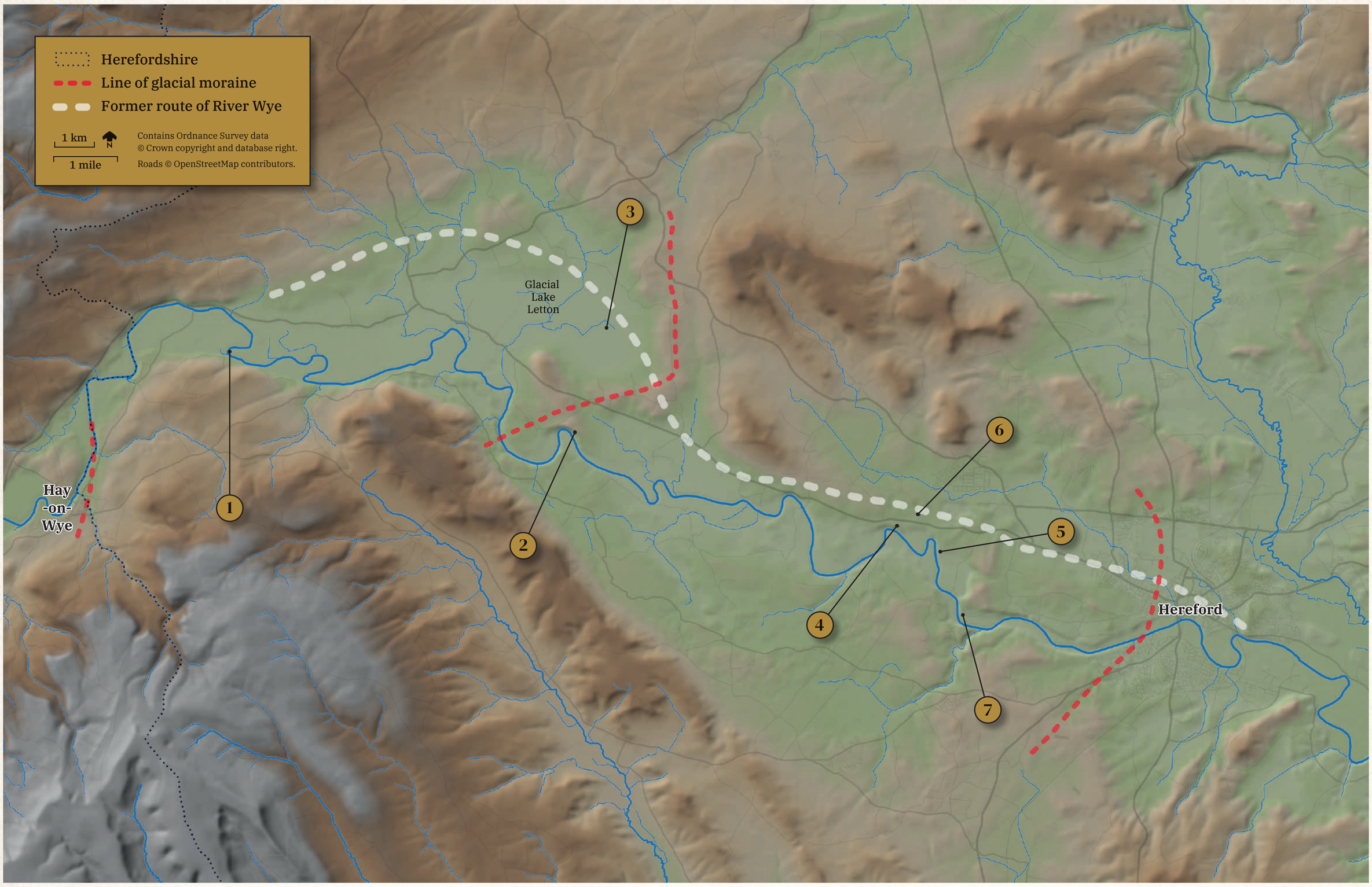
Geology of the Northern Wye Valley in Herefordshire *by Woolhope Geology Section*



1 **Locksters Pool.** A meander cut by the River Wye on a wide flood plain, eroding the outside of the bend and depositing gravel on the inside, where the current is slower.

2 **Old Red Sandstone river cliff,** here consisting of mudstone rock at Monnington (Brobury) Scar, Site of Special Scientific Interest, designated for its geology, Upper Silurian, Moor Cliffs Formation.

3 **View over the former glacial Lake Letton** seen from a ridge of moraine at Staunton on Wye which dammed the river. The River Wye has cut itself a new channel to the south of Oaker's Hill.

4 **Moss growing on tufa** precipitated from solution by water seeping from glacial deposits and flowing down the wall at the National Trust Weir Gardens.

5 **River cliff cut in glacial moraine at Weir Cliff,** formed of unsorted boulders and smaller rocks deposited by the melting glacier.

6 **A kettle hole,** one of the Ice Age ponds found in hollows in hummocky glacial moraine near Kenchester.

7 **View into Breinton Gorge,** cut by the River Wye when its valley was blocked by glacial moraine at Stretton Sugwas.

River Wye: *its magnificent heritage and current threats*

Woolhope Club
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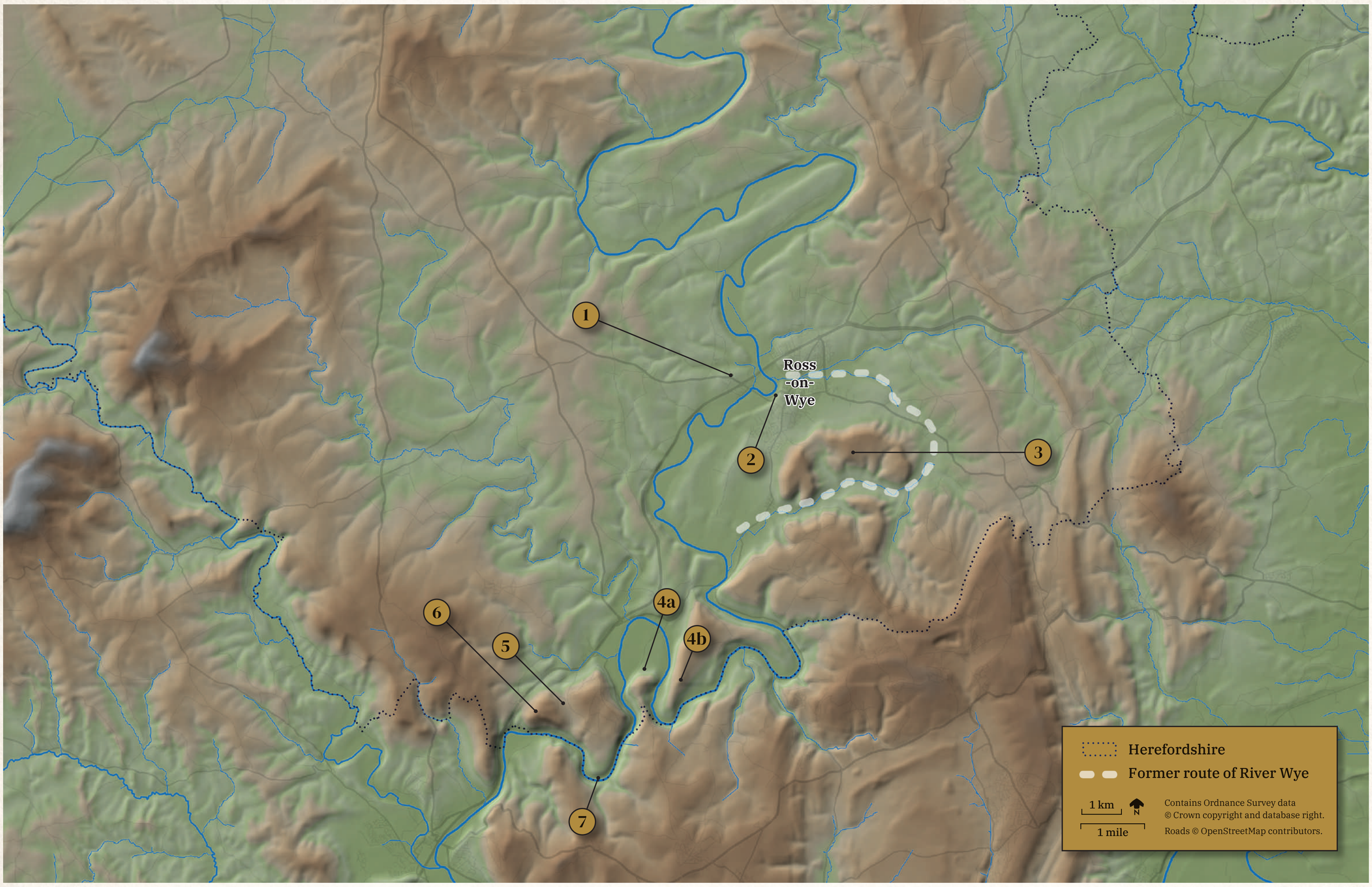
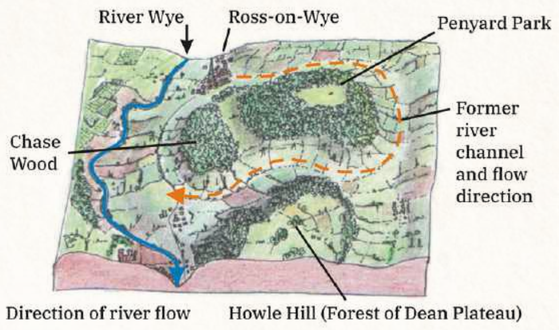
Geology of the Southern Wye Valley in Herefordshire *by Woolhope Geology Section*

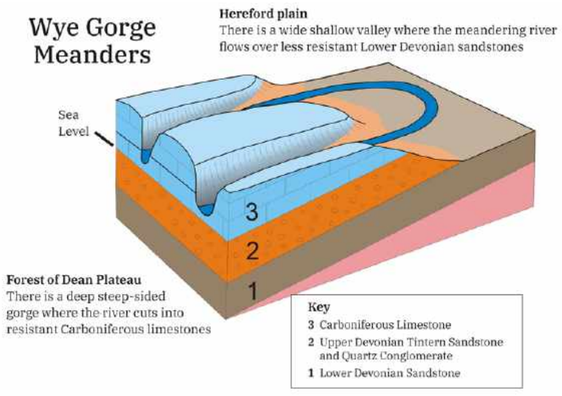


1 **A view from the Prospect,** Ross-on-Wye, showing the water covering the flood plain of the River Wye in 2014.

2 **Devonian sandstone cliffs at Wilton Bluff,** Ross-on-Wye, a Site of Special Scientific Interest for geology, deposits of seasonal streams rivers crossing an arid land about 400 million years ago.



3 **An abandoned meander of the River Wye,** which used to flow north and east of Penyard Park, is shown on the main map as a dashed white line.



4a **4b** **The Wye meanders through a deep steep-sided gorge in the Carboniferous limestone rock of the Forest of Dean Plateau.** There is a wider valley on the more easily weathered Devonian sandstone rock of the Herefordshire Plain. *Aerial Photo Derek Foxton.*

5 **King Arthur's Cave** in Carboniferous Limestone when the River Wye was flowing at a higher level than the present day.

6 **Cliffs of Quartz Conglomerate,** the deposits of a flash flood in the Middle Devonian Period, form crags on the hillside of Little Doward and Huntsham Hill.

7 **Calcareous tufa,** irregular deposits of lime, precipitated from solution as water flows over limestone cliffs at the Biblins.

River Wye: *its magnificent heritage and current threats*

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The landscape history and archaeology of the Wye *by Keith Ray*

The Afon Gwy (River Wye) is aptly named: in Welsh, ‘the winding river’ – derived from the long meanders in its lower course from Hay-on-Wye to the sea in the Bristol Channel.

Plate 1: The Wye from Symonds Yat Rock

This landscape of often deeply incised loops spans 58 miles (45 km), 78% of which is wholly or partly in Herefordshire. Although drift geology tells the story in gravels and sands of a much older configuration, ‘palaeo-Wye’, its present form reflects around 12,000 years of development. Multiple millions of tons of sediment fill its floodplain *(see Plate 1),* showing the Wye from Symonds Yat Rock, which is the justifiably famous view into Herefordshire from the border with Gloucestershire between Ross-on-Wye and Monmouth. The Yat Rock marked both that border and was a gateway through Offa’s Dyke (itself superimposed here onto an Iron Age promontory fort) into English-held lands to the south, from the early British kingdom of Ergyng, also known as Archenfield, occupying much of what became southern Herefordshire to the north.).

Some of these older sediments were observed briefly when the Roman road that crossed the valley near Kenchester (the 1st–5th century town of Magnis) four miles west of Hereford was sample excavated by Herefordshire Archaeology and Channel 4’s Time Team in July 2005. Overlying the dual roadway (upper gravelled carriageway for horses and pedestrians, parallel lower cobbled one for carts) were the silts laid down that included the ‘fossilised’ traces of medieval ridge and furrow ploughlands. Beneath it were the traces of millennia of prehistoric flooding episodes. *Plate 2* shows a view from the riverbank of the excavation in 2005 of the Roman road crossing of the River Wye near Kenchester, looking northwards across the floodplain. The cobbling represents a series of road surfaces approaching both metalled fords and successive bridges built and used in the Roman period. *Plate 3* is an aerial photograph showing the Roman road north and south of the river at Kenchester. The white lines are parch-marks showing the road built on a raft foundation across the alluvial deposits.

More detail on all these discoveries can be found in articles and reports in the pages of the Transactions of the Woolhope Naturalists’ Field Club. *These are viewable free online, but printed copies are available free to Members (please join to support such studies). They mostly feature also in the book The Archaeology of Herefordshire: An Exploration (Keith Ray, Logaston Press, 2015; 2nd edition due for publication in 2024).*

Plate 2: Excavation of the Roman river crossing near Kenchester

Plate 3: Aerial view of the Roman river crossing near Kenchester

River Wye: *its magnificent heritage and current threats*

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The landscape history and archaeology of the Wye *by Keith Ray*

Archaeology has uncovered many fascinating ‘Wye’ stories in recent years. These range from the simple huts of the Iron Age iron-makers and salt-traders of The Doward hillfort near Whitchurch, to the luxury villa-dwelling riverside Romano-Britons at The Weir Gardens west of Hereford and atop the rocky cliff at (later) Ross-on-Wye. And from the aged late Roman ‘refugees’ (if such they were) hiding out (and then buried in) the limestone caves south of Goodrich to the iron forges and furnaces at New Weir near Symond’s Yat West.

More detail on all these discoveries can be found in articles and reports in the pages of the Transactions of the Woolhope Naturalists’ Field Club. *These are viewable free online, but printed copies are available free to Members (please join to support such studies). They mostly feature also in the book The Archaeology of Herefordshire: An Exploration (Keith Ray, Logaston Press, 2015; 2nd edition due for publication in 2024).*

Plate 4 shows a smithing workshop excavated on the right bank of the Wye near in 2009 at New Weir, Whitchurch. This was a complex structure, the earliest part of which probably dates to the late 17th century, and that apparently underwent a series of modifications through to the mid-19th century.

Plate 4: Excavation of the industrial iron-working site near Whitchurch

In early medieval times, the Wye valley witnessed the foundation of Christian churches, several of which (for example Moccas, Holme Lacy, Sellack and Whitchurch) are dedicated to early saints. One 6th–7th century cemetery was investigated twenty years ago near the church of St David at Little Dewchurch.

Meanwhile, in the 1970s an early monastic centre existing by AD700 was uncovered directly overlooking the river at Castle Green (within the grounds of the later Norman castle) in Hereford. The city and its environs stood on the ‘front line’ between English and Welsh communities in these centuries, and impressive defences were built to surround the early settlement with its diocesan and monastic churches. In 2018, a fort built in late Saxon times to protect the western river approaches to Hereford was discovered and sample excavated at Breinton. *Plate 5* shows an early stage in a sample excavation of the north-facing defences of a mid- to late-Saxon fort at Breinton west of Hereford in 2018. In this view looking south-westwards, the top of the bank is visible to the left and the soil infilling the southern side of the 20m wide defensive ditch is being removed to the right. The ‘gorge’ through which the River Wye flows here can be seen in the background.

Plate 5: Excavation of the north-facing defences of a mid- to late-Saxon fort at Breinton west of Hereford in 2018

History of the River Saints *by David Whitehead*

St Guthlac (c.672–714) of Crowland, Cambridgeshire was buried on Castle Green in c.740, beside the Wye, within the precincts of an ancient minster church, which was subsequently named after him. His shrine survived until it was accidently destroyed by fire in the late 13th century. A monastery named after him in the suburbs of Hereford survived until the Dissolution in 1536. *(Plate 1)*

Context: Herefordshire from the end of the Roman period (c.400) until the mid-7th century (c.650) was part of a sub-Roman polity based upon the Severn Valley, aligned with Wales. It was Christian. North Herefordshire appears to have eventually fallen under Anglo-Saxon influence but there was no conquest. By 660 it was ruled by an English dynasty related to the Mercians in the Midlands. Its ruler was Merewahl and he looked towards the Roman Christian church dominant in Midland and southern England rather than the indigenous British church. He founded a monastery at Leominster. South Herefordshire, on the other hand, seems to retain its close contact with Wales and the earlier 'Celtic' Christianity.

Guthlac the Warrior: Guthlac was a descendent of the earliest king of Mercia, Penda and thus a kinsman of Merewahl. *(Plate 2)* In his late teens, c.680 he is found leading a Mercian war-band in south Herefordshire. His *Life* written in c.750 describes how the young prince in the company of other Mercian adventurers 'devastated towns and residences.... villages and fortresses with fire and sword....gathering together companions of various races (who) amassed immense booty'.

It seems that Guthlac's success created jealousy in the extended Mercian royal family and he was forced to live in exile among his erstwhile enemies. During this time he learnt the British (early Welsh) language and when in later life he became a hermit at Crowland in Cambridgeshire, he was taunted by British demons and understood their language.

Patronage: Whilst living the life of a hermit in a long barrow at Crowland, Guthlac became a renowned saint and developed a relationship with another Mercian outcast, Aethelbald who became king of Mercia in 716. *(Plate 3)* Aethelbald continued to struggle against the British (Welsh) in the southern borderland and in the 740s carried the war into Archenfield, across the Wye. It seems that Guthlac became something of a talisman for Aethebald and he brought the saints body (or part of it) to be buried on the river cliff at Hereford, which may already have been used as a British graveyard *(Plate. 4).* He founded a minster church here, which survived on the site until c.1140, albeit St Guthlac's shrine survived in the bailey of the royal castle until the reign of Edward I, when it was accidentally destroyed by fire.

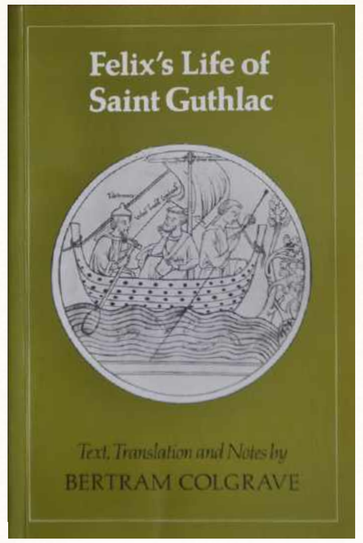

Plate 1: Guthlac's life was written by a disciple called Felix in c.740 – remarkably soon after his death. The modern edition is by Bertram Colgrave.

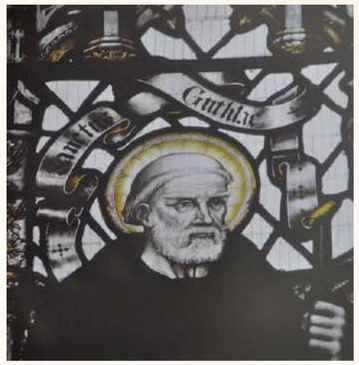

Plate 2: St Guthlac depicted as a hermit in a stained glass roundel in Crowland Church, late 19th century.

Plate 3: Guthlac lived as a hermit at Crowland in a megalithic tomb, perhaps like Arthur's Stone.

Plate 4: King Aethebald of Mercia was related to Guthlac and was campaigning in West Herefordshire in c.740 when he probably founded the minster on Castle Green, Hereford and built a shrine for him. Bones from an extensive grave yard, revealed in the crumbling cliff were noticed in the early 16th century.

History of the River Saints *by David Whitehead*

St Ethelbert (d. 794), king of East Anglia who alienated King Offa (757–96), the successor of Aethelbald and was assassinated at Marden. He was buried on Castle Green but transferred to the new cathedral built at Hereford in c.800. *(Plate 1)*

Context: Offa consolidated the achievements of his predecessor and hemmed-in the belligerent kings of Powys and Gwyneth with his Dyke. This was unnecessary in south Herefordshire since Aethelbald's raids of the 740s had established a marchland – Archenfield – which was colonised by English settlers who were later referred to as the Dunsaete – the hill-people – to distinguish them from the people of the plain –the Magonsaete to the east of the Wye. The new diocese was a symbol of these new arrangements.

Ethelbert the Prince: Little is known about Ethelbert but East Anglia – like West Anglia –later Herefordshire – was a peripheral part of Offa's kingdom and still had its own dynasty. A marriage between the teenager Ethelbert and Offa's daughter would have been the conventional way of sealing a peaceful alliance between the two kingdoms. However, Ethelbert appears to have had other aspirations, which threatened Offa. The latter was hoping to unify English currency as a symbol of Mercian over-lordship but out of the blue in the late 8th century new coins displaying Ethelbert's head were issued from East Anglia. Offa's decision to assassinate Ethelbert may have been the result. *(Plate 2)*

The Cathedral of St Ethelbert: It is difficult to explain why the religious community at Hereford adopted Ethelbert as their patron saint. Logically, the minster up on Castle Green should have become the Cathedral. Initially Ethelbert appears to have been buried here as his holy spring is on the edge of the ancient graveyard. *(Plate 3)* The Cathedral was a new-comer in Hereford and the first reference to its presence is c.800 – after Offa's death. In the 12th century there is a specific reference to the early bishops having been established at Ledbury. It is also, perhaps significant, that it was not until the end of the 10th century that the Ethelbert was added to St Mary as the joint dedication of the Cathedral.

Postscript: Albeit the relics of St Ethelbert appear to have been stolen or destroyed when the Welsh king Gruffydd ap Llewellyn sacked Hereford in 1055, the saints cult took-off in the 12th century when three separate Lives were written. Notwithstanding the canonisation of Thomas Cantilupe in the 14th century, St Ethelbert remained popular until the end of the Middle Ages. In 1994 the Cathedral celebrated his martyrdom and Princess Margaret attended a special service. *(Plate 4)*

Plate 1: Statue, dating from the 14th century, of Ethelbert crowned as a king on the south side of the high altar in Hereford Cathedral.

Plate 2: Set in the chancel floor in Godwin tiles, a rather operatic rendering of the murder of St Ethelbert, designed in c.1860 by George Gilbert Scott.

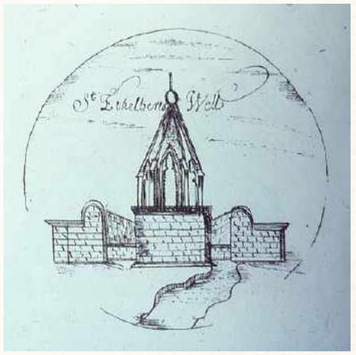

Plate 3a: The well shown by Dingley in the late 17thc with a 14th century canopy and a walk-way for pilgrims.

Plate 4: A modern view of the 19th century well decorated on St Ethelbert's Day, 20th May 2022.

Plate 3b: The degraded canopy, lacking walk-way, drawn by Stukeley in the early 18th century.

Rivers – a shifted baseline? *by Stuart Hedley*

Conservation, in all its forms, requires consideration of how something looked 'before'. This allows us to appraise the full extent of change and base our ideas of what may need to be done on a considered position. Defining the 'before' state can be difficult for complex things like wildlife habitat and ecosystems, as well as cathedrals and villages.

As the natural world has shrunk and its relicts become more precious, understanding of the importance of states of 'before' has become more sophisticated. Nature conservation began with a wish to safeguard attractive wild birds at the start of the 20thC, but by the 1950s this had developed into an appreciation of the importance of conserving the habitats of birds – and other species of wildlife. By 2000 this in turn had developed into an appreciation of the importance of *landscape conservation,* which not only conserves evident wildlife habitat but extends this to other areas of the land surface, so that events highly disruptive to human existence, such as flooding, wildfires, pollution, soil and coastal erosion and fishery and pollinator collapse are prevented.

Rivers are amongst our most modified ecosystems, to the extent that few people now appreciate what a wild river looks like. The fertile lowlands which mature rivers traverse have been important for agriculture since time immemorial, but our loss of consciousness of this particular type of 'before' has allowed mature riverine ecosystems to be completely eliminated in lowland Britain. Floodplain woodlands bear the dubious distinction of being the only natural vegetation type to have been completely wiped out, so that we have no reference points left to understand their make-up in the UK.

Other physical features of mature rivers are now also grossly underrepresented. These include stagnant and slow-flowing backwaters (the natural habitat of pondweeds and waterlilies), shifting shingle and sand beds, and the natural patterning which arises when a dynamic river writhes through grassland. The pictures in this poster illustrate these points.

Plate 1: Les Iles Bonny is a Natura 2000 site on the Loire in France, listed for its example of riverine woodland on a large mature river in Western Europe. It provides a good example of a wild river. Note the huge expanse and variety of sediment with the channel in summer occupying only a relatively small width, and localised colonisation by herbaceous and woody species (tussocks of sedge, clumps of purple osier and black poplar).

Plate 2: At the channel edge a broad, undefended levee with an unstable front on which seed-rich annuals of temporary ground abound, such as Hoary Mustard *Berteroa incana* and sand garlic *Allium scorodoprasum*.

Plate 3: We don't really know what the hinterland of floodplain woodlands would have looked like. Probably they were messy, locally humid and impenetrable places with a flora less dramatic than other woodlands, but incorporating swamps, tangles of climbers and robust competitive species thriving on the naturally fertile soils.

Plate 4: Rivers from above showing a range of states of naturalness. **(a)** the Wye in Herefordshire; **(b)** the Coquet of Northumberland; **(c)** the Vjosa of Albania and **(d)** the Mamberamo of West New Guinea. Whilst accommodating the wildness of the Mamberamo into the modern countryside is to most unthinkable, the Coquet and the Vjosa show how wilder rivers can fit in with contemporary land-use. *Images courtesy of Google Earth.*

(a)

(b)

(c)

(d)

The flora of the Wye *by Stuart Hedley*

The floristic impoverishment of the Wye is clear, despite lack of systematic monitoring (even given its status as SSSI), difficulties in identification of groups like pondweeds and water-crowfoots, and lack of access, so please do submit plant records on the I-Record platform for phone or desktop, or contact the County Recorder on **s2arth@hotmail.com**

True aquatic macrophytes have fared worst, rooted in the riverbed and submerged within the stream channel, dependent on clear waters for physical support and the transmission of bright light, they have suffered due to algal blooms in the Wye which muddy the water, reduce light, and thus reduce photosynthesis. Examples are the water-milfoil *Myriophyllum spicatum (Plate 1),* certain pondweeds adapted to slow-flowing rivers such as perfoliate pondweed *Potamogeton perfoliatus* and shining pondweed *P. lucens* (abundant a hundred years ago, frequent in the 1970s, and not recorded since 2000) and water-crowfoots, *Ranunculus fluitans,* and *R. penicillatus (Plate 2).*

The emergent aquatic plants which fringe the quieter parts of the Wye undergoing only modest declines, for example the unbranched bur-reed *Sparganium emersum,* lesser pond-sedge, *Carex acutiformis,* tufted sedge *Carex acuta,* bulrush *Schoenoplectus lacustris,* flowering rush *Butomus umbellatus (Plate 3)* and amphibious bistort *Persicaria amphibia.* Arrowhead *Sagittaria sagittifolia* has always been local on the river, and there are no recent records from the Ross area.

Another group where serious declines are unlikely comprises the tall terrestrial perennials of the river bank, including marsh woundwort *Stachys palustris,* and purple and yellow loosestrifes *Lythrum salicaria (Plate 4)* and *Lysimachia vulgaris* and Soapwort *Saponaria officinalis* and tansy *Tanacetum vulgare.*

In contrast, river bank annuals and biennials may not have fared so well, examples are the trifid bur-marigold *Bidens tripartita* and the bargeman's cabbage *Brassica rapa ssp campestris,* which appear now to be focussed on the Wye downstream of Hereford, possibly due to the extraordinary increase in Himalayan balsam *Impatiens glandulifera (Plate 5)* in the second half of the 20th C, which can reach 3m, competing very effectively for light. Its seed dispersal mechanism is famous.

The species to fare least well is native black poplar *Populus nigra ssp betulifolia (Plate 6 taken on the lower Danube)* which is unable to complete its life cycle in the absence of the damp, shifting sands which characterise a truly wild river.

Plate 1: Water-milfoil *Myriophyllum spicatum*

Plate 2: *Ranunculus sp*

Plate 3: Flowering rush *Butomus umbellatus*

Plate 4: Purple Loosestrife *Lythrum salicaria*

Plate 5: Himalayan balsam *Impatiens glandulifera*

Plate 6: Black poplar *Populus nigra ssp betulifolia* on the lower Danube

Aquatic Invertebrates on the River Wye *by Will Watson*

Photos and text provided by Will Watson and dragonfly by Mike Averill

Plate 1: Nut Orb Mussel *Sphaerium rivicola*

is a small round bivalve which is common in central England in canals and slow flowing rivers reaching lengths of 15 to 20mm. They are found widely in the River Wye. Mature shells have are glossy olive-brown bands often with contrasting horn-coloured bands. They have raised concentric lines on the shell known as riblets.

Plate 2: The Green Drake
Ephemera danica

is the most common river mayfly which can emerge in huge numbers. They synchronize their emergence in May and June to help restrict the impact of predators. They typically take two years to develop. The larvae dig tunnels into sand and gravel on the riverbed. They feed on organic detritus. This species is common along the length of the River Wye.

Plate 3: The Freshwater Shrimp
Gammarus pulex

is abundant in flowing water throughout most of Great Britain and is also found in ponds and lakes fed by streams. They grow up to 20mm in length have round-shaped eyes and typically swims on their side. Close to the confluence with the Bristol channel where the water is brackish it is replaced by the Brackish-Water Shrimp *Gammarus duebeni* which has kidney-shaped eyes.

Plate 4: Caddisfly *Halesus digitatus*

is a large caddisfly with orangey brown wings with a speckled pattern between the veins. The adults can be seen between August and November. It prefers slow moving streams and rivers and constructs its larval case from sand grains. It is has a widespread distribution in Britain and is fairly frequent.

Plate 5: Diving Beetle
Platambus maculatus

a medium sized diving beetle up to 8mm in length with distinctive dark markings on the thorax and wing cases contrasting with lighter yellowish-white parallel markings on the sides. It is common throughout mainland Britain in rivers and streams and is found throughout the Wye Catchment. It can be found beneath overhanging vegetation and sheltering amongst wood debris.

Plate 6: Rhyacophilidae

caseless caddis growing up to 24mm. They are green in colour with tufts of filamentous gills on either side of the abdomen. Its primary food is other caddisfly larvae. They build a stone shelter to pupate. They live in riverbeds where there is a lot of stone so will be more common in the upper reaches of the river.

Plate 7: River Bug
Aphelocheirus aestivalis

is a wholly aquatic bug with a gill system which allows it to remain permanently under water. It is dorso-ventrally flattened, brown in colour and grows up to 12mm in length. It inhabits medium fast flowing rivers where the bed of the river is gravel or shingle. It predates crustaceans. It is thought to common in the River Wye where suitable habitat is present.

Plate 8: River Skater
Aquarius najas

is one of the largest water skaters in the UK with adults being 13 to 17mm in length. They are found mainly on slow flowing water usually in flotillas made up of adults and juveniles. River skaters can be abundant on rivers and are locally common on the River Wye. A similar large species *Aquarius paludum* is spreading west from east and central England but is more suited to lakes.

Plate 9: Common Club-tailed dragonfly
Gomphus vulgatissimus

is a medium-sized dragonfly with distinctive black and yellow or green markings. In Britain, the main strongholds for the species are within the Severn and Thames catchments, with smaller populations on the Arun in south-east England and the Dee, Teifi, Twyi and Wye in Wales and the Welsh borders. For successful breeding rivers need to be of high water quality. There were 28 Clubtail records on the Wye in 2019 but only about 6 for 2020 & 6 for 2021; recording effort may have been reduced due to COVID (pers.com Mike Averill BDS).

Insect species important as fish food *by Dave Collins*

Photos supplied by Gwent Angling Society

For more information:
fishingwales.net/on-the-menu-welsh-river-insect-species

Insects are important as fish food as nymphs or larvae but also as emerging adults as show in the photographs on this panel. The first six species are members of the *Ephemeroptera,* the upwing mayfly family of which *E. Danica,* the classic mayfly, is also member.

Plate 1: Large Dark Olive
Baetis rhodani

emerges throughout the winter even on the coldest days, then into spring and again from late summer through autumn. In the winter and early spring, look out for these either side of mid-day into the early afternoon. There are many other important Baetis species which appear at other times of the year.

Plate 2: March Brown
Rhithrogena germanica

as the name suggests emerges in March and into early April. It is a large fly usually seen from March to mid-April. There are often several brief hatches each day from mid-morning onwards, when hatches may coincide with those of Grannom. Historically, and still, the iconic fly of the River Usk, March browns are found on many other rivers in Wales. To avoid possible but unnecessary confusion of identity, see Large Brook Duns.

Plate 3: Olive Upright
Rhithrogena semicolorata

emerges during May and June. A major species generally seen from May and into June but can be earlier. Like Yellow May Duns, a medium to large-sized fly, but with an olive body, clear upright wings and unmistakeable dark oval patches (like March Browns) on the femurs. Often seen in and downstream of riffles, from where they hatch. Fish love them!

Plate 4: Yellow May Dun
Heptagenia sulphurea

generally appears in May but will also trickle off until October. An unmistakable, beautiful, sulphur-yellow up-wing with an orange thorax, usually seen from early May onwards. Often seen from mid-morning but can emerge earlier in the day. A trickle-hatching species that can still be seen until early October. It has often been said that "fish don't like Yellow May Duns" but this is simply not true. Duns may often be seen passing unmolested whilst fish rise to something unseen – such fish are likely to be feeding on Yellow May emergers (YMEs). Unlike most Ephemeroptera, Yellow Mays are almost, but not quite, unique in that they can shed the nymphal shuck sub-surface before rising to the surface as true emergers, rather than classic Ephemeroptera spp. nymphs which undergo eclosion (the emergence of an adult insect from its pupal case) at the surface. Fish love YMEs!

Plate 5: Large Brook Dun
Ecdyonurus torrentis

is usually seen from May onwards, and from then well into the summer and early autumn. An upwing, somewhat larger than the March Brown, but often and unnecessarily confused with it. Both have heavily veined wings but only the March Brown has dark oval marks on each femur, and only the Large Brook Dun (LBD) has yellow pigmentation on the leading edges of its wings. Like Yellow May Duns, LBDs tend to trickle hatch and may often be seen drifting down river margins as well as in more open water.

Plate 6: Yellow Mayfly
Potamanthus luteus

is very rare but unique to the Wye and Usk – a scarce May-September emerger. I took that that photo on Jill's sweater at Bredwardine and we also saw a couple on your moth night so they are in your garden!

Plate 7: The Grannom

is a member of the *Tricoptera* family – the sedges or caddis flies. It appears in April in vast quantities and, together with March Browns and Large Dark Olives, provide the first substantial spring meals for over-wintered hungry fish. The Grannom is the first sedge or caddis of the year, appearing during April and whose emergence is triggered by sunshine, often early in the day. Don't confuse blizzards of Grannom seen drifting upstream with a hatch, as these are generally pregnant females, which emerged a day or two earlier, returning to lay eggs. Fish feed on Grannom cripples, spent adults, pupae and emergers, from which you will see adults popping out of the surface film accompanied by rising fish.

Fish on the River Wye *by Will Watson*

Plates 1–5 supplied by Will Watson,
Plates 6–8 Gwent Angling Associaton.

Plate 1: Common Bleak *Alburnus alburnus*

is a small member of the carp family. They can usually grow up to 25cm but are typically smaller. The body is generally silvery but may be golden-brown or greenish in colour. It is a slim-lined fish with upward pointing mouth and eyes. The lateral line is prominent and continuous. It is common river fish found at close to the surface. They feed on small molluscs, insect larvae, worms and plant detritus. They typically form large shoals and are often seen on the surface close to the riverbanks. This species is common along the length of the River Wye.

Plate 2: The European Eel *Anguilla anguilla*

is a snake-like and a catadromous fish; meaning that they undertake mass migration on a regular basis. The adult eels migrate to the Sargasso Sea where they spawn. The larvae metamorphise into glass eels entering estuaries and migrate upstream. The young yellow eels (see photo) take 5 to 15 years to become sexually mature when the flanks become silvery and their underside white. They used to be common in the UK and are now only occasionally encountered in the River Wye. The European Eel is listed as Critically Endangered under IUCN conservation status this is because numbers of Eels have thought to have declined by 90% since the 1970s. Threats include changes in the Gulf Stream and the effects of exposure to organic chlorine compounds.

Plate 3 & 4: Atlantic Salmon *Salmo salar*

also enter the seas to breed, mature fish change in colour and appearance before entering rivers to spawn. After 2 years at sea average fish length is 71 to 76cm and 3.6 to 5.4 kg in weight but specimens which spend longer at sea can be much larger. Adult freshwater salmon have blue and red spots with a silvery-blue sheen with black spots predominantly above the lateral line. When sexually mature the male fish takes on red colouration. The River Wye used to be a prime location for salmon fly fishing; now numbers are no longer at sustainable levels. The Atlantic Salmon is listed as Vulnerable under IUCN conservation status. Decline maybe due to interbreeding with farmed salmon which weakens genetic diversity and the effects of over-fishing in their marine habitat.

Plate 5: Common Minnow *Phoxinus phoxinus*

is a members of the carp family, the maximum length is 14cm. Minnows are streamline but in cross section have a round profile. When mature they tend to be brownish above the lateral line and silver below. Mature fish have black bars made up of dots on the upper flanks. Mature male fish have a black chinstrap patterning at the base of the fins. They can be prolific along the shallow margins of rivers. They are opportunistic feeders predating other small fish, aquatic invertebrates and algae. They are common in the River Wye.

Plate 6: Chub *Squalius cephalus*

are common fish of flowing waters and can live for 20 years. Juveniles feed on algae and small invertebrates, while older fish predate other fish, amphibians and other small animals. They mostly feed on the river bed but are often seen cruising on the surface taking emerging insects. Winter spates can kill off most of that season's juveniles. They thrive in good quality water, and need a varied habitat of refuges in which to overwinter, well flushed gravels for spawning, and places to evade predators such as cormorants and pike.

Plate 7: Grayling
Thymallus thymalus

sometimes called "Lady of the Stream", inhabits running well oxyegenated waters. It is characteristic of clear upper reaches or rivers with sand, gravel or rocky beds, and is extremely sensitive to pollution. They feed on aquatic insects and their nymphs and larvae, small worms and crustacea. Since grayling have some of the most exacting water requirements, they are valuable indicators of pollution. The species is of direct conservation importance and is listed under the Bern Convention and the EU Habitats Directive.

Plate 8: Brown Trout *Salmo trutta*

is a fish of clean, cool streams, rivers and lakes, but can also as "Sea Trout" occupy estuaries and coastal waters. They always breed in cool, well ogygenated rivers with suitable spawning gravels. Freshwater stock mature after 3–4 years, and run upstream to breed. The young parr feed on aquatic and terrestrial insects, molluscs, crustacea and small fish.

Pollution and birds *by Mick Colquhoun & Rachel Jenkins*

Pollution can affect bird populations in different ways, and there is much research remaining to be done to improving our understanding of the impact of the pollution of the riverine ecosystem on birds.

Mallard *(Plate 1)* and Mute Swans *(Plate 2)* are examples of species that can gather together and feed directly on sewage outflows.

However, increased nutrient input often leads to a shift in the vegetation community away from submerged larger plants (macrophytes) to algal blooms, and eventually result in the formation of dense algal mats, under which the sediment becomes very short of oxygen. At first the reduced oxygen in the sediment forces invertebrates to move up to the surface, improving the accessibility of food for invertebrate feeders, but these resources become rapidly depleted, leaving environments which are very low in oxygen and very low in invertebrates.

Some birds are still able to feed on the algal mats either directly e.g. Wigeon *(Plate 3)* or indirectly by feeding on the invertebrates sustained by the algae e.g. Shelduck *(Plate 4 and 5).*

Where there is increased availability of invertebrates, there may be increased availability of the fish that feed on them, and hence increased availability of the birds that prey on the fish (piscivores) such as Little Egret *(Plate 6)* and Grey Heron *(Plate 7)*. Conversely, where the invertebrates have become depleted, and where there is a lack of oxygen, fish populations fall, and so the numbers of birds which feed on either the invertebrates (e.g. Goldeneye, Tufted Duck and Pochard) or the fish (e.g. Kingfisher, Little Egret, Heron) may also fall.

The presence of sediment affects visibility for both piscivores and invertebrate feeders, and may also be an irritant (see poster on Dippers).

Further reading: *BTO Research Report 696. Pringle HEK and Burton NHK. 2017. Improving understanding of the possible relationship between improving freshwater quality and coastal water quality and bird interest on designated sites.*

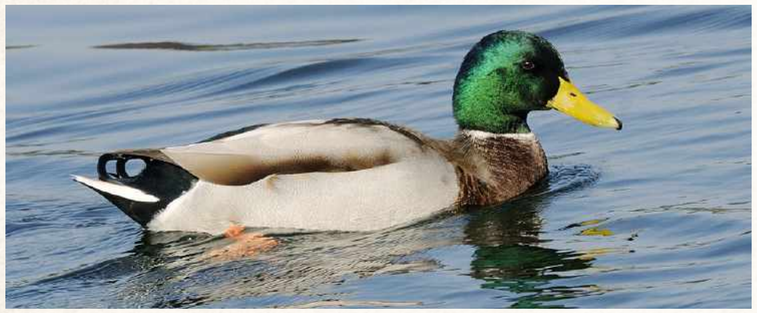

Plate 1: Male Mallard

Plate 2: Mute Swan with cygnets

Plate 3: Wigeon

Plate 4: Sheldrake

Plate 5: Female Shelduck with chicks

Plate 6: Little Egret

Plate 7: Grey Heron

Dippers *by Stephanie Tyler*

Dippers and Grey Wagtails have been studied on the lower Wye tributaries, mainly the Monnow catchment, since 1977 by Stephanie Tyler and Felicity Burge.

During that period of 45 years, Dippers have disappeared from some territories in the lowermost reaches of the river and declined markedly on some watercourses as the River Trothy and Mally Brook. Pairs nested in Monmouth until 2020.

On the upper reaches of the Afon Honddu in the Llanthony Valley, the Monnow from near Clodock up to Craswall and the Olchon Brook, Dippers populations are still healthy with pairs holding territories of about 500m. Grey Wagtails are widespread throughout the catchment from the fast-flowing rocky upland stretches down to Monmouth.

Although Grey Wagtails now nest two to three weeks earlier than in the 1970s, Dippers show much variation in the date of egg-laying from year to year. The first pairs of Dippers start laying in mid-February but the peak in laying is the second or third week of March. Many pairs have a second clutch but the season is over by late June; the adults moult their flight and tail feathers during July and August and are then less able to fly.

Nests are large domed mossy structures with a grass cup within the dome and the cup lined usually with dry beech or ivy leaves. Nest sites include man-made sites as ledges or crevices or drainpipes in walls, bridges and tunnels but pairs will nest in holes in trees, on fallen trees over the river, on rock ledges or crevices on riverside cliffs or ledges by or behind waterfalls.

Most Dipper pairs lay four to five eggs with six eggs only occasional. Females incubate for 16 or 17 days and then both adults feed the young for about three weeks. After fledging the juveniles are fed by the adults for about a week and then are independent.

From ringing we know that young males rarely move more than a few kilometres from their natal site but young females in their first autumn may fly up or downriver, even crossing watersheds, and moving up to 50 km away from their natal site. This helps avoid inbreeding. We have had many movements between river systems. For example, Dippers from the River Lugg have moved to the River Monnow and others from the Rivers Monnow or Dore have moved to the Trothy and Angidy. Adults are largely sedentary after the first year with most pairs on the upper upland reaches remaining in territory throughout the year. On some steep short tributaries of the lower Wye south of Monmouth birds move away from these streams and often winter along the main River Wye.

An increase in spates after heavy rainfall makes it difficult for Dippers to feed especially when the water is deep and laden with sediment. If prolonged spates occur in the spring or early summer it can adversely affect survival of juveniles. If there are winter spates, this may affect the ability of females to put on weight prior to egg-laying. There have been recent sightings of Dippers with swollen orbital rings and we have suggested that this may be due to water at times entering the bird's nostrils when the water is flowing fast and small particles in the water entering the nostrils might irritate the sinuses and cause this effect.

Plate 1: Dipper nest tucked into a crevice in an old riverside Alder. Nests in or on trees are not uncommon in the Black Mountains.

Plate 2: Photo of 3 day old nestlings. Incubation takes 16 or 17 days from completion of the clutch. Dipper nestlings at about three days with eyes still closed. By the seventh day the feathers will be in pin.

Plate 3: Dipper nestling at about 12 days with feathers emerging from sheaths as small paint brushes. Nests with large young more than 14 days old are not visited as the young could leap our prematurely. Although they can swim and dive and gain the river bank they will be more vulnerable to predators. They need to stay in the nest for another week or so before they can fledge naturally and fly.

Plate 4: Juvenile Dipper begging for food from a parent. Juveniles will be dependent on parents for food for about a week after fledging and then become independent. Juveniles lack the clean white breast of the adults. They gain adult plumage after six weeks but can be recognised as first year birds until the following spring by white tips to the wing coverts and a duller olive eye. *Photo by Ken Smith*

Plate 5: Adult Dipper with aquatic invertebrates in its bill. Favoured prey are caddis larvae either extracted from cases or from webs, mayfly nymphs and stonefly larvae although small fish are sometimes taken, especially in the winter months as well as molluscs and fresh-water shrimps. Dippers use their eyes to find prey so sediment-laden water can make finding food more difficult. Run-off of sediment from land occurs during heavy rainfall and is a problem throughout the catchment.

Plate 6: Doughnut eyed-Dipper. One of the Dippers found on the Welsh borders with swollen eye orbital rings that may be due to polluted water or sediment laden water managing to enter the nares during high flows and causing irritation to the sinuses. In normal conditions a nasal flap covers the nares. *Photo by Tony Cross*

The River Wye and Mammals *by Herefordshire Mammal Group*

Aquatic Mammals

Otters and other aquatic mammals have long been part of the rich biodiversity in Herefordshire's rivers, with some bouncing back from threats whilst others face a difficult and uncertain future.

Otter *(Lutra lutra)* numbers crashed during the 1960s and 1970s, due to habitat loss, water pollution and toxic pesticides contaminating their prey *(Plate 1).* Their number have gradually risen since, repopulating many counties but they are still vulnerable to the effects of poor river quality and the removal of bankside cover. Eels, salmonids and other fish make up most of the otter's prey species.

Water shrews *(Neomys fodiens)* are the biggest UK shrew yet still weigh only 12–18g *(Plate 2).* They have venomous saliva which is used to stun their prey of freshwater shrimps, worms and beetles. Their numbers are believed to be relatively stable, but they are badly affected by pesticides in the water which poison and pollute their food source.

Water voles *(Arvicola amphibius),* misnamed 'Ratty' in 'Wind In The Willows', are shy bankside herbivores *(Plate 3).* They have suffered a huge population decline due to the combined effects of habitat destruction (they require quiet and well vegetated river banks) and predation by the non-native mink – a breeding pair can decimate a complete water vole community.

Plate 1: Otter © National Trust

Plate 2: Water shrew © Freshwater Habitats Trust

Plate 3: Water vole © Sussex Wildlife Trust

Found an injured bat?
Call the National Bat Helpline: 0345 1300228

Bats

Herefordshire can proudly claim to be the home to 16 of the UK's 18 resident bat species. Numbers crashed in the last century – how are they responding to legal protection and conservation efforts?

All UK bats are insectivores. Daubenton's bats *(Myotis daubentonii)* are also called water bats, due to their habit of hunting over water. They use their large feet and tail membrane to scoop up prey, after pin-pointing them by using echolocation *(Plate 4).* Brown long-eared bats *(Plecotus auritus) (Plate 5)* and common pipistrelles *(Pipistrelle pipistrellus) (Plate 6)* are amongst the more abundant bats in Herefordshire.

All UK bat species, along with their roost sites are protected by law (The Wildlife and Countryside Act 1981); previously bat populations had declined rapidly, mainly caused by mass insecticide use and the destruction of their roosts.

Whilst some bat populations are stabilising, thanks to their protected status, they still face many threats and pressures. Their preferred roosting sites, often in either old buildings or trees, are declining in number; this can partly be addressed by the use of bat boxes, leaving standing dead wood and maintaining access and roost space in building developments. The future looks a little brighter but bats still need our help and understanding.

Plate 4: Daubenton's ba © Paul van Hoof, Bat Conservation Ireland

Plate 5: Brown long-eared bat © National Trust

Plate 6: Common pipistrelle © Wildlife Trusts

Herefordshire Mammal Group

Herefordshire Mammal Group is dedicated to the conservation of mammals in Herefordshire. Our activities include recording the distribution and populations of mammals across the county, conservation projects, workshops and training days plus talks and visits. If you would like to become a member or find out more, visit: **herefordshiremammalgroup.org**

Are salmon likely to become extinct in the River Wye? *by Graham Paskett*

For years the River Wye was widely known as England's premier salmon river. People travelled from across the country, and even internationally, to try and catch The King of Fish in the Wye.

This focus on salmon and the Wye had a profound impact on the economies of Hereford, Ross-on-Wye, Monmouth and all towns along the river corridor from Wales down to the Severn Estuary. Hotels were filled with fishermen and their families, restaurants, fishing tackle shops and garages and filling stations all benefited from the regular influx of angling visitors, as well as local fishermen and women.

This continued from late Victorian times through to the mid-1970s when a disastrous fungal infection killed tens of thousands of salmon, not only in the Wye but other rivers in England, Scotland and Wales. The life cycle of a salmon means that it is on average five- year from being hatched until they return to the Wye, where they were born, to breed again.

Salmon numbers did slowly increase in the river but, at the same time, so did fishing pressures in the seas where they go to increase in size and strength, ready to return to the rivers of their birth. Professional fishing companies identified where these salmon congregate in the seas to feed and grow. Soon, industrially sized trawlers were gathering up these, often immature, salmon and selling them for the table around the world.

Not all fish were caught in this way and many did return to the Wye. But over the last thirty years or so sewage and agricultural effluent and chemicals have been dumped in the river in increasing quantities. As everyone knows, we are facing an international challenge with global warming and changing weather conditions. On the Wye we face regular summer periods of low and increasingly polluted water.

The result of all this is that salmon numbers in the River Wye have fallen dramatically. We are rapidly approaching the point where, unless corrective action is taken on pollution levels and on boosting salmon numbers within the next ten years, salmon will cease to exist in the Wye as a self-sustaining species.

Content for this poster produced by The Wye Salmon Association, the only organisation that is specifically tasked with protecting the long-term viability of the Wye salmon as a self-sustaining wild species. For more information, please visit **www.wyesalmon.com**

Plate 1: Dead fish resulting from July 2020 pollution on the River Llynfi, a tributary of Wye at Glasbury. This was third serious pollution and fish kill on the Llynfi since 2016.

Plate 2: Combined Sewage Outflow from Newlands sewage treatment works, into the Wye at Redbrook, below Monmouth during June 2021. This a regular occurrence.

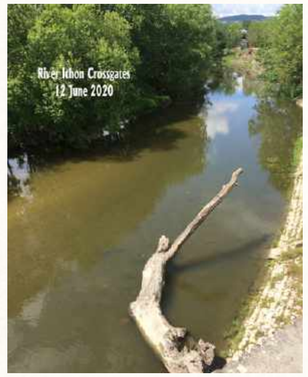

Plate 3: Algal bloom seen for the first time on the River Ithon, a major tributary of the Wye, high up in the Welsh Hills.

Plate 4: Run off from farmers fields during rain storm near to Talgarth in 2019. Water running down road into storm water drains and ultimately into river Llynfi a tributary of the River Wye.

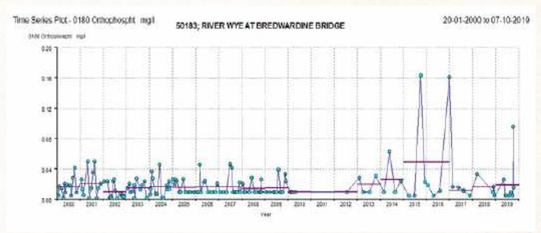

Plate 5: Graph of pollution measurements at Bredwardine.

River Wye: *its magnificent heritage and current threats*

Woolhope Club
www.woolhopeclub.org.uk

Article describing river pollution in 1968 *James Wentworth Day, The Times*

THE TIMES SATURDAY AUGUST 17 1968

The growing threat of Britain's poisoned rivers

By James Wentworth Day

Water pollution by farm chemicals, industrial effluent, sewage and other hazards is a growing threat to human health. The more the land is dosed with herbicides and pesticides whose long-term effects are unknown, the greater the risk to human life.

An example of water pollution was the poisoning of the river Chelmer recently. Thousands of fish floated, dead or dying, on the surface. Drinking water for Chelmsford, the county town of Essex, was promptly cut off from the river and obtained from other reserves. It shocked—and endangered—fifty thousand or more people in Essex, and is merely one sidelight of a world-wide problem.

The Chelmer matter was so serious that it is now the subject of an official inquiry with possible legal proceedings. Therefore one cannot comment further. But before long we shall know who was to blame and also, presumably, how grave the risk.

Another example of this growing problem is the mysterious agent which, says Mr. Douglas Mussett, an oyster merchant of Mersea Island, Essex, "has been killing up to 50 per cent of my oysters for the last three years". He thinks the reclamation of cattle grazing marshes inside the sea-wall bordering the creeks in which the oyster-beds lie is the possible cause, since the reclaimed land has been heavily limed and successive crops have been sprayed. In earlier days fresh water lay in the hollows on the cattle marshes throughout the year. It kept them sweet and green. Today when heavy rains fall on the new arable fields the water drains into dykes which discharge into the salt-water creek at certain states of the tide. What more likely than that the crop sprays poison the oyster beds?

When the oysters are taken up about half are found to be "gaping"—they have opened their tightly closed shells sufficiently wide to allow minute shrimps and tiny crabs the size of match heads to enter and feed on the living oysters.

The spraying of the sea-walls by the Essex River Authority to kill sea-beet and other herbage cannot be other than a hazard since the spray drains down the concrete walls into the tide where, according to a pathologist "it can kill algae and possibly small plant-life". This, in turn, could lead to fish-poisoning.

CHEMICAL BUILD-UP

The danger of this build-up of chemical residues in fresh and salt water and the way in which they can pass on to human beings—other than by drinking the water—was pinpointed by the notorious case of Clear Water Lake, 90 miles north of San Francisco, which in the late 1940s was dosed with DDD, a close relative of DDT, to wipe out infesting clouds of gnats. It was thought that DDD was harmless to fish-life.

Rachel Carson in her now-famous book Silent Spring, said that although the control measures were carefully planned and the insecticide was applied in such great dilution—one part of DDD to 70 million parts of water, later increased to 50 million parts of water—it started an appalling chain reaction of poison, which first affected the plankton, then the small fish which ate the plankton, then the bigger fish which ate the small fish, until finally fish died by the ton.

Analyses showed that plankton organisms contained about five parts per million of DDD which was 25 times the highest concentration in the actual water. Plant-eating fishes built up accumulations of from 40 to 300 parts per million. Carnivorous fish showed the terrifying concentration of 2,500 parts per million.

Twenty-three months after the DDD treatment of the water had ceased, the plankton still showed 5.3 parts per million. In short the poison passed on through successive generations of plankton, fish, frogs, birds.

Is there any reason why other pesticides or herbicides should not pose much the same dangers in this country? Land is being drenched with poison, which in turn drains into water furrows, land drains, ditches, brooks, rivers, estuaries and so into the sea. Crop sprays which may be thought to be harmless in minute quantities may build up a chain reaction whose long-term effects cannot possibly be prophesied.

Dr. Aubrey Westlake in his recent book, Life Threatened (Stuart and Watkins, 32s. 6d.), which is a balanced up-to-date survey of the dangers I pinpointed in 1957 in my book Poison On the Land, says: "All these chemical poisons sooner or later get washed down into the streams and rivers and continue their deadly work in a variety of ways. These same rivers supply the human population with their drinking water and, although the poisons are in very low concentration, nevertheless they are present in the public water supplies. Present, too, may be other hazards such as radio-active residues, dyes, metallurgical wastes and detergents, that latest addition to our difficulties. These troublesome synthetic substances are a good example of how industrial science foists a product on the public before it knows what the long-term effects are likely to be. . . . .

OIL AND SEWAGE

"The urgent question is, what are the long term effects (i.e. from chronic poisoning) on all the men, women, and children and animals as a result of drinking such contaminated water? The answer at present is that no one knows."

Rachel Carson points out that "cancer-producing substances are being introduced into public water supplies." Dr. W. C. Hueper of the United States National Cancer Institute has warned that "the danger of cancer hazards from the consumption of contaminated water will grow considerably within the foreseeable future". The cancer danger is caused mainly by "heavy applications of arsenical insecticides". So now we know—or do we? The frightening thing is that we do not know enough.

Pollution on the Norfolk and Suffolk Broads is a very real danger, caused by oil from power-driven craft and by discharge from their lavatories. Sewage from riverside bungalows is another cause of pollution.

A recent report by the Nature Conservancy says that oil pollution is causing "Damage to amenity and scientific interest, especially invertebrate fauna. Makes purification of domestic water supplies difficult". Commenting on sewage effluents from boats, houseboats and riverside houses, the report says the effects are "widespread but most noticeable in crowded waterways. Damage to amenity . . . risk to public health if contaminated water is used for domestic consumption . . . water rendered unfit for swimming . . . B.O.D. of water may rise to abnormal levels, especially in confined waterways in hot weather".

It quotes as outstandingly bad examples Malthouse Broad, Oulton Broad, and the River Bure between Wroxham and Horning and it points out that sewage from Great Yarmouth goes miles up the Bure on a rising tide. I have seen it myself.

The report says that the remedy is to "prohibit disposal of crude sewage from river craft and houseboats, &c. . . . fit 'slipper' tanks to all new craft and provide shore-based unloading facilities . . . use of chemical closets of 'Elsan' type not possible as phenols give very unpleasant taint to chlorinated drinking water, also very toxic to fish and wild life."

The effluents from sewage disposal plants are a serious problem in Broadland and other parts of the country. The report urges stricter standards of inspection, regular maintenance of the works, replacement of out-of-date equipment and more research on effects of detergents on fauna and flora.

Consider this letter from a friend who lives at Brundall, owns much of the marshland and is a first-rate naturalist:

"The River Yare, on which I have lived all my life, is now becoming first cousin to a sewer. The waves of detergent foam have killed a tremendous lot of underwater vegetation and weed in Surlingham Broad and down-river. I would not dream of bathing here. Heaven knows what one might catch. The water is too filthy some days for one to look at it without shuddering. I shudder to think of what it is doing to the fish."

The situation on rivers in the North and Midlands, polluted for years by industry, is pretty well past redemption. The Trent, Tyne, Severn, the Warwickshire Avon, the Lancashire Ribble and the Wyre are all poisoned in places, sometimes for miles. The Mersey, the Irwell, the Yorkshire Don are ruined. No fish swim in their polluted waters. No vegetation grows. No man, cattle or horse can drink or bathe without the risk of death or infection. In some their waters are dyed red-brown with filth. They stink and steam to high heaven. To that tale of once-lovely rivers you may add a hundred or more equally defiled.

It is a condemnation of a nation which prates endlessly of its natural beauties and the "ramblers' right" to enjoy the undefiled beauties of their native land.

In addition, estuaries and bathing beaches are poisoned by floating masses of town filth. Gulls eat it. They travel inland to reservoirs of drinking water and poison them with the germs they carry.

FEW PROSECUTIONS

Industry, corporations, private individuals and past governments are all to blame. It is a national scandal of the nation's own making. In 1951 the Rivers (Prevention of Pollution) Act became law. It did little to improve on previous laws. Few prosecutions have followed as a result. Today many of our waters are still a disgrace.

A leading water engineer, in charge of one of the biggest reservoirs in the country, writes to me: "The problems you enumerate with our rivers one is only too well aware of. I think the crux of the matter is the very small penalties that are imposed by law on persons who cause pollution. I understand that in this recent case, even should there be a conviction, the maximum penalty is £20. What is the use of this today? The whole problem with a lot of our laws is that the penalties in money are simply absurd on present-day values. This, of course, applies to our old problem of poaching. It has often been said—if you touch a man's pocket you touch his heart. I think the sooner the Government realizes that many penalties are completely out of date the better."

The pollution of our waters is not only a national disgrace but a national danger. Many river and local authorities do their best to diminish the danger. But who, short of a wizard with seven senses, can detect or stop the seepage of farm poisons into our rivers? There, apart from industrial dangers, lies one of the biggest and newest menaces to pure water. Swingeing fines—up to thousands of pounds—could be the answer.

Source: ***From the diary of Peter McDougall***

Some tenets of good farming practice *by Herefordshire Soils*

The six most highly regarded ‘Principles’ of Sustainable Agriculture and Environment are probably these; not necessarily in this order, as each landowner, landscape, and environment would have different starting points and priorities.

Plate 1: Keep soil covered with plants,

‘soil armoured’ in order to prevent rain splashing onto growing plants and to prevent soils overheating, wherever possible, especially during the winter. Maize and potato crops need to be grown on level ground in order to stop unnecessary run off. The right crop needs to be in the right location.

Plate 2: Stop soil movement

and only use ploughing as a method of reducing problem weeds. Less disturbance of soil fauna means greater chance of fungi establishment, then we have better processing and nutrient uptake by soil life. (See soil food web.)

Plate 3: Stop surface water runoff and maximise water infiltration

into the soil by encouraging worms with sensible use of organic matter and compost applications. Hold water in the landscape with small pools or scrapes. Slow ditches and larger water courses, thereby aerating as the water travels. Water leaving the farm can be cleaned by creating a biological filter using humus from compost, taking out salmonella and excess nutrients. This needs replacement once in two or three years depending on the load.

Plate 4: Aim for diversity of species

within rotation, in arable and grazing crops. Bring diverse grass swards back onto arable farms. Have as much diversity in grassland that you can afford for your location and soil type, don’t over graze, leave residue and plan for a long recovery period. Swap Nitrogen spend for herbal and diverse mixes. Profitable livestock if well-chosen is possible.

Plate 5: Reduce use of ‘cides’

– pest, fungal or herbicide also livestock wormers by longer periods between grazing. As soils start to cycle or function better, there is less need for soil applied nitrogen and phosphate, the two largest pollutants. ‘But you have to earn the right’ by slowly reaching this position. Legacy phosphate as it is popularly known is the massive reserve of nutrient built up over millennia as well as post war inorganic rock phosphates which will possibly take hundreds of years to unlock and make available in a plant form.

Plate 6: Value environmental corridors where the bulk of predators live

in order to enable migration of species, flight paths for barn owls, and connect separate landowning wilderness into glades in a rural mosaic. Rebuild and maximise lost species of plants and animals to bring a synergistic balance to the rural landscape.

Photograph acknowledgment:

Plate 1, 2, 4, 6: RegenBen, Townsend Farm, Brampton Abbotts.

Plate 3: Tom Jolley, Wye and Usk Foundation.

Plate 5: Stephen Ware, Throne Farm Weobley.