

**Ecological Assessment of  
Symonds Yat Rapids**

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## Ecological Assessment of Symonds Yat Rapids

### 1.0 Introduction

1.1.1. This report presents the results of an ecological assessment of Symonds Yat Rapids and habitats associated with it, undertaken by Cresswell Associates, a Hyder Consulting group company, on behalf of the British Canoe Union (BCU). The site is located in the county of Herefordshire, on the River Wye. The aims of the study were to assess the conservation value of the survey area, the likely presence of rare or protected species, and to identify any features, habitats or species which would constitute potential constraints to a proposal to strengthen the banks of both the river and an island in the river channel, as well as insertion of groyne (deflectors made of stone) to concentrate flow for the benefit of recreational canoeists. The surveys were undertaken during August 2007.

### 2.0 Methodology

#### 2.1. Desk study

2.1.1. The following organisations were approached, and internet sites reviewed in order to identify any existing ecological information relating to the site and its surroundings:

- Herefordshire Biological Records Centre
- Environment Agency
- Natural England
- NBN Gateway
- Multi-Agency Governmental Information for Conservation (MAGIC) web site
- Symonds Yat Rapids Preservation Group web site <http://www.yatrapids.co.uk/>

2.1.2. Consultation with the Environment Agency and Natural England included a site meeting on 16<sup>th</sup> November 2007.

#### 2.2. Field survey

2.2.1. A Phase I habitat and protected species survey was undertaken which comprised a walkover search of the site [both banks of the river for 30m upstream and downstream of the ends of the island, as well as the in-stream habitats and the island next to the rapids], to identify any habitats likely to be of conservation value, and to investigate the presence (or likely presence) of protected species of plants and/or animals. A specific search for otter resting sites was undertaken over a wider area stretching for 100m upstream and downstream of the rapids.

- 2.2.2. The habitat survey involved identifying and mapping the dominant habitat types following the survey methodology recommended by Natural England (Nature Conservancy Council, 1990). Dominant plant species were noted, as were any uncommon species or species indicative of particular habitat types, but there was no attempt to compile exhaustive species lists. Botanical names follow Stace (1997) for higher plants.
- 2.2.3. The likely conservation value of the river was assessed, particularly with regard to protected species, including white-clawed crayfish, water voles and otters. In particular, a survey for otters was carried out by searching for characteristic signs including holts, droppings (spraint), footprints, couches and slides. The likely value of the different habitats for otters was also critically assessed.
- 2.2.4. The value of the site for roosting and foraging bats was assessed, and all mature trees and other suitable structures were carefully scrutinised with binoculars to assess their likely occupancy by roosting or hibernating bats. The site was also investigated for characteristic signs of use by badgers; such as setts, paths, latrines and feeding signs.
- 2.2.5. Birds were also identified by sight and song incidentally during the survey.

### **3.0 Results**

#### **3.1 Desk study**

- 3.1.1. The site lies entirely within the River Wye Special Area for Conservation (SAC) and Site of Special Scientific Interest (SSSI). The citation sheets for these designations under the Habitats (&C.) Regulations 1994 and the Wildlife and Countryside Act 1981 (as amended) are included in Appendix IV of this report. Under the Habitats Regulations (&C.) 1994, the Annex I habitat that is a primary reason for selection of the SAC site is watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation. The Annex I habitat present as a qualifying feature, but not a primary reason for selection of this site is transition mires and quaking bogs.
- 3.1.2. Annex II species that are a primary reason for selection of this site are white-clawed (or Atlantic stream) crayfish (*Austropotamobius pallipes*), sea lamprey (*Petromyzon marinus*), brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*), twaite shad (*Alosa fallax*), Atlantic salmon (*Salmo salar*), bullhead (*Cottus gobio*) and Otter (*Lutra lutra*). The Annex II species present as a qualifying feature, but not a primary reason for site selection is the Allis shad (*A. alosa*).

- 3.1.3. The Lower Wye SSSI has been designated as a salmonid fishery under the EC Freshwater Fish Directive 78/659/EC. Consultation with the Environment Agency Fisheries department (Mr. Simon Witton) has highlighted the likely interest of the rapids and adjacent and downstream habitats as constituting suitable spawning areas for the majority of the fish species for which the Wye has been designated. However, there are no specific records of spawning in the area.
- 3.1.4. Surveys to determine the value of the rapids to aquatic invertebrates have been carried out in 2000 and in 2005 (see references and <http://www.yatrapids.co.uk/>). A beetle survey recorded fourteen species of aquatic coleoptera which included six species of *Elmidae* (riffle beetles). Of these six species, *Macronychus quadrituberculatus* and *Normandia nitens* are of Red Data Book<sup>1</sup> classification, whereas *Oulimnius troglodytes* is Nationally Notable. A further Nationally Notable beetle, *Pomatinus substriatus* was also recorded from the west bank of the river. The more recent survey included a stone-turning search for white-clawed crayfish but none were found. However, a diverse invertebrate fauna was found in the vicinity of the island and the margins of the river. Although the fauna of aquatic beetles was considered to be somewhat impoverished, the microhabitats provided within the immediate area were found to support at least four beetle species, one mayfly and one caddisfly of 'national' importance. The report concluded that "recreational canoeing activities are likely to have an adverse effect on the immediate environment and its associated invertebrate species". However, the use of natural stone revetments was considered likely to provide refugia for the invertebrate species characteristic of the site. Additionally, promotion of sedimentation in small areas along the banks of the river and the island was considered likely to increase the possibility of colonisation by the depressed river mussel (*Pseudanodonta complanata*), a National Biodiversity Action Plan Priority Species, found elsewhere in the River Wye catchment. Sedimentation would also promote colonisation by the nationally notable beetle *O. troglodytes*. Both reports recommended the retention of tree roots and fine gravels as an important habitat for scarce invertebrates.
- 3.1.5. Other protected species or species of conservation concern which are not directly related to the SAC designation have also been recorded in the area, including great crested newt (*Triturus cristatus*), a number of bat species including lesser horseshoe bat (*Rhinolophus hipposideros*) and greater horseshoe bat (*R. ferrumequinum*), as well as hazel dormouse (*Muscardinus avellanarius*). Badger (*Meles meles*) records are present in the 10km square around the site but none are found within it.

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<sup>1</sup> For definitions of these terms, see Appendix I

### 3.2. Field survey

3.2.1. The results of the Phase I habitat and protected species surveys are presented in map form on Figure 1. Mapping conventions and codes follow those described by Natural England (Nature Conservancy Council, 1990). Features of particular value, or habitats not readily conforming to the recognised types, are described individually as Target Notes (on Figure 1). The main characteristics of the site are described in the following sections, with sites or features of particular conservation value detailed as appropriate.

#### *Plants and habitats*

3.2.2. The survey area comprised a wide (approximately 30m) river, 30m upstream and downstream of the upstream and downstream ends of the island, as shown on Figure 1. The island, in the centre of the survey area, was made up of large cobbles, stones and various-sized mineral material. The vegetation on the island was characterised by mature Crack-willow (*Salix fragilis*) and Alder (*Alnus glutinosa*) with scattered stands of Reed Sweet-grass (*Phalaris arundinacea*), Meadowsweet (*Filipendula ulmaria*), Water-pepper (*Polygonum hydropiper*) and Hemlock Water-dropwort (*Oenanthe oenanthe*).

3.2.3. Sedimentation of riffles and heavy growth of filamentous algae on the right (west) bank side of the island was noted. This was considered to be indicative of low flow and eutrophication of the river from runoff from adjacent land.

3.2.4. The left (east) river bank was characterised by dry-stone revetments which had presumably been installed some time ago, to protect the railway line along the bank (when operational) and, latterly, to prevent wave-wash from the rapids. These were collapsing in a number of locations and had vegetation growing through the stones, as well as bare substrate exposed. The right river bank had more natural character, with sandy berms and actively eroding earth banks with exposed tree roots. Both banks were accessible to the public; footpaths were noted on the right bank, and a forestry track along the line of the old railway on the left bank.

3.2.5. Land use on both sides of the river was mixed woodland dominated by broad-leaved trees, including Sycamore (*Acer pseudoplatanus*), Hazel (*Corylus avellanaria*), Ash (*Fraxinus excelsior*), Beech (*Fagus sylvatica*), Alder (*Alnus glutinosa*), Spindle (*Euonymus europaeus*) and Elder (*Sambucus nigra*). The left bank woodland also included Wych Elm (*Ulmus glabra*), Yew (*Taxus baccata*) and Field Maple (*Acer campestre*). The ground flora included woodland species such as Dog's Mercury (*Mercurialis officinalis*), False Brome (*Brachypodium sylvaticum*), Ground-elder (*Aegopodium podagraria*), Bugle (*Ajuga reptans*), Wood Avens (*Geum urbanum*), Harts-

tongue (*Phyllitis scolopendrium*), Male Fern (*Dryopteris filix-mas*) and Soft Shield Fern (*Polystichum setiferum*), as well as species characteristic of riparian habitats, including Common Figwort (*Scrophularia auriculata*), Meadowsweet, Comfrey (*Symphytum sp.*) and Common Nettle (*Urtica dioica*).

- 3.2.6. Japanese Knotweed (*Fallopia japonica*), an invasive non-native perennial plant species, was noted on the right bank of the river. Himalayan Balsam (*Impatiens glandulifera*), a non-native invasive annual, was also noted on the right bank.

*Protected species and other species of conservation value*

*Invertebrates*

- 3.2.7. The main likely invertebrate interest of the site, as indicated by studies undertaken previously (see Desk Study), was considered to be the substrate of the river. A diverse range of habitats was noted within the survey area, including sediments of various types, cobbles and rocks, exposed submerged roots and flood debris. Specific searches for invertebrates were not undertaken on this occasion but habitat suitable for white-clawed crayfish was considered to be present, in spite of the negative results of the previous survey. Crayfish remains were found in otter spraint on the island, providing circumstantial evidence that they were present in the vicinity.
- 3.2.8. A number of the mature trees, both on the island and on the banks of the river, contained varying amounts of dead wood, and hence could be of some value to saproxylic (dead-wood) and other invertebrates.

*Fish*

- 3.2.9. Habitat suitable for a variety of fish species at different life stages was noted, including those identified as qualifying features for the River Wye SAC. Scoured areas of the river bed at the downstream end of the site appeared to be suitable as congregation areas for salmonids, shad species and lamprey species. The reach between the island and the right bank appeared to offer areas of clean gravels suitable for spawning salmonids, although this was limited by heavy growth of algae and silt deposition. The river substrate of the rapids themselves was difficult to assess but observation of material along the island shore suggested that a wide variety of mineral substrates is available as a spawning medium. Silt berms downstream of the island could be used by larval stages of lamprey species whilst small pools providing still water nursery areas for fish fry were noted along the west side and the downstream end of



the island. In addition, suitable refuges for bullhead were noted within the channel of the river.

#### *Amphibians*

- 3.2.10. The survey area did not contain any habitats or features which would constitute potentially suitable breeding sites for amphibians. It is possible, however, that common species forage in terrestrial habitats on both banks of the river.

#### *Reptiles*

- 3.2.11. The generally shaded character of the woodland on both banks of the river and the propensity for the island to flood suggested that reptiles would be unlikely to occur in any substantial numbers within the survey area. The only species likely to occur on the island is grass snake (*Natrix natrix*). Animals are only likely to visit it on rare occasions to take advantage of seasonally available food sources such as fish fry in pools. There are no suitable nesting sites on the island for this species.

#### *Birds*

- 3.2.12. It is likely that the area supports good numbers of breeding and over-wintering birds typical of riparian habitats. Dipper (*Cinclus cinclus*) and grey wagtail (*Motacilla cinerea*), as well as mute swan (*Cygnus olor*) were observed during the survey. All were considered likely to breed within, or adjacent to, the survey area. In addition, it is possible that kingfisher (*Alcedo atthis*) may breed in the eroding earth banks on the right bank of the river. However, burrows in these features were not found. Other species of bird likely to be found breeding along the river include common sandpiper (*Actitis hypoleucos*). Over-wintering species likely to be present include goosander (*Mergus merganser*) and great cormorant (*Phalacrocorax carbo*).

#### *Bats*

- 3.2.13. Many of the trees on the island and along the river bank contained dead wood, and hence a number of potentially suitable bat roost sites were identified. Those found on the island are shown on Figure 1 and listed in the attached Target Notes. Trees on the river banks had a wide variety of features that could be potentially suitable for roosting bats, including extensive growth of Ivy. Since the features available appeared to be represented on almost every tree, these were not mapped exhaustively. Although none showed conclusive signs of current or recent use by bats, such signs of use are not always visible.

*Dormice*

- 3.2.14. The woodland on both banks of the river constituted habitat suitable for occupation by dormice (*Muscardinus avellanarius*), having a range of food plants including Hazel and Honeysuckle (*Lonicera periclymenum*). However, an extensive search for signs of dormice was not undertaken as part of this survey.

*Water voles*

- 3.2.15. Limited areas of the river supported habitat suitable for occupation by water voles (*Arvicola terrestris*). However, no signs of this species were found, and its presence was considered to be unlikely, given that the river floods regularly (and therefore any burrows would be flooded) and that American mink (*Mustela vison*), an introduced predator which has been held partly responsible for the loss of water voles from large areas of the British Isles, are known to be present in the area.

*Otters*

- 3.2.16. As stated in the Methods Section, a specific search for otter resting sites was undertaken over a wider area stretching for 100m upstream and downstream of the rapids. Extensive signs of otters (*Lutra lutra*) were found within the survey area, mainly on the island. Four features on the island were identified as having the potential to provide otters with resting sites. These are detailed by protected species Target Notes 8, 10, 11 and 12. Of these, one had a “couch” of flattened vegetation inside which had the scent of otter on it, two had otter spraints next to them and one had the potential to be used by otters but did not have any signs in association with it.
- 3.2.17. Cavities between rocks on the left bank appeared suitable as resting sites for otters; however, disturbance from recreational users of the river and its banks was considered likely to prevent their occupation during the day. The only sign of otter activity found next to these features was a spraint.
- 3.2.18. The woodland on both banks of the river could provide a wide variety of resting sites for otters further from the river itself. However, this habitat was not extensively searched beyond a distance of 30m from the water’s edge. Beyond this distance, any disturbance effects on otters as a result of the proposals are considered unlikely.

### *Badgers*

3.2.19. Although no signs of badger activity were located within the survey area, the woodland on both banks of the river appeared to represent potentially suitable foraging habitat for badgers. Similarly, no setts were located within the survey area, which was searched up to 30m from the water's edge on both banks.

## **4.0 Assessment**

4.1.1. The most valuable features and habitats within the survey area are the substrate of the river bed and the island (for invertebrates and fish), the features identified as having been used by otters as resting sites and the trees with the potential to support roosting bats.

4.1.2. Desk study information has confirmed the value of the river substrate and the island for scarce invertebrate species. Although surveys to date have not found white-clawed crayfish (one of the species listed under Annex II of the Habitats Directive, and which is one of the primary reasons for the SAC designation), these were limited. Not all recognised survey techniques for this species that were appropriate to the conditions at this location were used. It is likely that the fish species listed under Annex II of the Habitats Directive and which are also primary reasons for the SAC designation do occur within the survey area, with suitable spawning sites available for all of the listed species.

4.1.3. The island is a resting site for otters, another species listed as a primary reason for the SAC designation. The frequency of use of the features identified (and, by implication, their importance) was not determined. However, given that the island floods frequently and that none of the features identified were not physically secure enough to offer conditions suitable for the establishment of a natal holt (where a female gives birth to her young), it seems unlikely that they are of high significance to the resident animals.

4.1.4. There are a number of trees with the potential to support roosting bats. Their occupancy by bats has not yet been investigated fully, pending the results of engineering feasibility studies into the most appropriate methods of working.

4.1.5. Invasive non-native plant species (Japanese Knotweed and Himalayan Balsam) are present within the survey area.

4.1.6. It is likely that dormice occur in the woodland on both banks of the river, given that Desk Study information shows that this species occurs in the woodlands around Symonds Yat.

## 5.0 Likely impact of the proposals

- 5.1.1. The installation of the river and island bank reinforcements and the groynes at the rapids will entail the construction of a temporary berm along the left bank of the river to provide a haul route to allow access to the riverside and a working area for machinery. This would be constructed using material won from the river bed, which itself formed part of the collapsing groynes that are currently on site, as well as the collapsed remains of a weir which stood at the upstream end of the island some time ago. Where necessary and where flows and water depths allow, machinery may also work directly in the river. The duration of the works is anticipated to be approximately 5 weeks.
- 5.1.2. Given that all of the species listed under Annex II of the Habitats Directive and which are primary reasons for the SAC designation have either been confirmed as present or are likely to be present, it is possible that there will be impacts on these species as a result of the proposed works.
- 5.1.3. Construction of in-stream deflectors along the left river bank and the island facing it will inevitably result in disturbance to the substrate of the riverbed and the island. If not carried out in a sensitive manner, or at certain times of the year, it is possible that impacts on invertebrates and fish of conservation concern could result.
- 5.1.4. Disturbance of the substrate by machinery and excavations to “key-in” materials used to create the deflectors are likely to cause the incidental mortality of invertebrates, including the insects studied previously (see Desk Study) and crayfish, if present. Carr (2000) has commented that “it is unlikely that the installation of permanent groynes will significantly affect the beetle populations in this section of the river” but that fine gravels, rotting bark and exposed tree roots should be preserved to ensure that microhabitats for beetles present at the rapids are retained.
- 5.1.5. Release of sediments currently held by the existing substrate could ‘clog’ clean substrate downstream, potentially smothering spawning and nursery sites for salmonids and other important fish species. However, once complete, the work is likely to concentrate flows and increase the amount of clean substrate at, and downstream of, the rapids. In the longer term therefore, the works could be beneficial to the interest of the area for spawning fish. Flood risk assessment (JBA Consulting 2007) has indicated that flow velocities would not increase as a result of the works. This baseline condition would, therefore, be unchanged and it is not anticipated that any further obstruction to fish movements upstream and downstream of the rapids would be caused.

- 5.1.6. The use of the island as a resting site for otters is likely to be temporarily disrupted during the construction phase of the proposed works. It is possible that some, or all, of the flood debris actually or potentially used by otters will need to be moved to allow a working area to be established, or to ensure a safe working environment for contractors; one of the features with the potential to be used by otters identified on the island (see Target Note 11) included a large metal boat balanced against a tree. If such features are moved, or removed, the potential exists for the permanent disruption of the use of this feature by otters. However, as discussed in the previous section, the uses made of the island by otters are unlikely to be extensive and, whilst the removal of actual or potential otter resting sites should be avoided, any such work required to ensure the effective delivery of the project (including considerations of health and safety) would not be expected to be significant to the local otter population. Neither would it present risks to individual animals, provided that the precautionary surveys specified in the Method Statement in Appendix VII are carried out to confirm the absence of otters in advance of the works commencing.
- 5.1.7. Trees identified as having the potential to support roosting bats could be lost as a result of the proposed works, to allow for a working area on the island. In addition, the Environment Agency has recommended that trees on the island are coppiced to aid in its stabilisation. Direct impacts on bats would only be likely if roosts are damaged, obstructed or destroyed. Under these circumstances the operation would be licensable. Further surveys to confirm the presence or absence of roosting bats from the affected trees on the island are outlined in the Method Statement provided in Appendix VII. An access point to the river from the left bank has been selected to avoid the loss of mature trees.
- 5.1.8. Impacts on dormice, if present, would be limited to trimming of branches overhanging the access track to the site and the clearance of vegetation at the site of the access ramp on the left bank. Branch trimming may cause a temporary and localised disruption to any actual or potential aerial routes across the track. The essential removal of branches likely to damage or otherwise obstruct machinery using an established track is not considered to be a licensable activity, provided that damage to places of rest and shelter used by dormice can be avoided. The only circumstance where this would be likely is if large branches with cavities in them are used as nest sites by dormice. The clearance of vegetation at the site of the access track will be very localised in extent and it is intended that this should be carried out by hand in order to minimise any risks to dormice that may be present. This “destructive search” would only require a European Protected Species licence if dormice or their places of rest and shelter were found. Further details of how this would be dealt with are given in the Method Statement provided in Appendix VII.

5.1.9. Whilst Japanese Knotweed was not in a location affected by the proposed works, its presence indicated the possibility that this species could establish as a result of soil disturbance on the left bank. Himalayan Balsam could also become established on the left bank as a result of the work proposed.

## **6.0 Recommendations for further survey and/or mitigation works**

6.1.1. Retention of heterogenous habitats within the river is considered to be the key to successful mitigation for invertebrates (Carr and Foster 2005). The interstices between rocks used in the construction of the groynes are likely to provide a variety of refuges for invertebrates. In addition to this, woody debris and silt trapped by the groynes will, in time, provide further more varied habitat. The groynes have been designed to encourage deposition of silt and other materials in slack water created downstream of them, and no specific additional mitigation is considered necessary.

6.1.2. Consultation with the Environment Agency and Natural England has confirmed that further surveys for white-clawed crayfish are not necessary. There is a general presumption against undertaking surveys for white-clawed crayfish where populations are already known to occur, because of the bio-security risks associated with the spread of crayfish plague. Instead, it has been agreed that a precautionary approach to mitigation should be adopted. The detail of the mitigation required, including any licensing requirements and appropriate timings of works, is given in the Method Statement provided in Appendix VII.

6.1.3. Avoidance of impacts on fish species that are qualifying features of the SAC will be necessary. This includes timing of works and the adoption of working methods to ensure that obstructions to migration and spawning habitat are avoided. The ideal timing for works would be the months of August and September. If this is not possible, works could be carried out in April, although limited impacts on fish and crayfish may be likely within this time period.

6.1.4. Clogging of clean substrate downstream by sediments released at the site of the works could be avoided or reduced by appropriate pollution control measures used to minimise sedimentation. This could include the installation of straw bales at the downstream end of the rapids to catch sediment. The use of other pollution control measures will be carefully reviewed in order to protect the water quality within the SAC as far as possible and in accordance with Environment Agency guidance (see references).

- 6.1.5. Given that the uses made of the island by otters are unlikely to be extensive, it is not considered appropriate to apply for a license to disturb them. Recent changes to the Habitats Regulations (&C. 1994) include provision for a proportional approach to the issue of disturbance. The threshold above which a person will commit the offence of deliberately disturbing a wild animal of a European Protected Species (EPS) has been raised. Now, a person will commit an offence only if he or she deliberately disturbs wild animals of an EPS in such a way as to be likely significantly to affect (a) the ability of any significant group of animals of that species to survive, breed, or rear or nurture their young, or (b) the local distribution or abundance of that species. Evidence to date suggests that this is not the case for otters using the island at Symonds Yat rapids. Nevertheless, the confirmed resting site known to be used by otters (indicated by Target Note 10 in Figure 1) will be avoided because destruction of, and/or obstructing access to places of rest and shelter is still an offence under the Wildlife and Countryside Act 1981 (as amended).. The detail of the precautionary surveys is given in the Method Statement provided in Appendix VII.
- 6.1.6. To avoid potential or actual impacts on roosting bats, trees identified as having the potential to support roosting bats should be avoided when planning the works. If this is not possible, further surveys of the trees to determine the presence or absence of bats will be required. This will include a combination of more detailed daytime inspections and emergence or dawn swarming surveys in the appropriate season. The detail of the surveys and mitigation required in these circumstances, including any licensing requirements and appropriate timings of works, is given in the Method Statement in Appendix VII.
- 6.1.7. Environment Agency best practice guidelines should be followed for the eradication of Japanese knotweed on the right bank side of the river in order to prevent the spread of this invasive plant within the area subject to the proposed work. Since the growth of knotweed was noted in an area not directly affected by excavation works (or any other works), it is considered sufficient to spray with glyphosate. EA guidelines recommend an application once a year.

## **7.0 Appropriate Assessment**

- 7.1.1. As identified in this report, the potential exists for the River Wye SAC (which has been designated as a European site on the basis that it supports habitats and species of European importance) to be adversely affected by the proposed works. Under Regulation 48(1) of the Conservation (Natural Habitats &c.) Regulations, 1994, the 'competent authority' (in this case, the Environment Agency) must undertake an Appropriate Assessment "of the implications for the site in view of the site's conservation objectives", where a plan or project:

- “is likely to have a significant effect on a European site in Great Britain (either alone or in combination with other plans or projects), and
- is not directly connected with or necessary to the management of the site.”

7.1.2. The first stage of this process is to complete a Screening Assessment, to demonstrate whether or not the proposals would be expected to result in any significant impacts on the SAC. The second stage of the Appropriate Assessment process involves the production of either a No Significant Effects Report or a Statement to Inform an Appropriate Assessment, in consultation with the statutory consultees. Where impacts are considered to be unlikely or where it is possible to demonstrate that these impacts are considered to be so minimal that they will have no significant effect on the integrity of the SAC, a No Significant Effects Report will be necessary. Where this is not possible, a Statement to Inform an Appropriate Assessment would be necessary. This is a formal submission which considers the significance of any adverse impacts against the overall integrity of the SAC, justifies the necessity for the works, and outlines how the impacts of the scheme will be avoided, reduced or mitigated against.

7.1.3. In the case of the proposed works at Symonds Yat Rapids, the first approach is considered to be appropriate. Appendix VI provides a screening matrix and findings of a No Significant Effects Report Matrix for the River Wye SAC, showing how the no significant effects conclusion was reached; indeed, the proposals overall are likely to have a beneficial effect on the SAC qualifying features.

7.1.4. It should be noted that whilst it is envisaged that there will be no significant effects on the integrity of the SAC, this assumes the effective implementation of the mitigation identified in this report and does not obviate the necessity for further surveys to investigate the effects of the works on other protected species which may be present, principally bats.



## 8.0 References

- 8.1.1. Carr, R. 2000. *Aquatic Coleoptra at River Wye SSSI, Symonds Yat Rapids, Herefordshire* (September 2000) [http://www.yatrapids.co.uk/beetle\\_survey.html](http://www.yatrapids.co.uk/beetle_survey.html)
- 8.1.2. Carr, Ron and Foster, Garth. 2005. *Aquatic Invertebrate Survey at River Wye SSSI, Symonds Yat, Herefordshire* (June 2005). [http://www.yatrapids.co.uk/aquatic\\_survey.html](http://www.yatrapids.co.uk/aquatic_survey.html)
- 8.1.3. Environment Agency (undated) *Special Requirements for Developers and Construction Contractors*. Guidance documentation issued by the Cardiff office of the Environment Agency.
- 8.1.4. European Commission Environment Directorate General. 2001. *Assessment of plans and projects significantly affecting Natura 2000 sites – Methodological guidance on the provisions of Article 6 (3) and (4) of the Habitats Directive 92/43/EEC*. Luxembourg: Office for Official Publications of the European Communities.
- 8.1.5. JBA Consulting. November 2007. *Symonds Yat In-River Works to Maintain the Canoe Rapid*. (Flood risk assessment).
- 8.1.6. Nature Conservancy Council. (1990) *Handbook for Phase I habitat survey*. JNCC (1993)
- 8.1.7. Peay, Stephanie (2000) *Guidance on works affecting white-clawed crayfish*. English Nature Report <http://www.englishnature.org.uk/science/licensing/pdf/GuidanceWhiteClawedCrayfish.pdf>
- 8.1.8. Stace, C. (1997). *New Flora of the British Isles Second Edition*. Cambridge University Press.

### Target Notes: Plants and habitats (Figure 1)

- Target Note 1 This vegetated island consists of a variety of materials, including mine waste and more natural riparian substrates. Alder (*Alnus glutinosa*) and Crack-willow (*Salix fragilis*) trees dominate the vegetation, with growth of Reed Sweet-grass (*Phalaris arundinacea*), Meadowsweet (*Filipendula ulmaria*), Brambles (*Rubus fruticosus* agg.), Water Pepper (*Persicaria hydropiper*), Hemlock Water-dropwort (*Oenanthe crocata*) and Raspberry (*Rubus idaeus*) growing between areas of bare substrate.
- Target Note 2 Riffles on the right bank (west) side of the island were clothed in algae, indicating eutrophication of the water.
- Target Note 3 Japanese Knotweed (*Fallopia japonica*) was recorded in a patch approximately 60m<sup>2</sup> at this location.
- Target Note 4 Himalayan Balsam (*Impatiens glandulifera*) was recorded here.
- Target Note 5 The right bank was dominated by a broad-leaved woodland which was continuous with a wider landscape of mixed and coniferous woodland and plantation. The river corridor was dominated by Sycamore (*Acer pseudoplatanus*), Ash (*Fraxinus excelsior*), Beech (*Fagus sylvatica*), Alder, Hazel (*Corylus avellana*), Spindle (*Euonymus europaeus*) and Elder (*Sambucus nigra*) with a ground flora consisting of Soft Shield-fern (*Polystichum setiferum*), Male Fern (*Dryopteris filix-mas*), Hart's-tongue Fern (*Phyllitis scolopendrium*), False Brome (*Brachypodium sylvaticum*), Common Couch *Elytrigia repens*), Ground Elder (*Aegopodium podagraria*), Common Figwort (*Scrophularia nodosa*), Meadowsweet, Hemp Agrimony (*Eupatorium cannabinum*), Nettle (*Urtica dioica*), Creeping Buttercup (*Ranunculus repens*), Ivy (*Hedera helix*), Bugle (*Ajuga reptans*), Russian Comfrey (*Symphytum asperum* x *S. officinale*) and Wood Avens (*Geum urbanum*).
- Target Note 6 The left (east) bank was also dominated by broadleaf woodland, with tree species including Ash, Wych-elm (*Ulmus glabra*), Field Maple (*Acer campestre*), Yew (*Taxus baccata*), Hazel and Dogwood (*Cornus sanguinea*), with Honeysuckle (*Lonicera periclymenum*) growing in profusion. The ground flora included Soft Shield-fern, Male Fern, Harts-tongue Fern, Brambles, Dog's Mercury (*Mercurialis perennis*), Wood Avens, Lords-and-ladies (*Arum maculatum*) and Ivy.

### Target Notes: Protected species (Figure 2)

- Target Note 1 The shallow riffles on the west side of the island, although clothed in algae, could provide habitat for white-clawed crayfish. This area of the river was subject to the slowest water flows within the survey area.
- Target Note 2 Shallow inlets on the west side of the island probably provide slack water habitat for fish fry.
- Target Note 3 This area was characterised by large amounts of exposed tree roots, providing potential refuge areas for a variety of invertebrates, including white-clawed crayfish.
- Target Note 4 Several fresh otter droppings (spraints) were found at this location, the downstream end of the island. White-clawed crayfish remains were found in one of the spraints.

- Target Note 5 The drystone revetments along the left bank provided crevices and cavities potentially suitable as nesting sites for riparian bird species such as dipper and grey wagtail.
- Target Note 6 A Crack-willow with a vertical rot hole at 1m height from the ground. This provided a suitable roosting site for bats, although no signs were found and the likelihood of frequent flooding was considered likely to prevent prolonged occupancy by bats.
- Target Note 7 An Alder with a vertical rot hole at 2.5m height from the ground. This was narrow and provided only limited roosting opportunities for bats. No signs were found.
- Target Note 8 Flood debris at this location provided the potential for an otter resting site. Old spraints were found in the vicinity of the feature.
- Target Note 9 A dead Alder stump with vertical rot holes at 1.75m height from the ground. This had the potential to support roosting bats.
- Target Note 10 A large pile of flood debris with cavities inside it. A mat of flattened vegetation smelling of otter was found inside.
- Target Note 11 Flood debris including a large metal boat. This feature contained cavities suitable for otter resting sites but no signs of occupation by otters were found.
- Target Note 12 A small fallen Crack-willow with Brambles growing over it. This could provide another otter resting site and three spraints were found in association with it.
- Target Note 13 A hollow under the root plate of a large Sycamore tree. This had the potential to provide an otter resting site but no signs were found. Bankside disturbance by recreational users was considered likely to be a source of disturbance.
- Target Note 14 A similar feature to that described by Target Note 13 but including the hollowed root plates of two adjacent Sycamores.
- Target Note 15 The woodland on the right bank of the river could offer innumerable otter resting sites away from the water's edge.
- Target Note 16 A steep bank upstream of the island with impenetrable vegetation on it. This could provide cover for otter resting sites but no signs were found.
- Target Note 17 Cavities between rocks in this location were large enough to provide limited otter resting sites. Spraint was found under a Sycamore root plate next to this feature.
- Target Note 18 Habitat in this area was considered to be particularly good for dormice, with Hazel and Honeysuckle significant components of the woodland flora. However, no signs of dormice were found.

## **Appendices**

## **Appendix I: Status Definitions and Criteria For Invertebrates**

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### **Red Data Book category 1 (RDB 1) - Endangered**

Definition:

Taxa in danger of extinction in Great Britain and whose survival is unlikely if the causal factors continue operating. Included are those taxa whose numbers have been reduced to a critical level or whose habitats have been so dramatically reduced that they are deemed to be in immediate danger of extinction. Also included are some taxa that are possibly extinct.

Criteria:

- Species which are known or believed to occur as only a single population within one 10 km square of the National Grid.
- Species which only occur in habitats known to be especially vulnerable.
- Species which have shown a rapid or continuous decline over the last twenty years and are now estimated to exist in five or fewer 10 km squares
- Species which are possibly extinct but have been recorded this century and if rediscovered would need protection.

### **Red Data Book category 2 (RDB 2) - Vulnerable**

Definition:

Taxa believed likely to move into the endangered category in the near future if the causal factors continue operating.

Included are taxa of which most or all of the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security is not yet assured; and taxa with populations that are still abundant but are under threat from serious adverse factors throughout their range.

Criteria:

- Species declining throughout their range.
- Species in vulnerable habitats.

### **Red Data Book category 3 (RDB 3) - Rare**

Definition:

Taxa with small populations in Great Britain that are not at present endangered or vulnerable, but are at risk. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

Criterion:

- Species which are estimated to exist in only fifteen or fewer 10 km squares. This criterion may be relaxed where populations are likely to exist in over fifteen 10 km squares but occupy small areas of especially vulnerable habitat

### **Red Data Book category 4 (RDB 4) - Out of Danger**

Definition:

Taxa formerly meeting the criteria of one of the above categories, but which are now considered relatively secure because effective conservation measures have been taken or the previous threat to their survival in Great Britain has been removed.

### **Red Data Book category 5 (RDB 5) - Endemic**

Definition:

Taxa which are not known to occur naturally outside Great Britain. Taxa within this category may also be in any of the other RDB categories or not threatened at all.

### **Red Data Book Appendix (RDB app.) - Extinct**

Definition:

Taxa which were formerly native to Great Britain but have not been recorded since 1900.

### **Red Data Book category I (RDB I) - Indeterminate**

Definition:

Taxa considered to be Endangered Vulnerable or Rare in Great Britain but where there is not enough information to say which of the three categories (RDB 1 to 3) is appropriate.

### **Red Data Book category K (RDB K) - Insufficiently Known**

Definition:

Taxa in Great Britain that are suspected but not definitely known, to belong to any of the above categories, because of lack of information.

Criteria:

- Taxa recently discovered or recognised in Great Britain which may prove to be more widespread in the future.
- Taxa with very few or perhaps only a single known locality but which belong to poorly recorded or taxonomically difficult groups.
- Species known from very few localities but which occur in inaccessible habitats or habitats which are seldom sampled.
- Species with very few or perhaps only a single known locality and of questionable native status, but not clearly failing into the category of recent colonist, vagrant or introduction.

**Nationally Scarce Category A - Notable A (Na)**

Definition:

Taxa which do not fall within RDB categories but which are none-the-less uncommon in Great Britain and are thought to occur in 30 or fewer 10 km squares of the National Grid or, for less well recorded groups, within seven or fewer vice-counties.

**Nationally Scarce Category B - Notable B (Nb)**

Definition:

Taxa which do not fall within RDB categories but which are none-the-less uncommon in Great Britain and are thought to occur in between 31 and 100 10 km squares of the National Grid or for less well recorded groups, between eight and twenty vice-counties.

**Nationally Scarce - Notable (N)**

Definition:

Taxa which do not fall within RDB categories but which are none-the-less uncommon in Great Britain and are thought to occur in between 16 to 100 10 km squares of the National Grid. Species within this category are often too poorly known for their status to be more precisely estimated.

## Appendix II: White-clawed crayfish

### Background Biology

White-clawed Crayfish (*Austropotamobius pallipes*) is the only native species of crayfish in Britain. They are small, lobster-like crustaceans with five pairs of legs. They are olive-brown in appearance and the undersides of their claws are dirty-white to pinkish in colour. They can grow up to a total length of 12cm, though they are usually smaller reaching a length of around 10cm, and weigh up to 90g. White-clawed Crayfish require good water quality and can be found in slow-flowing, stony rivers and streams, lakes, reservoirs, old gravel workings and brick-lined canals. The availability of suitable refuges is essential for providing shelter. Shelter can be found under, or in, stones and boulders, gaps and crevices in old brickwork etc., submerged tree roots, stands of aquatic vegetation and fringes of emergent macrophytes.

The White-clawed Crayfish is a predominately omnivorous and opportunistic feeder, typically eating small fish, invertebrates, macrophytes, detritus, carrion and leaf litter. White-clawed Crayfish can live up to 10 years, reaching sexual maturity within 3-4 years. Their breeding season is from September to November when water temp falls below 10°C. Females will carry anything between 20 – 160 eggs at one time.

The British Isles supports the greatest concentration of White-clawed Crayfish populations in Europe. Although previously widespread, populations are currently declining in the UK, due in part to the rapid increase in numbers and range of non-native crayfish populations. Strongholds for White-clawed Crayfish exist within northern England and the south-west of Northern Ireland.

Five other species of crayfish occur in the wild in the UK: these are the Turkish or narrow-clawed crayfish; the noble crayfish; the North American red swamp crayfish and the spiny-cheek crayfish; and the (most widespread) North American signal crayfish. These are non-native and the latter three can transmit 'crayfish plague'; a disease that they are immune to, but which is fatal to the native White-clawed Crayfish. Crayfish plague is caused by the fungus *Aphanomyces astacii* and can also be transmitted on damp fishing equipment. Crayfish are also thought to be under threat from competition for food and habitat from non-native species of crayfish; habitat modification, loss, degradation and fragmentation; and pollution, in particular, from sheep dip, other pesticides and sewage.



### **Legislative Protection**

The White-clawed Crayfish is afforded protection under the Wildlife and Countryside Act (1981), which makes it illegal to take from the wild or sell the species. It is also included in the Bern Convention and the European Habitats Directive which require measures to be taken to ensure taking of crayfish from the wild, along with their exploitation is compatible with being maintained at a favourable conservation status.

In addition, White-clawed Crayfish are identified as a species of principal importance in Wales and England under section 74 of the Countryside Rights of Way Act (2000), which means that Government departments need to take steps to promote their conservation. White-clawed Crayfish are also identified as a priority species in the UK BAP and many local BAPs. Consent is required from the Environment Agency under the Salmon and Freshwater Fisheries Act (1975) to undertake crayfish trapping.

Given that works to crayfish habitat (where their presence has been confirmed) are likely to have to proceed under licence to the relevant SNCO, then due attention should be paid to the likely presence of White-clawed Crayfish before the commencement of any development.

### **Surveys**

Surveys for White-clawed Crayfish should be carried out when a development or scheme is likely to affect a watercourse or waterbody in an area that is known to support White-clawed Crayfish (on the basis of information collected during the desk study) or if a scheme crosses or is likely to affect a watercourse or waterbody that comprises suitable habitat for White-clawed Crayfish and is within the geographic range of the species.

Surveys should be undertaken at an appropriate time of year, that is when they are active between late-March and late September but outside of the period when females carrying young are susceptible to disturbance (end of May to start of July).

A combination of survey techniques should be used, including manual searching, nocturnal torchlight surveys and trapping. A licence is required from the relevant Statutory Nature Conservation Organisation (SNCO) in order to undertake surveys which involve handling White-clawed Crayfish. Approval is also required from the Environment Agency.

Note: It is essential that appropriate bio-security measures and precautions are taken to avoid the incidental spread of crayfish plague between watercourses. The free-swimming zoospores of crayfish

plague only remain viable when damp and can be transmitted in water or on muddy damp equipment. Therefore, only clean, dry equipment should be used, and all equipment should be disinfected (using a hypochlorite or iodophor-based disinfectant) both before and after survey work.

### **Impacts and Mitigation**

White-clawed Crayfish habitat is likely to be affected by any work that involves any de-watering operation; disturbance of in-stream substrate; increased siltation levels; disturbance of bankside habitat which may contain crayfish burrows, and associated features such as tree roots which provide potential refuges.

A site- or project-specific licence is required from the SNCO in order to undertake mitigation works which involve a capture and relocation or translocation operation. Mitigation should be designed on a project specific and site basis. However, habitat creation, restoration and enhancement should be undertaken wherever possible, and an appropriate mitigation strategy should be devised in consultation with the SNCO. It will also be necessary to demonstrate that the works will result in a contribution to the conservation of White-clawed Crayfish in the locality.

Further advice is available in the *Ecology of the White-clawed Crayfish* (2000) by David Holdich and *Monitoring the White-clawed Crayfish* (2003) by Stephanie Peay, both available from English Nature, Northminster House, Peterborough, PE1 1UA or online at [www.english-nature.org.uk/LIFEinUKRivers/publications/crayfish.pdf](http://www.english-nature.org.uk/LIFEinUKRivers/publications/crayfish.pdf) and [www.english-nature.org.uk/LIFEinUKRivers/publications/crayfish\\_monitoring.pdf](http://www.english-nature.org.uk/LIFEinUKRivers/publications/crayfish_monitoring.pdf), and the Environment Agencies pamphlet *Freshwater Crayfish in Britain and Ireland*, available from the Environment Agency, Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol BS32 4UD.

## Appendix III: Bats

### Background Biology and Legislative Protection

Sixteen species of bats are resident in Britain, belonging to two families, the Rhinolophidae and the Vespertilionidae. These species, together with an 'extinct' species\* and a rare vagrant, are listed in the table below, along with their status and distribution in Britain.

Common Name	Scientific name	Status	Distribution
Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>	Native, Endangered	SW England S Wales
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	Native, Endangered	SW & W England Wales
Whiskered bat	<i>Myotis mystacinus</i>	Native Local	England, Wales, S Scotland
Brandt's bat	<i>Myotis brandtii</i>	Native Local	W & N England
Natterer's bat	<i>Myotis nattereri</i>	Native Fairly common	England, Wales, Scotland
Bechstein's bat	<i>Myotis bechsteinii</i>	Native Very rare	S & W England Wales
Greater mouse-eared bat	<i>Myotis myotis</i>	Extinct *	Formerly S England
Daubenton's bat	<i>Myotis daubentonii</i>	Native Fairly common	England, Wales, Scotland
Particoloured bat	<i>Vespertilio murinus</i>	Vagrant	Occasional records throughout Britain
Serotine	<i>Eptesicus serotinus</i>	Native Locally abundant	S & SE England
Noctule	<i>Nyctalus noctula</i>	Native Uncommon	England, Wales, SW Scotland
Leisler's bat	<i>Nyctalus leisleri</i>	Native Scarce	S, C & E England, Wales
'Common' Pipistrelle (45kHz)**	<i>Pipistrellus pipistrellus</i>	Native Common	England, Wales, Scotland
'Soprano' Pipistrelle (55kHz)**	<i>Pipistrellus pygmaeus</i>	Native Common	England, Wales, Scotland
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	Former migrant winter visitor, now a resident.	Occasional records throughout Britain
Barbastelle	<i>Barbastella barbastellus</i>	Native Rare	England, Wales
Brown long-eared bat	<i>Plecotus auritus</i>	Native Common	England, Wales, Scotland
Grey long-eared bat	<i>Plecotus austriacus</i>	Native Very rare	S England

\* There are no records of *Myotis myotis* in England prior to 1940, and the last known resident individual died in 1990. The species was at the very edge of its range in southern Britain and was probably never well-established. However, following the discovery of a young male found hibernating in Sussex in winter 2002/3 (and recorded each year since, including the winter of 2006/7), the current status of this species is unclear.

\*\* Research into the echolocation calls and genetics of pipistrelles has demonstrated that the species formally identified as *Pipistrellus pipistrellus* actually consists of two distinct species, to be called *P. pipistrellus* and *P. pygmaeus*. The common names in the tables are suggested but not formally adopted.

As shown in the table above, at least half of the species of bat found in Britain are rare or endangered. Even those which are relatively common have undergone massive population declines in the last fifty years and all species are of conservation concern.

Most bats are colonial and roost in groups in trees, buildings, caves, mines and other structures. Large numbers of bats may congregate at a particular roost site and this makes populations very vulnerable, since the loss of one roost site may affect the entire population of that species in a given area. Different roosts are used at different times of year: these can be within the same building or several kilometres apart.

Bats hibernate to conserve energy during the winter months when their insect food is in short supply. Hibernation roosts are normally in caves, buildings or hollow trees, where a constant low temperature and a high relative humidity can be guaranteed. In spring bats may move from roost to roost fairly regularly and gather into small groups. (At this time of year bats will often feed only on warmer nights and may remain torpid for several days at a time in bad weather.)

In June the females of a colony will congregate at a nursery roost to give birth and many species, such as brown long-eared bats, are very faithful to their natal nursery colony. Nursery colonies are often in buildings or trees. Males may visit the nursery colony at intervals throughout the summer, although they tend to spend most of the year singly in traditional roosts of their own. Once the young are weaned, the adult females, followed by the juveniles, will leave the nursery roosts.

In autumn, mating roosts (each held by a single territorial male) are set up and females visit to mate. Transitory roosts are then used, as the animals feed and gain weight before entering hibernation roosts again.

All British bats are insectivorous and rely mainly on habitat types which can provide a large biomass of insects, such as woodland and wetland, for feeding. The loss of such habitat types due to large-scale landscape change has led to a significant decline in bat numbers over the last 50 years. It should be noted, however, that bats regularly roost in urban areas, and they will also cross apparently unfavourable areas to reach distant foraging sites. Thus, with the exception of exposed high ground and intensive arable land, bats can be found almost anywhere.

Bats commute between roosting sites and feeding areas which may be quite distant, using echolocation as a means of navigation. Greater horseshoe bats, for example, may travel 2-3km in the course of a night's activity. Most species of bats tend to follow linear landscape elements such as tree-

lines or hedges, and these features can be important in supporting a population of bats in a given area.

As part of any ecological appraisal or environmental assessment, all mature trees and other suitable structures should be carefully scrutinised (with binoculars) to assess their likely occupancy by roosting or hibernating bats. Where trees with potentially suitable conditions for roosting bats have been identified which would have to be felled, these should be felled under the supervision of a licensed bat worker and, if possible, outside of the times when hibernating bats or bats with dependent young could be present. Ideally, this would mean felling such trees in either April-May or September - October, (there may be a conflict of interest with regard to occupation by nesting birds, which means that September-October is the optimum period). Trees with potentially suitable conditions for roosting bats which show signs of current or recent occupation by bats, or trees which require felling during periods of the year outside those specified above, should be monitored prior to felling (under supervision), should removal be essential.

Any buildings likely to be affected by a development should be investigated for evidence of use by bats. The buildings should be searched by experienced, licensed bat workers in order to locate evidence of current or past bat roosts, in the form of bats, droppings, staining, feeding signs, and/or remains of bats. The outside of the buildings should be searched for access points, and any evidence of their use by bats. If significant areas of the roof spaces are inaccessible, a bat detector survey should also be carried out to establish if bats emerge from any of the buildings, and to monitor bat activity across the site. Recommendations for the appropriate course of action would depend on the numbers and species of bats present in the property, and the times of year that bats used the property.

The habitat should be assessed for its likely value for foraging bats including an assessment of any linear landscape elements such as water-courses, tree-lines or hedges which might be affected by any development proposals.

### Legal Protection

Bats and the places they use to rest and breed are legally protected under the Wildlife and Countryside Act 1981 (as amended) (through their inclusion on Schedule 5) and the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (referred to as the '*Habitats Regulations 1994*'). Animals and plants afforded legal protection under the Habitats Regulations 1994 (as amended) are termed European Protected Species. The legislation should be referred to directly for details of the offences and licensing provisions concerning these species. Proposed developments likely to compromise the protection afforded any European Protected Species will require a licence from

Natural England under Regulation 44 of the Habitats Regulations 1994 (as amended) in order to do so lawfully. Any licence application in this respect will need full information about the species and numbers of bats likely to be affected and details of all the mitigation measures that will be undertaken to ensure that the population of bats at the location concerned will be maintained at a favourable conservation status.

Surveys for bats should be undertaken by a suitably qualified, experienced and where necessary, licenced ecologist. A licensed surveyor will be required for any surveys that involve the inspection of potential or known roost sites.

Further information is available in:

- English Nature's leaflet *FOCUS ON BATS* available from Natural England, PO Box 1995, Wetherby, West Yorkshire LS23 7EP.
- The Bat Conservation Trust's leaflet *BATS AND TREES A guide to the management of trees* available from The Bat Conservation Trust, 15 Cloister's House, 8 Battersea Park Road, London SW8 4BG.
- English Nature's Bat Mitigation Guidelines (2004).
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## **Appendix IV: Otters**

### **Background Biology**

Otters (*Lutra lutra*) are semi-aquatic carnivores in the family Mustelidae, and are found in rivers, streams, marshes, lakes and along rocky coastlines (mainly in Scotland). Otters are fairly large animals; adult males can reach up to 1.2m in length, including the tail. Within their home range otters require adequate food resources, and also a range of resting places, which must be relatively undisturbed. Female otters also require an undisturbed natal holt in which to give birth, which can be some distance from watercourses. Consequently, otter home ranges vary between a few hundred metres on productive coastlines, up to 40km on relatively unproductive rivers and streams. They are highly mobile and usually occur at extremely low densities. Populations are therefore extremely vulnerable across most of the British Isles.

Otters suffered a catastrophic decrease in numbers in the 1950's and early 1960's, mainly through poisons which accumulated in the aquatic food chain. Although few otters are thought to have been killed outright, their breeding success was affected and consequently too few young were born to maintain the population size. The otter was virtually extinct across most of England but, through recolonisation and reintroductions, is gradually returning to river systems in these areas. Nevertheless, otters can only be described as common in north and west Scotland. Although they have no natural predators in Britain, otters are regularly killed on roads, particularly when rivers are in flood, and coastal otters occasionally become caught in lobster pots and drown.

Otters are usually nocturnal, and are very rarely seen. In remote areas, particularly on the coast, they may be more active during the day. They feed primarily on fish, but also take crabs, crayfish, amphibians and may even kill birds or young rabbits if they happen to find them.

### **Resting sites**

Otters will use a number of resting sites within their home ranges, which could either be used on a regular basis, or on a single occasion. This term is used to describe any feature that an otter will use, and can be separated into the following types. A *Hover* is a resting site that tends to be used for short periods during the night. *Couches/lying-up sites* generally refer to structures that are not completely enclosed, such as reed platforms, willow pollards, spaces beneath exposed tree roots, under dense scrub etc. *Holts/dens* generally refer to more enclosed structures such as enlarged mammal burrows, deeper cavities beneath tree root plates etc. A distinction can also be made between natal and rearing holts (see below).

Throughout our reports the term 'resting site' is used to describe any feature that may be used by otters, with further description of likely form and function detailed in Target Notes.

### **Breeding**

In Britain, otters may breed at any time of year. Between one and three cubs are born, with fur but blind and helpless, in a natal holt. These will not usually be found on main rivers, and can be some distance from the nearest watercourse, possibly to avoid disturbance from other otters, and are often in disused rabbit burrows. Finding natal holts is extremely difficult, as otters tend not to spraint near to these structures. When the cubs become more active and mobile, they are moved to a rearing holt, which is usually close to productive feeding areas. A female with dependant young may have several rearing holts. Weaning begins at seven weeks, though they are not fully weaned until three months of age. The young then stay with their mother for up to 12 months. The reproduction rate is therefore relatively slow. Male otters play no part in the rearing of the young.

### **Field signs**

Several characteristic field signs can be used to confirm the presence of otters. These include footprints on muddy or sandy substrates at the edge of water, paths or slides where an otter regularly hauls out on to the bank, pathways across land, in particular between meanders or between watercourses, and otter faeces, which are known as spraints. Spraints have a characteristic sweet smell and are usually sited on prominent rocks, tree stumps or other features on river banks, in particular on structures beneath bridges. Otters are thought to use spraints to gain information on the sex and breeding status of other individuals. Spraints are deposited throughout an otter's home range, but particularly at its boundaries, and close to important holt sites. Rearing holts may have large quantities of spraint deposited nearby, however spraints are not usually deposited near natal holts. Field signs of otters are sometimes confused with those of the introduced American Mink (*Mustela vison*), which have similar, but much smaller, tracks than otters, and which also produce scats. However, mink scats have a characteristic musky smell, quite unlike the smell of otter spraints.

### **Legal Protection**

Bats and the places they use to rest and breed are legally protected under the Wildlife and Countryside Act 1981 (as amended) (through their inclusion on Schedule 5) and the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (referred to as the '*Habitats Regulations 1994*'). Animals and plants afforded legal protection under the Habitats Regulations 1994 (as amended) are termed European Protected Species. The legislation should be referred to directly for details of the offences and licensing provisions concerning these species. Proposed developments likely to



compromise the protection afforded any European Protected Species will require a licence from Natural England under Regulation 44 of the Habitats Regulations 1994 (as amended) in order to do so lawfully. Any licence application in this respect will need full information about the species and numbers of bats likely to be affected and details of all the mitigation measures that will be undertaken to ensure that the population of bats at the location concerned will be maintained at a favourable conservation status.

Licences are available from Natural England for certain activities, and licences are required from Natural England for any activities arising from development projects which may affect otters or their habitats. Before granting a licence for such work, Natural England/Welsh Assembly Government would need to be satisfied that sufficient mitigation measures would be put in place to ensure that the favourable conservation status of the species would be maintained.

Legal protection requires that due attention is paid to the presence of otters, and that appropriate actions are taken to safeguard the places they use for shelter or protection.

### **Mitigation**

An otter survey should be carried out prior to planning any work and this should ensure that appropriate mitigation measures are included in the proposals. Surveys may be more effective if carried out under certain conditions, for example footprints are only likely to be found when water levels are low enough for sand or mud to be exposed. In addition, surveys of rivers are less reliable immediately following periods of high flows, when many of the characteristic signs will have been washed away.

Where possible, the preferred course of action is to plan the development such that otter habitat can be retained and protected, and the risks of road mortality minimised, for example by use of viaduct style river crossings, rather than narrow bridges which may force otters to cross roads when rivers are in flood. In cases where viaducts cannot be used, or where existing narrow bridges are being modified, raised ledges under bridges or purpose-built culverts can be constructed (in combination with otter-proof fencing if appropriate, which allow otters to pass safely. It is also important that development does not increase fragmentation of otter habitat. As otters are generally dependant on linear habitats, they are particularly vulnerable to fragmentation at an individual and a population scale, particularly associated with bank protection and realignment of watercourses. Such activities would potentially also affect the abundance of prey items for otters. If destruction of the habitat cannot be avoided, damage should be minimised, and consideration should be given to creating potentially suitable alternative habitat nearby. Otter feeding resources can also be affected by remote

operations which might affect water quality in the streams and rivers which comprise their territories. It is therefore important that wherever necessary appropriate attenuation measures and pollution controls are implemented during the construction and operational phases of any works which could discharge into these watercourses.

### **Habitat Enhancement**

In addition to the construction of artificial holts, ledges or culverts, consideration should be given to undertaking long-term habitat management for otters. The provision of suitable breeding sites and cover, and a good food supply are essential requirements for otters. Therefore, the provision of the habitat features described below, including meanders, pools, riffles, and aquatic plants and marginal vegetation of value to fish, are all important.

Dense areas of bank-side scrub should be provided where possible, with a riparian buffer zone of at least 20m maintained along the watercourse. In addition, consideration should be given to planting-up areas between meanders etc. with Bramble, Hawthorn, Blackthorn and Alder to provide dense cover for otter resting sites. In some locations, it may be worth considering the incorporation of one or two bankside Sycamore trees. Whilst it is not normally recommended that Sycamore is planted, this species provides particularly suitable cavities for use by otters beneath its root plate. Obviously, Sycamore should only be planted if it does not contravene any other landscaping constraints.

Two types of artificial otter holts can be constructed, comprising interconnecting chambers, with entrances leading directly to the water's edge and onto land. Log-pile holts use natural materials to imitate piles of flood-debris likely to be encountered by otters using a watercourse. Chamber and pipe holts can be constructed from either rocks, breeze blocks, bricks, concrete pipe, paving stones or timber.

Further advice is available in *The Rivers and Wildlife Handbook* (1994), published by the RSPB and in *English Nature's Species Conservation Handbook* (1994).

## **Appendix V: Japanese Knotweed (*Fallopia japonica*) Background Biology and Treatment**

### *Background biology*

Japanese Knotweed is a tall, rhizomatous perennial weed with vigorous growth that has now become established over much of the UK. It has an aggressive growth form and is commonly found along watercourses, road verges, railway embankments and on waste ground. In many of these areas it has become a serious weed and has resulted in major expenditure from private and public bodies in its containment and eradication.

The plant usually first appears in spring (although can emerge as late as July) and is characterised by small green to red/purple shoots with small folded-back leaves. As the shoot matures the leaves unfurl and take on a distinctive cordate (spade like) appearance. In its mature state Japanese Knotweed is most easily recognized by its upright bamboo-like stems which are pale green with purple speckles.

In the summer the plants produce small white flowers in long clusters arising from the base of the leaves. The flowers produce a single seed enclosed in a three-winged seed capsule. Outside its natural range in Japan, these seeds are rarely viable and although seed production is copious, seedling survival in the wild is rare to non-existent, although some rare hybrid varieties do appear to produce viable seeds.

The underground rhizome system plays an important part in the life history of Japanese Knotweed. These rhizomes are technically underground stems (as opposed to the hair-like white roots), and act as storage organs to the plant allowing it to over-winter in an underground state. In the spring, nutrient reserves are rapidly transferred into the new shoots giving the plant an ability to grow extremely quickly and out-compete other vegetation. Once the Japanese Knotweed is established this flow of nutrients is reversed with photosynthetic products being transferred back into the rhizomes. The rhizome system may reach a depth of 2 metres and extend up to 7 metres away from a parent plant. Rhizomes range from 5 to 100mm in diameter and are reddish to dark brown on the outside and a distinctive orange colour on the inside. This distinctive appearance means it is possible to determine whether soil is contaminated with Japanese Knotweed rhizomes in the winter, and in addition any rhizomes can be tested for viability, which can be a useful tool in gauging the success of treatment works.

### *Problems associated with Japanese Knotweed*

From nature conservation perspective, the vigorous nature of the plant allows it to outcompete other flora, and prevents the growth and establishment of native species. In landscape terms the height of the plants can reduce visibility, especially on roadsides, and in winter when the plant dies back the bare soil exposed is prone to severe erosion. In the built environment Japanese Knotweed shoots are able to push up through asphalt, damaging pavements, car parks and other public facilities. Rhizomes have been recorded penetrating foundations and outer walls, land drainage works and lifting interlocking concrete blocks, causing a wide range of structural damage.

### *Legal status*

It is an offence under the Wildlife and Countryside Act (1981) to plant or otherwise cause the plant to grow in the wild. This effectively encompasses both the spread of the plant through movement of plant material, and allowing the living plant to colonise adjacent land.

### *Assessment of Japanese Knotweed*

Survey for Japanese Knotweed can often be carried out throughout the year on undisturbed sites, owing to the persistent nature of the dead stems. Winter surveys are the least preferable option since dead material may have been removed (often by children for use as 'pea-shooters') and no idea of the plant's potential spread can be assessed. It should be possible to survey for Japanese Knotweed from May onwards, but as stated earlier the plants can often emerge later, and therefore absence can rarely be confirmed prior to August.

### *Control Options*

There is a wide range of different ways to eradicate Japanese Knotweed, and the best option should be guided by the amount of material to be treated, the time available to carry out the treatments and the overall size and nature of any construction programme.

It is important to realize that there is no quick solution for the control of Japanese Knotweed, and the presence of the plant on site must be a material consideration when deciding on timing and costs for any size of development.

### *Fencing*

Once the extent of the Japanese Knotweed has been discovered it is vital that secure high-visibility fencing is erected prior to any clearance works being carried out. Japanese Knotweed can regenerate from extremely small parts of the stem or rhizomes, so if vegetation it tracked over this can easily lead

to a spread of material. In the same way it is essential that any machinery that has come into contact with Japanese Knotweed is thoroughly decontaminated before it is used on any other site.

#### *Chemical Treatment*

Dense stands of Japanese Knotweed can be treated with a glyphosate-based herbicide, such as 'Roundup'. If the Japanese Knotweed is sparsely distributed, 2,4-D amine can be used, which is specific to broadleaved plants and will not harm grasses. It may take two or three years to completely kill the entire plant. More effective control can be achieved if Japanese Knotweed is cut or sprayed in early summer, and then sprayed again in late summer, just before the winter dieback. This process can become more difficult if the vegetation has already been treated and has less foliage to absorb the chemicals. The obvious drawback of this method is the length of time required to achieve total eradication.

The use of pesticides is covered by the Control of Substances Hazardous to Health Regulations (COSHH) 1988, and may require a licence. Any chemical treatment works carried out near watercourses require consent from the Environment Agency.

#### *Mechanical Treatment*

This should be carried out by excavating the areas immediately surrounding the Japanese Knotweed, to a depth of 3m and to a surrounding strip of 5m. On a site with several areas of Japanese Knotweed this will result in the production of a large amount of waste material, and is ideally carried out by largescale earth-moving equipment.

#### *On-site burial*

Where the design of a scheme allows this option is likely to be the most cost effective and environmentally preferable by reducing vehicle movements and landfill costs.

To be effective on-site burial should be performed to a depth of at least 5m. The material should then be covered with a geotextile layer (e.g. Lowtrak) or a heavy gauge polythene sheet prior to infilling. Providing this burial is carried out with care it is not normally necessary to obtain a Waste Management Licence, however the local Environment Agency office environmental protection team must be informed at least one week prior to burial.

Where on-site burial is undertaken it is strongly advised that the burial site location is recorded and future owners advised of its location to avoid disturbance and potential re-infestation.

*Off-site burial*

If the development does not allow for on-site disposal it must be disposed of at an approved landfill facility, having first informed the site operator of the presence of viable Japanese Knotweed within the material.

Great care must be taken to avoid loss of material during transit. For small amounts of material this may involve placing into sealed bags, and for larger amounts covering any transport vehicles with a tightly sealed tarpaulin.

**Failure to dispose of Japanese Knotweed correctly may lead to prosecutions under Sections 33 & 34 of the Environmental Protection Act 1990 and Section 14 of the Wildlife and Countryside Act 1981.**

*Combined treatment*

Combinations of the two methods detailed above have proved extremely effective on the control of Japanese Knotweed. Chemically treating the material prior to excavation should decrease the viability of the rhizome stock, although at least two weeks should be allowed between the application of herbicide and excavation.

Alternatively an excavator can be used to scrape the top 25cm of soil (where most of the rhizomes occur) into a pile, and then cultivate the exposed ground to a depth of 50cm. The piled material should then be spread out over the cultivated area. This has been proven to stimulate the rhizomes to produce a higher density of shooting material, which renders it more vulnerable to herbicide treatment. Subsequent treatment has been shown to be effective after two applications using this method, although this is likely to require on-site supervision to correctly delineate the extent of underground growth.

It should be noted that Japanese Knotweed is commonly found rooted within structures, such as wall bases and edges of buildings, and where these structures are to be retained this will further complicate any treatment programmes.

*Further reading*

Lois Child & Max Wade (2000) *The Japanese Knotweed Manual*. Packard Publishing Limited, West Sussex.

**Appendix VI:****Screening Matrix and Findings of No Significant Effects Report Matrix for the River Wye SAC**

Screening Matrix (taken from: European Commission, 2001)

1. Name of project or plan	Symonds Yat In-River Works
2. Brief description of the project or plan	The proposed installation of groynes to deflect river flow and bank revetments to stabilise the left river bank and the east side of an island in the River Wye.
3. Brief description of the Natura 2000 site	The SAC site is designated for the presence of <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation, white-clawed (or Atlantic stream) crayfish, sea lamprey, brook lamprey, river lamprey, twaite shad, Atlantic salmon, bullhead and Otter.
<b>Assessment Criteria</b>	The construction of in-river features.
4. Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	
5. Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of: <ul style="list-style-type: none"> <li>• Size and scale;</li> <li>• Land-take;</li> <li>• Distance from the Natura 2000 site or key features of the site;</li> <li>• Resource requirements (water abstraction etc);</li> <li>• Emissions (<i>disposal to land, water or air</i>);</li> <li>• Excavation requirements;</li> <li>• Transportation requirements;</li> <li>• Duration of construction, operation, decommissioning etc;</li> <li>• Other.</li> </ul>	<p>The site lies entirely in the SAC and covers an area of approximately 5,100m<sup>2</sup>. Land-take will be restricted to the installation of new groynes to replace collapsed ones. There will be approximately 10 of these features, each occupying approximately 12m<sup>2</sup>.</p> <p>Resource requirements will include the importation of large block stone to form the core of each groyne, as well as the excavation from the river bed of material which was once part of the old groynes and of a weir which was located at the upstream end of the island.</p> <p>Emissions will be restricted to those from machinery used in the course of the works. This will be restricted to exhaust emissions. The guidance issued by the Environment Agency (title: "Special Requirements for Developers and Construction Contractors") will be adhered to in order to avoid spillages into the river.</p> <p>Sedimentation of downstream habitats may occur as a result of the excavation of material from the river but any fines released will be intercepted by sediment traps installed at the downstream end of the island.</p>

	<p>Block stone and machinery will be brought to site along an established forestry track.</p> <p>Construction will last for approximately five weeks.</p>
<p>6. Describe any likely changes to the site arising as a result of:</p> <ul style="list-style-type: none"> <li>• Reduction of habitat area;</li> <li>• Disturbance to key species;</li> <li>• Habitat or species fragmentation;</li> <li>• Reduction in species density;</li> <li>• Changes in key indicators of conservation value (water quality etc.);</li> <li>• Climate change.</li> </ul>	<p>A temporary reduction of in-stream habitat will result from the installation of haul routes along the left bank of the river and the left bank side of the island. These will be removed once works are complete. There will be a small loss of submerged habitat beneath the footprint of the groynes. However, the increase in in-stream habitat heterogeneity resulting from the variations of flow, scour and sediment deposition will represent a beneficial enhancement for the fish species which are qualifying features of the SAC.</p> <p>The potential exists for disturbance to a series of confirmed Otter resting sites, however, overall the disturbance impacts on local Otter populations are expected not to be significant given that the features identified are ephemeral and the lengths of bankside habitat that would be affected, compared to the large size of an Otter's territory (which can be as much as 40km of watercourse), the relatively short time period and temporary nature of any disturbance and the fact that even if their behaviour is temporarily affected as a result of the works, they would still be expected to continue to access important parts of their territories.</p> <p>There will be no obstructions to the passage of fish migrating up the river as a result of in-river works, both during and after construction.</p> <p>A "crayfish rescue" will be mounted, thereby ensuring that any animals in the rapids or in features adjacent to it are removed to suitable safe habitat for the duration of the works. This will represent a temporary gap in the distribution of crayfish along this section of the river (if currently present) but re-colonisation of the enhanced habitat once works are complete is anticipated to be rapid.</p> <p>Habitat fragmentation is not considered likely to occur since all habitat types occurring within the area of works will be retained, enhanced or reinstated, and connectivity between retained habitats and those both upstream and downstream of the area of works will be retained throughout the construction period.</p>



	No adverse cumulative impacts on habitats and species in the SAC would be expected.
<p>7. Describe any likely impacts on the Natura 2000 site as a whole in terms of:</p> <ul style="list-style-type: none"> <li>• Interference with the key relationships that define the structure of the site;</li> <li>• Interference with key relationships that define the function of the site.</li> </ul>	No changes are expected to the integrity of the SAC.
<p>8. Indicate the significance as a result of the identification of impacts set out above in terms of:</p> <ul style="list-style-type: none"> <li>• Loss;</li> <li>• Fragmentation;</li> <li>• Disruption;</li> <li>• Disturbance;</li> <li>• Change to key elements of the site (e.g. <i>water quality, hydrological regime etc</i>).</li> </ul>	<ul style="list-style-type: none"> <li>• Loss – There will be no net loss of area from the site.</li> <li>• Fragmentation – There will be no fragmentation of the site or habitats connected to it.</li> <li>• Disturbance – There will be the potential for disturbance to otters but this is considered to be minimal, because all resting sites found were of an ephemeral nature.</li> <li>• Change to key elements of the site - There will be no changes to the key elements of the site.</li> </ul>
<p>9. Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.</p>	No significant impacts are expected.
<p>10. <i>Outcome of screening stage (delete as appropriate).</i></p>	Not Likely to be Significant Effects
<p>11. <i>Is the appropriate Nature Conservation Body in agreement with this conclusion (delete as appropriate and attach relevant correspondence).</i></p>	

## **Appendix VII: Method Statement for pre-construction surveys and mitigation for white-clawed crayfish, otters, bats and dormice**

### **Introduction**

A series of precautionary works has been identified to ensure that impacts on protected species and species that are qualifying features of the River Wye SAC do not occur as a result of works to stabilise the rapids at Symonds Yat on the River Wye. This Appendix sets out a Method Statement detailing how these works will be carried out and what mitigation and licensing may be necessary.

### **Methods and timings by species**

#### *White-clawed crayfish destructive search and rescue*

Following discussions at a site meeting on 19th November 2007, with Charlie Owen of the Environment Agency Wales, it has been agreed that no further surveys will be required in advance of the work. However, it will be necessary to carry out a precautionary search for crayfish immediately prior to the works going ahead. This will involve the checking and removal (by hand) of suitable crayfish refuges from the area of the channel to be affected.

Any crayfish encountered will be moved upstream of the works to a suitable receptor site. In order to carry out this work it will be necessary to apply for licences from Natural England and the Environment Agency. This should be undertaken in August/ September, immediately before in-river works commence.

#### *Otters*

A precautionary search of the feature identified as having been used by otters, and those where the potential was identified for use by otters, will be necessary immediately prior to the works going ahead, in order to confirm that the status of the features has not changed and to confirm that direct disturbance impacts will not occur during the construction period. This will be undertaken in parallel with the crayfish rescue. The resting site already confirmed as being used by otters will remain undisturbed, as will any other features subsequently confirmed as otter resting sites. All other features with the potential to be used as resting sites but where the absence of an otter (or otters) can be confirmed by the survey may be removed to facilitate the bank works on the island.

It is possible that some or all of the features identified as actual or potential otter resting sites during the 2007 survey, will be modified or removed by high flows and flooding in the winter of 2007-2008. If this is the case, a complete re-survey of the island may be necessary.

### *Bats*

A walk-through survey of the haul route to identify any features of value to bats or dormice (see Dormice section below) is proposed in order to ensure that any trimming of branches to allow vehicle access does not impact on roosting sites. In particular, it is important that branches with cavities in them are not cleared to allow the passage of machinery until they are fully investigated for the presence of bats.

Should a bat roost be found, measures will be taken to avoid impacts on the roost by minor diversions of the haul route. If this proves to be impossible, the options for licensing and mitigation will be reviewed.

If the three trees identified on the island as having the potential to support roosting or hibernating bats (see Target Notes 6, 7 and 9 in our report) are to be coppiced, the Environment Agency have requested that further surveys for bats be undertaken prior to the work. An initial daytime inspection of these trees will be carried out using an endoscope to investigate cavities. If such an inspection can rule out the presence of bats then no further survey would be required and the trees would be coppiced immediately. However, if the presence of bats cannot be ruled out, due for instance, to the shape of the cavities obscuring views inside, evening emergence and dawn re-entry surveys would be carried out. These would be undertaken on three occasions, in April/May, June and July 2008.

If bats are found during either the initial inspection, or emergence/re-entry surveys, there are two options.

- The first option would be to not coppice the tree(s) with the bat roost(s) in them. Such a decision may depend on how critical the retention of the trees would be to the long-term integrity of the island.
- If the trees have to be coppiced, an application for a European Protected Species licence would be necessary. It is envisaged that appropriate mitigation in these circumstances would be the erection of artificial bat roosting boxes.

### *Dormice*

A destructive search of vegetation and dead branches at the site of the access ramp for dormice will be necessary in order to ensure access to the river is unobstructed at the time of the construction works going ahead. If dormice or dormouse nests are found in the course of this search, a European Protected Species licence will be needed to allow the clearance of the ramp. If dormice are not found,

the destructive search will be completed to the point where the habitat is rendered unsuitable for this species for the duration of the construction period.

The destructive search will be carried out at a time of year when dependent young are not expected but when adult animals have aroused from hibernation. Notwithstanding cold weather in the spring, this will be done in late April or early May. In addition, a walk-through of the haul route will be undertaken to identify any features of value to dormice (see Bat section above). Should a dormouse resting site be found, measures will be taken to avoid impacts on it by minor diversions of the haul route. If this proves to be impossible, the options for licensing and mitigation will be reviewed.

Below is a table summarising the proposals.

<b>Task</b>	<b>Task</b>	<b>Timing</b>	<b>Comments</b>
1	Dormouse search at site of ramp.	April/ May 2008	
2	Walk-through survey for dormouse and bat resting sites along haul route.	April/ May 2008	Ideally accompanied by a representative of the successful contractor.
3	Further daytime bat survey of three trees on the island.	April/ May 2008	If the presence of bats can be ruled out at this stage, Tasks 4-10 will not be necessary.
4	First emergence survey for bats	April/ May 2008	If necessary.
5	First dawn re-entry survey	April/ May 2008	If necessary.
6	Second emergence survey for bats	June 2008	If necessary.
7	Second dawn re-entry survey	June 2008	If necessary, on the following day.
8	Third emergence survey for bats (if necessary).	July 2008	If necessary.
9	Third dawn re-entry survey (if necessary) on the following day.	July 2008	If necessary on the following day.
10	Bat EPS licence		If necessary, to be prepared as soon as sufficient information is gathered.
11	Natural England White-clawed crayfish licence	To be obtained before works commence.	
12	Permission for crayfish re-location under the Salmon and Freshwater Fisheries Act.	To be obtained before works commence.	
13	Undertaking crayfish rescue and checks for otters	August/ September 2008	

**Appendix IX: Desk study information**

## River Wye/ Afon Gwy Special Area for Conservation

### Site details



Location of River Wye/ Afon Gwy SAC/SCI/cSAC

<b>Country</b>	England/Wales
<b>Unitary Authority</b>	Fynwy/ Monmouthshire; Gloucestershire; Herefordshire; Powys
<b>Grid Ref*</b>	SO109369
<b>Latitude</b>	52 01 24 N
<b>Longitude</b>	03 17 59 W
<b>SAC EU code</b>	UK0012642
<b>Status</b>	Designated Special Area of Conservation (SAC)
<b>Area (ha)</b>	2234.89

\* This is the approximate central point of the SAC. In the case of large, linear or composite sites, this may not represent the location where a feature occurs within the SAC.

## **General site character**

Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins) (9.5%)  
Salt marshes. Salt pastures. Salt steppes (1.5%)  
Inland water bodies (standing water, running water) (52.5%)  
Bogs. Marshes. Water fringed vegetation. Fens (3.1%)  
Heath. Scrub. Maquis and garrigue. Phygrana (1%)  
Dry grassland. Steppes (5.3%)  
Humid grassland. Mesophile grassland (2.4%)  
Improved grassland (10.4%)  
Broad-leaved deciduous woodland (12.3%)  
Inland rocks. Screes. Sands. Permanent snow and ice (0.2%)  
Other land (including towns, villages, roads, waste places, mines, industrial sites) (1.8%)

[Boundary map](#) and associated biodiversity information on the NBN Gateway.

[Natura 2000 data form](#) for this site as submitted to Europe (PDF format, size 30kb).

## **Annex I habitats that are a primary reason for selection of this site**

### **3260 [Water courses of plain to montane levels with the \*Ranunculon fluitantis\* and \*Callitricho-Batrachion\* vegetation](#)**

The Wye, on the border of England and Wales, is a large river representative of sub-type 2. It has a geologically mixed catchment, including shales and sandstones, and there is a clear transition between the upland reaches, with characteristic bryophyte-dominated vegetation, and the lower reaches, with extensive *Ranunculus* beds. There is a varied water-crowfoot *Ranunculus* flora; stream water-crowfoot *R. penicillatus* ssp. *pseudofluitans* is abundant, with other *Ranunculus* species – including the uncommon river water-crowfoot *R. fluitans* – found locally. Other species characteristic of sub-type 2 include flowering-rush *Butomus umbellatus*, lesser water-parsnip *Berula erecta* and curled pondweed *Potamogeton crispus*. There is an exceptional range of aquatic flora in the catchment including river jelly-lichen *Collema dichotum*. The river channel is largely unmodified and includes some excellent gorges, as well as significant areas of associated woodland.

## **Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site**

### **7140 [Transition mires and quaking bogs](#)**

## **Annex II species that are a primary reason for selection of this site**

### **1092 [White-clawed \(or Atlantic stream\) crayfish](#) *Austropotamobius pallipes***

The Welsh River Wye system is the best site known in Wales for **white-clawed crayfish** *Austropotamobius pallipes*. The tributaries are the main haven for the species, particularly at the confluences of the main river and the Edw, Dulas Brook, Sgithwen and Clettwr Brook.

### **1095 [Sea lamprey](#) *Petromyzon marinus***

The Wye is an extensive river system crossing the border between England and Wales and the **sea lamprey** *Petromyzon marinus* population is found in the main stem below Llyswen. The site provides exceptionally good quality habitat for sea lamprey and supports a healthy population.

### **1096 [Brook lamprey](#) *Lampetra planeri***

The Wye is an extensive river system spanning the border between England and Wales and the **brook lamprey** *Lampetra planeri* population is widely distributed in its catchment. The river provides exceptionally good quality habitat for brook lamprey and supports a healthy

population.

**1099 River lamprey *Lampetra fluviatilis***

The Wye is an extensive river system crossing the border between England and Wales, and the **river lamprey *Lampetra fluviatilis*** population is widely distributed in the catchment. The Wye provides exceptionally good quality habitat for river lamprey and supports a healthy population.

**1103 Twait shad *Alosa fallax***

**Twait shad *Alosa fallax*** have long been abundant in the Wye, an extensive river system spanning the border between England and Wales. Twait shad often spawn at or just above the tidal limit, but in the Wye they migrate over 100 km upstream, the highest spawning site being at Builth Wells. Data held by the Environment Agency indicate that, of the three selected rivers, the largest spawning areas for this species occur on the Wye. The river has relatively good water quality, adequate flows through an unobstructed main channel and a wide range of aquatic habitats conducive to supporting this fish species. In particular, there are a number of deep pools essential for congregation before spawning.

**1106 Atlantic salmon *Salmo salar***

Historically, the Wye is the most famous and productive river in Wales for **Atlantic salmon *Salmo salar***, with high-quality spawning grounds and juvenile habitat in both the main channel and tributaries; water quality in the system is generally favourable. It is also one of the most diverse river systems in the UK, with a transition from hard geology, high gradients, rapid flow fluctuations and low nutrient-content in its upper reaches, to a more nutrient-rich river with lower gradient, more stable flow and softer geology in the lowlands. The effect of river engineering work on migration and spawning has been limited, although there is a localised influence from the Elan Valley reservoirs, through inundation of spawning and nursery habitat and fluctuations in flow and water levels in the upper Wye. The most important tributaries for spawning are included in the SAC. Although in the past non-native salmon may have been released to the system, the impact of this is likely to have been minimal. The Wye salmon population is particularly notable for the very high proportion (around 75%) of multi sea winter (MSW) fish, a stock component which has declined sharply in recent years throughout the UK. This pattern has also occurred in the Wye, with a consequent marked decline in the population since the 1980s. However, the Wye salmon population is still of considerable importance in UK terms.

**1163 Bullhead *Cottus gobio***

The Wye represents **bullhead *Cottus gobio*** in an extensive river system crossing the border between England and Wales. The Wye is one of the most diverse river systems in the UK, with a range of nutrient conditions and aquatic habitats and generally good water quality for fish species. The diversity of habitat types in the Wye means that it is likely to represent most of the habitat conditions in which bullhead occurs in Britain, highlighting the conservation importance of this river.

**1355 Otter *Lutra lutra***

The Wye holds the densest and most well-established **otter *Lutra lutra*** population in Wales, representative of otters occurring in lowland freshwater habitats in the borders of Wales. The river has bank-side vegetation cover, abundant food supply, clean water and undisturbed areas of dense scrub suitable for breeding, making it particularly favourable as otter habitat. The population remained even during the lowest point of the UK decline, confirming that the site is particularly favourable for this species and the population likely to be highly stable.

***Annex II species present as a qualifying feature, but not a primary reason for site selection***

**1102 Allis shad *Alosa alosa***

*Many designated sites are on private land: the listing of a site in these pages does not imply any right of public access.*



## SSSI Citation

**COUNTY:** HEREFORD AND WORCESTER/ File Ref: SO55/4  
GLOUCESTERSHIRE/MONMOUTHSHIRE/POWYS

**SITE NAME:** RIVER WYE (LOWER WYE)  
AFON GWY (GWY ISAF) SDdGA

**STATUS:** Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981, as amended.

## LOCAL PLANNING AUTHORITIES:

Hereford and Worcester County Council Gloucestershire County Council  
Powys County Council Monmouthshire County Council  
Leominster District Council South Herefordshire District Council  
Forest of Dean District Council Hereford City Council

**NATIONAL GRID REFERENCES:** ST544912 - SO230429

## Area:

England: 1159.6 ha

Wales: 245.2 ha

Total: 1404.8 ha 157 km

**DATE NOTIFIED (UNDER 1949 ACT):** November 1978

**DATE NOTIFIED (UNDER THE 1981 ACT):** November 1996

## Other information

The River Wye is listed in 'A Nature Conservation Review' edited by D A Ratcliffe (1977), Cambridge University Press.

The site supports the following species and habitats covered by Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora :

Allis shad *Alosa alosa* Annex IIa, Va;

Twaite shad *Alosa fallax* Annex IIa, Va;

Sea lamprey *Petromyzon marinus* Annex IIa

Brook lamprey *Lampetra planeri* Annex IIa

River lamprey *Lampetra fluviatilis* Annex IIa, Va;

Atlantic salmon *Salmo salar* Annex IIa, Va;

Bullhead *Cottus gobio* Annex IIa

Grayling *Thymallus thymallus* Annex Va;

Common otter *Lutra lutra* Annex IIa, IVa;

Atlantic stream crayfish *Austropotamobius pallipes* Annex IIa, Va;

Freshwater pearl mussel *Margaritifera margaritifera* Annex IIa, IVa;

Floating vegetation of *Ranunculus* of plane and sub-mountainous rivers Annex I

Common otter, Atlantic stream crayfish and freshwater pearl mussel are also listed under Schedule 5 of the Wildlife and Countryside Act 1981, as amended.

The River Wye (Lower Wye) SSSI has been designated as a salmonid fishery under the EC Freshwater Fish Directive 78/659/EC. Part of the SSSI falls within the Wye Valley Area of Outstanding Natural Beauty (AONB). Within Powys the river lies within the Radnorshire Environmentally Sensitive Area (ESA).

The River Wye (Lower Wye) abuts the following SSSIs in England and Wales: the River Wye (Upper Wye); the River Lugg; Monnington Scar; the Upper Wye Gorge; Shorn Cliff and Caswell Woods; the Lower Wye Gorge; Pennsylvania Fields; Livox Wood; Pierce, Alcove and Piercefield Woods; Blackcliff-Wyndcliff and the Severn Estuary.

## **Description and Reasons for Notification**

### **River Wye**

Together the River Wye (Lower Wye) and the River Wye (Upper Wye) SSSIs and several of their tributaries represent a large, linear ecosystem which acts as an important wildlife corridor, an essential migration route, and a key breeding area for many nationally and internationally important species. The Wye is of special interest for its associated plant and animal communities. Its character spans a range of types from an upland base-poor stream to an estuarine, silty lowland river. The river's overall diversity is a product of its underlying geology, soil type, adjacent land use and near natural fluvio-geomorphological regime.

The River Wye forms one of the longest, near natural rivers in England and Wales. From its source to its confluence the main channel is 250kms long, drains a catchment of 4136km<sup>2</sup> and has the fourth largest flow of any river in England and Wales. Rising at an altitude of 680m on Pumlumon Fawr in Powys the Wye meanders down through Wales, Herefordshire and Gloucestershire, finally entering the Severn Estuary at Chepstow.

### **River Wye (Lower Wye) (Hay on Wye to Chepstow)**

The River Wye (Lower Wye) is a rare example of a near natural, large western eutrophic river which, unlike many rivers of a similar type, has not been subject to significant modification from human activities. The river is of special interest for three main aquatic plant community types - rivers on sandstone, mudstone and hard limestone, clay rivers and lowland rivers with minimal gradient, as well as for certain flowering plants and bryophytes.

The river shows a clear downstream succession in plant communities reflecting variations in geology, flow rate and land use. In particular the river exhibits a natural increase in dissolved minerals as it flows over the underlying geology of Old Red Sandstone and Carboniferous Limestone. Localised differences in water chemistry are also created where major tributaries, such as the River Lugg, enter the main channel. In its tidal reaches the river becomes increasingly saline as it nears its confluence with the Severn Estuary. The invertebrate fauna (molluscs; beetles; mayflies; caddis flies; true flies and dragonflies) is characteristic of a large lowland river and is of special interest for species associated with riffles, river shingles and saltmarsh, river deadwood and bankside vegetation. The fish fauna includes, Atlantic salmon (*Salmo salar*), twaite shad (*Alosa fallax*), allis shad (*Alosa alosa*) and bullhead (*Cottus gobio*) as well as three species of lamprey (*Petromyzon marinus*, *Lampetra planeri* and *Lampetra fluviatilis*) which are all of European importance and are listed on Annex II of the EU Habitats & Species Directive. The site is also of international importance for its Atlantic stream crayfish (*Austropotamobius pallipes*), common otter (*Lutra lutra*) and beds of water crowfoot (*Ranunculus* spp.). Whilst not a special feature of the site, there is a good range of breeding birds associated with riverine habitats. The SSSI incorporates adjacent areas of riparian habitat including wet woodland, marshy grassland, reed beds and topographical features which directly support the special interest of the river.

### **Geology and Topography**

The catchment of the Lower Wye is 2513km<sup>2</sup> in area and is predominately low lying, the Radnor Forest and Black Mountains being the most significant upland areas within it. The river is thus lowland in character, meandering across a flood plain up to 2km wide and falling

from 72m AOD at Hay-on-Wye to sea level over a distance of 157km. Between Hay-on-Wye and Goodrich the River Wye (Lower Wye) flows over a Lower Old Red Sandstone substrate composed of sandstones and marls with occasional limestone bands. The river bed is comprised of gravels, silt and occasional boulders. Below Goodrich it enters the Wye Valley Gorge. Here the river flows over Carboniferous Limestone outcrops, cutting near vertical cliffs within a restricted floodplain. Over thousands of years land level rise relative to sea level fall has caused the channel to become incised, leaving distinct shelves of land like that at Livox Quarry. The floodplain widens where major tributaries, such as the Trothy and Monnow, join the main channel before the river re-enters the Wye Valley Gorge again with its vertical limestone cliffs and more gentle sandstone and mudstone slopes. In the lower parts of the Wye Gorge the river becomes tidal and brackish and there is a gradual transition to estuarine conditions. Bedrock and boulders commonly constitute the bank and bed material but are usually overlain with silty alluvium. At Chepstow dramatic vertical cliffs have been cut through the limestone. Between Chepstow and the Severn Estuary the river flows over Triassic Mercia mudstones which eventually give way to the alluvium of the Severn coastal plain. The River Wye (Lower Wye) has a relatively natural fluvio-geomorphic regime and has remained relatively free from man-made straightening, widening and deepening schemes. The upper and middle sections are active, migrating meanders depositing shingle point bars and islands, and cutting vertical faces into the banks. The pattern of meander loops along the entire length of the river is complex, steep outer slopes contrasting with shallow slip-off slopes. In many places, increased gradients expose extensive gravel substrates over which the river forms complex pool and riffle sections. Few examples of oxbow lakes and active back channels remain adjacent to the river.

### **Flora**

In its upper and middle reaches the river channel is dominated by submerged flowering plants such as spiked water milfoil (*Myriophyllum spicatum*) and beds of water crowfoot (*Ranunculus fluitans*). Other common plants include rigid hornwort (*Ceratophyllum demersum*) and perfoliate pondweed (*Potamogeton perfoliatus*). Rare aquatic species include whorled water milfoil (*Myriophyllum verticillatum*). In the lower reaches of river through the Wye Gorge, the calcium and nutrient content of the water increases. Here, aquatic vegetation is mainly comprised of pondweed species such as fennel pondweed (*Potamogeton pectinatus*) and curled pondweed (*P. crispus*). Aquatic macrophytes disappear below the tidal limit at Brockweir and marginal vegetation is often absent or much reduced below this point due to tidal scour. However, some species thrive along the transition zone between brackish and freshwater conditions where large areas of mud are exposed at low tide. Marginal vegetation often consists of reed canary-grass (*Phalaris arundinacea*) and branched bur-reed (*Sparganium erectum*). Other marginal plants such as amphibious water bistort (*Polygonum amphibium*), brooklime (*Veronica beccabunga*), yellow-cress (*Rorripa* spp.) and water forget-me-not (*Myosotis scorpioides*) are widespread and frequent. (The nationally scarce horse-tail (*Equisetum x litorale*) is found growing along the margins of the river in its upper section). Below Brockweir the upper mud banks of the river are colonised by salt-marsh species such as sea aster (*Aster tripolium*), saltmarsh-grass (*Puccinellia* spp.) and sea-milkwort (*Glaux maritima*). Characteristic bankside plants include stinging nettle (*Urtica dioica*), great willowherb (*Epilobium hirsutum*) and reed canary-grass (*Phalaris arundinacea*). Locally the river bank vegetation can be diverse containing species such as common black knapweed (*Centaurea nigra*) and comfrey (*Symphytum* spp.). A number of rare and restricted species occur along the river banks, including common meadow-rue (*Thalictrum flavum*), meadow saxifrage (*Saxifraga granulata*) and chives (*Allium*

*schoenoprasum*). The latter species grows in deep crevices in riverside outcrops and bedrock. Along wooded brackish reaches of the river, the banks become almost entirely dominated by stands of couch grass (*Elytrigia repens*). The riverbank is frequently tree lined. Willows (*Salix* spp.) are common along the upper and middle sections whilst alder (*Alnus glutinosa*) and ash (*Fraxinus excelsior*) become more frequent in the lower reaches. Sycamore (*Acer pseudoplatanus*) is widespread along the length of the river

The adjacent land use through the Hereford Plain is dominated by mixed farming with occasional oak (*Quercus* spp.), ash and sycamore woodland running down to the river. Below Goodrich the river enters the Wye Valley Gorge cutting through a landscape of permanent pasture and steep woodlands before flowing through the coastal grassland plain and entering the Severn Estuary.

### **Mammals**

The common otter (*Lutra lutra*) is widespread along the length of the river where appropriate bankside cover exists. The roots of mature bankside trees are often used as otter holts. Water voles (*Arvicola terrestris*) can be found along the middle sections of the river. The bankside tree cover provides valuable feeding and roosting habitats for several bat species including the greater horseshoe (*Rhinolophus ferrumequinum*) and Daubenton's bat (*Myotis daubentonii*).

### **Invertebrates**

The River Wye's invertebrate community is characteristic of a large lowland river. Several invertebrate species associated with such conditions include the nationally rare mayfly (*Potamanthus luteus*) and the caddis fly (*Hydroptila lotensis*) together with the nationally scarce stonefly (*Brachyptera putata*) and the club-tailed dragonfly (*Gomphus vulgatissimus*). Through the middle reaches of the river the black-tailed skimmer (*Orthetrum cancellatum*) breeds on the north western edge of its distribution. The thick emergent fringes of vegetation on the banks provide cover and breeding habitat for the white-legged damselfly (*Platycnemis pennipes*). The river is of high invertebrate interest for species associated with riffle, shingle and saltmarsh habitats. Of particular interest are the riffle beetles (*Normandia nitens*) and (*Oulimnius major*) and the shingle beetle (*Neobisnius proxlixus*), all of which are nationally rare. Nine other nationally scarce beetles associated with these habitats have been recorded including (*Chaetocnema sahlbergi*) and (*Pogonus littoralis*), which are both found on saltmarsh. Several nationally rare invertebrate species are associated with river dead wood such as the beetle (*Macronychus quadrituberculatus*) and the caddis flies (*Oecetis notata*). Other nationally rare species are associated with sandy river banks such as the crane fly (*Limonia omissinervis*). Bankside trees and tall ruderal herbs provide ideal habitat for five nationally scarce species of moth, including the waved carpet (*Hydrelia sylvata*) and the micro moth (*Mompha langiella*). All six British species of unionid mussels occur on the river, including the scarce depressed river mussel (*Pseudanodonta complanata*). This is believed to be a unique assemblage in Britain. The nationally rare snail (*Pseudamnicola confusa*) is also present and is restricted to the saline reaches of the river.

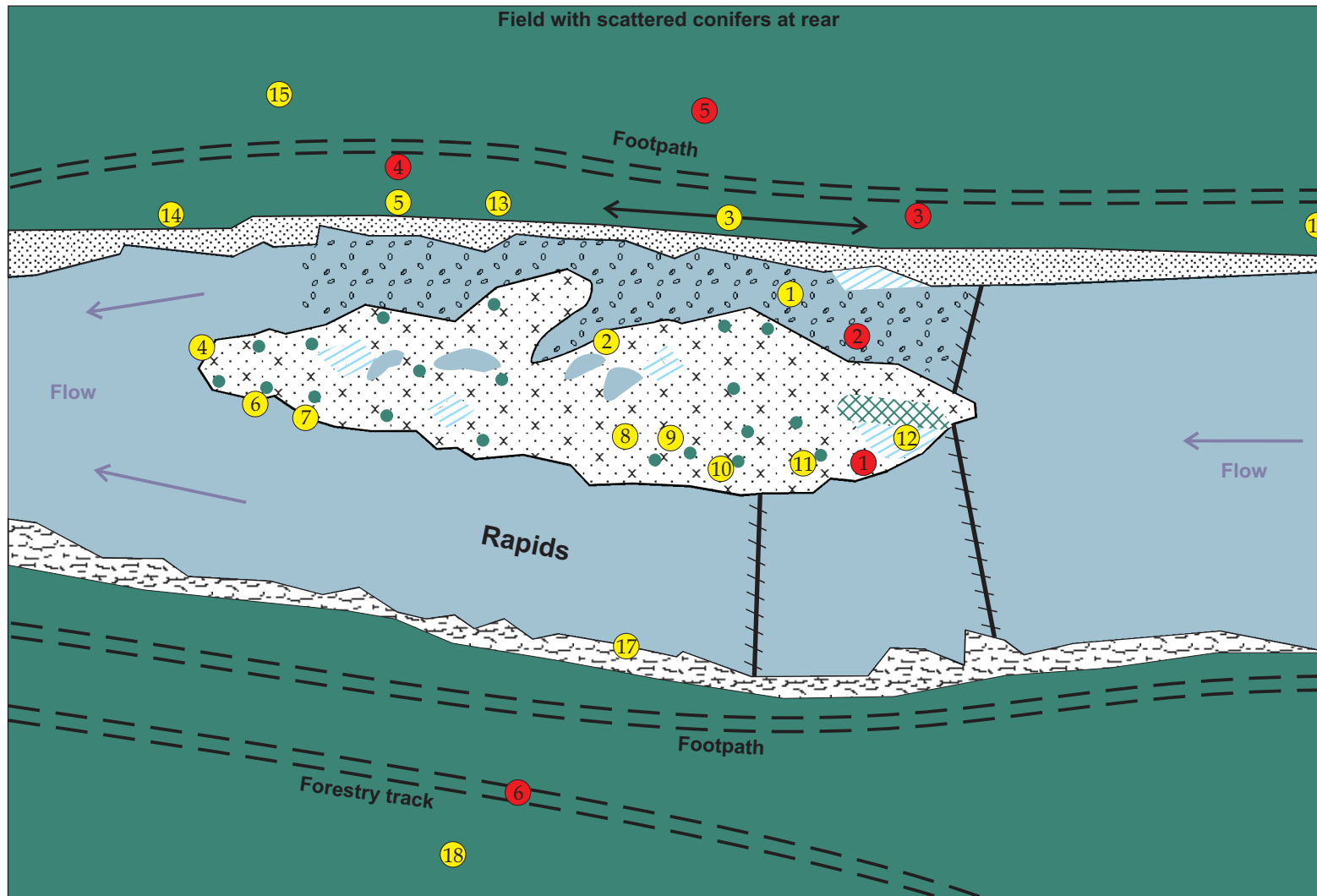
### **Fish**

The river has a wide range of migratory and non-migratory fish species. The most abundant coarse species include chub (*Leuciscus cephalus*), dace (*Leuciscus leuciscus*) and pike (*Esox lucius*) which together with roach (*Rutilus rutilus*) and perch (*Perca fluviatilis*) are the most

widely distributed fish along the river. Species such as tench (*Tinca tinca*) and ruffe (*Gymnocephalus cernua*) are restricted to the lower reaches. Sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*), twaite shad (*Alosa fallax*) and the very rare allis shad (*Alosa alosa*) all migrate into the river each year from the Severn Estuary and spawn at various localities along its length. Large numbers of elvers (*Anguilla anguilla*) migrate up the river with the spring high tides. The river also supports internationally important populations of brook lamprey (*Lampetra planeri*) and bullhead (*Cottus gobio*). Several game fish species including grayling (*Thymallus thymallus*), brown trout (*Salmo trutta fario*) and sea trout (*Salmo trutta trutta*) breed and migrate along the River Wye (Lower Wye). Important numbers of Atlantic salmon (*Salmo salar*) migrate up the main channel in order to reach spawning grounds in the headwaters of the Wye.

### **Birds**

The River Wye (Lower Wye) supports a varied assemblage of breeding birds associated with rivers. Several species including the mute swan (*Cygnus olor*) and coot (*Fulica atra*) are associated with its slow flowing reaches and breed along the length of the river. However, species associated with upland streams and rivers such as dipper (*Cinclus cinclus*) and grey wagtail (*Motacillia cinerea*) also breed along the faster flowing sections, especially where rapids occur. Sedge warbler (*Acrocephalus schoenobaenus*) and reed bunting (*Emberiza schoeniclus*) breed in riparian habitat along the river banks. Extensive shingle shoals provide suitable breeding habitat for the little ringed plover (*Charadrius dubius*) whilst vertical banks provide nesting sites for the sand martin (*Riparia riparia*) and kingfisher (*Alcedo atthis*). Goosanders (*Mergus merganser*) are present throughout most of the year. The tidal reaches of the river support breeding shelduck (*Tadorna tadorna*) and an established heronry. Occasional low lying, wet areas of land adjacent to the river support breeding wader species including snipe (*Gallinago gallinago*) and lapwing (*Vanellus vanellus*), whilst common sandpiper (*Actitis hypoleucos*) is widely distributed along the length of the river.



Key	
	Semi-natural weir
	Bare ground and ephemerals
	Bare ground (fine substrates)
	Loose stone revetments
	Scrub
	Inundation vegetation
	Water
	Scattered trees
	Plant/Habitat Target Note
	Protected Species Target Note



<b>Symonds Yat</b>	
Figure 1: Ecological Survey Results	
Contract No. WX82034-C1025	Drawn by CW
Scale NTS	Version No. - date A - 19/10/07
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The purpose of this figure is for the illustration of ecological data only. It should not be used for design, estimation, scaling, construction or any other technical or engineering purposes.