Preliminary Environmental Information Report

Volume 4
Appendix 7.5

RTS Aquatic Macrophyte and Macroinvertebrate Surveys

RTS Aquatic Macrophyte and Macroinvertebrate Surveys

River Thames Scheme

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1 Introduction

1.1 Project and site overview

As part of the River Thames Scheme (RTS) the Environment Agency requested that ecological and environmental surveys be re-run in 2021 and 2022, following the collection of baseline data by the Environment Agency in 2019 (Meadows, 2020[1]). This is to provide an up-to-date baseline for the proposed RTS, hereafter referred to as 'the Project'. The scope of this document includes the following surveys in Runnymede Channel section (formally known as channel Section 2) and Spelthorne Channel section (formally known as channel Section 3) only of the project:

- Macrophyte surveys.
- Macroinvertebrate surveys.

The need for surveys additional to those carried out in 2021 came out of a gap analysis post commissioning of the 2021 surveys. Both 2021 and 2022 survey data are presented in this aquatic ecology report (therefore superseding APEM, 2021[2]). Water Framework Directive (WFD) metrics have been calculated where the data allow, and written summaries of key points namely species of conservation interest), potential impacts and proposals for future survey work have been included. The below sections detail the locations, methodology, results, interpretation, conclusions, and recommendations for these surveys. The 2021 surveys were conducted at the river locations as detailed in Table 1 to replicate the 2019 surveys[3]. The 2022 surveys were carried out at the locations listed in Table 2 and Table 3.

This report also highlights Invasive Non-Native species (INNS) that were identified as part of the baseline monitoring described above; however, a separate programme of aquatic and riparian INNS specific monitoring was carried out in 2022 and is reported on elsewhere[4].

[1] Meadows, G. (2019) Baseline Aquatic Surveys for Macrophytes & Macroinvertebrates. River Thames Scheme Capacity Improvements & Flood Channel project, Environmental Impact Assessment. Environment Agency (Thames Area)
[2] APEM (2022). RTS Macroinvertebrate and Macrophyte Surveys 2021. APEM Scientific Report P00006251. Binnies, March 2022 P01
[3] Meadows, G. (2019) Baseline Aquatic Surveys for Macrophytes & Macroinvertebrates. River Thames Scheme Capacity Improvements & Flood Channel project, Environmental Impact Assessment. Environment Agency (Thames Area)
[4] River Thames Scheme aquatic INNS surveys 2022. Report at draft stage.

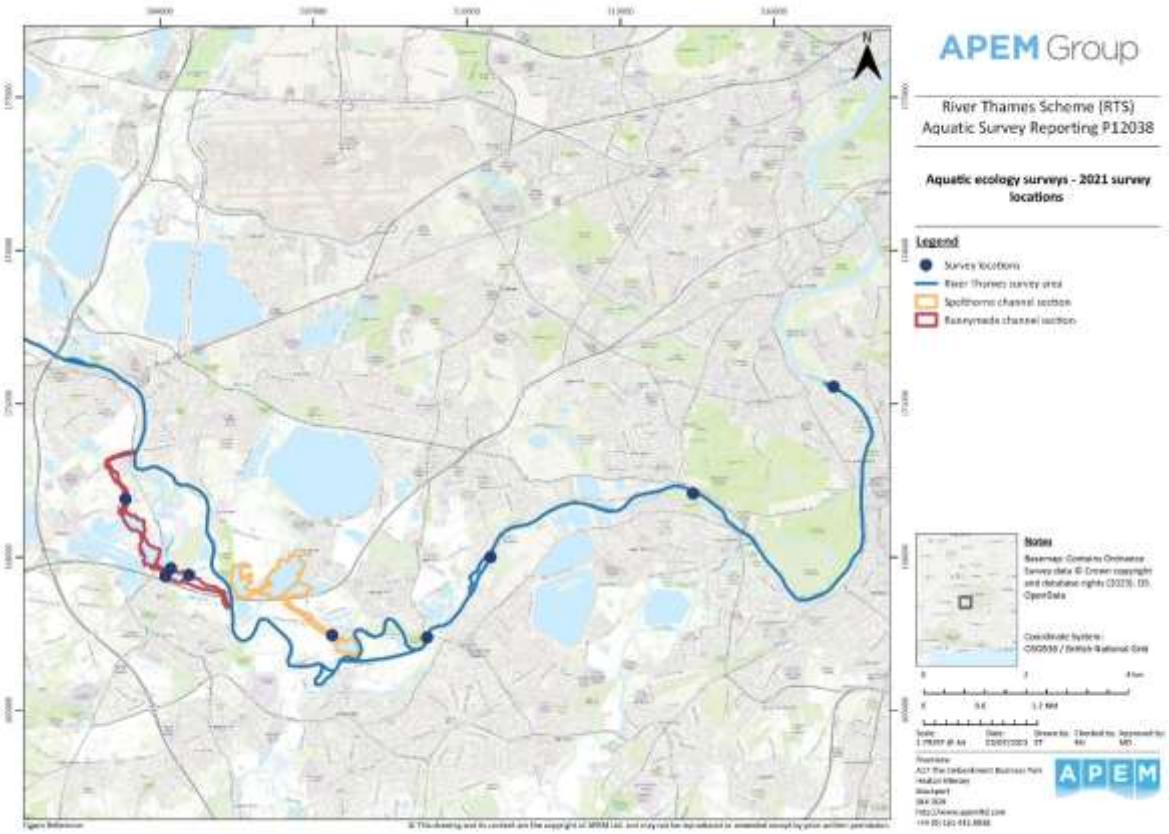


Figure 1: Macroinvertebrate and macrophyte river survey locations 2021

Table 1: Macroinvertebrate and macrophyte survey locations 2021

River name	Site name	NGR	Section
Abbey River*	US intersection	TQ0421467782	Runnymede Channel
Abbey River*	DS intersection	TQ0410867628	Runnymede Channel
Burway Ditch**	Near water works	TQ0456967653	Runnymede Channel
Mead Lake Ditch	Above Norlands Lane	TQ0332969141	Runnymede Channel
Ferry Lane Ditch**	Ferry Lane	TQ0736766473	Spelthorne Channel
River Thames	US of Sunbury Weir	TQ1046368003	Spelthorne Channel
River Thames	US of Molesey weir	TQ1442269246	Spelthorne Channel
River Thames	US of Walton Bridge	TQ0922266429	Spelthorne Channel
River Thames	Teddington Weir	TQ1716771335	Spelthorne Channel

* Macrophyte surveys only undertaken.

** Sites dry in both spring and autumn 2021. No data presented in this report.

US = US, DS=DS

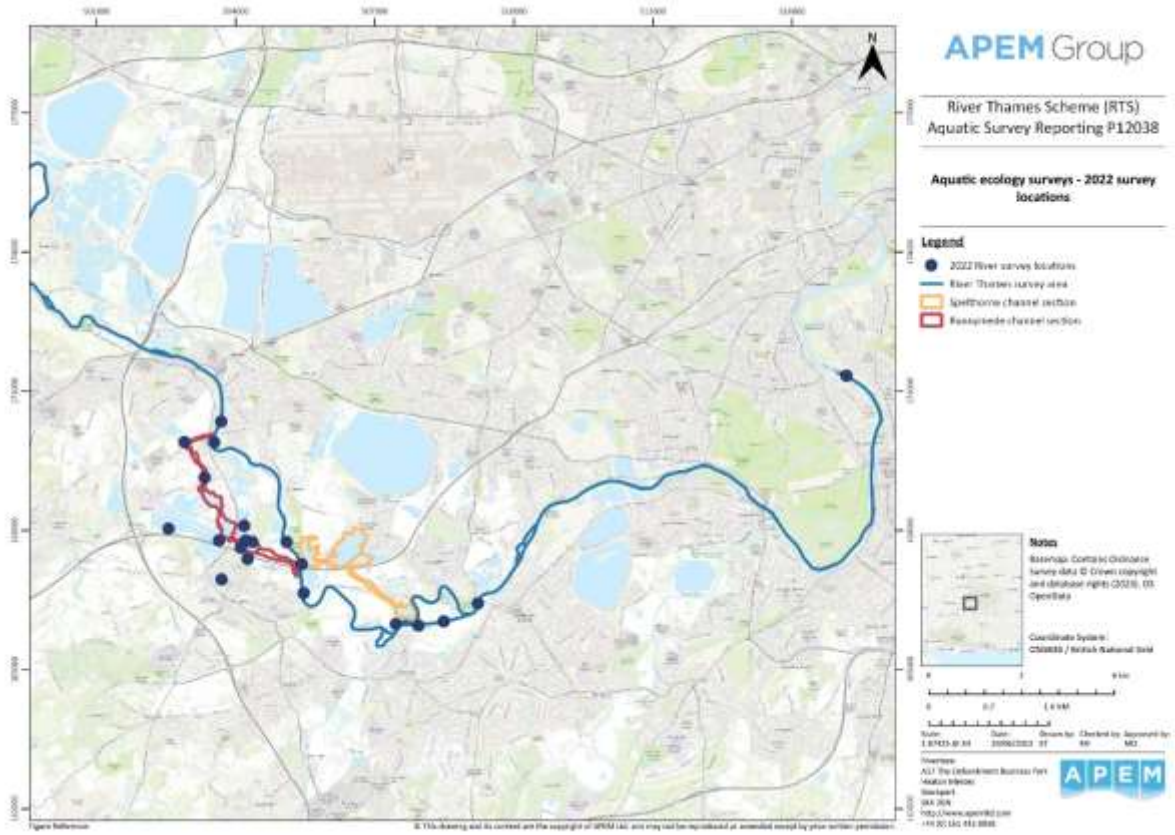


Figure 2: Macroinvertebrate and macrophyte river survey locations 2022

Table 2: Macroinvertebrate and macrophyte river survey locations 2022

Watercourse name	Location name	NGR
River Thames	US of the Runnymede Channel intake	TQ0368470349
River Thames	DS of Runnymede Channel intake	TQ0353469900
River Thames	US of Spelthorne Channel intake	TQ0546566651
River Thames	US of Runnymede Channel outfall and DS of Spelthorne Channel Intake	TQ0542167273
River Thames	DS of Runnymede Channel outfall	TQ0509567755
River Thames	US of Spelthorne Channel outfall	TQ0745465982
River Thames	DS of Spelthorne Channel outfall	TQ0794165950
River Thames	Desborough Cut	TQ0848566040
River Thames	US of Walton Bridge	TQ0922266429
River Thames	Teddington Weir	TQ1716771335

Watercourse name	Location name	NGR
Mead Lake Ditch (MLD) (Runnymede Channel)	MLD US of intersection	TQ0289369904
MLD (Runnymede Channel)	MLD DS of intersection	TQ0363667782
MLD (Runnymede Channel)	MLD Above Norlands Lane	TQ0332969141
Chertsey Bourne (CB) (Runnymede Channel)	CB US of intersection	TQ0254968037
CB (Runnymede Channel)	CB DS of intersection	TQ0369366946
Abbey River (AR) (Runnymede Channel)	AR US of intersection A	TQ0418068103
AR (Runnymede Channel)	AR DS of intersection A	TQ0425567388
AR (Runnymede Channel)	AR US of intersection B	TQ0421467782
AR (Runnymede Channel)	AR DS of intersection B	TQ0410867628
Burway Ditch (BD) (Runnymede Channel)	BD US of intersection	TQ0435667754

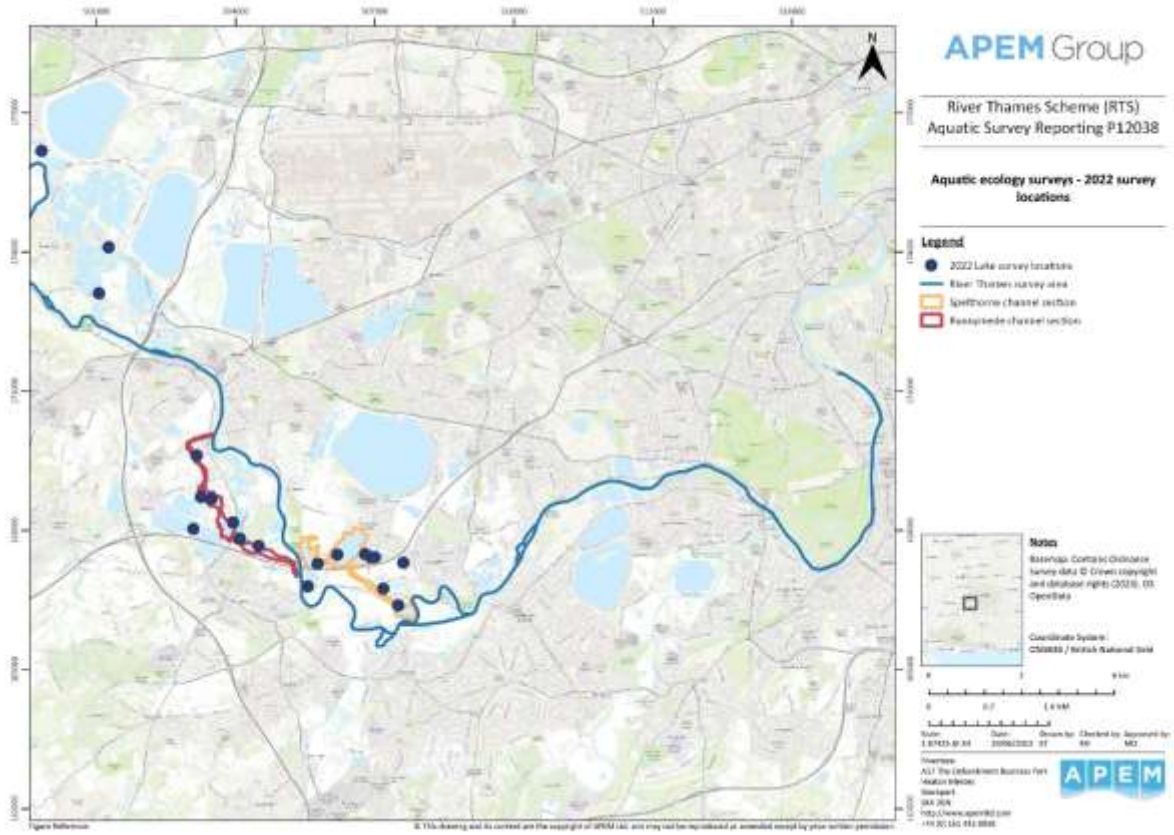


Figure 3: Macroinvertebrate and macrophyte lake survey locations 2022

Table 3: Macroinvertebrate and macrophyte lake survey locations 2022

Site name	NGR
Datchet 2	SU9981576180
Wraysbury 2 (north)	TQ0125974103
Wraysbury 2 (south)	TQ0104973112
St Ann's	TQ0308468033
Manor	TQ0324768724
Fleet	TQ0348068690
Lake South of Green Lane	TQ0315569618
Abbey	TQ0393968171
Abbey 1	TQ0408767824
Abbey 2	TQ0449667667
Littleton North	TQ0576767283
Littleton South	TQ0555266798
Littleton East	TQ0618767479
Sheepwalk East	TQ0700167423
Sheepwalk West 2	TQ0691867417
Black Ditch Pond	TQ0761367305
Sheepwalk West 1	TQ0678967490
Ferry Lane	TQ0750466385
Halliford Mere Complex	TQ0717866748

2 Methods

2.1 Macrophytes (River)

Macrophyte surveys were conducted in accordance with Environment Agency Operational Instruction 131_07 surveying freshwater macrophytes in rivers[5] to be compliant with the Water Framework Directive (2000/60/EC). Surveys were undertaken in July 2021 and June 2022, during the optimal survey season (1st June to 30 September[6]). Data were analysed in accordance with the standard methods used for classifying the status of macrophytes in UK water bodies under the WFD using LEAFPACS2 software[6].

Following all macrophyte surveys, data were processed, and biotic indices calculated, following UKTAG guidance[6]. This allowed the calculation of biotic indices (described below), and subsequent observed expected scores for each survey location, if considered appropriate.

- River Macrophyte Nutrient Index (RMNI).This is a measure of which plants grow in the river and their association with high nutrients and is measured on a scale from 1-10. High scores are associated with species that dominate under enriched conditions.
- Number of macrophyte taxa (NTAXA).The number of truly aquatic taxa (hydrophytes).
- Number of Functional Groups (NFG). Diversity metric allocating hydrophytes to functional groups.
- Cover of Green Filamentous Algae (ALG). The percentage cover of filamentous algae in the survey stretch.
- EQR (Ecological Quality Ratio). EQR for each sample. This is calculated in the usual manner of observed index / predicted index.
- Class. WFD status class for each sample, based on the EQR.

Taxon Cover Values (TCV) were calculated in the field for entry into the LEAFPACS survey calculator tool. The percentage cover for each TCV is given in Table 4.

Species were also checked against the London priority species list to determine if species were of London regional importance.

[5] Environment Agency, 2016. Surveying freshwater macrophytes in rivers: Operational Instruction 131_07 Issued 31/05/2015 Environment Agency, Bristol.
[6] UKTAG, 2014. UKTAG River Assessment Method Macrophytes and Phytobenthos: Macrophytes (River LEAFPACS2).

Table 4: TCV based on the percentage of the channel area that the macrophyte covers

Taxon Cover Value	Percentage cover for the macrophyte species
C1	<0.1%
C2	0.1 to 1%
C3	1 to 2.5%
C4	2.5 to 5%
C5	5 to 10%
C6	10 to 25%
C7	25 to 50%
C8	50 to 75%
C9	>75%

2.2 Macrophytes (Lake)

Macrophyte survey data were collected at nineteen lake sites in summer 2022. For the Thorpe Park Lakes (Saint Anns, Fleet, Manor and Abbey Lakes) macrophyte surveys were conducted in accordance with UKTAG (2014[7]) guidance to meet requirements of the WFD (although the surveys were carried out after September, between the 10th to the 13th of October, 2022, and therefore were outside of the survey season). Following the WFD methodology the survey area was divided into four sectors comprising 100m of shoreline and extending to the centre of the lake, or the point of maximum colonisation of macrophytes. Each sector was sub-divided and five wading transects were carried out, along with one boat transect. Each macrophyte encountered was recorded to the lowest taxonomic level along with biomass. Water chemistry (alkalinity) and physical parameters were also recorded (depth, altitude, surface area). The remainder of the lakes were surveyed along their perimeter only with at least one 100m transect surveys at each lake. Boat access to the lakes was requested by Dalcour McLaren but many landowners turned down the request or could not be contacted prior to the July 2022 survey dates (between the 11th and 13th July, 2022).

[7] UKTAG, 2014. UKTAG Lake Assessment Method Macrophytes and Phytobenthos: Macrophytes (Lake LEAFPACS2).

2.2.1 Thorpe Park Lakes

The surveys at Thorpe Park Lakes followed the approach of a previous survey in 2016 by ENSIS Ltd[8] and included two elements:

- A standard LEAFPACS survey involving four transects at St. Ann's Lake and three transects at Manor, Fleet and Abbey Lakes. Each transect included boat, wader, and perimeter surveys.
- A survey of random points across each of the lakes aimed at exploring the vegetation patterns across the lakes. Survey points were widely spread around the lakes and at each point the species present were recorded with dominant, abundant, frequent, occasional and rare (DAFOR) abundance ratings. Depth was also recorded at each point.

The survey of random points, in addition to the standard WFD LEAFPACS methodology, was due to the presence in Thorpe Park Lakes of a number of notable stonewort species and the additional survey effort would be useful in allowing comparisons between the 2016 and 2022 datasets.

2.3 Macroinvertebrates (River)

Macroinvertebrate samples were collected in spring on the 17th, 18th and 19th May 2021 and autumn on the 19th October 2021 and 16th and 17th November 2021. In 2022 spring samples were collected on 25th and 26th May and autumn samples on the 7th, 8th, 12 and 13th September. Prior to collecting each macroinvertebrate sample, a site walkover was completed to capture key environmental parameters (e.g. in-situ water quality, substrate composition) required to determine the expected diversity and abundances of the biological elements.

Samples were collected using standard Environment Agency methods, documented in Environment Agency Operational Instruction 018_08 Freshwater macroinvertebrate sampling in rivers[9]. Most samples were collected using the airlift method as the average water depth across the river channels was greater than 80cm. This involves removal of sediment from the riverbed using a vacuum pump and includes three-minutes of sampling of all habitats in proportion to their occurrence, combined with a one-minute marginal sweep and search. If the average depth across the channel was less than 80cm then the standard three-minute kick / sweep method was used. All samples were checked for the presence of depressed river mussel prior to

[8] Goodrich, S & Gooldsmith, B (2016) River Thames Scheme Lake Surveys: Macrophytes. ECRC Research Report Number 176.. September 2016.

[9] Environment Agency, 2017. Freshwater macroinvertebrate sampling in rivers: Operational Instruction 018 08 Issued 01/03/17 Environment Agency, Bristol.

preservation. If any mussels were found they were returned to the river. Samples were preserved on site using Industrial Methylated Spirit (100%) for later laboratory analysis. Prior to preservation airlift samples were checked for depressed river mussels.

Environmental data were collected to calculate the expected reference conditions for the indices listed below using the RIVPACS IV model[10] within RICT. In addition, the Community Conservation Index (CCI) was also calculated which gives an indication of the conservation value of macroinvertebrates.

- Whalley Hawkes Paisley Trigg (WHPT) indices[11]. This is derived from the Biological Monitoring Working Party (BMWP) approach but incorporates measures of abundance and includes more taxa with some composite groups split (i.e. Diptera). Average Score Per Taxa (ASPT) and Number of Taxa (NTAXA) are replaced with two new metrics; WHPT and WHPT NTAXA, which have replaced their equivalent BMWP metrics in determining WFD status classifications for macroinvertebrates.
- Lotic Invertebrate index for Flow Evaluation (LIFE[12]). LIFE is the average of abundance-weighted flow groups that indicate the preferences of each taxon for higher water velocities and clean gravel/cobble substrata or slow/still water velocities and finer substrata. LIFE is used to index the effect of flow variations on macroinvertebrate communities and is calculated at both family (LIFE_F) and species level (LIFE_S).
- Proportion of Sediment-sensitive Invertebrates (PSI[13]) was also calculated. PSI assesses potential impacts associated with excessive deposition of fine sediment.
- Community Conservation Index (CCI[14]) was also calculated. CCI gives a comparative measure of the conservation value of macroinvertebrates between sampling locations and in the national context, based on both the diversity of the community and the rarity of the species present.

Samples were processed in the laboratory to the requirements outlined in Environment Agency Operational Instruction 024_08 Freshwater macroinvertebrate analysis of

[10] Davy-Bowker J., Clarke R., Corbin T., Vincent H., Pretty J., Hawczak A., Blackburn J., Murphy J. & Jones I., (2008) River Invertebrate Classification Tool. A report to the Scotland and Northern Ireland Forum for Environmental Research. [SNIFFER project WFD72C].
[11] WFD-UKTAG UKTAG River Assessment Method Benthic Invertebrate Fauna. Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT). Stirling, UK
[12] Extence, C.A., Balbi, D.M. and Chadd, R.P. (1999) River flow indexing using British Benthic Macroinvertebrates: A Framework for setting hydroecological objectives. Regulated Rivers Research and Management, 15: 543 – 574.
[13] Extence, C.A., Chadd, R.P., England, J., Wood, P.J. and Taylor., E.A., (2011). The assessment of fine sediment accumulation in rivers using macro-invertebrate community response. River Research and Applications. doi: 10.1002/rra.1569
[14] Chadd, R.P and Extence, C.A. (2004) The conservation of freshwater macroinvertebrate populations: a community-based classification scheme. Aquatic Conservation: Marine and Freshwater Ecosystems, 14: 597–624.

riverine samples[15]. Macroinvertebrate sample analysis was undertaken to (Mixed Taxon Level 5) MTL5 and included speciation of *Pisidium* sp.

2.4 Macroinvertebrates (Lake)

Macroinvertebrates were collected at each lake the week commencing the 29th August 2022 following the methods described in Environment Agency (2007)[16]. Littoral areas only were sampled due to lack of boat access. Boat access to the lakes was requested by Dalcour McLaren but many landowners turned down the request or could not be contacted prior to the survey dates. At each location, the littoral habitat was divided between vegetated areas and bare substrate areas and these habitats were sampled using a three-minute kick/sweep in proportion to their occurrence, combined with a one-minute hand search.

Four samples were taken from different locations in each lake to capture the range of habitats and environmental conditions.

Samples were processed and analysed in the same way as macroinvertebrate river samples (Section 2.3).

2.5 Review of notable species

Macroinvertebrate and macrophyte species collected during the surveys were cross checked against local and national records (NBN Gateway, Defra Data Services Platform databases, London Priority Species List) to understand the distribution of each species, both locally and nationally, and to identify any non-native species collected during the surveys.

2.6 Biosecurity

APEM follow strict biosecurity methods while undertaking field surveys. This included consideration of the current risk status of each site in relation to any other site visits conducted, any biosecurity measures already in place at each site and what work was to be done on site. Initial planning also considered how and where biosecurity would be applied when entering the site, and what equipment was required.

As part of this process any known INNS and disease present at the site were considered when planning each visit, as well as the order in which visits were conducted in a day (from lowest to highest risk). All legal notices, instructions, and

[15] Environment Agency, 2014. Freshwater macroinvertebrate analysis of riverine samples: Operational Instruction 024 08 Issued 28/01/14 Environment Agency, Bristol.
[16] Environment Agency, 2007. Lake benthic macroinvertebrates I: improving sampling methodology. Science Report: SC030294/SR1 Environment agency, Bristol.

legal boundaries regarding animal, and plant/tree disease or INNS control were respected as appropriate. If the site was under a restriction due to disease or INNS, then a delay to the visit or rescheduling was considered. If managed sites were to be visited, then any biosecurity procedures in place were considered and adopted for that visit.

Between each visit robust biosecurity measures were applied to all equipment. When entering a site, the following procedures were used:

- All equipment, footwear, PPE and vehicles (including boats) were cleaned and/or disinfected.
- When entering the site, surveyors kept to established tracks and paths. Where possible hard standing was used, and livestock areas avoided if possible.
- If using an off-road vehicle, surveyors avoided driving through fields that had, or had recently had, livestock in them or where manure or slurry had recently been spread.
- Efforts to keep the vehicle clean and avoiding areas where livestock had access minimised the need to use disinfectants.
- If surveyors came into direct contact or were physically handling animals such as fish or invertebrates, appropriate PPE was worn.
- Any contact with dead / dying or infected animal or plants was avoided. If it was required to have contact, then appropriate PPE was worn.

When leaving a site, the following procedures were used:

- Any contact with dead / dying or infected animal or plants was avoided. If it was required to have contact, then appropriate PPE was worn.
- Surveyors ensured all equipment, footwear, PPE and vehicles (including boats) were clean of vegetation, detritus and mud.
- Once clean, surveyors sprayed the boot / sole or equipment with disinfectant solution.
- If facilities were provided on site to clean footwear e.g. footbaths, then surveyors made sure they were also used.
- Any disposable PPE, if used, was removed and bagged for disposal.

2.7 Limitations

2.7.1 Macrophytes

Rivers

Environment Agency guidance suggests avoiding survey sections that contain artificial features such as locks and artificially lined channels, of which the navigable sections of the Thames are a good example. Artificial channels, locks, and boat traffic result in an increase in turbidity and consequently a dominance of marginal habitat. This will give a misleading calculation of the expected biotic scores for the water body surveyed using the depth and width measurements of the surveyed reach as marginal habitat will be dominant. Due to the location of the proposed RTS it was not possible to avoid navigable sections of the River Thames and therefore much of the plant community was restricted to the margins.

Lakes

Boat access was not possible at a number of lakes and as a result completion of the lake LEAFPACS method was only possible at the Thorpe Park Lakes complex. Where access was difficult a species list was recorded from accessible areas of the perimeter of each lake. Whilst it is expected that a large majority of macrophytes will have been recorded using this method, it is possible that submerged macrophytes of deeper water could have been missed. Whilst relatively low numbers of macrophyte taxa would be expected from deeper water the presence of notable charophytes within the Thorpe Park lakes highlight that notable species might be expected in the deeper water of other gravel pit lakes in the area. The late season of survey from the 10-13th October 2022 at the Thorpe Park Lakes complex, which is outside the recommended survey season in the UKTAG lake macrophyte method statement, could also have been a factor in explaining differences in the abundances recorded for some species; however, the surveys were not considered compromised as a result.

2.7.2 Macroinvertebrates

Rivers

The airlift sampling method is recommended for surveys on deep rivers such as the River Thames. Good coverage of the riverbed is possible; however, it should be noted that targeted sampling of smaller habitat features is not possible using the airlift methodology, as the surveyor is effectively blind. This is especially true on the River Thames as the river is naturally silty and visibility of bed features is only possible in shallow and marginal habitats. It is also noted that two weeks prior to the autumn 2021

surveys river levels on the Thames were above normal for the time of year (145% of the long-term average[17] (1981-2010)) and wash-out effects may have affected the communities sampled. Despite the limitations the surveys were undertaken following best practice methods for the river types and provide a robust description of the ecological communities at each site surveyed.

Lakes

A boat was not used for the lake macroinvertebrate sampling due to the lack of access described above, and therefore samples were biased towards marginal habitat. However, as the greatest diversity of macroinvertebrates is expected be found at the lake margins, rather than in the open water habitat, the samples were still expected to provide a good overall representation and will provide an adequate baseline against which to carry out an impact assessment.

[17] Hannaford, Jamie; Eastman, Michael; Crane, Emily; Clemas, Sandie. 2021 *Hydrological summary for the United Kingdom: October 2021.* Wallingford, UK, UK Centre for Ecology & Hydrology, 12pp. (UKCEH Project no. C04954)

3 Results

3.1 Macrophytes - River (2021)

Results of the site level LEAFPACS data are presented in Table 5. Estimates of the percentage taxon cover values for each macrophyte species that scores under the LEAFPACS2 assessment are given in Appendix A. The list of species recorded at each site is also presented in Appendix A.

Surveys on Abbey River took place on 5th July in fine weather conditions with flow conditions normal for the time of year, survey reaches were heavily shaded on both banks.

Surveys on Mead Lake Ditch took place on 6th July in fine weather conditions with flow conditions normal for the time of year, survey reaches were heavily shaded on both banks.

Surveys on the River Thames took place on 6th, 7th and 8th July in fine weather conditions with flow conditions normal for the time of year. At two locations (US Mosely Weir and US Sunbury Weir) survey reaches were heavily shaded on the left-hand bank. Shading was reduced at the other two Thames locations (US of Walton Bridge and Teddington Weir). All sample locations are influenced by watercraft.

Table 5: LEAFPACS2 output for each site and indicative site classification.

River name	Site name	RMNI	NTAXA	NFG	ALG
Abbey River*	US intersection	7.98	5.00	4.00	0.00
Abbey River*	DS intersection	8.23	4.00	3.00	0.00
Mead Lake Ditch*	Above Norlands Lane	8.71	0.00	0.00	0.00
River Thames	Teddington Weir	7.53	3.00	3.00	0.00
River Thames	US Mosely Weir	8.08	3.00	3.00	0.05
River Thames	US Sunbury Weir	8.05	2.00	2.00	0.00
River Thames	US of Walton Bridge	7.88	2.00	2.00	0.00

* Observed scores only are presented due to the modified nature of both streams. All environment data required to undertake a WFD classification has been calculated.

3.2 Notable species: Macrophytes - River (2021)

Analysis of the survey results against records listed on NBN Gateway, Defra Data Services Platform databases, London Priority Species List found no macrophyte taxa were listed as nationally or locally important.

3.3 Macrophytes - River (2022)

Results of the site level LEAFPACS data are presented Table 6. Estimates of the percentage taxon cover values for each macrophyte species that scores under the LEAFPACS2 assessment are given in Appendix A. The list of species recorded at each site is also presented in Appendix A.

Table 6: LEAFPACS2 output for each site and indicative site classification.

River name	Site name	RMNI	NTAXA	NFG	ALG	EQR
River Thames	US of the Runnymede Channel intake	8.28	7	3	0	0.540
River Thames	DS of Runnymede Channel intake	7.25	2	2	0	0.802
River Thames	US of Spelthorne Channel intake	8.05	4	4	17.5	0.497
River Thames	US of Runnymede Channel outfall and DS of Spelthorne Channel intake	8.33	6	4	0	0.576
River Thames	DS of Runnymede Channel outfall	7.06	1	1	0	0.832
River Thames	US of Spelthorne Channel outfall	8.31	5	4	0	0.542
River Thames	DS of Spelthorne Channel outfall	5.83	4	4	0	1.407
River Thames	Desborough Cut	7.36	2	2	0.05	0.766

River name	Site name	RMNI	NTAXA	NFG	ALG	EQR
River Thames	US of Walton Bridge	8.03	2	2	0	0.520
River Thames	Teddington Weir	7.31	2	2	0.05	0.792
Mead Lake Ditch*	MLD US of intersection	8.64	2	0		
Mead Lake Ditch*	MLD Above Norlands Lane	8.88	0	0	0	
Chertsey Bourne	CB US of intersection	8.79	3	3	0	0.216
Chertsey Bourne	CB DS of intersection	8.50	5	4	0	0.316
Abbey River*	AR US of intersection	7.89	0	0	0	
Abbey River*	AR DS of intersection	7.76	4	3	0	
Abbey River*	AR US of intersection	8.16	5	3	0	
Abbey River*	AR DS of intersection	8.41	5	3	0	

* Observed scores only are presented due to the modified nature of both streams. All environment data required to undertake a WFD classification has been calculated.

Figure 4: WFD classification categories, colour-coded

3.4 Notable species: Macrophytes - River (2022)

Analysis of the survey results against records listed on NBN Gateway, Defra Data Services Platform databases, London Priority Species List found no macrophyte taxa were listed as nationally or locally important.

3.5 Invasive Non-Native species: Macrophytes – River (2021 and 2022)

In the 2021 survey *Hydrocotyle ranunculodies* (floating pennywort) was recorded at Abbey River, DS intersection site. In 2022 *Lemna minuta* (least duckweed) was recorded at several river sites, and *Azolla filiculoides* (water fern) was present at the site 'US of the Runnymede Channel intake' while *Mimulus sp./hybrid was recorded at the site '*DS of Spelthorne Channel outfall'.

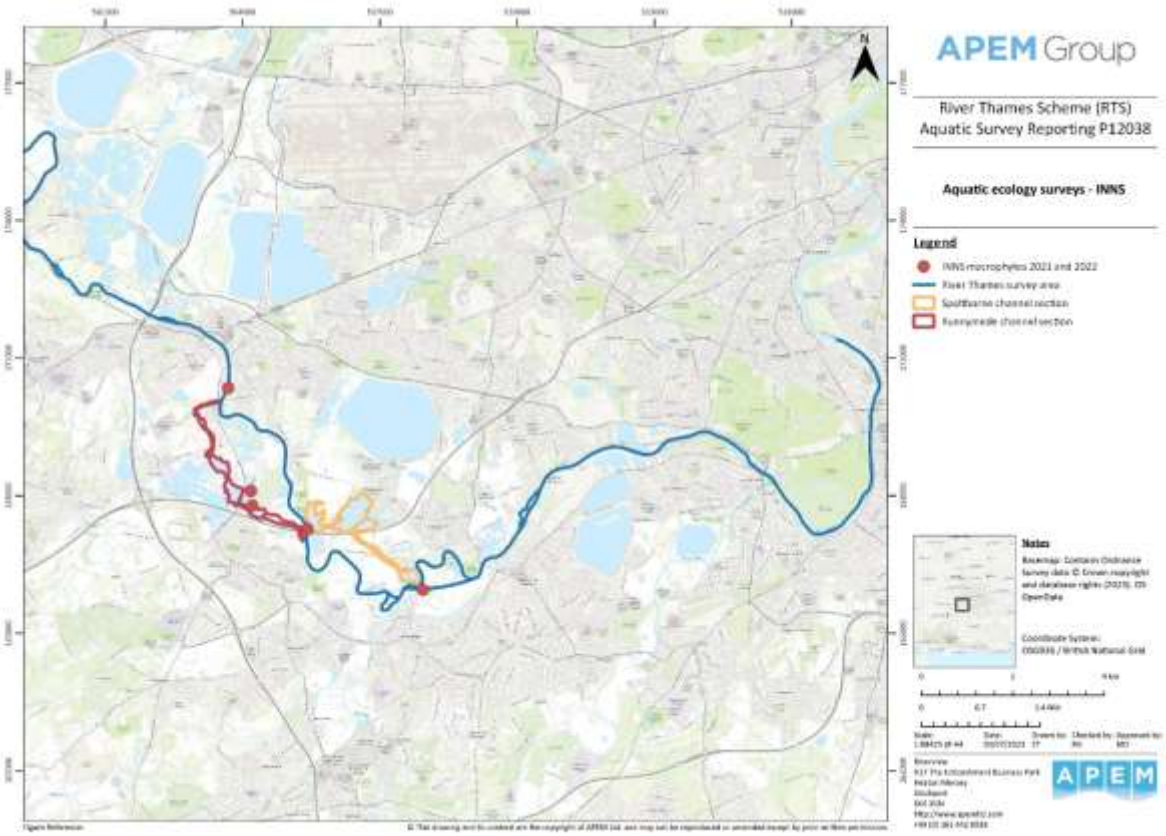


Figure 5: 2021 and 2022 river locations with INNS macrophytes

Table 7: Macrophyte INNS– river locations

Year	Location name	Recorded INNS and taxon cover
2021	Abbey River, DS intersection	*Hydrocotyle ranunculodies* (C1)
2022	US of the Runnymede Channel intake	*Lemna minuta (C1)*
2022	US of Runnymede Channel outfall and DS of Spelthorne Channel intake	*Lemna minuta (C1)*
2022	DS of Spelthorne Channel outfall	*Mimulus sp./hybrid (C1)*
2022	CB DS of intersection	*Lemna minuta (C5)*
2022	AR US of intersection	*Lemna minuta (C1)*

3.6 Macrophytes – Lake (2022)

Full species lists for all lake macrophyte surveys are presented in Appendix A.

Indicative WFD classifications for the Thorpe Park Lakes surveys are presented in Table 8, (also see Figure 4 Section in 3.4). According to LEAFPACS calculations, the status of St. Ann's Lake is "Poor" while Abbey, Manor and Fleet Lakes are "Moderate". This is unchanged since 2016 although the scores have changed a little within these bandings. This reflects that the lakes are in an unsatisfactory state and the EQR scores for individual LEAFPACS metrics indicates that the lowest-scoring metric is the Lake Macrophyte Nutrient Index (LMNI).

Where the fully compliant lake WFD methodology could not be carried out because of access issues indicative WFD statuses cannot be provided.

Table 8: LEAFPACS2 output for each lake and indicative WFD classification

Lake	Survey year	EQR LMNI	EQR NTAXA	EQR NFG	EQR COV	EQR ALG	Final EQR
St Anns Lake	2016	0.407	1.035	0.995	0.688	0.747	0.272
St Anns Lake	2022	0.472	1.379	1.138	0.783	0.787	0.353
Fleet Lake	2016	2016	0.653	1.254	0.925	0.759	0.590
Fleet Lake	2022	6.75	12.00	6.00	3.61	0.45	0.547
Manor Lake	2016	7.02	12.00	7.00	3.31	0.14	0.482
Manor Lake	2022	6.89	12.00	6.00	4.38	0.05	0.518
Abbey Lake	2016	6.86	11.00	5.00	5.64	0.08	0.520
Abbey Lake	2022	7.15	12.00	8.00	5.47	0.17	0.444

3.7 Notable species: Macrophytes – Lake (2022)

The Thorpe Park Lakes were found to have a diverse flora. Although *Elodea nuttallii* (Nuttall's waterweed) and *Ceratophyllum demersum* (rigid hornwort) are abundant this was not to the overall exclusion of other species. Five stonewort species were recorded including *Nitellopsis obtusa (*starry stonewort), classified as Natural Environment Research Council Section 41 species, Non-Vascular Plant Species[18] (however, *Nitellopsis obtusa* is likely to be downgraded in the near future). This

[18] https://lists.nbnatlas.org/speciesListItem/list/dr2111

species is classed as 'Vulnerable'[19]. In 2022 *Nitellopsis obtusa* was the most abundant charophyte species and had increased in abundance since 2016. It was also present at two of the other lake sites: Littleton East A and Abbey 1. Across all lakes, *Nitellopsis obtusa* was most dominant in the deeper water habitats but was outcompeted by other species in shallow water, especially *Ceratophyllum demersum* and *Elodea nuttalli*.

Apart from *Nitellopsis obtusa*, the abundance of stonewort species appears to have declined since 2016. Starry stonewort has increased in abundance, particularly in Abbey Lake where it is widespread and locally dominant, especially in deeper water over 2.5m. *Tolypella prolifera,* which was locally abundant in 2016, was not found in 2022. In Britain this species is normally a ditch species visible in summer and autumn but its ecology in lakes is much less understood. In central Europe it is more frequent in lakes (e.g. in the Rhine valley) and seems to be much more of a vernal species (K. van der Weyer pers. comm.), so it is possible that it was not found in 2022 because of the late season of survey, i.e., outside the recommended survey season as stated in the limitations section.

Across the other lake survey locations, shown in Figure 5 two notable macrophyte species were recorded. One species *Cyperus longus* (sweet galingale), located at Littleton East, was deemed as 'Nationally scarce' and listed as 'Near threatened' on the Red List GB Post 2001. *Cyperus longus* grows at the edges of lakes and other still waterbodies; however, its distributions have declined since the 1960s due to reduced grazing in many habitats. The other notable species, *Nitellopsis obtusa* was present at two sites: Littleton East A in the Spelthorne Channel section and Abbey 1 in the Runnymede Channel section.

[19] https://data.jncc.gov.uk/data/98fb6dab-13ae-470d-884b-7816afce42d4/UKBAP-priority-nonvascular-plants.pdf

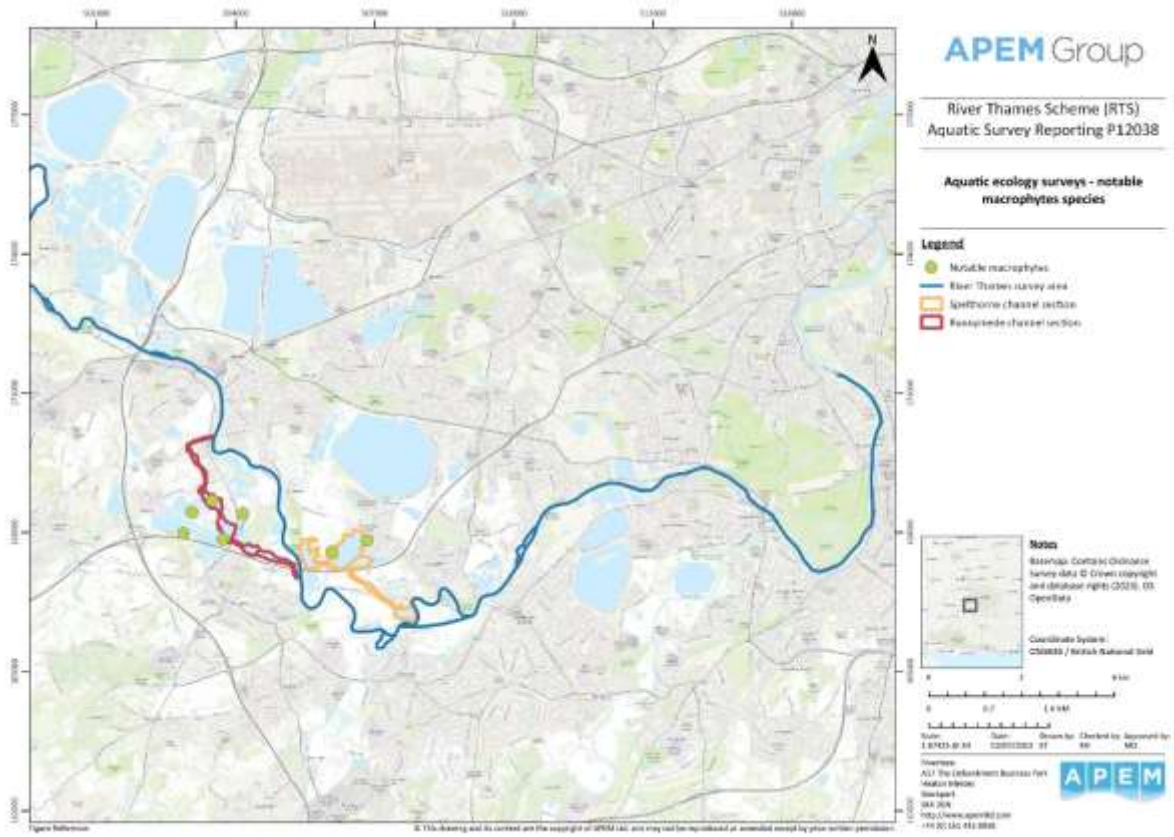


Figure 6: 2022 lake locations with notable macrophyte species

3.8 Invasive Non-Native species: Macrophytes – Lake (2022)

Elodea nuttallii (Nuttall's waterweed) was present at several sites. In addition, Crassula *helmsii* (New Zealand pigmyweed) and *Lemna minuta* (least duckweed). Finally, *Azolla filiculoides* (water fern) was present at St Ann's Lake in the Thorpe Parks Lakes complex but was not recorded at any other site.

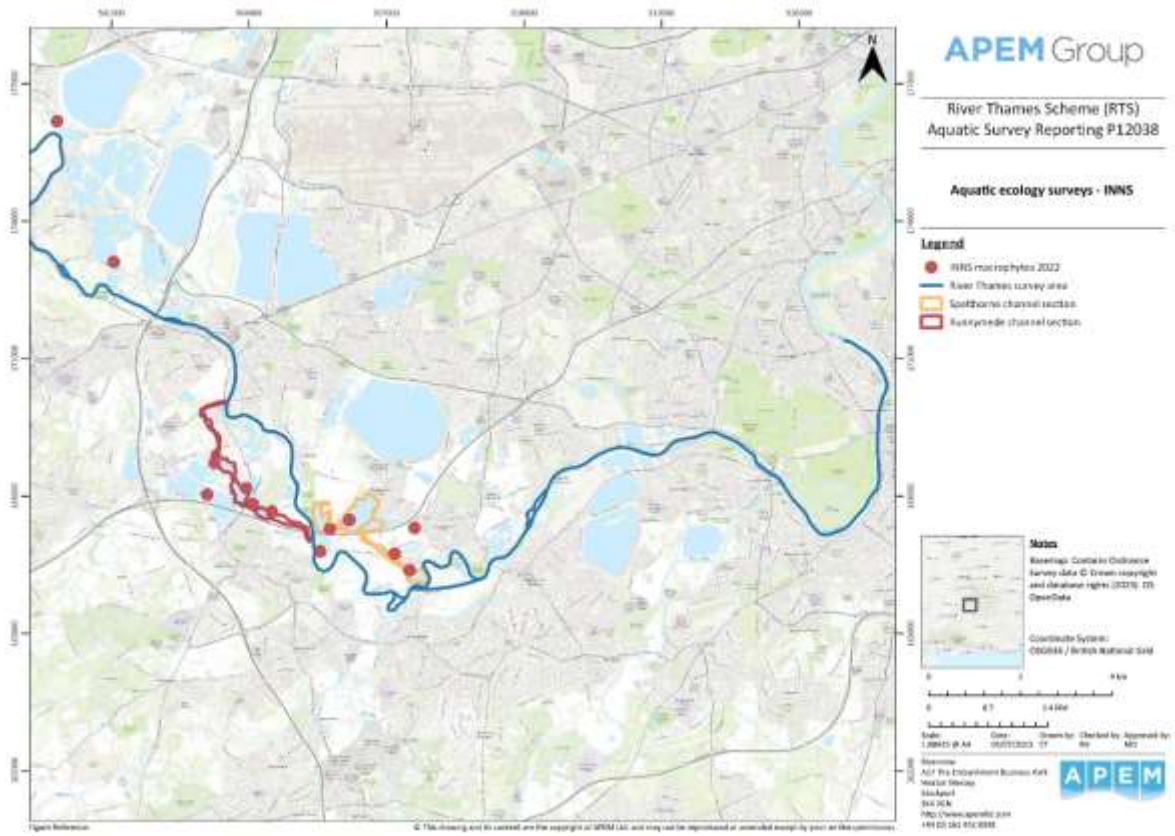


Figure 7: 2022 lake locations with INNS macrophytes

Table 9: Macrophyte INNS– lake locations 2022

Location name	Recorded INNS and taxon cover (where available)
Manor Lake	*Elodea nuttallii*
Abbey Lake	*Elodea nuttallii*
St Ann's Lake	*Azolla filiculoides*
Littleton East A	*Elodea nuttallii (C1)*
Abbey 1	*Elodea nuttallii (C6)*
Abbey 2	*Elodea nuttallii (C9)*
Ferry Lane	*Elodea nuttallii (C3)*
Wraysbury 2 South	*Elodea nuttallii*
Datchet 2	*Elodea nuttallii*
Halliford Mere	*Elodea nuttallii*
Littleton South	*Elodea nuttallii*

3.9 Macroinvertebrates – River (2021)

Observed / expected biotic index ratios are presented in Table 10. Ratios were similar in both the spring and autumn of 2021 for WHPT and LIFE. WHPT NTAXA scores were lower in autumn 2021 compared to spring at all survey locations on the River Thames. The list of species recorded at each site is presented in Appendix C.

Surveys on Mead Lake Ditch took place in spring on the 18th May and the 19th May and in autumn on the 19th October in fine weather conditions with flow conditions normal for the time of year

Surveys on the River Thames took place in spring on the 18th and 19th May. In autumn surveys took place on the 17th and 18th November. Weather conditions were fine at the time of the surveys with flow conditions normal for the time of year; however, two weeks prior to the autumn 2021 surveys river levels on the Thames were above normal for the time of year (145% of the long- term average). All sample locations are influenced by watercraft.

Multi-parameter probe readings were taken during each survey to record conductivity (µS/cm), pH, oxygen (mg/l and % saturation) and temperature (°C). All results were within the expected range for the surveyed river types and seasons.

No depressed river mussels were found during the surveys.

Table 10: Macroinvertebrate observed / expected ratios for survey locations on the River Thames in 2021

Water body	Site name	WHPT ASPT		WHPT NTAXA		LIFE family		PSI species	
		Spring 2021	Autumn 2021	Spring 2021	Autumn 2021	Spring 2021	Autumn 2021	Spring 2021	Autumn 2021
Thames (Egham to Teddington)	US Molesey Weir	1.05	1.05	0.43	0.27	1.08	1.14	0.90	1.57
Thames (Egham to Teddington)	US Sunbury Weir	1.05	1.13	0.86	0.40	1.01	1.07	0.91	0.79
Thames (Egham to Teddington)	Teddington Weir	0.98	1.05	0.62	0.32	0.98	1.09	0.59	0.83

Water body	Site name	WHPT ASPT		WHPT NTAXA		LIFE family		PSI species	
		Spring 2021	Autumn 2021	Spring 2021	Autumn 2021	Spring 2021	Autumn 2021	Spring 2021	Autumn 2021
Thames (Egham to Teddington)	US Walton Bridge	1.00	1.01	0.95	0.62	1.03	1.03	1.12	0.71
Mead Lake Ditch	Above Norlands Lane	0.82	0.96	0.30	0.95	1.13	0.98	2.25	1.82

3.10 Notable species macroinvertebrates – River (2021)

In spring 2021, one notable mayfly species, *Caenis beskidensis*, was recorded at the US Walton Bridge location. This species is 'Nationally Rare' and is typically found in small and medium sized streams with slow flowing shallow water. It has not previously been recorded in the Thames. The previous records were all on the River Lugg, Herefordshire. The specimen was confirmed by Craig Macadam of Buglife and by Peter Malzacher on the 27th July 2021.

3.11 INNS macroinvertebrates – River (2021)

Dikerogammarus haemobaphes (Demon shrimp) was recorded at almost all river sites. Other invasive non-native macroinvertebrates found at the 2021 river survey locations included *Potamopyrgus antipodarum* (New Zealand mud snail) *Chelicorophium curvispinum, and Hypania invalida.*

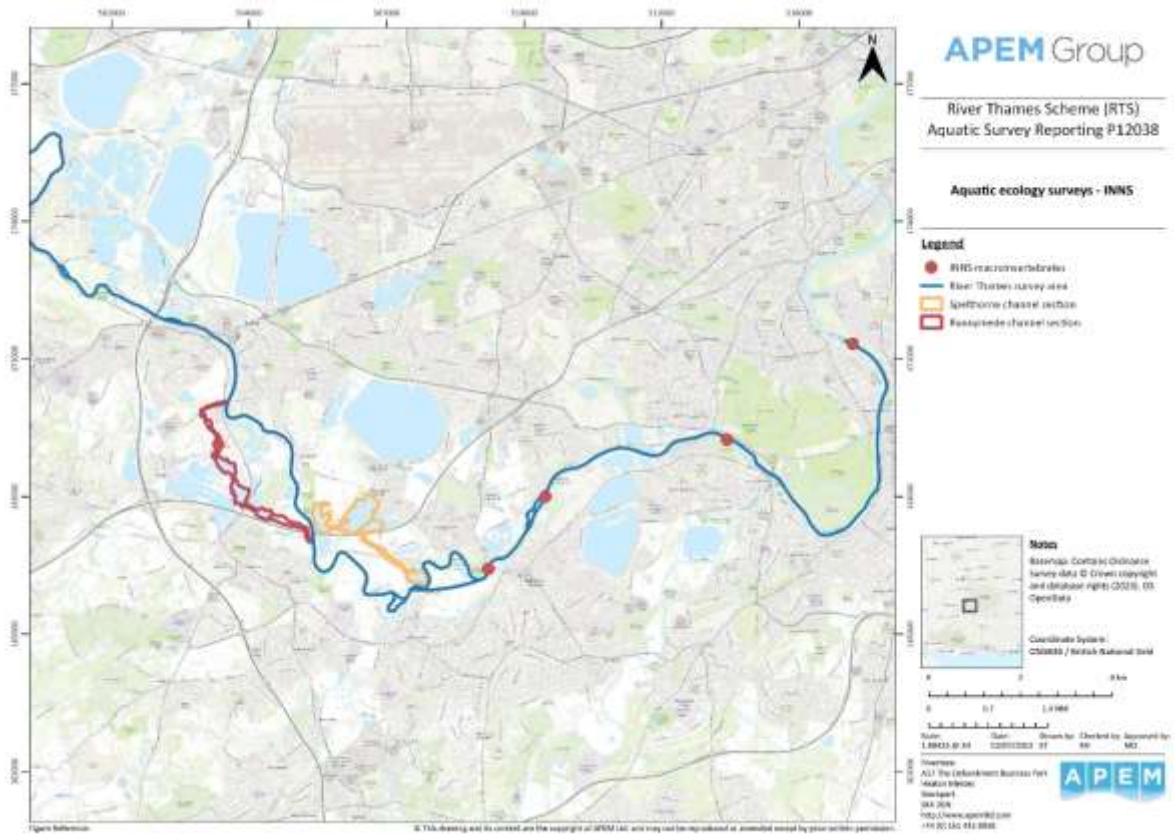


Figure 8: 2021 river locations with INNS macroinvertebrates

Table 11: Macroinvertebrate INNS– river locations 2021

Location name	Recorded INNS
US Molesey Weir	*Dikerogammarus haemobaphes, Hypania invalida*
US Sunbury Weir	*Chelicorophium curvispinum , Dikerogammarus haemobaphes, Dreissena polymorpha, Hypania invalida, Potamopyrgus antipodarum*
Teddington Weir	*Branchiura sowerbyi, Chelicorophium curvispinum, Dikerogammarus haemobaphes,, Dreissena polymorpha, Hypania invalida , Potamopyrgus antipodarum*
US Walton Bridge	*Chelicorophium curvispinum, Dikerogammarus haemobaphes, Hypania invalida, Potamopyrgus antipodarum,*
Mead Lake Ditch	*Potamopyrgus antipodarum*

3.12 Macroinvertebrates – River (2022)

Observed / expected biotic index ratios are presented in Table 12. Scores were similar in both the spring and autumn of 2022 for WHPT APT, NTAXA, and LIFE. For most locations, and barring Abbey River, PSI observed / expected species ratios were higher in autumn 2022 compared to spring 2022. The list of species recorded at each site is presented in Appendix C.

Surveys on the River Thames took place in spring on the 25th and 26th May. In autumn surveys took place on the 7th and 8th September. Weather conditions were fine at the time of the surveys with flow conditions normal for the time of year.

Surveys on Chertsey Bourne and Mead Lake Ditch took place in the spring on the 25th May. In autumn surveys took place on the 12th September. Weather conditions were fine at the time of the surveys with flow conditions normal for the time of year.

Table 12: Macroinvertebrate observed / expected ratios for survey locations on the River Thames in 2022

Water body	Site name	WHPT ASPT		WHPT NTAXA		LIFE family		PSI species	
		Spring 2022	Autumn 2022	Spring 2022	Autumn 2022	Spring 2022	Autumn 2022	Spring 2022	Autumn 2022
Chertsey Bourne (Runnymede Channel)	CB DS of intersection	0.77	0.78	0.79	0.79	0.96	0.99	0.50	0.86
Chertsey Bourne (Runnymede Channel)	CB US of intersection	0.74	0.72	0.56	0.68	0.89	0.97	0.22	0.80
Thames (Egham to Teddington)	Desborough Cut	1.02	1.14	0.66	0.68	1.06	1.11	1.11	1.65
Thames (Egham to Teddington)	DS of Runnymede Channel intake	0.97	1.11	0.58	0.82	1.05	1.08	0.83	1.40
Thames (Egham to Teddington)	DS of Runnymede Channel outfall	0.90	1.20	0.99	0.61	0.99	1.05	0.79	0.70
Thames (Egham to Teddington)	DS of Spelthorne Channel outfall	1.00	1.17	0.55	0.75	1.07	1.10	1.39	2.28
Mead Lake Ditch**	Above Norlands Lane	0.85		0.49		0.93		2.25	
Mead Lake Ditch*	US intersection	3.42	3.73	12	20	5.9	5.47		
Thames (Egham to Teddington)	Teddington Weir	0.95	1.00	0.76	0.68	1.03	0.99	0.83	1.49

Water body	Site name	WHPT ASPT		WHPT NTAXA		LIFE family		PSI species	
		Spring 2022	Autumn 2022	Spring 2022	Autumn 2022	Spring 2022	Autumn 2022	Spring 2022	Autumn 2022
Thames (Egham to Teddington)	US of Walton Bridge	1.05	1.06	0.62	0.68	1.04	1.08	1.54	1.75
Thames (Egham to Teddington)	US of Runnymede Channel outfall and DS of Spelthorne Channel Intake	0.91	1.12	0.68	0.57	1.00	1.07	0.69	0.84
Thames (Egham to Teddington)	US of Spelthorne Channel intake	0.91	0.93	0.78	0.89	0.98	1.00	0.57	1.14
Thames (Egham to Teddington)	US of Spelthorne Channel outfall	1.00	1.04	0.62	0.83	1.09	1.02	1.27	0.78
Thames (Egham to Teddington)	US of Runnymede Channel intake	0.95	1.05	0.89	0.68	1.04	1.06	1.19	0.93
Abbey River*	DS Intersection A	4.07	4.17	26	26	5.91	6	14.55	9.26
Abbey River*	DS Intersection B	3.92	4.03	22	32	6	5.69		7.46
Abbey River*	US Intersection A	4.46	4.26	29	37	6.28	5.9	17.65	12.66
Abbey River*	US Intersection B	4.83	4.32	15	27	6.5	6	14.29	6

* Observed scores only are presented due to the modified nature of both streams. All environment data required to undertake a WFD classification has been calculated.

3.13 Notable species: Macroinvertebrates – River (2022)

In both spring and autumn, nine notable species were recorded across the river survey locations, shown in ~Table 9. Eight were deemed 'Nationally scarce' and one was designated as 'IUCN Near Threatened'. The species noted as 'IUCN Near threatened' was *Macronychus quadrituberculatus* (riffle beetle), located at US and DS of Runnymede Channel intake locations only. The remaining notable species deemed 'Nationally scarce' were *Ephemera lineata* (mayfly larvae), *Gyraulus albus* (white ramshorn freshwater snail), *Leptocerus lusitanicus* (long-horned caddisfly), *Micronecta minutissima* (pygmy water boatmen), *Oulimnius major* (riffle beetle), *Scarodytes halensis* (beetle), and *Unio tumidus* (swollen river mussel).

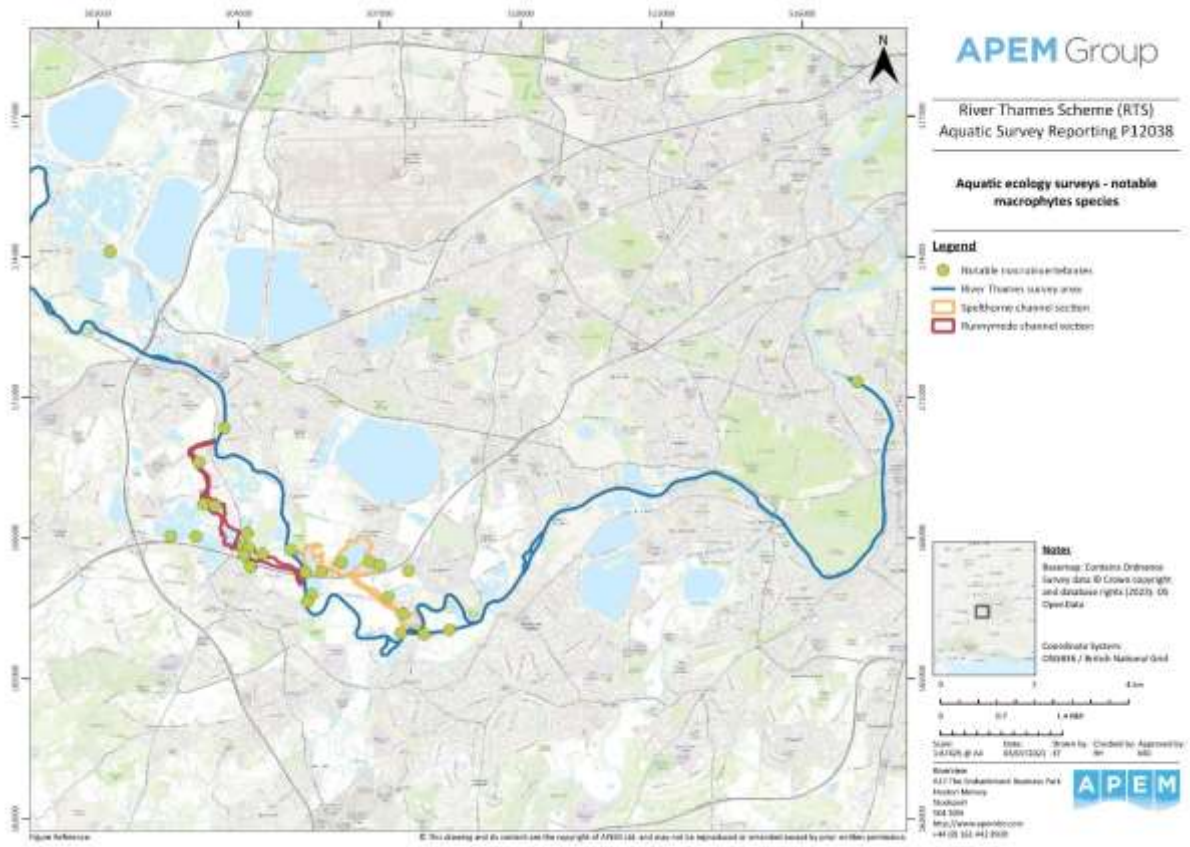


Figure 9: 2021 and 2022 river locations with notable macroinvertebrate species

3.14 INNS macroinvertebrates – River (2022)

Potamopyrgus antipodarum (New Zealand mud snail) was recorded at almost all river sites in 2022. Other invasive non-native macroinvertebrates found across the survey locations included *Dikerogammarus haemobaphes* (Demon shrimp), *Dreissena polymorpha* (zebra mussel), Chelicorophium curvispinum, and Hypania invalida.

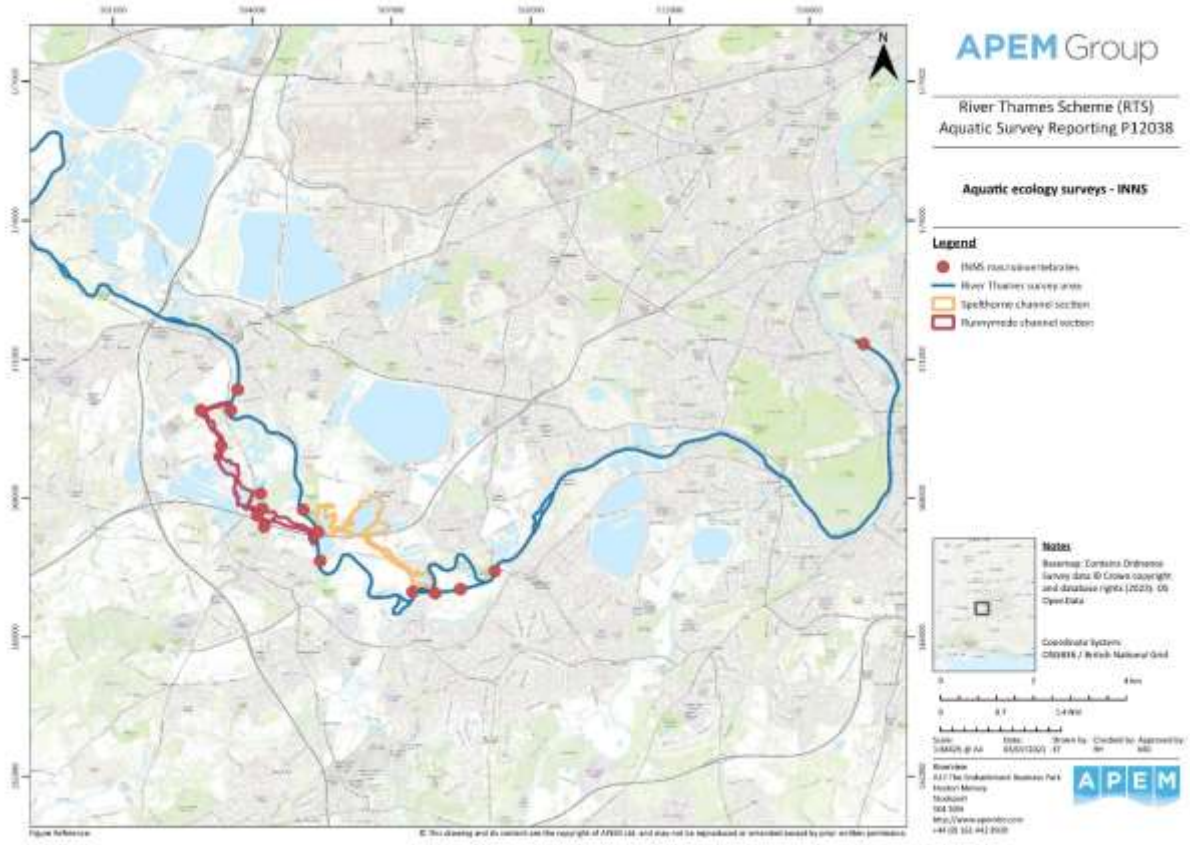


Figure 10: 2022 river locations with INNS macroinvertebrates

Table 13: Macroinvertebrate INNS– river locations 2022

Location name	Recorded INNS
Mead Lake Ditch Above Norlands Lane	*Potamopyrgus antipodarum*
Mead Lake Ditch US Intersection	*Planaria torva*
Abbey River US intersection A	*Potamopyrgus antipodarum, Hypania invalida, Dikerogammarus haemobaphes*
Abbey River DS intersection A	*Potamopyrgus antipodarum, Hypania invalida,*
Abbey River US intersection B	*Hypania invalida*
Abbey River DS intersection B	*Potamopyrgus antipodarum, Chelicorophium curvispinum*
US Runnymede Channel intake	*Potamopyrgus antipodarum, Chelicorophium curvispinum, Dikerogammarus haemobaphes, Dreissena polymorpha,*
DS Runnymede Channel intake	*Potamopyrgus antipodarum, Chelicorophium curvispinum*
US Spelthorne Channel intake	*Potamopyrgus antipodarum, Chelicorophium curvispinum*
US Runnymede Channel outfall and DS of Spelthorne Channel intake	*Potamopyrgus antipodarum, Chelicorophium curvispinum, Hypania invalida, Dikerogammarus haemobaphes,*
DS of Runnymede Channel outfall	*Potamopyrgus antipodarum, Dreissena polymorpha, Chelicorophium curvispinum,*
US of Spelthorne Channel outfall	*Potamopyrgus antipodarum, Hypania invalida, Branchiura sowerbyi, Dikerogammarus haemobaphes*
DS of Spelthorne Channel outfall	*Potamopyrgus antipodarum, Dreissena polymorpha, Chelicorophium curvispinum, Dikerogammarus haemobaphes,*
Desborough Cut	*Potamopyrgus antipodarum, Hypania invalida, Dikerogammarus haemobaphes,*
US Walton Bridge	*Potamopyrgus antipodarum, Dreissena polymorpha, Chelicorophium curvispinum, Dikerogammarus haemobaphes,*
Teddington Weir	*Potamopyrgus antipodarum, Ferrissia californica, Chelicorophium curvispinum, Dikerogammarus haemobaphes, Hypania invalida*

3.15 Macroinvertebrates – Lake (2022)

Surveys within the lakes took place between the 31st August and 12th September 2022. The list of species recorded at each location is presented in Appendix C.

3.16 Notable species: Macroinvertebrates – Lake (2022)

Across the summer macroinvertebrate lake samples, eight notable species were recorded. Seven were deemed ‘Nationally Scarce’ and once was characterised by having only three UK records. The species noted for having only three records in the

UK was *Glossiphonia verrucata* (leech) which was located at Abbey 1. The remaining species identified as 'Nationally scarce' were *Aquarius paludum* (water skater), *Gyraulus laevis* (water snail), *Leptocerus lusitanicus* (caddisfly), *Limnephilus politus* (caddisfly), *Unio tumidus* (river mussel), and *Viviparus contectus* (river snail).

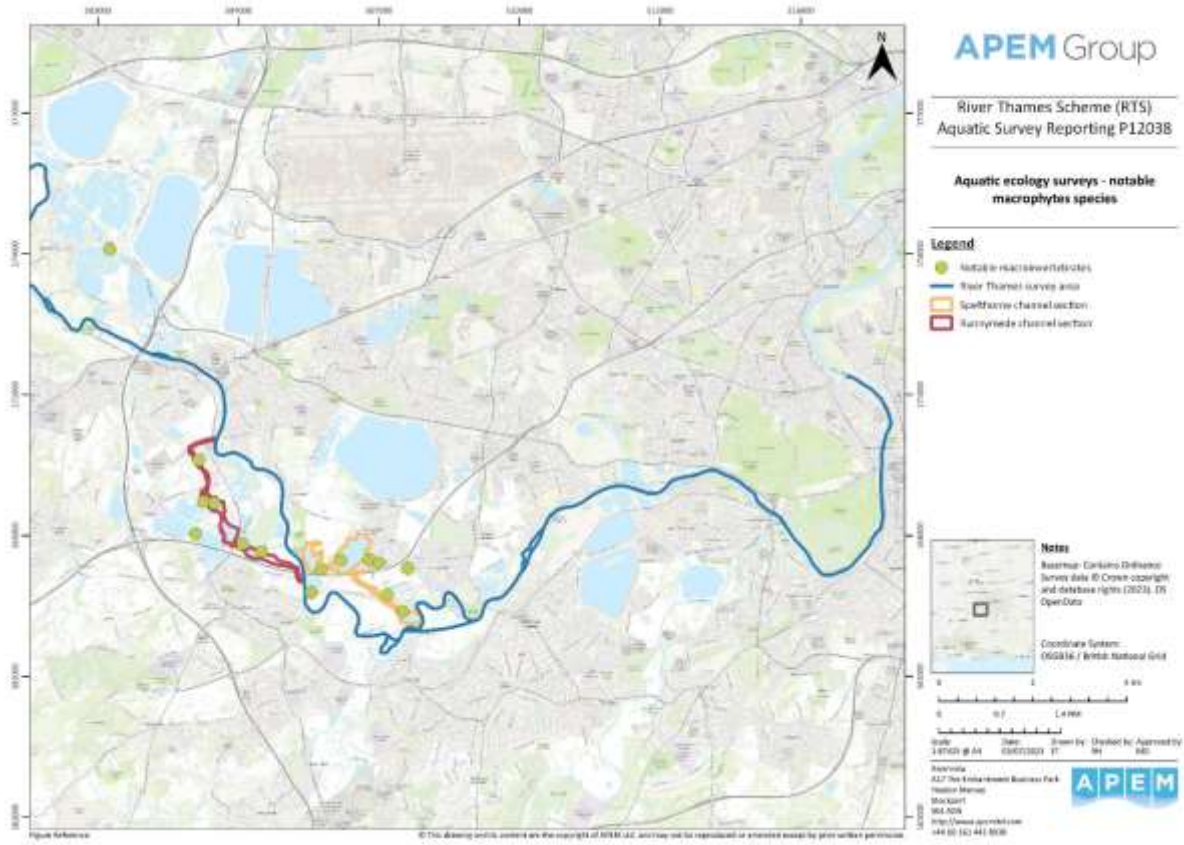


Figure 11: 2022 lake locations with notable macroinvertebrate species

3.17 INNS macroinvertebrates – Lake (2022)

Potamopyrgus antipodarum (New Zealand mud snail) was recorded at most lake survey locations in 2022. Other invasive non-native macroinvertebrates found across the survey locations included *Ferrissia californica* (Wautier's limpet), *Dikerogammarus haemobaphes* (Demon shrimp), *Dreissena polymorpha* (zebra mussel), *Chelicorophium curvispinum,* and *Hypania invalida.*

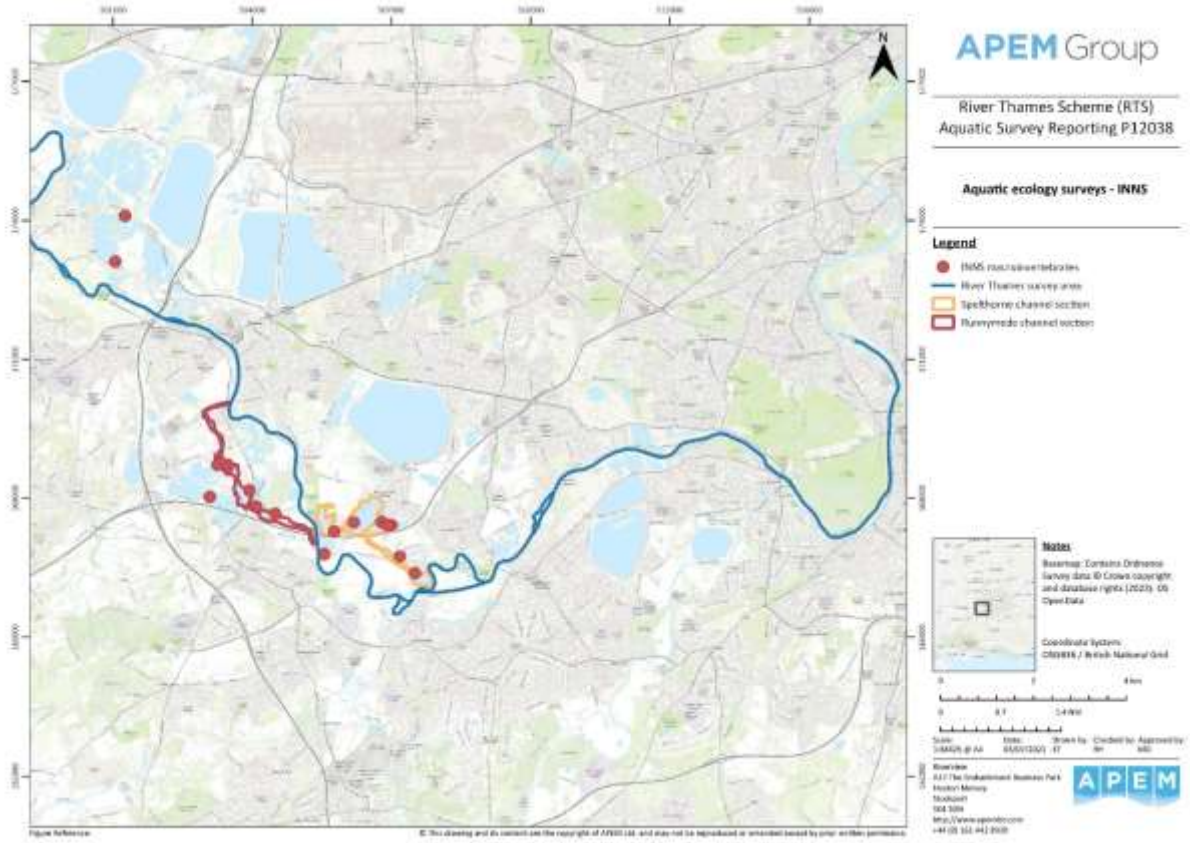


Figure 12: 2022 lake locations with INNS macroinvertebrates

Table 14: Macroinvertebrate INNS– lake locations 2022

Location name	Recorded INNS
Abbey	*Potamopyrgus antipodarum, Dreissena polymorpha, Branchiura sowerbyi,*
Sheepwalk West 1	*Potamopyrgus antipodarum, Dreissena polymorpha*
Sheepwalk East	*Ferrissia californica, Dreissena polymorpha*
Sheepwalk West 2	*Potamopyrgus antipodarum, Dreissena polymorpha*
Abbey 2	*Potamopyrgus antipodarum, , Ferrissia californica, Dreissena polymorpha, Dikerogammarus haemobaphes,*
Littleton South	*Potamopyrgus antipodarum, Dreissena polymorpha*
Fleet	*Dreissena polymorpha*
Halliford Mere Complex	*Ferrissia californica, Dreissena polymorpha,*
Littleton North	*Potamopyrgus antipodarum, Ferrissia californica, Branchiura sowerbyi, Chelicorophium curvispinum , Dikerogammarus haemobaphes,*
Manor	*Potamopyrgus antipodarum, Ferrissia californica, Dreissena polymorpha,*
Abbey 1	*Potamopyrgus antipodarum, Dreissena polymorpha*
Ferry Lane	*Potamopyrgus antipodarum, Dreissena polymorpha, Dikerogammarus haemobaphes*
Littleton East	*Potamopyrgus antipodarum, Dreissena polymorpha, Dikerogammarus haemobaphes*
Wraysbury 2 North	*Dreissena polymorpha*
Wraysbury 2 South	*Potamopyrgus antipodarum, Dreissena polymorpha*
St Ann's	*Potamopyrgus antipodarum,*

4 Summary

4.1 Macrophytes

4.1.1 River

Overall, the 2021 and 2022 macrophyte data were consistent across locations with the number of hydrophytes collected at all locations being low. The percentage cover of algae was also low. The low number of hydrophytes and low percentage cover of algae within the River Thames, likely both reduced due to turbidity and boat traffic rather than nutrient concentration at a majority of locations, may have resulted in misleading indicative WFD classifications with artificially inflated scores. This is also stated in the 2019 report[3] which found Thames locations to be indicative of High status but noted that this should be treated with caution. Across all river macrophyte surveys no notable species were recorded.

4.1.2 Lake

The lowest-scoring metric for macrophyte communities of the Thorpe Park Lakes in 2022 was the Lake Macrophyte Nutrient Index (LMNI). The four waterbodies are currently classified by the Environment Agency at 'Moderate' status, apart from St Ann's Lake which is classified as 'Poor'.

The presence of five charophyte species at Thorpe Park in 2022 was notable and would qualify the location as a nationally "Important Stonewort Area" (Stewart, 2004). The lake complex would also qualify as a Site of Special Scientific Interest based on its stonewort interest (JNCC 2021). Despite the less than Good WFD classifications this interest is considered to be directly linked to the relatively low levels of nutrients (nitrogen and phosphate) and this may be a result of the isolation of the lakes from the nutrient-rich River Thames.

Changes observed between 2016 and 2022 were considered overall to be negative; with only the increase in starry stonewort to be judged as positive. Nutrient sensitive species mostly declined and nutrient tolerant species increased. This was also reflected in an increase in cloudiness and in the number of sample points without vegetation. Whether these changes were part of a long-term trend or reflective of fluctuations from year to year was uncertain. As the survey was undertaken outside the recommended season of survey, this could also have been a factor in explaining differences in the abundances recorded for some species, but, as stated in the limitations section, the baseline surveys were not considered compromised by this.

Across the other lake sites, two notable macrophyte species were recorded. One species *Cyperus longus* (sweet galingale), located at Littleton East, is deemed as 'Nationally Scarce' and listed as 'Near threatened' on the Red List GB Post 2001. The

other notable species, *Nitellopsis obtusa* was present at two sites outside of the Thorpe Park lake complex: Littleton East A in the Spelthorne Channel section and Abbey 1 in the Runnymede Channel section.

4.2 Macroinvertebrates

4.2.1 River

The macroinvertebrate metric most commonly used as an indicator of water quality, WHPT ASPT, did not indicate communities highly sensitive to oxygen concentrations. This was unsurprising given the slow flowing, and often impounded, nature of these waterbodies. Indicative WFD classifications could be made for the Chertsey Bourne and indicated Moderate status for WHPT, suggesting a pre-existing impact of poor water quality (low dissolved oxygen concentrations) on the macroinvertebrate communities.

The notable mayfly species *Caenis beskidensis* recorded at the US of Walton Bridge location in 2021 was only the fifth UK record according to NBN Atlas. Craig Macadam of Buglife stated the following regarding habitat preference of this species: "*Typically this species is found in small and medium-sized streams, however they can also be found in the epipotamal zone (the relatively calm upper reaches of a lowland stream) where they inhabit shallow water with low currents and sand, mud and stone substrates*". Areas of low flow will occur on the leeward side of boulders and other benthic features and this species might be more abundant in the River Thames. Of the nine notable macroinvertebrate species recorded in 2022 from the river locations three were recorded offline from the River Thames, but not within the River Thames itself. These were *Micronecta minutissima* (a species of pygmy water boatmen), recorded in the Abbey River; *Scarodytes halensis* (a water beetle), recorded in the Chertsey Bourne; and *Oulimnius major* (a riffle beetle), recorded in the Abbey River. None of the three species are considered to be highly sensitive to organic pollution and would be better described as moderately sensitive.

4.2.2 Lake

Eight notable macroinvertebrate species were recorded within the lakes surveyed in 2022. The rare leech species, *Glossiphonia verrucata*, recorded within Abbey Lake, is often associated with submerged vegetation such as charophytes. As a result, the species is vulnerable to nutrient enrichment and consequent algal blooms, as the charophytes it depends on typically disappear when oxygen and light availability decline. In contrast, *Aquarius paludum* (water skater), recorded in Manor Lake, occupies a wide variety of temporary and permanent waterbodies and is widespread in southern England, especially the south-east. The aquatic snail *Gyraulus laevis* (found in 11 of 18 lakes surveyed) is a rare pioneer species of ponds and gravel pits, which

has declined from many habitats in response to nutrient enrichment from diffuse agricultural pollution. The other snail species, *Viviparus contectus,* (recorded in Manor Lake) similarly occupies slowly moving waters or lake shores and is currently decreasing in parts of its range as a result of eutrophication, alteration of watercourses and changing flow regimes[20]. Finally, *Unio tumidus* (swollen river mussel), recorded in Fleet Lake, is restricted to central and southern England*,* and is generally concentrated in marginal habitats, drainage channels, oxbow lakes and flooded pits. It appears to require cleaner and better oxygenated water than other *Unio* species and is rapidly declining in several European countries in its western range due to threats of water pollution, disturbance from habitat modification for river and canal management and pressure from INNS[21].

[20] The IUCN Red List of Threatened Species: Viviparus contectus – published in 2014. http://dx.doi.org/10.2305/IUCN.UK.2014-3.RLTS.T155717A42430987.en

[21] The IUCN Red List of Threatened Species: Unio tumidus – published in 2011. http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T156111A4898810.en

5 Recommendations

The 2021 and 2022 data presented in this report conclude the repeat of baseline ecological and environmental surveys (originally carried out in 2019) specified by the Environment Agency in relation to the proposed RTS. It is considered that enough ecological data have been collected to allow for an impact assessment of the proposed project; however, it is recommended that the Environment Agency review the data collected to consider whether any follow-up surveys are required at this time. Furthermore, further macrophyte and macroinvertebrate sampling in the non-Thorpe Park gravel pit lakes should be considered; the shore-based surveys may have missed charophyte communities (and any macroinvertebrates associated with this habitat), as observed in Thorpe Park lakes.

Review of notable species has indicated that the ecology of the Thorpe Park Lakes, both regarding macrophytes and macroinvertebrates, are likely to be sensitive to increased nutrient status. Further investigation into how nutrient status of gravel pit lakes might be affected by the RTS is being considered within the ongoing conceptual water modelling work that will inform the Environmental Impact Assessment and WFD compliance assessment for the project.

Appendix

Appendix A Macrophyte Species List

Macrophytes – River (2021)

River name	Location name	Recorded species and taxon cover (see ranges in Table 4)
Abbey River	US intersection	*Glyceria maxima* (C3), *Iris pseudacorus* (C2), *Lemna gibba* (C3), *Mentha aquatica* (C2), *Nuphar lutea* (C5), *Nymphaea alba* (C3), *Oenanthe crocata* (C3), *Phalaris arundinacea* (C4), *Rorippa nasturtium-aquaticum agg.* (C3), *Sparganium emersum* (C4), *Sparganium erectum* (C3), *Typha latifolia* (C3)
Abbey River	DS intersection	*Pellia endiviifolia (C3), Butomus umbellatus (C1), Glyceria maxima (C3), Hydrocotyle ranunculoides (C1), Lemna gibba (C2), Lemna minuta (C2), Oenanthe crocata (C2), Phragmites australis (C3), Sparganium erectum (C3)*
Mead Lake Ditch	Above Norlands Lane	*Glyceria maxima (C4), Phragmites australis, (C4), Typha latifolia (C2)*
River Thames	Teddington Weir	*Elodea canadensis (C1), Iris pseudacorus (C1), Oenanthe crocata (C1), Persicaria amphibia (C1), Rumex hydrolapathum (C1),*
River Thames	US Mosely Weir	*Cladophora glomerata/Rhizoclonium hieroglyphicum (C1), Iris pseudacorus (C1), Nuphar lutea (C4), Octodiceras fontanum (C1), Typha latifolia (C1)*
River Thames	US Sunbury Weir	*Nuphar lutea (C5), Oenanthe crocata (C1),*
River Thames	US of Walton Bridge	*Mentha aquatica (C1), Nuphar lutea (C6), Oenanthe crocata (C1)*

Macrophytes – Lake (2022)

Location and NGR	Species List (Taxon Cover Value included where available)
Manor Lake Indicative NGR: TQ0324768724	*Cladophora, Spirogyra, Sponge, Ceratophyllum demersum, Chara contraria, Chara vulgaris, Elodea nuttallii, Lemna trisulca, Nitellopsis obtusa, Potamogeton pusillus, Potamogeton trichoides, Ranunculus circinatus, Stuckenia pectinata*
Fleet Lake Indicative NGR: TQ0348068690	*Cladophora, Spirogyra, Sponge, Ceratophyllum demersum, Chara contraria, Elodea nuttallii, Fontinalis antipyretica, Lemna trisulca, Myriophyllum spicatum, Nitellopsis obtusa, Potamogeton pusillus, Ranunculus circinatus, Stuckenia pectinata, Zannichellia palustris*
Abbey Lake Indicative NGR: TQ0393968171	*Cladophora, Spirogyra, Sponge, Ceratophyllum demersum, Chara contraria, Chara globularis, Elodea nuttallii, Lemna trisulca, Myriophyllum spicatum, Nitellopsis obtusa, Potamogeton pusillus, Potamogeton trichoides, Ranunculus circinatus, Stuckenia pectinata,*
St Ann's Lake Indicative NGR: TQ0308468033	*Cladophora, Spirogyra, Hydrodictyon reticulatum, Ulva flexuosa, Sponge, Azolla filiculoides, Ceratophyllum demersum, Chara contraria, Chara globularis, Elodea nuttallii, Lemna trisulca, Myriophyllum spicatum, Nitellopsis obtusa, Potamogeton pusillus, Ranunculus circinatus, Zannichellia palustris*
Littleton East A TQ0683467834	*Ceratophyllum demersum (C5), Chara aspera (C8), Chara globularis (C1), Cladophora glomerata (C3), Elodea nuttallii (C1), Myriophyllum spicatum (C4), Nitellopsis obtusa (C9), Potamogeton trichoides (C6), Stuckenia pectinata (C6)*
Abbey 1 TQ0415268411	*Ceratophyllum demersum (C6), Chara contraria (C7), Chara globularis (C7), Cladophora / Rhizoclonium (C1), Elodea nuttallii (C6), Lemna trisulca (C1), Nitellopsis obtusa (C9), Potamogeton tricoides (C3)*
Abbey 2 TQ0445667569	*Cladphora / Rhizoclonium (C2), Cladophora glomerata (C1), Elodea nuttallii (C9), Schoenoplectus lacustris (C2)*
Ferry Lane TQ0782166368	*Calystegia sepium, Calystegia sylvatica, Calystegia ×lucana, Carex hirta, Elodea nuttallii (C3), Iris pseudacorus, Juncus effusus, Juncus inflexus, Lycopus europaeus, Lythrum salicaria, Mentha × piperita, Myosotis scorpioides, Pulicaria dysenterica, Rorippa amphibia, Rumex conglomeratus, Salix alba, Salix cinerea, Salix × fragilis, Salix viminalis, Solanum dulcamara, Sparganium erectum, Stachys palustris, Typha ×glauca, Typha latifolia, Mentha aquatica (C1), Persicaria amphibia (C1), Potamogeton trichoides (C2), Zygnematalean algae (C1), Cladophora glomerata (C2), Nuphar ×porphyranthera (C1), Persicaria amphibia (C1)*
Wraysbury 2 South TQ0178372785	*Cladophora/Rhizoclonium, Ceratophyllum demersum, Elodea nuttallii, Iris pseudacorus, Lycopus europaeus, Lysimachia vulgaris, Lythrum salicaria, Persicaria maculosa, Phragmites australis, Rorippa amphibia, Solanum dulcamara, Sparganium erectum*
Datchet 2 SU9989276041	*Chara globularis, Chara vulgaris, Agrostis stolonifera, Ceratophyllum demersum, Elodea nuttallii, Lemna trisulca, Lycopus europaeus, Cladophora glomerata, Nostoc sp., Myriophyllum spicatum, Persicaria amphibia, Potamogeton trichoides, Stuckenia pectinata, Typha latifolia*
Black Ditch Pond TQ0763367280	*Cladophora glomerata, Leptodictyum riparium, Carex pendula, Ceratophyllum demersum, Crassula helmsii, Galium palustre, Iris pseudacorus, Lemna gibba, Lemna minor, Lemna minuta, Lemna trisulca, Lemna valdiviana, Lycopus americanus, Lycopus europaeus, Lythrum salicaria, Mentha × verticillata, Phragmites australis, Salix cinerea, Salix × fragilis, Salix alba, Typha latifolia*
Littleton East TQ0607067588	*Leptodictyum riparium, Alnus glutinosa, Carex acuta, Carex acutiformis, Cyperus longus, Epilobium hirsutum, Eupatorium cannabinum, Iris pseudacorus, Juncus inflexus, Lycopus europaeus, Lysimachia vulgaris, Lythrum salicaria, Persicaria amphibia, Phragmites australis, Pulicaria dysenterica, Salix cinerea, Salix x fragilis, Scrophularia auriculata, Scutellaria galericulata, Sparganium erectum, Stachys palustris*

Location and NGR	Species List (Taxon Cover Value included where available)
Halliford Mere TQ0717866748	*Acorus calamus, Crassula helmsii, Cladophora glomerata, Leptodictyum riparium, Alnus glutinosa, Aster sp., Butomus umbellatus, Carex hirta, Carex otrubae, Carex pendula, Ceratophyllum demersum, Elodea nuttalli, Epilobium hirsutum, Equisetum palustre, Hemerocallis fulva, Iris pseudacorus, Juncus bufonius, Juncus inflexus, Lemna trisulca, Riccia fluitans, Lemna valdiviana, Lycopus europaeus, Lysimachia nummularia, Lythrum salicaria, Mentha aquatica, Nymphaea alba, Nymphaea ×thiona (cf.), Persicaria amphibia, Phragmites australis, Pulicaria dysenterica, Ranunculus lingua, Salix cinerea, Stuckenia pectinata, Typha latifolia*
Littleton North TQ0576767283	*Chara vulgaris, Butomus umbellatus, Carex pendula, Carex pseudocyperus, Glyceria maxima, Juncus inflexus, Lythrum salicaria, Nymphaea × marliacea, Oenanthe crocata, Persicaria amphibia, Zygnematalean algae, Phragmites australis, Potamogeton pusillus, Salix alba, Salix cinerea, Salix x fragilis, Stuckenia pectinata, Typha angustifolia, Typha latifolia*
Littleton South TQ0555266798	*Carex pseudocyperus, Carex riparia, Epilobium hirsutum, Elodea nuttallii, Juncus bufonius, Juncus inflexus, Lythrum salicaria, Mentha aquatica, Myriophyllum spicatum, Oxybasis rubra, Persicaria maculosa, Phragmites australis, Pulicaria dysenterica, Rorippa palustris, Salix cinerea, Salix viminalis, Salix x fragilis, Veronica anagallis-aquatica, Veronica catenata*

Thorpe Park lake macrophyte species 2022

Location and NGR	Species List
Manor	*Cladophora-type, Spirogyra-type, Sponge, Ceratophyllum demersum, Chara contraria, Chara vulgaris, Elodea nuttalii, Lemna trisulca, Nitellopsis obtusa, Potamogeton pusillus, Potamogeton trichoidies, Ranunculus circinatus, Stuckenia pectinata*
Fleet	*Cladophora-type, Spirogyra-type, Sponge, Ceratophyllum demersum, Chara contraria, Elodea nuttallii, Lemna trisulca, Nitellopsis obtusa, Potamogeton pusillus, Potamogeton trichodies, Ranunculus cirinatus, Stuckenia pectinata*
Abbey	*Cladophora-type, Spirogyra-type, Sponge, Ceratophyllum demersum, Chara contraia, Chara globularis, Elodea nuttallii, Lemna trisulca, Myriophyllum spicatum, Nitellopsis obtusa, Potamogeton pusillus, Potamogeton trichodies, Ranunculus circinatus, Stuckenia pectinata*
St Ann's	*Cladophora-type, Spirogyra-type, Hydrodictyon reticulatum, ulva flexuosa, Sponge, Azolla filiculodies, Ceratophyllum demersum, Chara contraria, Chara globularis, Elodea nuttallii, Lemna trisulca, Myriophyllum spicatum, Nitellopsis obtusa, Potamogeton pusillus, Ranunculus circinatus, Zannichellia palustris*

Macrophytes – River (2022)

Lake name	Species List (Taxon Cover Value included where available)
US of the Runnymede Channel intake	*Azolla filiculoides (1), Carex acuta (2), Iris pseudacorus (1), Lemna gibba (1), Lemna minor (1), Lemna minuta (1), Nuphar lutea (2), Oenanthe crocata (1), Spirodela polyrhiza (1)*
DS of Runnymede Channel intake	*Glyceria maxima (1), Hygroamblystegium tenax (1), Iris pseudacorus (1), Lythrum salicaria (1), Mentha aquatica (1), Oenanthe crocata (1), Phragmites australis (1), Rumex hydrolapathum (1)*
US of Spelthorne Channel intake	*Carex acuta (2), Cladophora glomerata/Rhizoclonium hieroglyphicum (6), Glyceria maxima (2), Iris pseudacorus (2), Lythrum salicaria (1), Mentha aquatica (1), Nostoc verrucosum (6) Oenathe crocata (1), Persicaria amphibia (1), Phalaris arundinacea (2), Sparganium emersum/erectum (1)*

Lake name	Species List (Taxon Cover Value included where available)
US of Runnymede Channel outfall and DS of Spelthorne Channel intake	*Fontinalis antipyretica (1), Glyceria maxima (1), Lemna gibba (1), Lemna minuta (1), Nuphar lutea (6), Oenanthe crocata (1), Persicaria amphibia (1), Phalaris arundinacea (2), Sparganium emersum/erectum (2), Spirodela polyrhiza (1)*
DS of Runnymede Channel outfall	*Iris pseudacorus (1), Oenanthe crocata (1), Phalaris arundinacea (1), Typha angustifolia (1)*
US of Spelthorne Channel outfall	*Fontinalis antipyretica (1), Octodiceras fontanum (1), Sagittaria sagittifolia (4), Schoenoplectus lacustris (6), Sparganium emersum (6)*
DS of Spelthorne Channel outfall	*Brachythecium rivulare (1), Carex acuta (1), Hildenbrandia rivularis (1), Mimulus sp./hybrid (1), Octodiceras fontanum (1), Oenanthe aquatica (1)*
Desborough Cut	*Cladophora glomerata/Rhizoclonium hieroglyphicum (1), Oenanthe aquatica (1)*
US of Walton Bridge	*Lythrum salicaria (1), Nuphar lutea (7), Oenanthe aquatica (1)*
Teddington Weir	*Carex acutiformis (1), Cladophora glomerata (1), Oenanthe crocata (1)*
MLD US of intersection	*Lemna minor (2), Sparganium emersum (1)*
MLD Above Norlands Lane	*Glyceria maxima (3), Sparganium erectum (4), Typha latifolia (8)*
CB US of intersection	*Callitriche obtusangula (2), Lemna gibba (2), Sparganium emersum (1), Sparganium erectum (1)*
CB DS of intersection	*Callitriche obtusangula (6), Lemna gibba (5), Lemna minuta (5), Lythrum salicaria (1), Oenanthe crocata (1), Phalaris arundinacea (5), Rorippa amphibia (2), Sparganium emersum (7), Sparganium erectum (5), Typha latifolia (2)*
AR US of intersection	*Iris pseudacorus (1), Phalaris arundinacea (1), Sparganium erectum (3)*
AR DS of intersection	*Acorus calamus (1), Glyceria maxima (5), Iris pseudacorus (2), Lythrum salicaria (1), Mentha aquatica (2), Nuphar lutea (3), Nymphaea alba (4), Oenanthe crocata (1), Phalaris arundinacea (2), Sparganium emersum (2), Typha latifolia (1),*
AR US of intersection*	*Glyceria notata (5), Iris pseudacorus (4), Lemna gibba (1), Lemna minuta (1), Nuphar lutea (4), Oenanthe crocata (1), Phalaris arundinacea (5), Sparganium erectum (2), Spirodela polyrhiza (1), Typha latifolia (1),*
AR DS of intersection*	*Lemna gibba (1), Lemna minor (1), Nuphar lutea (5), Oenanthe crocata (1), Sparganium erectum (5), Spirodela polyrhiza (1)*

** B intersection locations*

Appendix B Macroinvertebrate Species List

Macroinvertebrates - River (2021)

River name	Location name	Species recorded in spring 2021 survey	Species recorded in autumn 2021 survey
Thames (Egham to Teddington)	US Molesey Weir	*Ancylus fluviatilis, Athripsodes cinereus, Athripsodes sp., Caenis horaria, Caenis luctuosa/macrura, Ceratopogonidae, Chironomidae, Corbicula fluminea, Dikerogammarus haemobaphes, Dikerogammarus sp., Ephemera sp., Gammaridae, Gastropoda, Hypania invalida, Mystacides longicornis, Oligochaeta, Piscicola sp., Pisidium sp., Potamopyrgus antipodarum, Sphaeriidae, Viviparus sp.*	*Athripsodes cinereus, Caenis luctuosa/macrura, Ceratopogonidae, Chironomidae, Corbicula fluminea, Dikerogammarus haemobaphes, Hypania invalida, Oligochaeta, Tinodes waeneri*
Thames (Egham to Teddington)	US Sunbury Weir	*Anabolia nervosa, Ancylus fluviatilis, Anodonta anatine, Asellus aquaticus, Athripsodes cinereus, Bithynia tentaculate, Bivalvia, Caenis luctuosa/macrura, Centroptilum luteolum, Ceraclea dissimilis, Ceraclea senilis, Ceratopogonidae, Chaetopteryx villosa, Chelicorophium curvispinum, Chironomidae, Copepoda, Corbicula fluminea, Corophiidae, Cyrnus trimaculatus, Dikerogammarus haemobaphes, Dreissena polymorpha, Dugesia lugubris/polychroa, Ecnomus tenellus, Ephemera danica, Ephemera sp., Ephemera vulgate, Gammaridae, Hydroptila sp., Hypania invalida, Leuctra sp., Limnephilus lunatus, Lymnaeidae, Oligochaeta, Ostracoda, Oulimnius tuberculatus, Pisidium sp., Potamopyrgus antipodarum, Radix balthica, Sphaerium sp., Tricladida, Unio tumidus, Unionidae, Viviparus sp., Viviparus viviparus*	*Athripsodes cinereus, Caenis luctuosa/macrura, Ceraclea annulicornis, Ceratopogonidae, Chelicorophium curvispinum, Chironomidae, Corbicula fluminea, Corophiidae, Dikerogammarus haemobaphes, Ephemera danica, Ephemera sp., Ephemera vulgate, Gammaridae, Goera Pilosa, Hypania invalida, Oecetis notata, Oligochaeta, Pisidium sp., Potamopyrgus antipodarum, Sphaerium sp.*

River name	Location name	Species recorded in spring 2021 survey	Species recorded in autumn 2021 survey
Thames (Egham to Teddington)	Teddington Weir	*Asellus aquaticus, Bithynia leachii, Bithynia tentaculate, Branchiura sowerbyi, Caenis horaria, Caenis luctuosa/macrura, Caenis sp., Ceraclea senilis, Ceratopogonidae, Chelicorophium curvispinum, Chironomidae, Corbicula fluminea, Dikerogammarus haemobaphes, Ephemera danica, Ephemera sp., Ephemera vulgate, Erythromma najas, Gammaridae, Gyraulus albus, Limnephilus lunatus, Mystacides longicornis, Nematoda, Oligochaeta, Ostracoda, Physella sp., Physidae, Pisidium sp., Polycentropodidae, Potamopyrgus antipodarum, Sphaeriidae, Unio tumidus*	*Caenis luctuosa/macrura, Ceraclea annulicornis, Chironomidae, Dikerogammarus haemobaphes, Dreissena polymorpha, Ephemera sp., Hypania invalida, Oligochaeta, Pisidium sp., Potamopyrgus antipodarum, Sphaerium sp.*
Thames (Egham to Teddington)	US Walton Bridge	*Anabolia nervosa, Ancylus fluviatilis, Asellus aquaticus, Athripsodes cinereus, Bithynia leachii, Bithynia tentaculate, Caenis beskidensis, Caenis luctuosa/macrura, Calopteryx sp., Centroptilum luteolum, Ceraclea dissimilis, Ceraclea senilis, Ceratopogonidae, Chaetopteryx villosa, Chelicorophium curvispinum, Chironomidae, Coenagrionidae, Collembola, Copepoda, Corbicula fluminea, Corophiidae, Dikerogammarus haemobaphes, Dugesia tigrine, Ephemera Danica, Ephemera sp., Gammaridae, Gyraulus crista, Hypania invalida, Limnephilus lunatus, Lymnaeidae, Lype sp., Mystacides longicornis/nigra, Neureclipsis bimaculate, Oligochaeta, Ostracoda, Oulimnius sp., Piscicola geometra, Pisidium sp., Potamopyrgus antipodarum, Radix balthica, Simuliidae, Sphaeriidae, Sphaerium sp., Tinodes waeneri, Unionidae, Viviparus sp., Viviparus viviparus*	*Ampullaceana balthica, Asellus aquaticus, Bithynia tentaculate, Caenis luctuosa/macrura, Calopteryx splendens, Ceraclea albimacula, Ceraclea annulicornis, Ceratopogonidae, Chelicorophium curvispinum, Chironomidae, Corbicula fluminea, Dendrocoelum lacteum, Dikerogammarus haemobaphes, Ephemera danica, Ephemera vulgate, Gammaridae, Hemimysis anomala, Hypania invalida, Lepidoptera, Limnephilidae, Microturbellaria, Mystacides longicornis, Nematoda, Oligochaeta, Oribatei, Ostracoda, Pisidium sp., Potamopyrgus antipodarum, Sphaerium sp., Viviparus viviparus*

River name	Location name	Species recorded in spring 2021 survey	Species recorded in autumn 2021 survey
	Mead Lake Ditch	*Asellus aquaticus, Chironomidae, Clinocerinae, Dendrocoelum lacteum, Empididae, Gastropoda, Halesus radiatus, Limnephilus lunatus, Limnophora sp., Nematoda, Oligochaeta, Simuliidae*	*Anisus sp., Anisus vortex, Asellus aquaticus, Bathyomphalus contortus, Bithynia leachii, Bithynia sp., Bithynia tentaculate, Chaoborus sp., Chironomidae, Cladocera, Cloeon dipterum, Coenagrion puella, Coenagrionidae, Collembola, Copepoda, Crangonyx pseudogracilis/floridanus, Culicidae, Dendrocoelum lacteum, Dixella sp., Dytiscidae, Gyrinus substriatus, Hippeutis complanatus, Ilybius sp., Ilybius/Agabus sp., Ischnura elegans, Leptocerus lusitanicus, Limnephilidae, Lymnaea stagnalis, Lymnaeidae, Molophilus sp., Noterus clavicornis, Notonecta glauca, Oligochaeta, Physa fontinalis, Physella sp., Pisidium sp., Planorbarius corneus, Planorbis sp., Potamopyrgus antipodarum, Pyrrhosoma nymphula, Simuliidae, Succineidae, Viviparus contectus*

Macroinvertebrates – River (2022)

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
Mead Lake Ditch	Mead Lake Ditch Above Norlands Lane	*Polycelis nigra/tenuis, Valvata cristata, Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii , Bathyomphalus contortus, Hippeutis complanatus, Oligochaeta, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Enallagma cyathigerum, Coenagrion puella, Hyphydrus ovatus, Anabolia nervosa, Limnephilus lunatus, Athripsodes aterrimus, Diptera Chironomidae*	N/A
Mead Lake Ditch	Mead Lake Ditch US Intersection	*Tricladida, Planaria torva, Polycelis nigra/tenuis, Valvata cristata, Bithynia leachii, Lymnaeidae,, Lymnaea stagnalis, Acroloxus lacustris, Sphaeriidae, Pisidium sp., Musculium lacustre, Oligochaeta, Piscicola siddalli, Hydracarina, Oribatei, Cladocera, Copepoda, Asellus aquaticus, Proasellus meridianus, Crangonyx pseudogracilis/floridanus, Notonecta sp., Chironomidae*	*Tricladida, Polycelis nigra/tenuis, Dendrocoelum lacteum, Valvata cristata, Bithynia sp., Bithynia tentaculate, Bithynia leachii, Lymnaea stagnalis, Stagnicola sp., Planorbis planorbis, Anisus sp., Anisus vortex, Bathyomphalus contortus, Acroloxus lacustris, Pisidium sp., Musculium lacustre, Oligochaeta, Asellidae, Asellus aquaticus, Proasellus meridianus, Crangonyx pseudogracilis/floridanus, Hydrometra stagnorum, Ilybius ater, Hydrophilidae, Helophorus brevipalpis, Cercyon tristis, Diptera, Molophilus sp., Psychodidae, Dixella amphibia, Culicidae Culicinae, Anopheles sp., Chironomidae, Odontomyia/Oplodontha sp.*
Chertsey Bourne	Chertsey Bourne US intersection	*Tricladida, Polycelis sp., Polycelis nigra/tenuis, Dendrocoelum lacteum, Valvata piscinalis, Pisidium sp. Oligochaeta, Helobdella stagnalis, Erpobdella octoculata, Hydracarina Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Calopteryx splendens, Velia sp. Velia caprai, Scarodytes halensis, Gyrinus sp. Simuliidae, Chironomidae*	*Tricladida, Girardia tigrine, Dendrocoelum lacteum, Nematoda Valvata sp., Ampullaceana balthica, Bathyomphalus contortus, Gyraulus crista, Acroloxus lacustris, Ancylus group (Ancylus, Ferrissia & Acroloxus), Sphaeriidae, Sphaerium sp., Pisidium sp., Oligochaeta, Helobdella stagnalis, Erpobdellidae, Erpobdella sp., Erpobdella octoculata, Hydracarina, Asellus aquaticus, Crangonyx*

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
			pseudogracilis/floridanus, Gammarus pulex, Gammarus pulex/fossarum, Baetis sp., Baetis vernus, Calopteryx sp., Calopteryx splendens, Gerridae, Hydropsyche sp., Hydropsyche angustipennis, Simuliidae, Chironomidae
Chertsey Bourne	Chertsey Bourne DS intersection	*Valvata piscinalis, Bithynia tentaculate, Physidae, Physa fontinalis, Lymnaeidae, Lymnaea stagnalis, Ampullaceana balthica, Acroloxus lacustris, Pisidium sp., Oligochaeta, Helobdella stagnalis, Ostracoda, Asellus aquaticus, Crangonyx pseudogracilis/floridanus,Gammarus sp., Gammarus pulex, Gammarus pulex/fossarum, Calopteryx splendens, Velia sp., Notonecta sp., Anacaena globulus, Dryops sp., Hydropsyche angustipennis, Goeridae, Diptera, Psychodidae,, Chironomidae Limnophora sp.*	*Hydridae, Polycelis nigra/tenuis, Girardia tigrine, Nematoda, Valvata piscinalis, Bithynia tentaculate, Bithynia leachii, Physa fontinalis, Gyraulus crista, Ferrissia californica, Acroloxus lacustris, Pisidium sp., Oligochaeta, Helobdella stagnalis, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammarus sp., Gammarus pulex, Gammarus pulex/fossarum, Baetis vernus, Coenagrionidae, Calopteryx sp., Calopteryx splendens, Gerridae, Hydropsyche sp., Hydropsyche angustipennis. Athripsodes sp., Athripsodes cinereus, Simuliidae, Chironomidae*
Abbey River	Abbey River US intersection A	*Microturbellaria, Dugesia lugubris/polychroa, Nematoda,, Valvata piscinalis, Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii, Physa fontinalis, Physella sp., Anisus vortex, Acroloxus lacustris, Sphaerium sp., Pisidium sp., Hypania invalida, Oligochaeta, Piscicola geometra, Helobdella stagnalis, Erpobdella octoculata, Hydracarina, Cladocera, Ostracoda, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammarus pulex/fossarum, Dikerogammarus haemobaphes, Centroptilum luteolum, Caenis luctuosa/macrura, Calopteryx splendens, Gerridae, Notonecta sp., Coleoptera, Gyrinus sp., Oulimnius tuberculatus, Hydroptila sp., Polycentropus irroratus, Chaetopteryx villosa. Limnephilus lunatus, Dixidae, Ceratopogonidae, Simuliidae*	*Girardia tigrine, Valvata piscinalis Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii, Physella sp., Lymnaeidae, Anisus vortex, Gyraulus albus, Hippeutis complanatus, Sphaerium sp., Pisidium sp., Oligochaeta, Branchiura sowerbyi, Helobdella stagnalis, Erpobdella octoculata, Ostracoda, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammarus pulex, Gammarus pulex/fossarum, Centroptilum luteolum, Ephemera sp., Ephemera vulgate, Coenagrionidae, Ischnura elegans, Calopteryx sp., Calopteryx splendens, Brachytron pratense, Nepa cinerea, Notonecta glauca, Anacaena bipustulata, Enochrus melanocephalus, Oulimnius sp., Oulimnius major, Oulimnius tuberculatus, Sialis lutaria,*

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
		Chironomidae	*Polycentropodidae, Neureclipsis bimaculate, Limnephilidae, Molanna angustata, Mystacides longicornis/nigra, Cataclysta lemnata, Helius sp., Pilaria sp., Psychodidae, Dixidae, Dixa nebulosa, Dixella sp., Culicidae, Anopheles sp., Ceratopogonidae, Simuliidae, Chironomidae, Oxycera/Vanoyia sp., Odontomyia sp., Ephydridae*
Abbey River	Abbey River DS intersection A	*Nematoda, Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii, Physa fontinalis, Lymnaeidae, Ampullaceana balthica, Anisus vortex, Gyraulus albus, Hippeutis complanatus, Unio pictorum, Sphaerium sp., Pisidium sp., Corbicula fluminea, Hypania invalida, Oligochaeta, Glossiphonia complanate, Helobdella stagnalis, Cladocera, Ostracoda, Copepoda, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammarus sp., Gammarus pulex, Gammarus pulex/fossarum, Baetidae, Cloeon dipterum, Caenis luctuosa/macrura, Coenagrionidae, Ischnura elegans, Velia sp., Notonecta sp., Micronecta minutissima, Gyrinus sp., Anacaena limbate, Sialis lutaria, Limnephilidae, Limnephilus lunatus, Leptoceridae, Dixidae, Ceratopogonidae, Chironomidae*	*Dugesia lugubris/polychroa, Valvata sp., Valvata piscinalis, Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii, Physidae, Physella sp. Lymnaeidae, Gyraulus albus, Acroloxus lacustris, Sphaeriidae, Sphaerium sp., Pisidium sp., Oligochaeta, Helobdella stagnalis, Erpobdella sp., Cladocera, Ostracoda, Asellidae, Asellus aquaticus, Proasellus meridianus, Crangonyx pseudogracilis/floridanus, Gammarus sp., Gammarus pulex, Gammarus pulex/fossarum, Baetidae, Cloeon dipterum, Ephemera sp., Coenagrionidae, Calopteryx sp., Oulimnius sp., Sialis lutaria, Molanna angustata, Cataclysta lemnata, Helius sp., Dixidae, Ceratopogonidae, Chironomidae*
Abbey River	Abbey River US intersection B	*Microturbellaria, Nematoda, Unio pictorum, Pisidium sp., Oligochaeta, Piscicola geometra, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammarus tigrinus, Caenis luctuosa/macrura, Calopteryx splendens, Sialis lutaria, Chaetopteryx villosa. Dixidae, Ceratopogonidae, Chironomidae*	*Tricladida, Polycelis nigra/tenuis, Girardia tigrine, Bithynia tentaculate, Bithynia leachii, Physidae, Physa fontinalis, Physella sp., Lymnaeidae, Stagnicola sp., Anisus vortex, Gyraulus albus, Acroloxus lacustris, Pisidium sp. Hypania invalida, Oligochaeta Theromyzon tessulatum, Alboglossiphonia heteroclite, Erpobdella sp., Asellidae, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammarus pulex/fossarum,*

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
			Coenagrionidae, Ischnura elegans, Calopteryx splendens, Gyrinus urinator, Anacaena bipustulata, Oulimnius sp., Polycentropodidae, Mystacides longicornis/nigra, Helius sp., Psychodidae, Dixidae, Dixa nebulosa, Dixella sp., Anopheles sp., Chironomidae, Oxycera/Vanoyia sp., Odontomyia/Oplodontha sp.
Abbey River	Abbey River DS intersection B	*Valvata piscinalis, Potamopyrgus antipodarum, Bithynia leachii, Physella sp., Ampullaceana balthica, Gyraulus albus, Unio pictorum, Pisidium sp., Oligochaeta, Caenis luctuosa/macrura, Calopteryx splendens, Micronecta minutissima, Trichoptera, Anabolia nervosa, Molanna angustata, Ceratopogonidae, Chironomidae*	*Spongillidae, Tricladida, Polycelis feline, Polycelis nigra/tenuis, Girardia tigrine, Dendrocoelum lacteum, Valvata piscinalis, Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii, Physidae, Physa fontinalis, Physella sp., Anisus vortex, Gyraulus albus, Acroloxus lacustris, Pisidium sp., Oligochaeta, Piscicola sp., Helobdella stagnalis, Alboglossiphonia heteroclite, Erpobdellidae, Hydracarina, Cladocera, Asellus aquaticus, Chelicorophium curvispinum Crangonyx pseudogracilis/floridanus, Baetidae, Centroptilum luteolum, Cloeon dipterum, Caenis luctuosa/macrura, Coenagrionidae, Ischnura elegans, Calopteryx sp., Calopteryx splendens, Gerridae, Notonecta glauca, Anacaena bipustulata, Anacaena limbata Oulimnius major, Athripsodes aterrimus, Athripsodes cinereus Mystacides longicornis/nigra, Cataclysta lemnata, Psychodidae Dixella sp., Anopheles sp., Chironomidae, Oxycera sp., Odontomyia/Oplodontha sp.*
River Thames	US Runnymede Channel intake	*Dendrocoelidae, Valvata piscinalis, Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii Ampullaceana balthica, Gyraulus albus, Ancylus fluviatilis, Unionidae, Unio pictorum, Sphaerium sp.*	*Tricladida, Girardia tigrine, Dendrocoelum romanodanubiale, Viviparus viviparus, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Lymnaeidae, Ampullaceana balthica, Ancylus fluviatilis*

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
		Pisidium sp., Dreissena polymorpha, Hypania invalida Oligochaeta, Trocheta pseudodina (bykowskii) Chelicorophium curvispinum, Gammaridae, Dikerogammarus haemobaphes, Baetis vernus Ephemera Danica, Ephemera vulgate, Caenis luctuosa/macrura, Calopteryx splendens, Aphelocheirus aestivalis, Notonecta sp., Plea minutissima, Elmis aenea, Hydroptilidae, Tinodes waeneri, Athripsodes cinereus, Leptocerus lusitanicus, Oecetis notata, Chironomidae	*Ancylus group (Ancylus, Ferrissia & Acroloxus), Unio sp., Unio pictorum, Unio tumidus, Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena sp., Dreissena polymorpha, Hypania invalida, Oligochaeta, Ostracoda, Corophiidae, Chelicorophium sp., Chelicorophium curvispinum, Chelicorophium robustum, Gammaridae, Dikerogammarus haemobaphes, Ephemera sp., Ephemera danica, Caenis luctuosa/macrura, Macronychus quadrituberculatus, Oulimnius sp., Sericostoma personatum Athripsodes sp., Athripsodes cinereus, Ceraclea annulicornis, Mystacides sp., Mystacides longicornis/nigra, Chironomidae*
River Thames	DS Runnymede Channel intake	*Microturbellaria, Girardia tigrine, Nematoda Potamopyrgus antipodarum Bithynia tentaculate. Lymnaeidae, Ampullaceana balthica, Ancylus fluviatilis Unio pictorum, Sphaerium sp. Pisidium sp., Hypania invalida Oligochaeta, Corophiidae Chelicorophium curvispinum Gammaridae, Dikerogammarus haemobaphes, Ephemera Danica, Caenis luctuosa/macrura, Limnius volckmari, Trichoptera, Tinodes waeneri, Tinodes waeneri, Anabolia nervosa Leptoceridae, Chironomidae*	*Hydridae, Dugesiidae Dugesia lugubris/polychroa, Girardia tigrine, Dendrocoelum romanodanubiale, Nematoda, Viviparus sp., Potamopyrgus antipodarum, Bithynia sp. Bithynia tentaculate, Bithynia leachii Ampullaceana balthica, Ancylus fluviatilis, Ancylus group (Ancylus, Ferrissia & Acroloxus), Unio sp., Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena sp., Hypania invalida Oligochaeta, Cladocera, Copepoda Corophiidae, Chelicorophium curvispinum, Chelicorophium robustum, Gammaridae Dikerogammarus haemobaphes Baetidae, Ephemera sp., Ephemera danica, Ephemera vulgate, Caenis luctuosa/macrura, Macronychus quadrituberculatus, Tinodes sp. Goera pilosa, Sericostoma personatum Molanna angustata, Athripsodes sp. Athripsodes cinereus, Ceraclea sp. Ceraclea annulicornis, Mystacides sp.*

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
			Mystacides longicornis/nigra, Oecetis sp., Diptera, Chironomidae
River Thames	US Spelthorne Channel intake	*Nematoda, Viviparus viviparus Potamopyrgus antipodarum Physa fontinalis, Physella sp. Lymnaeidae, Lymnaea stagnalis, Ampullaceana balthica, Anisus vortex Bathyomphalus contortus, Gyraulus albus, Planorbarius corneus, Ancylus fluviatilis Acroloxus lacustris, Unio sp. Unio pictorum, Sphaerium sp. Pisidium sp., Dreissena polymorpha, Polychaeta Hypania invalida, Oligochaeta Glossiphoniidae, Hydracarina Ostracoda, Asellus aquaticus Chelicorophium curvispinum Dikerogammarus haemobaphes, Ephemera sp. Ephemera danica, Caenis sp. Caenis luctuosa/macrura Ischnura elegans, Calopteryx splendens, Anabolia nervosa, Athripsodes albifrons group (bilineatus & commutatus), Athripsodes cinereus, Leptocerus lusitanicus, Mystacides nigra, Ceratopogonidae, Chironomidae*	*Tricladida, Dugesiidae, Girardia tigrina Dendrocoelum romanodanubiale, Plumatella sp., Viviparus viviparus, Valvata piscinalis, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Bithynia leachii, Physidae, Physella sp., Lymnaea stagnalis, Radix Auricularia, Ampullaceana balthica, Gyraulus albus, Ancylus fluviatilis, Ferrissia californica, Ancylus group (Ancylus, Ferrissia & Acroloxus), Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena polymorpha, Hypania invalida, Oligochaeta, Cladocera, Ostracoda, Corophiidae, Chelicorophium curvispinum, Crangonyx pseudogracilis/floridanus, Gammaridae, Dikerogammarus haemobaphes, Baetidae, Cloeon dipterum, Caenis luctuosa/macrura, Coenagrionidae, Nepa cinerea, Psychomyia pusilla, Sericostoma personatum, Molanna angustata, Leptoceridae, Athripsodes sp., Athripsodes cinereus, Ceraclea annulicornis, Leptocerus lusitanicus, Mystacides sp., Mystacides longicornis/nigra, Chironomidae*
River Thames	US Runnymede Channel outfall and DS of Spelthorne Channel intake	*Nematoda, Viviparus viviparus Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Lymnaeidae Ampullaceana balthica, Ancylus fluviatilis, Sphaerium sp., Pisidium sp., Dreissena sp., Hypania invalida, Cladocera, Ostracoda, Copepodal, Chelicorophium curvispinum, Dikerogammarus haemobaphes, Centroptilum luteolum, Ephemera danica*	*Viviparus viviparus, Potamopyrgus antipodarum, Lymnaeidae Ampullaceana balthica, Ancylus group (Ancylus, Ferrissia & Acroloxus) Sphaerium sp., Pisidium sp., Corbicula fluminea, Hypania invalida, Oligochaeta, Chelicorophium sp. Chelicorophium curvispinum, Gammaridae, Dikerogammarus haemobaphes, Cloeon dipterum*

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
		Caenis luctuosa/macrura, Ischnura elegans, Enallagma cyathigerum, Calopteryx splendens, Curculionidae, Halesus radiatus, Chaetopteryx villosa, Anabolia nervosa, Leptocerus lusitanicus, Psychodidae, Ceratopogonidae, Chironomidae	*Ephemera sp., Ephemera danica, Ephemera lineata, Ephemera vulgate, Caenis luctuosa/macrura, Coenagrionidae, Chaetopteryx villosa, Goera pilosa, Molanna angustata Athripsodes cinereus, Leptocerus sp., Mystacides longicornis/nigra, Chironomidae*
River Thames	DS of Runnymede Channel outfall	*Tricladida, Girardia tigrine, Dendrocoelidae, Dendrocoelum lacteum, Viviparus viviparus, Valvata cristata, Potamopyrgus antipodarum, Bithynia tentaculate, Physella sp., Ampullaceana balthica, Gyraulus albus, Planorbarius corneus, Ancylus fluviatilis, Unio pictorum, Sphaerium sp., Pisidium sp., Corbicula fluminea, Hypania invalida Oligochaeta, Erpobdella testacea, Ostracoda, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammaridae, Gammarus sp., Dikerogammarus haemobaphes, Ephemera danica, Ephemera lineata, Ephemera vulgata, Caenis luctuosa/macrura, Notonecta sp., Micronecta scholtzi, Micronecta minutissima/poweri, Oulimnius sp., Limnephilus lunatus, Molanna angustata, Athripsodes cinereus, Mystacides longicornis, Oecetis notata, Tipulidae, Psychodidae, Ceratopogonidae, Chironomidae*	*Tricladida, Dugesia lugubris/polychroa Girardia tigrina, Potamopyrgus antipodarum, Ferrissia californica Ancylus group (Ancylus, Ferrissia & Acroloxus), Unio sp., Sphaeriidae, Sphaerium sp., Pisidium sp., Musculium sp., Dreissena polymorpha Corbicula fluminea, Hypania invalida, Oligochaeta, Cladocera, Ostracoda, Copepoda, Corophiidae, Chelicorophium curvispinum, Chelicorophium robustum, Dikerogammarus haemobaphes, Ephemera sp., Ephemera Danica, Ephemera vulgate, Caenis sp., Caenis luctuosa/macrura, Hydroptila sp., Anabolia nervosa, Goera pilosa, Sericostoma personatum, Athripsodes sp., Athripsodes cinereus, Chironomidae*
River Thames	US of Spelthorne Channel outfall	*Nematoda, Viviparus viviparus Potamopyrgus antipodarum Bithynia tentaculate, Bithynia leachii, Lymnaeidae, Ancylus fluviatilis, Unionidae Sphaerium sp., Pisidium sp. Corbicula fluminea, Hypania invalida, Oligochaeta, Ostracoda, Corophiidae Chelicorophium curvispinum, Corophium robustum (PLEASE USE CHELICOROPHIUM ROBUSTUM), Dikerogammarus*	*Microturbellaria, Girardia tigrine, Nematoda, Cristatella sp., Valvata piscinalis, Potamopyrgus antipodarum Bithynia tentaculate, Physidae, Physella sp., Lymnaeidae, Ampullaceana balthica, Gyraulus albus, Ancylus fluviatilis, Ferrissia californica, Unio sp., Unio pictorum, Unio tumidus, Sphaeriidae, Sphaerium sp., Pisidium sp., Corbicula fluminea, Hypania*

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
		haemobaphes, Procloeon pennulatum, Ephemera sp., Ephemera danica, Ephemera vulgate, Caenis luctuosa/macrura, Limnius volckmari, Oulimnius sp. Hydropsyche pellucidula, Athripsodes cinereus, Ceratopogonidae, Chironomidae	*invalida, Oligochaeta, Branchiura sowerbyi, Cladocera, Ostracoda, Chelicorophium sp., Chelicorophium curvispinum Dikerogammarus haemobaphes Dikerogammarus sp., Ephemera sp. Ephemera danica, Ephemera vulgata Caenis luctuosa/macrura, Coenagrionidae, Erythromma sp. Calopteryx sp., Oulimnius sp. Polycentropodidae, Molanna angustata, Athripsodes cinereus Mystacides sp., Mystacides azurea Mystacides longicornis/nigra, Ceratopogonidae, Chironomidae*
River Thames	DS of Spelthorne Channel outfall	*Microturbellaria, Nematoda Potamopyrgus antipodarum Bithynia tentaculata Ampullaceana balthica Ancylus fluviatilis, Unio pictorum, Sphaerium sp. Pisidium sp., Corbicula fluminea, Hypania invalida Oligochaeta, Piscicola siddalli, Ostracoda, Corophiidae Chelicorophium curvispinum Gammarus sp., Dikerogammarus haemobaphes, Ephemera danica, Ephemera vulgate, Caenis luctuosa/macrura, Chaetopteryx villosa,, Athripsodes cinereus, Ceraclea dissimilis Ceratopogonidae, Chironomidae*	*Tricladida, Dugesia lugubris/polychroa, Girardia tigrine, Nematomorpha, Viviparus viviparus Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Ampullaceana balthica, Ancylus fluviatilis, Unio tumidus, Sphaeriidae Sphaerium sp., Pisidium sp., Dreissena polymorpha, Corbicula fluminea, Hypania invalida, Oligochaeta, Corophiidae, Chelicorophium curvispinum, Dikerogammarus haemobaphes, Dikerogammarus sp. Heptageniidae, Ephemera sp., Ephemera danica,, Caenis luctuosa/macrura, Calopteryx sp., Limnius volckmari, Oulimnius sp. Brachycentrus subnubilus, Athripsodes sp., Athripsodes cinereus, Ceraclea sp. Ceraclea annulicornis, Ceraclea nigronervosa, Oecetis sp., Ceratopogonidae, Chironomidae*
River Thames	Desborough Cut	*Microturbellaria, Tricladida, Girardia tigrine, Nematoda, Potamopyrgus antipodarum, Bithynia tentaculate, Ampullaceana balthica, Gyraulus albus, Ancylus fluviatilis, Unio pictorum, Sphaerium sp., Pisidium sp.,*	*Tricladida, Girardia tigrine, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Ampullaceana balthica, Ancylus fluviatilis, Unio sp., Sphaerium sp., Pisidium sp., Corbicula fluminea, Hypania invalida, Oligochaeta, Argulus foliaceus, Corophiidae,*

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
		Corbicula fluminea, Hypania invalida, Oligochaeta, Cladocera, Ostracoda, Copepoda, Chelicorophium curvispinum, Gammaridae, Dikerogammarus haemobaphes, Ephemera sp. Ephemera danica, Caenis rivulorum, Leuctra fusca, Limnius volckmari, Oulimnius sp., Athripsodes cinereus, Ceratopogonidae, Chironomidae	*Chelicorophium sp., Chelicorophium curvispinum, Chelicorophium robustum, Gammaridae, Dikerogammarus haemobaphes, Dikerogammarus sp. Ephemera sp., Ephemera danica Ephemera lineata, Ephemera vulgata Caenis luctuosa/macrura, Calopteryx sp., Megasternum concinnum, Limnius volckmari, Oulimnius sp., Tinodes waeneri, Sericostoma personatum, Athripsodes cinereus, Ceraclea annulicornis, Chironomidae*
River Thames	US Walton Bridge	*Dendrocoelidae, Viviparus viviparus, Potamopyrgus antipodarum, Bithynia tentaculata Ampullaceana balthica, Ancylus fluviatilis, Unio pictorum, Sphaerium sp., Pisidium sp., Corbicula fluminea, Hypania invalida, Oligochaeta, Ostracoda, Chelicorophium curvispinum, Gammaridae, Dikerogammarus haemobaphes, Ephemera danica, Ephemera vulgata, Caenis luctuosa/macrura, Leuctra fusca,Trichoptera, Ecnomus tenellus, Cyrnus trimaculatus, Leptoceridae Athripsodes cinereus, Ceraclea annulicornis, Ceraclea dissimilis, Ceratopogonidae, Chironomidae*	*Girardia tigrine, Viviparus viviparus, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Lymnaeidae, Ancylus fluviatilis, Ancylus group (Ancylus, Ferrissia & Acroloxus), Unionidae, Sphaeriidae, Sphaerium sp. Pisidium sp., Dreissena polymorpha, Corbicula fluminea, Hypania invalida, Oligochaeta, Cladocera, Corophiidae, Chelicorophium sp., Chelicorophium curvispinum, Gammaridae, Dikerogammarus haemobaphes, Dikerogammarus sp., Baetis scambus/fuscatus, Ephemera sp. Ephemera vulgate, Caenis sp., Caenis luctuosa/macrura, Molanna angustata Athripsodes sp., Ceraclea sp., Ceraclea annulicornis, Mystacides sp., Ceratopogonidae, Chironomidae*
River Thames	Teddington Weir	*Polycelis nigra/tenuis, Nematoda, Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii , Physella sp., Ampullaceana balthica, Gyraulus crista , Ancylus fluviatilis, Unio pictorum, Sphaerium sp., Pisidium sp., Corbicula fluminea, Hypania invalida, Oligochaeta, Helobdella stagnalis,Cladocera, Ostracoda, Copepoda , Corophiidae, Chelicorophium*	*Hydridae, Tricladida, Dugesia lugubris/polychroa, Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii, Radix Auricularia, Ampullaceana balthica, Gyraulus albus, Ancylus fluviatilis, Ferrissia californica, Ancylus group (Ancylus, Ferrissia & Acroloxus), Unio sp., Sphaeriidae, Pisidium sp. Musculium sp., Dreissenidae, Hypania invalida, Oligochaeta,*

River name	Site name	Species recorded in spring 2022 survey	Species recorded in autumn 2022 survey
		curvispinum, Crangonyx pseudogracilis/floridanus, Dikerogammarus haemobaphes, Cloeon dipterum, Ephemera danica, Caenis luctuosa/macrura, Plea minutissima, Cyrnus trimaculatus, Limnephilus lunatus, Leptoceridae, Athripsodes cinereus, Leptocerus lusitanicus, Chironomidae	*Cladocera, Ostracoda, Copepoda, Corophiidae, Chelicorophium sp., Chelicorophium curvispinum, Chelicorophium robustum, Crangonyx pseudogracilis/floridanus, Gammaridae, Gammarus pulex/fossarum, Dikerogammarus haemobaphes, Dikerogammarus sp., Ephemera sp., Ephemera vulgata Caenis luctuosa/macrura, Ecnomus tenellus, Cyrnus trimaculatus, Athripsodes sp., Ceraclea sp., Ceraclea annulicornis, Culex sp., Chironomidae*

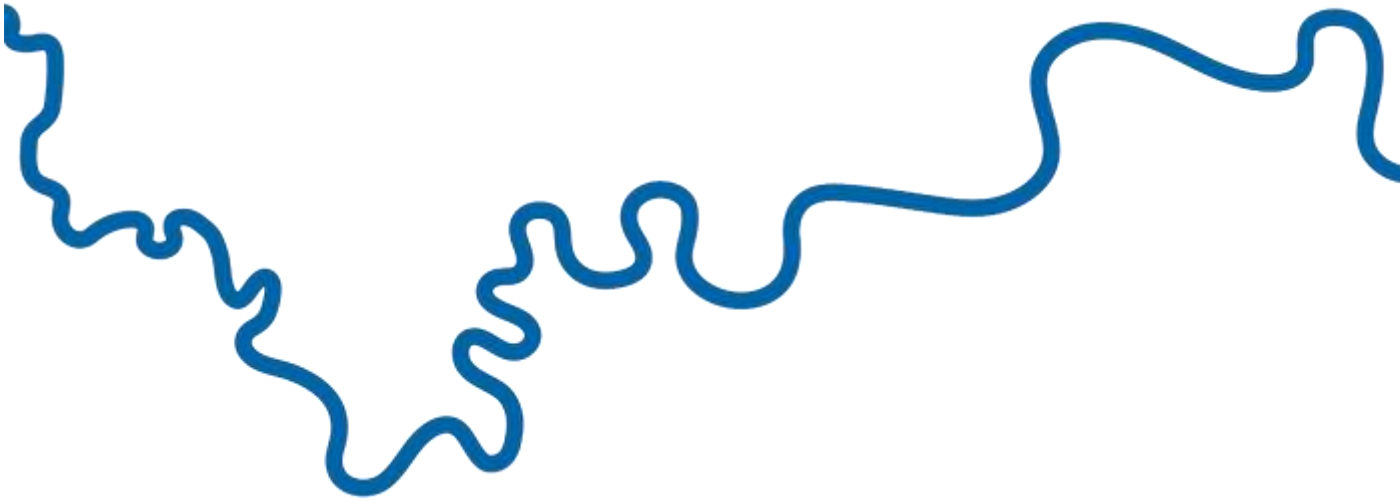
Macroinvertebrates – Lake (2022)

Lake name	Species recorded in autumn 2022 survey
Abbey	*Tricladida, Girardia tigrine, Potamopyrgus antipodarum, Bithynia sp., Physidae,, Planorbidae, Pisidium sp., Dreissena sp., Dreissena sp., Dreissena polymorpha Oligochaeta, Branchiura sowerbyi, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Baetidae, Cloeon dipterum, Haliplus sp., Haliplus ruficollis group, Haliplus flavicollis, Hydroptilidae, Oxyethira sp., Orthotrichia sp., Psychomyiidae, Tinodes waeneri, Leptocerus sp., Leptocerus tineiformis, Chironomidae*
Black Ditch Pond	*Tricladida, Girardia tigrine, Gyraulus laevis, Musculium lacustre Hydracarina, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Cloeon dipterum, Coenagrionidae, Aeshnidae, Gerris sp., Ilyocoris cimicoides, Notonecta glauca, Plea minutissima, Cymatia coleoptrata, Hyphydrus ovatus, Sialis lutaria, Leptocerus sp., Leptocerus tineiformis, Mystacides azurea, Ceratopogonidae, Chironomidae*
Sheepwalk West 1	*Girardia tigrine, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Bithynia leachii, Hippeutis complanatus, Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena polymorpha, Oligochaeta, Hydracarina, Cladocera, Asellidae, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammaridae, Dikerogammarus haemobaphes, Ephemera sp., Coenagrionidae, Gerridae, Haliplus sp.,Haliplus flavicollis, Sialis lutaria, Anabolia nervosa, Athripsodes cinereus, Leptocerus sp., Leptocerus lusitanicus, Mystacides longicornis/nigra, Tipula sp., Helius sp., Ceratopogonidae, Chironomidae, Chrysops sp.*
Sheepwalk East	*Tricladida, Polycelis nigra/tenuis, Girardia tigrine, Dendrocoelum lacteum, Valvata cristata, Bithynia sp., Bithynia tentaculate, Bithynia leachii, Physidae, Physella sp., Lymnaeidae, Radix Auricularia, Planorbis carinatus, Anisus vortex, Gyraulus albus, Hippeutis complanatus, Ferrissia californica, Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena sp., Dreissena polymorpha, Hydracarina, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Cloeon dipterum, Coenagrionidae, Gerridae, Gerris argentatus, Plea minutissima, Haliplus sp., Colymbetinae , Hyphydrus ovatus, Hydrophilidae, Hydroptilidae, Agraylea multipunctate, Hydroptila sp., Ecnomus tenellus, Anabolia nervosa, Molanna angustata, Leptoceridae, Leptocerus sp., Leptocerus lusitanicus, Mystacides longicornis, Mystacides longicornis/nigra, Helius sp., Chironomidae, Odontomyia sp.*
Sheepwalk West 2	*Tricladida, Girardia tigrine, Valvata cristata, Valvata piscinalis, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculata* *Bithynia leachii, Physella acuta, Lymnaea stagnalis, Planorbis carinatus, Bathyomphalus contortus, Gyraulus albus, Hippeutis complanatus, Planorbarius corneus, Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena polymorpha, Oligochaeta, Theromyzon tessulatum, Helobdella stagnalis, Hydracarina, Ostracoda, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Cloeon dipterum, Coenagrionidae* *Aeshnidae, Haliplus ruficollis group, Sialis lutaria, Molanna angustata, Leptocerus sp., Mystacides sp., Mystacides longicornis/nigra, Chironomidae*
Abbey 2	*Tricladida, Girardia tigrine, Potamopyrgus antipodarum, Physidae, Physella sp., Planorbidae, Gyraulus albus, Gyraulus laevis, Gyraulus crista, Ferrissia californica, Ancylus group (Ancylus, Ferrissia & Acroloxus), Pisidium sp., Dreissena sp.* *Dreissena polymorpha, Asellidae, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammaridae, Dikerogammarus haemobaphes, Dikerogammarus sp., Ephemera sp., Coenagrionidae, Gerridae, Ilybius/Agabus sp.,*

Lake name	Species recorded in autumn 2022 survey
	Anacaena limbate, Anacaena lutescens, Sialis lutaria, Leptoceridae, Athripsodes sp., Mystacides sp., Mystacides longicornis/nigra, Helius sp., Dixa nebulosa, Chironomidae
Littleton South	*Tricladida, Dugesia lugubris/polychroa, Girardia tigrine, Dendrocoelum lacteum, Potamopyrgus antipodarum, Physella sp., Lymnaeidae, Lymnaea stagnalis, Planorbis sp., Planorbis carinatus, Gyraulus albus, Gyraulus laevis, Sphaeriidae, Pisidium sp., Dreissena polymorpha, Oligochaeta, Hydracarina Cladocera, Asellidae, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Cloeon dipterum, Zygoptera, Coenagrionidae, Anax sp., Ilyocoris cimicoides, Plea minutissima, Haliplus confinis, Haliplus flavicollis, Hyphydrus ovatus, Ilybius fenestratus, Anabolia nervosa, Limnephilus rhombicus/politus, Limnephilus decipiens, Leptoceridae, Mystacides sp., Nymphula stagnata, Parapoynx stratiotata, Crambidae, Chironomidae*
Fleet	*Girardia tigrine, Dendrocoelum lacteum, Potamopyrgus antipodarum, Bithynia tentaculate, Bithynia leachii, Physidae, Physella sp., Lymnaeidae, Lymnaea stagnalis, Planorbis group (Planorbis, Anisus, Bathyomphalus & Gyraulus), Planorbis sp., Anisus vortex, Gyraulus albus, Gyraulus laevis, Gyraulus crista,Hippeutis complanatus, Acroloxus lacustris, Unio tumidus, Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena polymorpha, Oligochaeta, Glossiphoniidae, Helobdella stagnalis, Alboglossiphonia heteroclite, Haemopidae, Hydracarina, Cladocera, Argulus foliaceus, Asellidae, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Cloeon dipterum, Caenis horaria, Coenagrionidae, Ischnura elegans, Erythromma najas, Hydrometra sp., Gerridae, Gerris lacustris, Gerris odontogaster, Haliplidae, Haliplus sp., Haliplus ruficollis group, Haliplus immaculatus, Ilybius fenestratus, Sialis lutaria, Hydroptila sp., Oxyethira sp., Limnephilus politus, Molanna angustata, Athripsodes sp., Athripsodes aterrimus, Leptocerus sp., Leptocerus tineiformis, Mystacides azurea, Mystacides longicornis/nigra, Acentria ephemerella, Parapoynx stratiotata, Cataclysta lemnata, Helius sp. Ceratopogonidae, Chironomidae*
Halliford Mere Complex	*Tricladida, Girardia tigrine, Dendrocoelum lacteum, Bithynia sp., Bithynia tentaculate, Physidae, Physella sp., Lymnaeidae, Stagnicola sp., Bathyomphalus contortus, Gyraulus albus, Gyraulus laevis, Hippeutis complanatus, Ferrissia californica, Sphaerium sp., Dreissena polymorpha, Piscicola sp., Theromyzon tessulatum, Hydracarina, Cladocera, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Cloeon dipterum, Caenis robusta, Coenagrionidae, Aeshnidae, Anax parthenope, Plea minutissima, Haliplus sp., Noterus clavicornis, Oxyethira sp., Ecnomus tenellus, Phryganeidae, Athripsodes cinereus, Leptocerus sp., Leptocerus lusitanicus, Leptocerus tineiformis, Mystacides sp., Mystacides longicornis/nigra, Oecetis sp., Parapoynx stratiotata, Helius sp., Ceratopogonidae, Chironomidae*
Littleton North	*Hydridae, Tricladida, Dugesia lugubris/polychroa, Girardia tigrine, Bdellocephala punctata, Gastropoda, Potamopyrgus antipodarum, Bithynia tentaculate, Physidae, Physella acuta, Radix Auricularia, Ampullaceana balthica, Gyraulus laevis, Ferrissia californica, Pisidium sp., Dreissena sp., Dreissena polymorpha, Oligochaeta, Branchiura sowerbyi, Hydracarina, Cladocera, Corophiidae, Chelicorophium curvispinum, Dikerogammarus haemobaphes, Dikerogammarus sp., Coenagrionidae, Haliplus sp., Haliplus flavicollis, Hydroptilidae, Agraylea sexmaculata, Athripsodes cinereus, Leptocerus sp., Mystacides sp., Mystacides longicornis, Mystacides longicornis/nigra, Crambidae, Chironomidae*
Manor	*Hydridae, Tricladida, Dugesiidae, Dugesia lugubris/polychroa, Girardia tigrine, Viviparus contectus, Potamopyrgus antipodarum, Bithynia tentaculate, Physella sp., Ferrissia californica, Sphaeriidae, Pisidium sp., Dreissena sp.,Dreissena polymorpha, Oligochaeta, Hydracarina, Cladocera, Asellidae, Asellus aquaticus,*

Lake name	Species recorded in autumn 2022 survey
	Crangonyx pseudogracilis/floridanus, Cloeon dipterum, Caenis horaria, Coenagrionidae, Gerridae, Aquarius paludum Haliplus sp., Haliplus flavicollis, Hydroptilidae, Molanna angustata, Ceraclea sp., Leptocerus lusitanicus, Leptocerus tineiformis, Mystacides sp., Acentria ephemerella, Parapoynx stratiotata, Crambidae, Chironomidae
Abbey 1	*Girardia tigrine, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Physidae, Physella sp., Lymnaeidae, Stagnicola sp., Gyraulus albus, Gyraulus laevis, Sphaerium sp., Pisidium sp., Dreissenidae, Dreissena polymorpha, Oligochaeta, Glossiphonia verrucata, Hydracarina, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammarus fossarum, Coenagrionidae, Gerridae, Nepa cinerea, Plea minutissima, Haliplus flavicollis, Noterus clavicornis, Anacaena bipustulata, Oxyethira sp., Phryganeidae, Parapoynx stratiotata, Helius sp., Chironomidae*
Ferry Lane	*Tricladida, Dugesia lugubris/polychroa, Valvata piscinalis, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculata, Bithynia leachii, Physidae, Physella sp., Lymnaeidae, Lymnaea stagnalis, Planorbis group (Planorbis, Anisus, Bathyomphalus & Gyraulus), Anisus vortex, Bathyomphalus contortus, Gyraulus albus, Gyraulus laevis, Hippeutis complanatus, Planorbarius corneus, Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena sp., Dreissena polymorpha, Oligochaeta, Glossiphoniidae, Helobdella stagnalis, Erpobdella sp., Cladocera, Ostracoda, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Dikerogammarus haemobaphes, Dikerogammarus sp., Cloeon dipterum, Zygoptera, Coenagrionidae, Gerridae, Sialis lutaria, Oxyethira sp., Ecnomus tenellus, Anabolia nervosa, Mystacides longicornis/nigra, Dixa sp., Chironomidae*
Littleton East	*Tricladida, Girardia tigrina, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Bithynia leachii, Lymnaeidae, Radix Auricularia, Planorbidae, Bathyomphalus contortus, Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena sp., Dreissena polymorpha, Oligochaeta, Helobdella stagnalis, Erpobdella Testacea, Argulus foliaceus, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammaridae, Dikerogammarus haemobaphes, Dikerogammarus sp., Coenagrionidae, Haliplus flavicollis, Oulimnius sp., Oulimnius tuberculatus, Hydroptila sp., Halesus radiatus, Anabolia nervosa, Limnephilus sp., Limnephilus politus, Molanna angustata, Athripsodes aterrimus, Athripsodes cinereus, Oecetis ochracea, Chironomidae*
Wraysbury 2 North	*Tricladida, Polycelis nigra/tenuis, Dugesia lugubris/polychroa, Girardia tigrine, Dendrocoelum lacteum, Viviparus viviparus, Bithynia tentaculate, Bithynia leachii, Physidae, Physella sp., Lymnaeidae, Planorbis carinatus, Anisus vortex, Bathyomphalus contortus, Gyraulus albus, Gyraulus crista, Hippeutis complanatus, Sphaeriidae, Sphaerium sp., Dreissena polymorpha, Oligochaeta, Theromyzon tessulatum, Hemiclepsis marginata, Helobdella stagnalis, Alboglossiphonia heteroclite, Erpobdella sp., Erpobdella, Testacea, Hydracarina, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammaridae, Dikerogammarus haemobaphes, Cloeon dipterum, Coenagrionidae, Aeshnidae, Gerridae, Gerris argentatus, Ilyocoris cimicoides, Notonecta glauca, Notonecta maculate, Plea minutissima, Oulimnius sp., Oulimnius tuberculatus, Ecnomus tenellus, Phryganea bipunctata, Limnephilus lunatus sp., Molanna angustata, Leptocerus sp., Mystacides sp., Mystacides longicornis, Mystacides longicornis/nigra, Ceratopogonidae, Chironomidae*
Wraysbury 2 South	*Dugesia lugubris/polychroa, Girardia tigrine, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Bithynia leachii, Physidae, Physella sp., Lymnaeidae, Lymnaea stagnalis, Ampullaceana balthica, Planorbis sp., Planorbis carinatus, Gyraulus albus, Gyraulus laevis, Hippeutis complanatus, Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena polymorpha, Oligochaeta, Glossiphonia complanate, Hydracarina, Cladocera, Asellidae, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Gammarus sp., Cloeon dipterum, Ephemera vulgate, Coenagrionidae, Plea minutissima, Haliplus confinis, Hyphydrus ovatus,*

Lake name	Species recorded in autumn 2022 survey
	Ilybius/Agabus sp., Sialis lutaria, Athripsodes sp., Athripsodes cinereus, Mystacides longicornis/nigra, Pyralidae, Ceratopogonidae, Chironomidae
St Ann's	*Tricladida, Dugesia lugubris/polychroa, Girardia tigrine, Dendrocoelum lacteum, Potamopyrgus antipodarum, Bithynia sp., Bithynia tentaculate, Bithynia leachii, Physidae, Physa fontinalis, Physella sp., Lymnaeidae, Lymnaea stagnalis, Radix Auricularia, Ampullaceana balthica, Planorbis sp., Planorbis carinatus, Planorbis planorbis, Anisus vortex, Gyraulus albus, Gyraulus laevis, Gyraulus crista, Hippeutis complanatus, Sphaeriidae, Sphaerium sp., Pisidium sp., Dreissena polymorpha, Oligochaeta, Helobdella stagnalis, Hydracarina, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Cloeon dipterum, Coenagrionidae, Gerridae, Ilyocoris cimicoides, Plea minutissima, Corixa panzer, Haliplus sp., Haliplus confinis, Haliplus flavicollis, Noterus clavicornis, Laccophilus hyalinus, Hyphydrus ovatus, Ilybius fenestratus, Trichoptera, Leptoceridae, Leptocerus sp., Leptocerus tineiformis, Ceratopogonidae, Chironomidae*
Lake South of Green Lane	*Girardia tigrine, Bithynia tentaculate, Bithynia leachii,, Physidae, Physella sp., Anisus vortex, Bathyomphalus contortus, Hippeutis complanatus, Sphaeriidae, Sphaerium sp.* *Oligochaeta, Theromyzon tessulatum, Helobdella stagnalis* *Alboglossiphonia heteroclite, Asellus aquaticus, Crangonyx pseudogracilis/floridanus, Coenagrionidae, Gerridae, Gerris argentatus, Plea minutissima, Leptocerus sp., Mystacides longicornis/nigra, Ceratopogonidae, Chironomidae*



The River Thames Scheme, delivered in a partnership led by the Environment Agency and Surrey County Council, will reduce flood risk for residents and businesses and improve the surrounding area.