors (ALL) ➢ A-E: Undertake further habitat works (coppicing, hinging, 'chop&drop') to increase the amount of in-channel and riparian deadwood (SCC, SWT, Brocton Hall GC, Milford Hall estate) ➢ B-C: Seek opportunities to de-culvert and re-naturalise the brook through Brocton (Brocton PC, SWT, SCC, EA) ➢ C-D: Re-naturalise sections of the brook course at Brocton golf course. There is a current opportunity to restore a reach where the bank protection has failed. Incorporate more natural methods of installing green bank protection (e.g. over-widening and the installation of wet berms keyed in with pre-planted coir rolls). (BHGC, SCC, SWT)



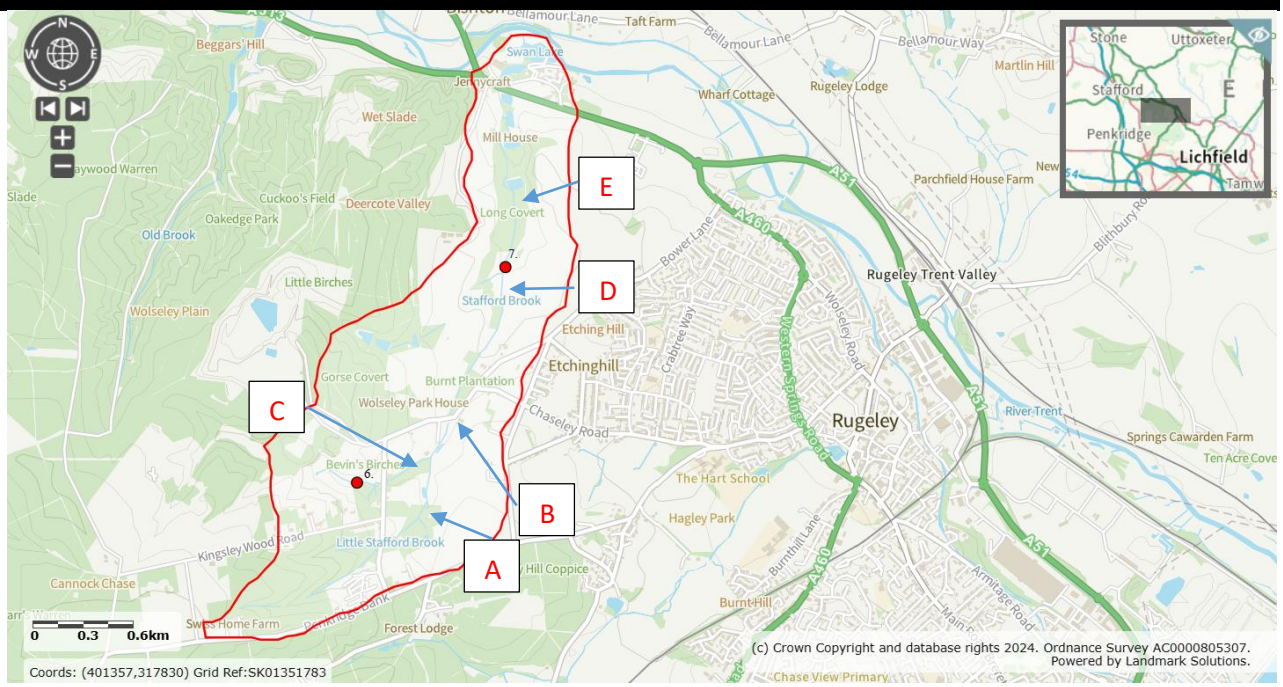
Watercourse	**Sher Brook** is a spring-fed watercourse that rises at the head of the Sherbrook Valley and runs in a predominantly single-thread channel for approximately 6km before entering the Shugborough Estate where it is piped in at least two buried culverts to join the ornamental arm of the River Sow.
Survey Sites	**3. Cherry Slade, 4. Alder Carr.**
Baselines	Cherry Slade autumn 2014 & spring 2015. Alder Carr 2021-22.
Water quality / Pressures?	Excellent water quality in the headwaters is being impacted at times by high levels of visitor pressure (dogs, bikes, horses).
Habitat quality / Impacts?	Visitor pressure is pronounced along a 1.5km reach of Sher Brook upstream of the Stepping Stones and has also markedly increased in the last 10 years along the section adjacent to Punchbowl car park evidenced by erosion and denuded vegetation along the paths and stream margins. Dogs accessing the water in these reaches are causing the main impacts.
Key Species	White-clawed Crayfish have been re-introduced to the Upper Sher Brook following a devastating crayfish plague outbreak in May 2011 which wiped out the entire population (estimated to be approximately 70,000 animals). Other species include the British endemic stonefly *Perlodes mortoni* and the caddis *Lype reducta*. The Lower Sher Brook is also a stronghold for the Logjammer Hoverfly *Chalcosyrphus eunotus* which is a flagship species associated with saturated wood in clean streams.
Recommended Actions	➢ A-B: Investigate and analyse any changes to the hydrology and vegetation in the valley mires and the wet heath areas. Seek to re-wet using nature-based solutions (NE, SCC, CCNL, SWT) ➢ A-D: Protect and enhance the White-clawed Crayfish habitats (NT, SCC, SWT) ➢ Promote biosecurity through Check, Clean, Dry to all visitors (ALL, especially Shugborough) ➢ C-D: Deliver the wetland restoration components of the NT Wood Pasture Plan to complete major coppicing works in the wet woodland compartments in the Lower Sher Brook. Undertake further habitat works (coppicing, hinging, 'chop&drop', ring-barking, winching) to increase the amount of in-channel and riparian deadwood, increase biocomplexity, re-wet stream margins and promote channel anastomosing. Release beavers. (NT, SCC, SWT) ➢ A-C: Continue to reinforce the White-clawed Crayfish population (SWT, Buglife, NT, SCC)



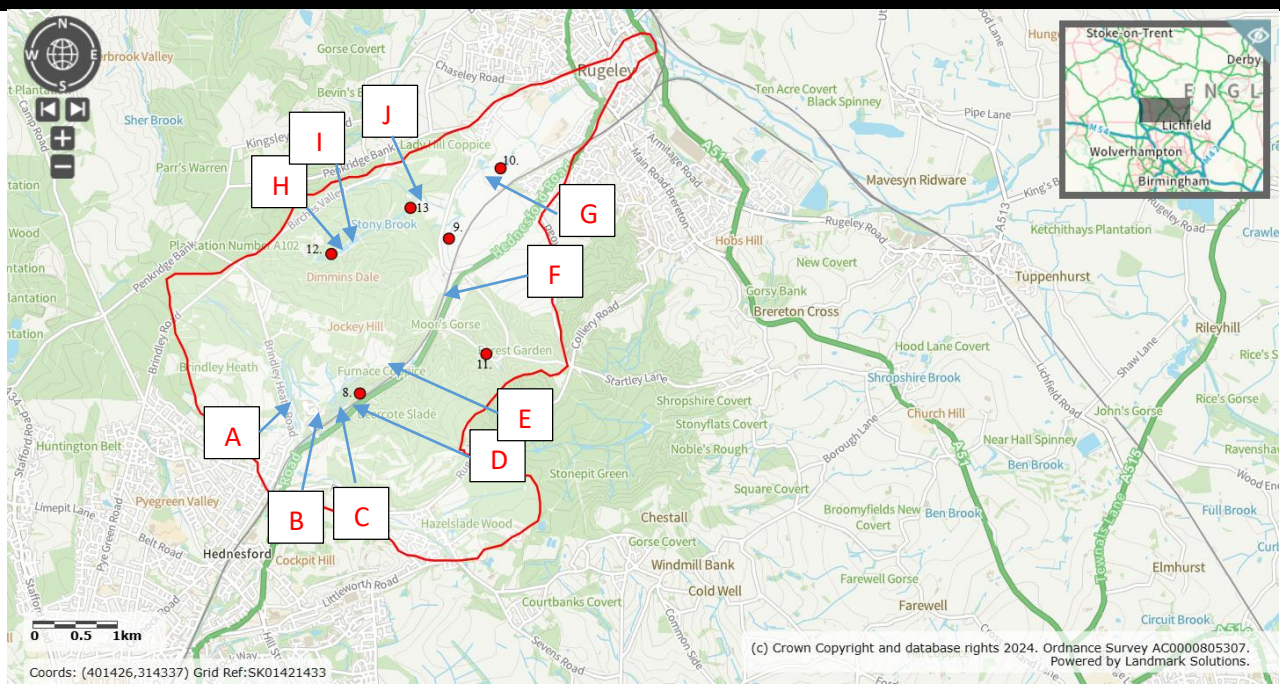
Watercourse	**Old Brook** is a fed by a plethora of springs along its length. The upper reaches are part of the SAC and are in a near natural state. In the middle reaches the original stream course has been diverted to run through a series of excavated on-line fishery ponds. A major project was carried out by SWT, FWAG and the EA in 2006 to restore the Old Brook to its original channel at Navigation Farm. The **Short Brook** is a left hand tributary joining at the lower reaches. It rises at Seven Springs.
Survey Sites	**5. Abraham's Valley**
Baselines	**2014-15**
Water quality / Pressures?	No impacts detected
Habitat quality / Impacts?	No impacts recorded. This is a near natural reach.
Key Species	Stonefly *Perlodes mortoni*. The cranefly *Epiphragma ocellare* and the Logjammer Hoverfly which are both associated with saturated dead wood. Until 2013 the Lower Old Brook was a stronghold for White-clawed Crayfish, but suspected Crayfish plague outbreaks eliminated them. A trial reintroduction to the headwaters in 2014 was completed but no signs have been seen since 2015.
Recommended Actions	➢ A-B: Review flow pathways from forestry tracks following high rainfall events. Manage and intercept run-off with cross drains and interception ponds (FE) ➢ Review culvert at B and replace with an open bottom pipe arch design, or a bridge (FE, SWT) ➢ A-C: Undertake further habitat works (coppicing, hinging, 'chop&drop') to increase the amount of in-channel and riparian deadwood (FE, SWT). ➢ Consider restoring sections of the Old Brook at C to D (Oakedge Park estate, SWT) ➢ Repair and replace the stream 'diversion bund' at F using imported clay and oak piles (Navigation Farm, SWT) ➢ Investigate potential pesticide signatures at E-F / Seven Springs pool and the Short Brook where there is a high degree of use by dogs (SCC, EA) ➢ A-C: Reintroduce White-clawed Crayfish to the headwaters (SWT, FE)



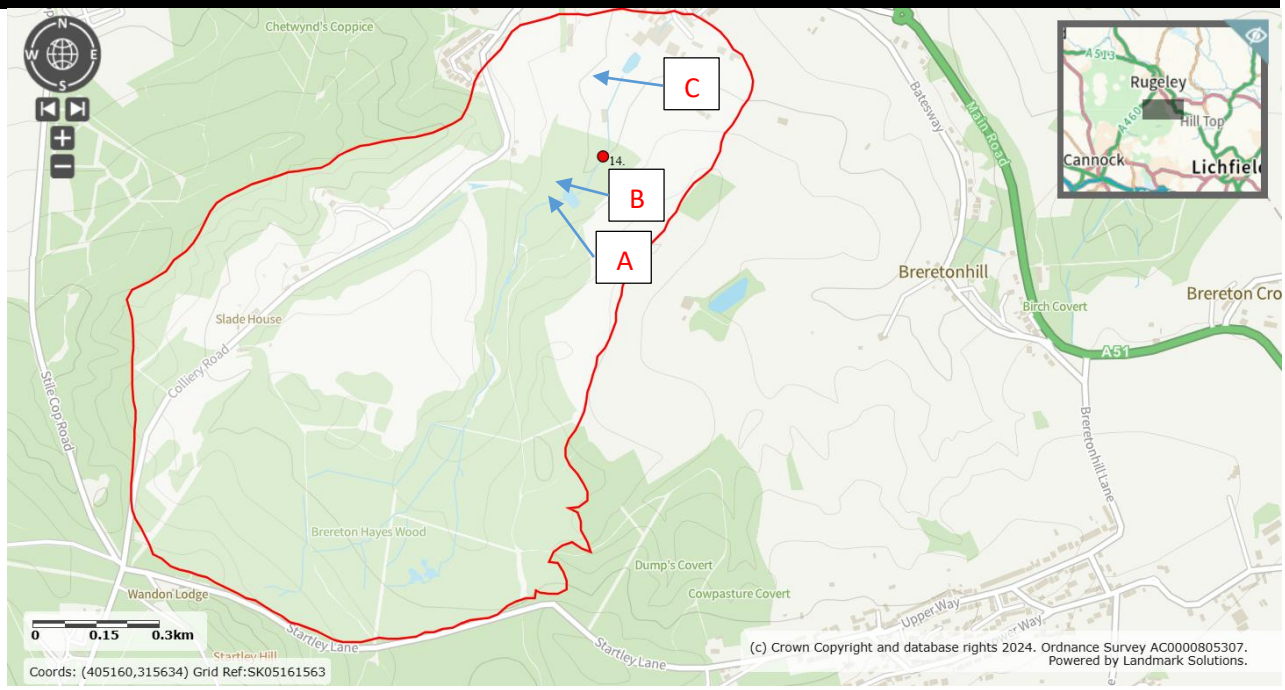
Watercourses	**Stafford Brook** and the **Little Stafford Brook** are spring-fed systems rising at Bevin's Birches (part of the SAC) and at Silvertrees respectively before flowing in a single thread channel through Stafford Brook SSSI, then through four mill and fishing pools before entering SWT's Wolseley reserve. Here the flow is split to run through two ornamental lakes (Swan and Temple) and a series of ponded reaches governed by weirs before discharging into the River Trent.
Survey Sites	**6. Bevin's Birches, 7. Stafford Brook SSSI**
Baselines	None for Site 6. 2014-15 for Site 7
Water quality / Pressures?	Site 7 was slightly impacted by elevated silt burdens during spring 2025. The upstream reach at B has a heavily stocked on-line fishing pool and an unstable stream bed due to repeat dredging and intensive field drainage.
Habitat quality / Impacts?	Much of the Stafford Brook has suffered from previous straightening and deepening. Some sections have been restored or have re-naturalised. Habitat connectivity and integrity has been compromised through the creation of several on-line ponds.
Key Species	Stafford Brook SSSI is a stronghold for the Logjammer Hoverfly. Until 2014 the Lower Stafford Brook at the Wolseley reserve was a stronghold for White-clawed Crayfish, but suspected Crayfish plague outbreaks eliminated them. A trial reintroduction to the headwaters in 2015 was completed but no signs have been seen since that time.
Recommended Actions	➢ A-E: Undertake further habitat works (coppicing, hinging, 'chop&drop') to increase the amount of in-channel and riparian deadwood (landowners, SWT) ➢ A-B. Follow up work will be required at Stafford Brook Stables and Stafford Brook Farm to widen the buffer strip along the watercourse and to crack and remove land drains in this area and to run them through interception ponds. ➢ D-E. Stafford Brook SSSI is in unfavourable condition. Sensitive management is required to restore the fen habitats through conservation grazing and cutting whilst not poaching the stream corridor. (SWT, SCC) ➢ Reintroduce White-clawed Crayfish to the headwaters at C and continue to reinforce. (SWT)



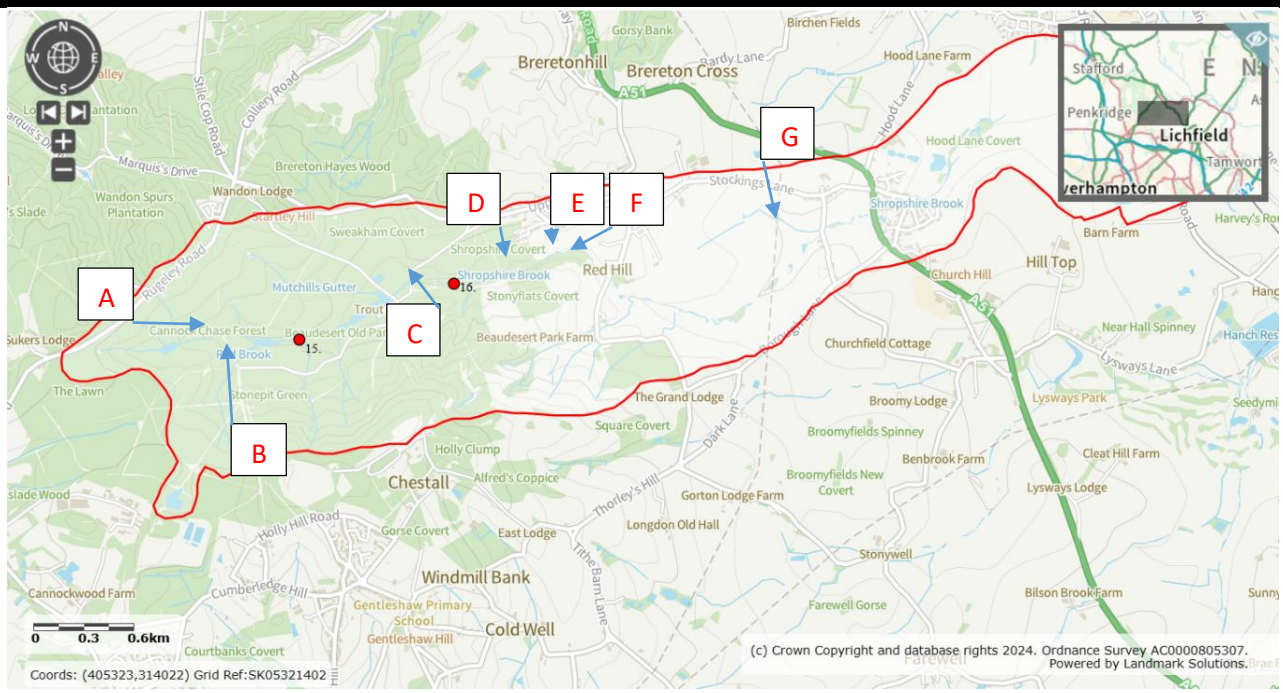
Sub-catchment	**Rising Brook, including Bentley Brook, Stony Brook, and Fallow Stream**
Survey Sites	**8. Furnace Coppice, 9. Sheepwash Farm, 10. Slitting Mill, 11. Seven Springs, 12. Fair Oak, 13. Birches Valley**
Baselines	9. Sheepwash Farm in 2021-22. 11. Seven Springs & 12. Birches Valley in 2014-15
Water quality / Pressures?	Significant organic enrichment pollution was detected in spring 2024 at Site 8 Furnace Coppice. This was from an unknown source. The upstream catchment has urban runoff as well as a nearby outfall from two on-line fishing pools.
Habitat quality / Impacts?	Impacts from urban parts of the Bentley Brook. Modifications include bed and bank reinforcements upstream of furnace Coppice and previous agricultural dredging of the Rising Brook. Two online fishing lakes at Fair Oak have been drawn down after their dams both failed their structural integrity inspections under the Reservoirs' Act.
Key Species	Caddis *Hydatophylax infumatus* for Site 8. Craneflies *Eloeophila trimaculata (1st record for Cannock Chase)* and *Dicranota robusta* (Nationally Scarce) at site 12, Caddis *Lype reducta* associated with saturated wood in small streams found at site 13. White-clawed Crayfish are still found throughout the length of the Rising Brook, most of the Stony Brook, and the Fallow Stream. The Logjammer Hoverfly was recorded for the first time on the Stony Brook in May 2024
Recommended Actions	➢ Undertake further habitat works (coppicing, hinging, 'chop&drop') to increase the amount of in-channel and riparian deadwood (FE, SCC, SWT). ➢ A. American Signal Crayfish were first discovered at Tackeroo Pools in 2015. Surveys of the age classes suggested that the population was already well established by that time and could have been there for 8+ years. A. Continue to contain the Signal Crayfish at the site using 'arrestor mesh' in front and behind the trash screen at the culvert outfall of the downstream pool. Monitor and replace the arrestor mesh as necessary (SCC) ➢ B-C this section of the Rising Brook is a former tip site and the stream margins and bed have been reinforced with a geotextile. Undertake a feasibility study to re-naturalise and restore this reach (SCC) ➢ The Mining Remediation Authority (formerly the Coal Authority) is currently investigating the potential to discharge surplus mine water into the Rising Brook at Furnace Coppice at D. Ensure that there are no negative impacts to White-clawed Crayfish, other aquatic invertebrates and fish (EA, SCC, MRA) and undertake habitat enhancements throughout this reach D-E at Furnace Coppice (SCC, SWT, MRA) ➢ Continue to work at Sheepwash Farm to buffer and protect the Rising Brook corridor habitats from livestock grazing at F-G (SWT) ➢ Remove two major dams (integrity failed engineering reports under Reservoirs' Act) at H and I. Restore stream channel, valley mire and wet woodland habitats (FE, SWT). ➢ Remove culvert at J and replace with stepping stones. This has been agreed with the private landowners and FE. (FE, landowners, SWT)



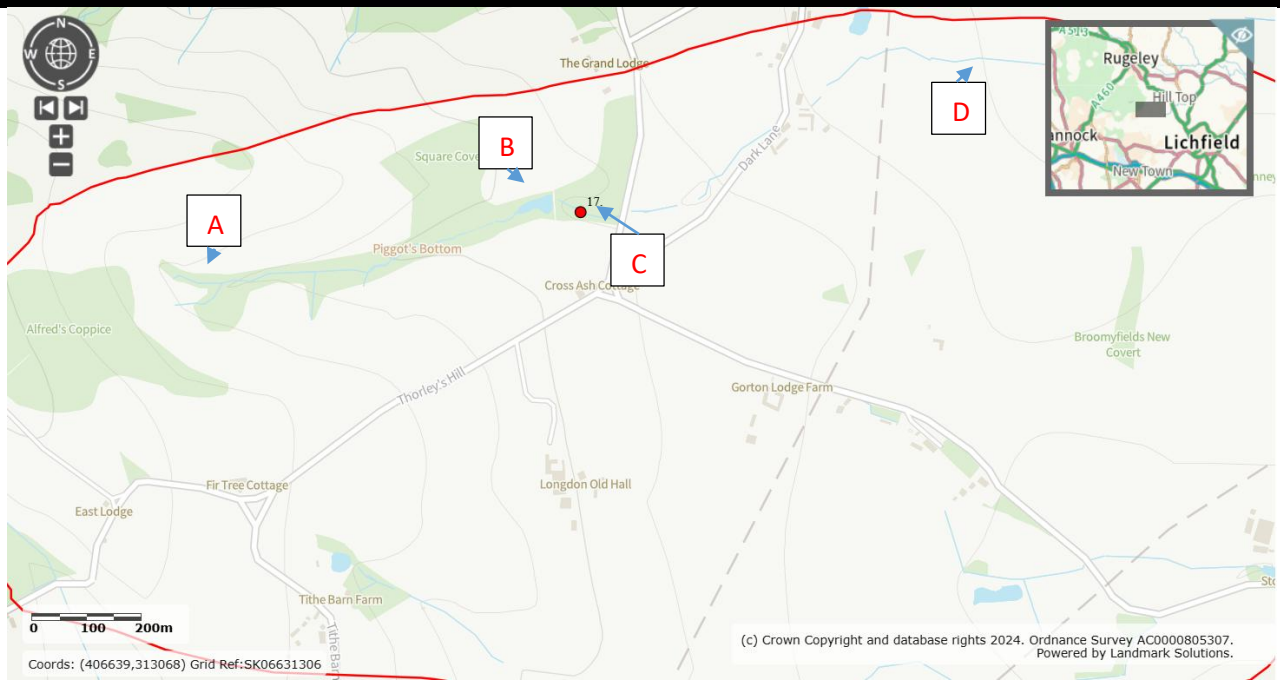
Watercourse	**Upper Brereton Brook**
Survey Sites	**14. Brereton**
Baselines	None
Water quality / Pressures?	A significant 'chemical' (SPEAR) stress was recorded in spring 2024 from an unknown upstream source.
Habitat quality / Impacts?	Upstream habitat has been disrupted by the recent enlargement of an online fishing pool and stocking with Carp.
Key Species	Nationally scarce White-barred Soldierfly *Oxycera morrisii* (1st record for Cannock Chase)
Recommended Actions	➢ Net, remove and sell Carp from the on-line pool at A using an EA permit (landowners, EA) ➢ B-C: Some initial small-scale additions of wood to the channel have taken place, but the riparian zone would benefit from selective coppicing and ring-barking to increase the deadwood resource at this site and to prep for the arrival of White-clawed Crayfish (landowners, SWT, Buglife) ➢ B-C: Carry out water testing to double-check that the parameters for pH, dissolved oxygen, dissolved calcium, phosphate, nitrate, salinity, etc., are suitable for White-claws (SWT, Buglife) ➢ Apply for a licence from NE to use this as an Ark site for White-clawed Crayfish (SWT). The recommended donor site is the Lower Shropshire Brook. The licence would cater for an initial translocation of 200-400 White-claws, with a reinforcement of a further 200 animals after the third year (SWT, FE).



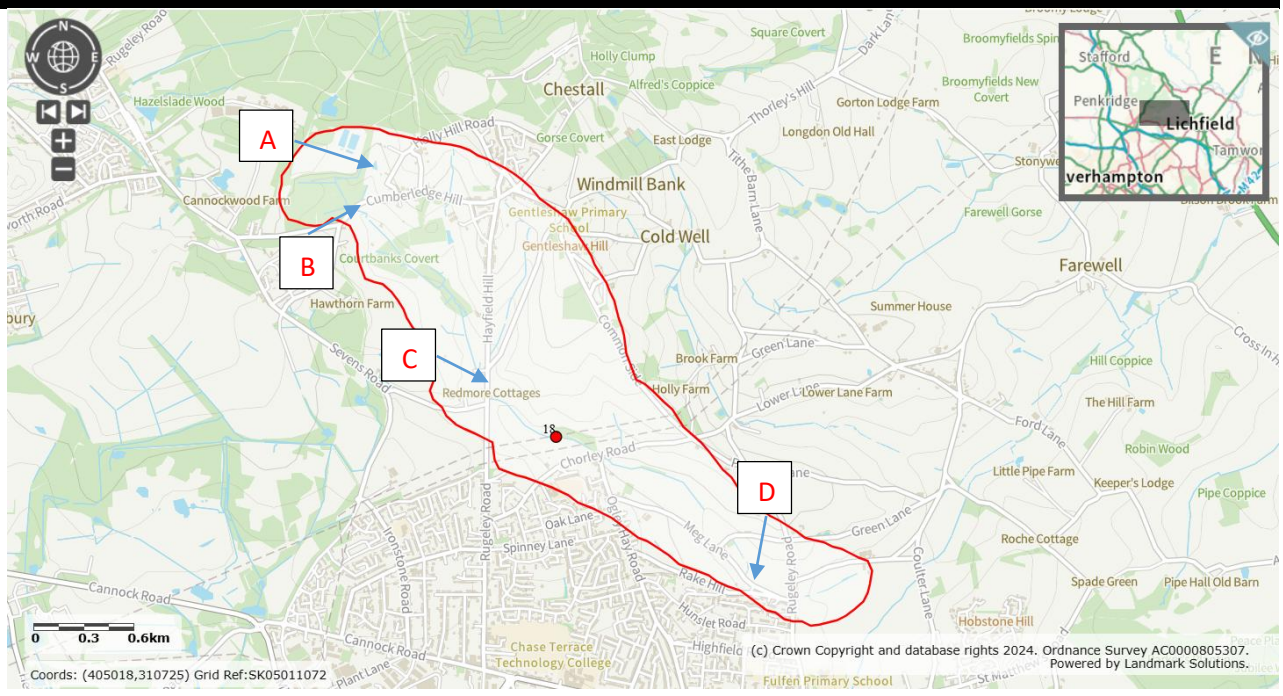
Watercourses	**Upper Shropshire Brook, including the Red Brook** are spring-fed systems running through a mixture of deciduous woodland, mire, forestry plantations and a series of on-line ornamental lakes, pools and a buried culvert.
Survey Sites	**15. Beaudesert Old Park, 16. Hare's Hill**
Baselines	Site 16 in 2014-15
Water quality / Pressures?	A significant herbicide (SPEAR) pollution was recorded at Site 16 Hare's Hill in Autumn 2023
Habitat quality / Impacts?	There are reaches with high quality stream corridor habitats, but there are several on-line fishing pools and ornamental lakes which sever the connectivity and affect the nutrient status of the watercourse immediately downstream.
Key Species	White-clawed Crayfish at both sites. These populations make up one of the last major strongholds for White-claws in Staffordshire and have been used as a donor site for translocations since 2014. A female Golden-ringed Dragonfly was observed laying eggs into the stream at Site 16 in July 2014 with larvae found in 2015 (not found since that time). Aquatic invertebrates associated with woody debris (including Logjammer Hoverfly, the Caddis *Lype reducta*, an Empid fly *Chelifera* sp.) were mostly found at Hare's Hill. The Yellow May Dun Mayfly *Heptagenia sulphurea* was found at site 16.
Recommended Actions	➢ Undertake further habitat works (coppicing, hinging, 'chop&drop') to increase the amount of in-channel and riparian deadwood. Priority reaches are A, B, C-E and at F-G (FE, SWT, landowners) ➢ F-G: Liaise and work with all of the riparian landowners along the Shropshire Brook from the FE's downstream boundary near Upper Longdon to the downstream extent of Badger Brook Farm at Longdon to coordinate further habitat enhancements to benefit natural stream function and health, e.g. reducing livestock grazing density and access, removal of land drains, buffer strips, buffer ponds, areas of natural regeneration, tree and scrub planting, deer control, culvert removals, etc. (NE, Landowners, SWT) ➢ The culvert that serves the bridleway crossing at D is due to be replaced. Ensure that it is replaced with a bridge or an open-bottomed, pipe arch culvert design aligned with the gradient of the stream so that natural processes and the drift of sediment and wood is not impeded (FE, SWT)



Watercourse	**Upper Ben Brook tributary** is a groundwater-fed watercourse that rises at the western edge of Piggot's Bottom which is a woodland nature reserve managed by Staffordshire Wildlife Trust. The infant stream joins the Ben Brook which is, in turn, a tributary of the Bourne Brook which joins the River Trent near Orgreave.
Survey Sites	**17. Piggot's Bottom**
Baselines	Spring 2022
Water quality / Pressures?	There were no obvious anthropogenic stresses at the Piggot's Bottom sample site in the spring of 2024 and bioquality was modest (BMWP, WHPT and species richness). There was some borderline indication of fine sediment (PSI) stress at this site, but not marked.
Habitat quality / Impacts?	There is an impoundment which disrupts the habitat integrity and connectivity of this headwater stream. The on-line pond has now succeeded to mud flats and reedswamp. There is very little disturbance from people and dogs at this part of the nature reserve.
Key Species	The Nationally-scarce Caddis *Wormaldia subnigra* was recorded here in autumn 2023. White-clawed Crayfish were translocated to set up an Ark site at Piggot's Bottom in September 2023 and reinforced in September 2024.
Recommended Actions	➢ Initial management to increase the deadwood resource in the channel, margins and riparian zone was completed in September 2023 between B & C. Undertake similar work at A-B and repeat small-scale coppicing, ring-barking and wood introductions every 5 years (SWT) ➢ C-D: Promote further sensitive watercourse management to landowners including buffering with livestock fencing, removal of land drains and the excavation of wildlife ponds (SWT)



Watercourse	Upper **Redmoor Brook** is a spring-fed system that has been impacted by mining. It rises between Castle Ring and Prospect Village to run south-east as part of the Bourne Brook catchment.
Survey Sites	**18. Gentleshaw Common**
Baselines	None
Water quality / Pressures?	There were marked signs of anthropogenic stresses at the Gentleshaw Common sample site in the spring of 2024 and bioquality was relatively poor (BMWP, WHPT, species' richness). Both BMWP and WHPT ASPT bioquality indicators had dropped below 5 indicating polluted conditions. The overall bioquality was likely associated with the more marked 'chemical' (SPEAR) and fine sediment (PSI) stresses**.**
Habitat quality / Impacts?	The headwaters of the Redmoor Brook have been heavily modified and affected by remediation and re-landscaping of former mining areas. Ochre is a feature of the substrate of the brook and may be exacerbated by leachate from old mine workings. Some semi-natural habitat survives including a pocket of wet woodland near B.
Key Species	*Oxycera* Soldierfly species recorded in spring 2024.
Recommended Actions	➢ A: Remove American Skunk Cabbage, including all the rhizomes. The landowners have agreed to undertake this task and to monitor for any regrowth. ➢ B: A small-scale stream restoration project has been designed and agreed with the private landowners and is due to be undertaken here in 2025. It comprises approximately 100 metres of watercourse that has been deepened and straightened in the past. The dredge bank is still in place with the gravels formed the original substrate of the brook still in evidence. The scheme design is a form of 'Stage 0' which is simply to sieve out the gravels, push the bed material into the channel mixed in with root plates, woody debris and sprouting willows, creating micro-topography, and to dress the active tract with the old stream gravels. The idea is to create an anastomosing (a series of split channels) watercourse that will probably succeed to a type of willow carr woodland. This will be the first time this experimental technique has been used in Staffordshire. The results will be monitored and will be promoted to other river restoration practitioners and landowners to trial at appropriate sites elsewhere. (SWT, SCC, River Restoration Centre, landowners). ➢ B-C & C-D: continue to work with private landowners to buffer, protect and enhance the watercourse corridor habitats (SWT).



Further Recommendations

- Achieve**,** or maintain, **good ecological status** for all Cannock Chase National Landscape watercourses by 2030. The number one priority is to protect, buffer, enhance and restore the natural function and integrity of these watercourses and their associated corridor habitats. An integrated management plan is required to achieve this, setting out short, medium and long term actions.

- Further **information gathering** is needed. Sub-catchment 'walkover surveys' are required to help identify and map any further detrimental impacts and pollution pathways to watercourses including leaking septic tanks, cracked soakaways, outfalls, misconnections from housing, land drains, ochre leachate, sediment run off from tracks, car parks and forestry operations, road run off, farm runoff, overgrazing, nutrient loading from over-stocked on-line fishery ponds, over-abstraction, illegal irrigation, loss of water to old mine workings, and the spread of invasive plant and animal species.

- **High water temperatures**. The 2014-24 surveys and biometrics do not specifically identify spikes in water temperature as a negative pressure. It is recommended that water temperature is monitored and assessed at key sites across the National Landscape using data loggers that have been keyed into the substrate of watercourses and on-line ponds. A university research project in partnership with the Environment Agency, Forestry England, SCC and National Trust would be an ideal outcome. Priority watercourses are the Stony Brook (where water temperatures of 27 degrees Celcius were recorded at two drawn down online lakes at Fair Oak in July 2023) and the Shropshire Brook.

- Produce a **Crayfish Action Plan** for Cannock Chase National Landscape by 2028. Aspects of White-clawed Crayfish conservation at Cannock Chase are at an advanced stage, but there are strategic gaps that need to be addressed. These include the adoption of biosecurity protocols by all visitors, landowners, school groups, surveyors and anglers.

- **Biosecurity for anglers.** This is the most important issue to address in order to protect the surviving White-clawed Crayfish populations at Cannock Chase. The Check, Clean, Dry campaign is a good introduction to this subject but it is recommended that more direct biosecurity measures are discussed directly with all the angling clubs including talks and advisory visits. Biosecurity measures can also be written in as conditions to fishing tenancy agreements. Fishing clubs offering a 'day ticket' option are a particular problem. Anglers and their gear visit from all over the Midlands. Strict biosecurity is critical at these sites. An important additional point to make is that good biosecurity also helps to stop the spread of fish and amphibian diseases as well as crayfish plague.

- **Invasive non-native species (INNS).** Many watercourses, riparian zones, wetlands and ponds at Cannock Chase have been invaded by non-native plants and animals. This represents one of the most significant threats to our aquatic environments. A great deal of effort has been invested in tackling the problem but, perhaps, a more strategic approach is required to make the best use of resources across the National Landscape. Up-to-date mapping of each species is required to help inform an initial five year costed action plan.

- **Feasibility for the introduction of Beaver *Castor fiber* to Cannock Chase**. There is a small population of wild beavers (origin: unknown) in Staffordshire with ongoing

activity on the River Trent between Armitage and Barton-under-Needwood, on the River Dove between Rocester and Uttoxeter, and near the confluence of the Bourne Brook and the River Tame at Fazeley. In February 2025 the government finally gave the green light for applications to reintroduce beavers back into the wild at appropriate locations in England. At the time of writing SWT is submitting an expression of interest to Natural England (NE) on behalf of a partnership to consider the future release of 50 beavers over a 10 year period at key sites in the Upper Trent river catchment area. It is anticipated that the next stage would be an invitation to submit a full licence application to NE once in-depth consultation, feasibility and assessments have been completed. A crucial element will be to predict the benefits to society (flood alleviation, groundwater recharge, eco-tourism) and any potential problems (damage to special trees, damage to crops, blocking culverts). Arrangements for ongoing management, mitigation measures and advice will be put in place. Cannock Chase has some good quality sites that are being considered for future beaver releases by SWT and National Trust). Beavers have the potential to carry out (for free) many of the management tasks recommended in this report. This could, in turn, offer a lifeline to many our rare aquatic invertebrate species (including White-clawed Crayfish, Logjammer Hoverfly and Golden-ringed Dragonfly) and increase the overall diversity and abundance of species inhabiting our forest stream corridors. It is recommended that further consideration is given to introducing this keystone species within the National Landscape.

Beaver activity along on a small woodland stream in Scotland with increases in habitat heterogeneity. Large quantities of water are held upstream of these 'leaky dams' in newly created wetlands. Could we see similar scenes along some of our forest streams at Cannock Chase National Landscape in the not-too-distant future?

7. Conclusions

Overview:
The forest streams at Cannock Chase are cherished places that need protection for future generations.

Many of the species that survive in these unique habitats are highly sensitive to change. Careful, but ambitious, stewardship is required to protect the most natural reaches and to re-connect, buffer and restore the damaged reaches.

Summary / survey aims:
Assess the health of the main watercourses at Cannock Chase and complete an analysis of water quality pressures through biometric fingerprinting. The study identified that six out of 11 watercourses surveyed are rated good-moderate (Oldacre, Sher, Old, Stafford, Fallow, Stony), four are rated moderate-poor (Rising, Shropshire, Brereton and Ben), and one is rated poor (Redmoor). The water quality of these forest streams are becoming increasingly exposed to negative pressures, in particular, habitat fragmentation, increased sedimentation, organic enrichment, and pesticides.

Benchmark against previous surveys carried out between 2014 and 2022. Comparing the 2023-24 results against 2014-22 baselines revealed improvements in the aquatic species community conservation composition (CCI) at five survey sites (Everall, 2015; 2024). All of the sites exhibited variable fortunes for rarer aquatic species' composition during this study period. This highlighted both the fragile nature of these watercourses and the crucial need for ongoing protection, enhancement and sensitive management. Between spring 2015 and spring 2024 reduced environmental stresses, associated with higher BMWP scores, were recorded at both Oldacre Burn (Brocton) and Ben Brook tributary (Piggot's Bottom). From the available biometrics it was not apparent what stresses the lowered bio-quality bio-signatures in 2020 at Brocton in the Oldacre Burn were due to, but they had improved markedly by 2024 (Everall, 2024). The baseline site data showed that the stresses in the Ben Brook tributary at Piggot's Bottom appeared to be associated with complex chemical incursions of some type (SPEAR) in 2021 and the overall water quality had improved by 2024 (Everall, 2024).

Generate further records of aquatic invertebrates. The surveys generated 799 records of 123 species.

Identify rare, scarce and specialist species: The findings identified a number of scarce aquatic invertebrates living in these forest streams. Highlights included records of the globally endangered White-clawed Crayfish (for now Cannock Chase remains a nationally important stronghold), the nationally scarce White-barred Soldierfly *Oxycera morrisii* (the larvae live in mossy edges of streams), the red-listed caddis species *Lype reducta* and *Diplectrona felix* (associated with in-channel woody debris and leaf packs in clean, shaded streams), the nationally scarce caddis *Wormaldia subnigra* (often associated with neutral or base-rich streams with a rocky substrate), and the nationally notable cranefly species *Dicranota robusta* and *Eloeophila trimaculata* (both associated with high quality woodland stream habitats). Other aquatic species that were previously considered widespread, but are now declining, for example, the Yellow May Dun Mayfly *Heptagenia sulphurea*, were recorded during the surveys.

Yellow May Dun Mayfly Heptagenia sulphurea (female sub-imago)

Although the study was focussed on freshwater invertebrates, important records and observations were also gathered for key fish species including Brook Lamprey *Lampetra planeri*, Brown Trout *Salmo trutta*, Bullhead *Cottus gobio*, and Three-spined Stickleback *Gasterosteus aculaeatus.* Further monitoring of Brook Lamprey and Brown Trout recruitment is recommended.

Recommend priority actions for the future management of these watercourses between 2025-30, and beyond. This report includes specific management recommendations -targeted at decision makers, landowners and practitioners alike- that, if implemented, could make a vital contribution to the conservation of our precious forest streams.

Limitations:

The study did have some limitations. The baseline surveys carried out in 2014-15 only investigated six sites. Although baselines were completed for five further sites between 2020-22 the data is a little fragmented to afford neat comparisons between the 2023-24 survey results and the partial baselines carried out at separate times. It is recommended that a complete re-survey of all 18 sites is completed in 2028-29 to analyse the health and future species' composition of the forest streams.

Surveyor's personal statement:

It is the opinion of the lead surveyor that, without strategic restoration, the integrity of these streams will be further compromised. I would like to see the partnership actions recommended in this report carried out as a matter of urgency. In particular, I would like to ensure that the crucial groundwater sources which feed these forest streams are monitored, protected, repaired and enhanced. Spikes in water temperature was identified as a further negative pressure at some locations. Establishing baseline and ongoing water temperature monitoring is important. I think habitat restoration works to remove dams and culverts, as well as increasing the average width of buffer strips, the return of beavers, and further increases in volumes of riparian and in-channel woody debris, would make meaningful contributions to the integrity and natural function of these enchanting watercourses.

The future?

These forest streams face an uncertain future. Climate change -including prolonged periods of heavy rain ('atmospheric rivers') or drought, or intense 'heat domes'- is a very real threat. Targeted habitat restoration works together with the reintroduction of beavers may well offer a solution to the 'futureproofing' of these streams, their groundwater supplies, their corridor wetlands, and their dependant species.

8. References

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Acknowledgements

Many thanks to:

- Richard Harris and Ian Marshall at Cannock Chase National Landscape for commissioning and funding this survey, and for their comments on the draft report;
- Dr Nick Everall and his team from Aquascience Consultancy;
- Forestry England;
- Staffordshire County Council;
- Farming in Protected Landscapes;
- Staffordshire Ecological Record;
- National Trust;
- Mining Remediation Authority;
- Volunteers, Hayley Percival and Charlotte Harper, who assisted with the surveys;
- The landowners and managers who kindly gave permission for the surveys.

The Turkey Brown Mayfly Paraleptophlebia submarginata. Shropshire Brook, 1st May 2024.

Publication data: **Mott, N. (2025). A Survey of the Aquatic Invertebrates of Cannock Chase's Forest Streams in Staffordshire, 2023-24, including assessments of water and habitat quality, and future management recommendations. Staffordshire Wildlife Trust. Report to Cannock Chase National Landscape.**

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February, 2025

www.staffs-wildlife.org.uk

APPENDIX 1.

Results. Autumn 2023 Data: Species' lists and Biometrics

---Please use the separate download link---

APPENDIX 2.

Results. Spring 2024 Data: Species' lists and Biometrics

---Please use the separate download link---