HIGH WEALD AONB
INTEGRATED CATCHMENT
MANAGEMENT & RIVER
RESTORATION
STUDY

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Prepared for the
High Weald AONB Unit

By

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High Weald AONB River Photo Sheets (2 no.)

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1. INTRODUCTION

**Project Scope**

1.1. The High Weald AONB Unit and the southern region of The Environment Agency have sought advice on how the rivers in the AONB might be best managed in the future to sustain and enhance their natural physical characteristics. Of particular interest, is the relationship between management to control flooding and management to enhance natural riverine ecology and provide opportunity for sustainable catchment land management.

**Existing River Management**

1.2. Historically, river management within the High Weald has been exercised to a greater or lesser degree to reflect the extent to which river conditions (notably out of bank flooding) compromise agricultural activity and/or human settlement and associated infrastructure on adjoining land. To this end, the natural form and hydrological function of the majority of main rivers in the area have and continue to be fundamentally influenced by river management practice which aims to reduce the frequency of out of bank flooding, and to rapidly conduct floodwaters to sea.

1.3. In light of predictions for future sea-level rise, and changing weather patterns, flood defence will continue to be a key driver for river management in the future. This is particularly pertinent as recent trends in river flooding patterns show a disturbing increase in both frequency and peak flows that cannot be explained by any single phenomenon such as global warming.

1.4. The recent spate of major flood events across the UK, has raised awareness and understanding of the benefits to society of attenuating rates of flood runoff. This can be achieved on a river catchment scale by changing approaches to land and river management, in addition to adopting site-specific flood alleviation engineering schemes which are frequently very costly to design and construct and have significant long-term maintenance requirements.

**Opportunities for Future River Management**

1.5. A catchment-scale approach to sustainable land management to attenuate flood runoff can reduce the height at which river flood water levels rise. If attenuated, floods will take longer to build up and longer to subside but the most damaging peak levels could be reduced. Similarly, by deliberately allowing select areas of land adjoining rivers to flood and temporarily store flood water, pressure on more flood sensitive
sites along the river can be reduced. The recently published Curry Report discusses the future of UK agriculture, and recognises the value of catchment-scale land management initiatives that can be implemented by farmers to attenuate and manage floodwaters. It specifically recommends that, where applicable, farmers could be paid to use land as floodwater storage rather than for crop production and should be encouraged to develop farming practices that reduce the rate of flood run of into rivers.

1.6. In addition to contributing to flood defence requirements, sustainable catchment land management could provide a range of additional environmental benefits, notably increased biodiversity associated with less intensive agricultural land management, and new habitat creation associated with new flood storage areas (e.g. reed-beds, flood meadows, woodland and hedgerows). Such changes to landscape character could also provide other beneficial spin-offs in the long-term, such as increased opportunity for recreational enjoyment and the promotion of green tourism – the latter benefit is also cited by the Curry Report. Sustainable water management and an improved approach to integrate water management is also promoted by the Department for Environment Food and Rural Affairs (DEFRA)1

1.7. By seeking to attenuate flood runoff by adopting sustainable approaches to catchment land management, additional indirect benefits to river form and function can be also be achieved. As highlighted previously, UK rivers have been historically managed to efficiently store and discharge floodwaters within bank. Frequently this involves lowering riverbed levels by dredging, and the straightening of rivers by removal of bends (meanders). In both instances, such actions will result in the removal and/or degradation of natural riverine features (e.g. silt bars, gravel shoals and riffles, woody debris etc.) and result in an associated decline or total loss of dependent aquatic flora, fauna and fisheries.

1.8. If catchment land management initiatives can be undertaken to reduce flood peaks, associated reductions in the extent and frequency of routine river channel maintenance operations (dredging and weed cutting) can be explored to reduce maintenance costs, encourage biodiversity and facilitate landscape change. Taking this further, the re-instatement of lost river features such as meanders and/or the lowering/select removal of constructed flood embankments could also help attenuate flood discharge (meander reinstatement to ‘hold-up’ flood flows), and to store flood waters on select floodplain areas by embankment lowering/removal. Both of these scenarios would also have additional associated environmental and economic benefits as highlighted previously.

1 Directing the Flow - Priorities for Future Water Policy. DEFRA (November 2002)
1.9. The EC Water Framework Directive, is another significant driver that will need to be considered in relation to future of river management in the High Weald. The aim of the Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater in order to:

a) prevent further deterioration and protect and enhance the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on aquatic ecosystems.

b) promote sustainable water use.

c) aim at enhanced protection and improvement of the aquatic environment through progressive reduction of pollution of groundwater.

d) bring about progressive reduction of pollution of groundwater.

e) contribute to mitigating the effects of floods and droughts.

1.10. The Directive’s principal aim is to ensure *good ecological status* of aquatic systems (rivers and dependent wetlands), and this will require the co-ordination of all water management activity in the broadest sense through the production of River Basin Management Plans.

**Reporting**

1.11. This report has been produced by Land Use Consultants with significant input from Richard Vivash of the River Restoration Centre (RRC). It is based on an assessment of readily available published material on existing rivers within the High Weald, and a rapid field assessment of rivers within the AONB, that focussed most closely on the River Rother.

1.12. This report supersedes the first stage report (November 2002), and takes account as far as was considered practicable, consultation comment received from the High Weald AONB Unit and the Environment Agency.
2. BACKGROUND TO CURRENT RIVER MANAGEMENT

2.1. This chapter sets a general background context for river catchment management and restoration within the High Weald AONB. It has drawn only on readily available Environment Agency reports and publications (notably Local Environment Agency Action Plans (LEAPS)), aerial photographs, and information gained from brief walkover field survey of select areas undertaken in the summer and autumn of 2002 by LUC.

2.2. A summary of the various river catchment attributes and issues recorded by this assessment within the AONB is provided in tabular form in Appendix 1.
LOCATION

2.3. The High Weald AONB is located in the south east of England (Figure 1: The High Weald AONB). It includes parts of the counties of Kent, East Sussex, West Sussex and Surrey.

PHYSICAL LANDSCAPE

Geology

2.4. The Weald has a distinctive geology (Figure 2: Geology) which strongly influences the hydrology of the area as well as its landform and land use.

2.5. The sedimentary rocks of the High Weald were laid down as shallow marine and, later, inland river floodplain sediments - the most important strata being the iron-rich clays and sandstones of the Hastings Group. Around 110 million years ago the Weald landmass sank, and marine conditions returned to the area resulting in the formation of chalk beds. This continued until, around 70 million years ago, the landmass uplifted and led to the creation of the domed Wealden anticline.

2.6. Subsequent folding and faulting modified the landscape further. Differential erosion of the area, particularly over the last 1.8 million years, has resulted in the removal of the chalk from the Weald, leaving only the outer chalk ‘ring’ of the North and South Downs. Further erosion of the elevated central dome led to the loss of the softer Weald Clay, revealing the older geologies below.

2.7. The Wealden Clay is much less permeable than the sandstone formations, which act as a minor aquifer, and influence the morphological and run-off characteristics of the AONB rivers. Elevated clay areas tend to shed rainfall rapidly with little infiltration, and therefore these watercourses display more ‘flashy’ characteristics than those elsewhere.

2.8. It appears that, in general terms, historic river management has focussed mainly on the need to manage river flooding, and has resulted in specific river reaches, most frequently in the middle and lower courses of a river, having been artificially deepened, straightened and/or embanked (e.g. Photo 1 & 2). It is also reported by the Environment Agency, that River Habitat Survey (RHS) data highlights that the region’s most natural and unmanaged rivers are most often the minor headwater and tributary streams that occur in the upper river reaches (e.g. Photo 3).

2.9. Detailed field survey in combination with an assessment of old maps and RHS data would be needed to confirm the full extent and location of historic river management action within the AONB, and is considered to be an important prerequisite to informing future management to restore lost riverine features.
Landform and Elevation

2.10. The High Weald is a ridged landscape that follows an approximately east-west orientation (Figure 3: Topography). The principal ridgeline, the Forest Ridge, includes the highest point of the Weald at Crowborough Beacon c. 240m AOD. The Forest Ridge is a major watershed dividing the river systems of the south of the AONB that drain towards the south coast (the Ouse catchment), from those of the north that drain into the Thames Estuary (the Medway catchment).

2.11. The Battle Ridge is a spur that branches from the Forest Ridge and creates the watersheds of the Cuckmere and Pevensey Levels catchments. The Forest Ridge and the Battle Ridge combine to form the Rother catchment watershed.

2.12. The elevated and ridged landform of the High Weald is further subdivided by the presence of tributary channels that have eroded narrow steep-sided valley gorge features that are frequently grown-over by broad-leaved woodland that is unmanaged. These features are known as gills and are a distinct and valuable riverine biodiversity features within the High Weald (see Photo 3).

2.13. In contrast to the elevated and ridged landscape of the western AONB, the eastern end is low-lying with large areas of land falling below 25m AOD that is susceptible to fluvial and tidal flooding (e.g. Photo 4 & 5).

2.14. Approximate riverbed gradients have been calculated across the AONB using topographical analysis in GIS (see Appendix 1). Typically, bed gradients of the upper river reaches situated on higher land are between 1:50-1:100, and contrast dramatically with the practically flat river beds (typically gradients of 1:1000-1:2000) that occur within the low-lying Rother catchment to the east.

HYDROLOGY

Catchments within the High Weald AONB

2.15. The distribution and location of the river catchments within the AONB are shown on Figure 4: Catchments and Rivers. They include:

- Rother, (including the Rivers Rother, Tillingham and Brede);
- Medway (Rivers Medway, Teise and Beult);
- Ouse (Rivers Ouse and Uck);
- Cuckmere (Cuckmere River); and
- The Pevensey Levels (Wallers and Combe Haven).
2.16. The Rother catchment is the most significant river system within the High Weald, as 78% of the entire catchment area occurs within the AONB which represents 41% of the total AONB land area (see Table 1).

Table 1: Catchment Areas of the High Weald

<table>
<thead>
<tr>
<th>Catchment</th>
<th>Area of whole catchment (ha)</th>
<th>Area of catchment within AONB (ha)</th>
<th>% of catchment within AONB</th>
<th>Catchment as % of AONB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rother</td>
<td>76,315</td>
<td>59,830</td>
<td>78%</td>
<td>41%</td>
</tr>
<tr>
<td>Medway</td>
<td>169,631</td>
<td>48,086</td>
<td>28%</td>
<td>33%</td>
</tr>
<tr>
<td>Ouse</td>
<td>66,845</td>
<td>19,135</td>
<td>29%</td>
<td>13%</td>
</tr>
<tr>
<td>Pevensey Levels</td>
<td>27,829</td>
<td>8,057</td>
<td>29%</td>
<td>6%</td>
</tr>
<tr>
<td>Cuckmere</td>
<td>22,099</td>
<td>3,224</td>
<td>15%</td>
<td>2%</td>
</tr>
<tr>
<td>Adur</td>
<td>51,750</td>
<td>2,344</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Arun</td>
<td>97,460</td>
<td>2,824</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Mole</td>
<td>-</td>
<td>2,206</td>
<td>-</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>145,707</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Rother Catchment

2.17. **Location:** The Rother catchment is located in the east of the High Weald AONB, between the settlements of Mayfield (east), Hastings (south east) and Tenterden (north east).

2.18. **Sub-catchments:**

- River Rother (main river)
- River Tillingham (main river)
- River Brede (main river)
- Hexden Channel (secondary river)
- Newmill Channel (secondary river)
2.19. **Area outside the AONB:** This catchment drains in a general easterly direction to Romney Marsh (comprising Romney, Denge and Walland Marshes).

**Medway Catchment**

2.20. **Location:** The Medway Catchment is located in the north of the High Weald AONB, and incorporates the towns of Royal Tunbridge Wells, East Grinstead, Crowborough, Goudhurst and Tonbridge.

2.21. **Sub-catchments:**

- River Medway (main river)
- River Teise (main river)
- River Eden (headwater and some main river)
- River Beult (headwater)

2.22. **Area outside the AONB:** The catchment extends considerably northwards beyond the boundary of the AONB to the Medway Estuary around Chatham, and to Northfleet and Gravesend.

**Ouse Catchment**

2.23. **Location:** The Ouse Catchment is located in the southwest of the AONB, north of Haywards Heath incorporating Balcombe.

2.24. **Sub-catchments:**

- River Ouse (main river)
- River Uck (main river)

2.25. **Area outside the AONB:** The Ouse drains into the English Channel at Newhaven.

**Cuckmere River Catchment**

2.26. **Location:** The Cuckmere Catchment covers a small area around Heathfield in the south west of the AONB.

2.27. **Sub-catchments:**
2.28. **Area outside the AONB:** The Cuckmere River rises near Heathfield and flows southwards to discharge into the English Channel west of Eastbourne.

**Pevensey Levels Catchment**

2.29. **Location:** The Pevensey Levels Catchment covers a large area in the south of the AONB area to the north-west of Hastings.

2.30. **Sub-catchments:**

- Wallers Haven
- Combe Haven

2.31. **Area outside the AONB:** Wallers Haven and Combe Haven drain into the Pevensey Levels outside the AONB.

**Adur Catchment**

2.32. **Location:** The Adur Catchment covers a small area located in the southwest of the AONB, between Lower Beeding and Cuckfield.

2.33. **Sub-catchments:** None.

2.34. **Area outside the AONB:** Only the headwaters of the River Adur are present within the AONB. The Adur drain southwards to discharge into the English Channel at Shoreham-by-Sea.

**Arun Catchment**

2.35. **Location:** The Arun is located in the far west of the AONB.

2.36. **Sub-catchments:** None

2.37. **Area outside the AONB:** Only the headwaters of the Arun are present. The Arun drains southwards into the English Channel at Littlehampton.
Mole

2.38. **Location:** The Mole is located in the west of the AONB.

2.39. **Sub-catchments:** None.

2.40. **Area outside the AONB:** Only the headwaters of the Mole are present. The Mole drains northwards.
Rainfall

2.41. Rainfall is variable across the High Weald with higher rainfall patterns generally associated with the more elevated land areas to the west. Rainfall averages about 750mm per annum across the Weald, although typically half of this will be lost to evaporation (effective rainfall) and therefore does not enter the river system.

2.42. Rainfall varies considerably between years, with some catchments receiving only 570mm/annum in drought years increasing to 800mm/annum in wet years.

WATER RESOURCES

Abstraction

2.43. The need to supply potable water for human consumption and for irrigation of arable lands necessitates water abstraction across the High Weald. Some water is abstracted as groundwater from the Hastings Sandstone aquifer, but this is a minor aquifer. Most water is abstracted at surface water points, particularly from the Rivers Teise and Ouse.

2.44. Inconsistency of water supply (due to seasonal drought and flashy river flows) has led to the implementation of a number of large-scale engineering approaches to river flow regulation and associated reservoirs water storage. The largest of these reservoirs is Bewl Reservoir (within the Medway catchment) that has been in operation since 1977 and supplies a population of more than 500,000 in the Medway towns and West Kent.

2.45. The scheme was designed primarily to create high summer flows in the River Medway at the Maidstone (Springfield) public supply intake and by this means, sustain greater rates of daily abstraction with an overall improvement in yield. Water abstracted during the winter at intakes on the River Medway at Yalding and the river Teise at Smalbridge is pumped to Bewl Reservoir and stored for subsequent release back into the river at times of low flow in the Medway. Releases are also made to sustain a minimum residual flow of water to satisfy environmental and water quality objectives for the river and its estuary.

2.46. The principal surface water resources in the Rother catchment are also provided by pumped storage reservoirs. The largest is Darwell, which receives its water from the River Rother at an intake at Robertsbridge and is augmented with a transfer from Bewl Reservoir. The River Brede supplies the smaller Powdermill Reservoir.
2.47. Forecast demand growth information for future water supply needs in the AONB is not well documented. A more detailed analysis involving consultation with key Environment Agency and Water Company personnel would be required for a full assessment of the predicted demand for water supply in the AONB over a future 20 year time frame.

2.48. Similarly, a detailed assessment of the implications and effects of the various water supply infrastructure and flow regulation regimes that effect AONB rivers would also be needed to inform options for future river management and restoration.

**Flows**

2.49. As highlighted previously, the rolling clay dominated geology of the High Weald gives rise to 'flashy' river flows that can reach bank-full height over relatively short time periods following heavy rainfall. In the Medway catchment, flows are artificially regulated by flood control infrastructure, notably the Leigh Barrier.

2.50. The upper Rother catchment is reported to be susceptible to low summer flows that are thought to be exacerbated by surface water abstraction for public water supply at Robertsbridge. The walkover assessment confirmed that many of the minor AONB tributaries are likely to dry out on a regular basis due to natural processes, but on the whole, this does not appear to be a significant negative factor across the High Weald.

**Flooding/Flood Risk**

2.51. The low-lying land (0-25m AOD) to the east of the AONB that constitutes the Rother catchment is susceptible to fluvial and tidal flooding (see Figure 3). To counteract this risk, modern day bank raising coupled with channel re-sectioning has been undertaken in many of the lower reaches of the Rother, Brede, Tillingham and Wallers Haven, and has resulted in a regular trapezoidal channel form that is intensively managed (Photos 7-9).

2.52. River engineering works within the Rother catchment such as the installation of a tidal sluice gate/barrier at Scots Float, and floodplain drainage work, have pushed the historic tidal flood limit eastwards and therefore reduced the likelihood of direct tidal flooding.

2.53. Because much of the Rother catchment falls at or below sea-level, the area has a tendency to become tide-locked, meaning river floodwaters are unable to discharge into the sea. This can lead to large-scale out of bank flooding and excessive silt accumulation within the channel.
2.54. It is possible that increasing sea level and annual average rainfall levels as a result of future climate change could increase flooding risk, particularly within the Rother catchment.

2.55. For somewhat different reasons, some of the Medway (upstream of the Leigh Barrier) is susceptible to fluvial flooding as floodwaters are deliberately held back by the barrier and allowed to flood onto surrounding agricultural land in order to protect the more heavily settled landscape downstream.

2.56. Much of the eastern Rother coast, which is unprotected by cliffs or higher ground, is at risk from coastal flooding, and a range of coastal defences exist and are maintained by the Environment Agency. Banks of shingle and smaller areas of sand dune stretching from Littlestone-on-Sea to Camber and from Rye to Farlight Cove, provide a first line of coastal defence. Particularly vulnerable settlements include the coastal town of Rye and this area is further protected by concrete walls and clay embankments that are maintained by the Agency.

2.57. It has not been possible to explore proposals for future coastal management within the AONB as part of this study. However, the Eastern Rother LEAP (1999) identifies that managed retreat, involving setting back the line of actively maintained defence to a new line inland between the old and new defences, had not been considered to be an option for the Rother Area.

2.58. It will be important to ensure that future options for river management within the Rother catchment consider future proposals for managed coastal retreat.

**Water Quality**

2.59. Water quality is assessed by the Environment Agency using the General Quality Assessment (GQA) system, which divides water quality into the following classes:

<table>
<thead>
<tr>
<th>Class</th>
<th>Type of Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A</td>
<td>Water of very good quality</td>
</tr>
<tr>
<td>Class B</td>
<td>Water of good quality</td>
</tr>
<tr>
<td>Class C</td>
<td>Water of fairly good quality</td>
</tr>
<tr>
<td>Class D</td>
<td>Water of fair quality</td>
</tr>
<tr>
<td>Class E</td>
<td>Water of poor quality</td>
</tr>
<tr>
<td>Class F</td>
<td>Water of bad quality</td>
</tr>
</tbody>
</table>
Chemical GQA

2.60. The Chemical GQA assesses the chemical quality of river water in order to determine water pollution levels. It reflects the degree of pollution at the time of sampling, and may not be wholly representative of baseline water quality conditions as pollutants may vary over temporal scales.

2.61. The rivers of the High Weald vary considerably in their respective water quality but, in general, tend to be of *fair* to *good* quality with some stretches being *very good* quality and some stretches of *poor quality*. Lower quality reaches tend to be associated with treated sewage discharge points and agriculturally derived pollution including run-off from dairy farm slurry spreading and inadvertent pollution from silage and slurry clamps, and the effects of agro-chemical fertilisers (leading to eutrophication) and pesticides. In some areas, naturally high concentrations of iron can lead to toxic effects and restrict aquatic macro-invertebrate diversity.

2.62. As described previously, the low-lying shallow gradient sections of the Rother catchment are also susceptible to increased silt deposition, which in turn can lower dissolved oxygen levels in the summer months when water levels are reduced and water temperatures are high.

Biological GQA

2.63. The Biological GQA assesses the health of rivers by the assessment of the diversity of aquatic macro-invertebrate taxa that live on the riverbed. This assessment provides a good picture of baseline water quality and compliments the Chemical GQA.

2.64. The Biological GQA results are similar to chemical GQA, with most rivers varying between *fair* to *good quality*, with some stretches being *very good* and some stretches *poor*.

LANDCOVER AND USE

2.65. The High Weald is a largely rural landscape with few significant settlements — the largest being the town of Tunbridge Wells and the former ports located at Winchelsea and Rye on the edge of the AONB. There are also numerous small ridge-top market towns and villages such as Cranbrook and Wadhurst.

2.66. The High Weald is a highly wooded landscape with both commercial coniferous and native broadleaf woodlands, and is one of the most densely wooded areas of the UK.
Agriculture is the dominant commercial land use, with arable (mostly cereals) and grazing pasture (mostly dairying and sheep) occurring across the whole AONB (e.g. Photo (10-11)). Arable agriculture tends to occur most frequently on the more fertile low-lying land areas to the east, and arable fields tend to be relatively large and with fewer boundary elements than pasture fields, and ploughing often occurs close to river banks (Photo 11).

2.67. In addition to cereal production, an arc of land across the elevated rolling landscape of the Weald supports commercial fruit growing, including characteristic Kentish apple orchards, and hop production.

2.68. Arable agriculture is intensive, and frequently occurs close to riverbank.
Table 3: Landcover Proportion by Catchment

<table>
<thead>
<tr>
<th>Catchment</th>
<th>Area of Settlement ha (%)</th>
<th>Area of Woodland (over 2ha) (%)</th>
<th>Area of ‘other’ including agriculture (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rother</td>
<td>2,017 (3%)</td>
<td>11,295 (19%)</td>
<td>46,518 (78%)</td>
</tr>
<tr>
<td>Medway</td>
<td>1,666 (3%)</td>
<td>13,063 (27%)</td>
<td>33,357 (69%)</td>
</tr>
<tr>
<td>Ouse</td>
<td>563 (3%)</td>
<td>5,357 (28%)</td>
<td>13,215 (69%)</td>
</tr>
<tr>
<td>Pevensey Levels</td>
<td>259 (3%)</td>
<td>1,852 (23%)</td>
<td>5,946 (74%)</td>
</tr>
<tr>
<td>Cuckmere</td>
<td>285 (9%)</td>
<td>736 (23%)</td>
<td>2,203 (68%)</td>
</tr>
<tr>
<td>Adur</td>
<td>7 (0%)</td>
<td>737 (31%)</td>
<td>1,600 (68%)</td>
</tr>
<tr>
<td>Arun</td>
<td>25 (1%)</td>
<td>1314 (47%)</td>
<td>1,485 (53%)</td>
</tr>
<tr>
<td>Mole</td>
<td>1 (0%)</td>
<td>1413 (64%)</td>
<td>792 (36%)</td>
</tr>
<tr>
<td>Total</td>
<td>(3%)</td>
<td>35,767 (25%)</td>
<td>105,116 (72%)</td>
</tr>
</tbody>
</table>

Agricultural Land Classification

2.69. The heavy clay of the Wealden soils produces argillic brown earth soils with impeded drainage, whereas the sandstone areas produce poor quality acidic soils. As a result, the average Agricultural Land Classification (ALC) of the High Weald is fairly low, largely Grade 3, with the clay soils being utilised for a mixture of arable and pastoral use, and the sandstone soils for commercial forestry (see Figure 5: Agricultural Land Classification).

2.70. The highest quality soils within the AONB (ALC Grade 2) are associated mainly with the reclaimed low-lying floodplain land within the Rother catchment.

Recreation

2.71. The High Weald is located in close proximity to a number of large urban centres including London and Brighton, and many people visit the area to participate in recreational pursuits.

2.72. Angling (coarse and game) take place throughout the Weald's main rivers and reservoirs, and the lower reaches of the Rother catchment are navigable to recreational boating.
HISTORIC INFLUENCES

2.73. The historic development of the High Weald landscape has been described in great detail elsewhere (e.g. The Making of the High Weald) and only those aspects most relevant to the current study are considered here.

2.74. In summary, the river channels of the low-lying land in the east of the AONB have seen significant modification over the centuries to convert floodplain wetlands and saltmarsh into productive agricultural land, and to protect it from fluvial and tidal flooding.

2.75. Records for reclamation of the River Brede valley, for example, exist as early as the late twelfth and early thirteenth centuries, and was probably initiated by merchants from Rye and Winchelsea, and entailed the creation of sea walls across the river to prevent tidal ingress.

2.76. The River Rother and its floodplain has also been subject to multiple and varied historic flood control and drainage operations, which includes the construction of the Knelle Damme sea wall across the northern end of Wittersham level in the eleventh century. This structure restricted tidal flooding and led to considerable siltation of the Appledore (northern) Rother Channel reducing its viability as a navigation route by boats, and ultimately led to the construction of a new river channel (the Craven Cannel) south of the Isle of Oxney in 1680-4.

2.77. Drainage and flood control works continue to the current day with extensive modern engineering works having taken place (in the 1960s and 70s) on the Tillingham, Brede and Rother that included bank raising works and channel re-sectioning (e.g. Photo 8 & 9).

2.78. The other main influence effecting the AONB watercourses was the iron industry, which developed to exploit the iron clays of the Hastings Group. The industry originated in the late Iron Age and in the late Medieval and post Medieval period many of the fast flowing upper tributaries were dammed to produce on-line lakes or ‘hammer ponds’. These were used to power the waterwheels that drove the furnace forge bellows and iron hammers. As well as being historic features these have also developed distinct biodiversity interest and some are designated as Sites of Special Scientific Interest (SSSIs). In terms of their current impact on the functioning of the regions rivers, hammer ponds are likely to act as on-line waterbodies that trap sediment, but their contribution to geomorphological functioning is not well understood.
BIODIVERSITY

RE Target

2.79. The Environment Agency monitors water quality in all main rivers, setting targets for their ability to support aquatic life – the River Ecosystem (RE) classification:

Table 4: RE Target Classes

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RE1</td>
<td>Water of very good quality suitable for all fish species.</td>
</tr>
<tr>
<td>RE2</td>
<td>Water of good quality suitable for all fish species.</td>
</tr>
<tr>
<td>RE3</td>
<td>Water of fair quality suitable for high class coarse fish populations.</td>
</tr>
<tr>
<td>RE4</td>
<td>Water of fair quality suitable for coarse fish populations.</td>
</tr>
<tr>
<td>RE5</td>
<td>Water of poor quality which is likely to limit coarse fish populations.</td>
</tr>
<tr>
<td>Unclassified</td>
<td>Water of bad quality in which fish are unlikely to be present, or insufficient data available by which to classify water quality.</td>
</tr>
</tbody>
</table>

2.80. River water tends to be of fair to good quality in the High Weald and therefore can support high-class coarse fish populations. However, no river reaches within the AONB achieve RE1.

Key Habitats/Features

River Channel and Floodplain

2.81. At present only a patchy and limited understanding of the relative ecological value and functioning of the AONB’s rivers and their tributaries exists. However, a number of the regions rivers are known to support aquatic and wetland taxa that possess high individual nature conservation value by virtue of being nationally rare and/or subject to Biodiversity Action Planning. These include otter, water vole, native (white-clawed) crayfish and black poplar (a tree species that is characteristic of river floodplains).

2.82. While the relationship between physical in-channel features and biodiversity is only partially understood, it is generally accepted that physical habitat diversity is positively correlated to biodiversity. In summary, the more physical habitat features (silt bars, pools, riffles, slack water, eddies, shoals, point bars, side bars and riparian trees etc.)
the river possesses the more species of aquatic animal and plant the river can support in the absence of other limiting factors such as water quality.

2.83. In general terms, morphologically 'natural' tributaries within the AONB (e.g. Photo 3) are likely to be more ecologically valuable than the highly modified and intensively maintained channels of the Rother catchment to the east (e.g. Photo 13 & 14).

2.84. For example, the gill stream tributaries across the High Weald are distinct habitat features that have escaped man's influence due to their steep topography and general inaccessibility to machinery, and have developed into species rich broad-leaved woodlands particularly noted for their lower plant floras (lichens, liverworts and mosses). It is also considered likely (although not currently well understood) that ghyll streams make a distinct and valuable contribution to the overall ecological functioning of the High Weald rivers, and will possess rare and specialist invertebrate species with restricted distributions within the region.

2.85. Floodplain wetland habitats are not a significant feature within the High Weald because of the clay rivers general capacity to keep floodwaters within bank through natural bed erosion and deliberate over-deepening, and because former floodplain habitats continue to be actively drained and kept dry by active pumping.

2.86. The most ecologically valuable floodplain habitats would appear to be the water-filled ditches that drain the former floodplain wetlands of the Rother catchment. These aquatic habitats have good potential to support a range of taxa with high individual nature conservation value such as water vole and specialist aquatic macro-invertebrate species, including the shining ramshorn mollusc \((\text{Segmentina nitida})\) that is known to occur in ditches on the Pevensey Levels. The Pett Levels and Walland Marsh areas within the AONB (Rother catchment) are both designated as SSSIs because of their drainage ditch wildlife interest.

**Wider Catchment**

2.87. The AONB is noted particularly for its woodland habitats, which includes a large proportion ancient woodland (i.e. continuously forested since 1600) (see Figure 6: Nature Conservation Designations). The distribution of the previously described ghyll woodland and non-ancient woodland is shown on Figure 7: Gills and Woodlands.

2.88. In addition to woodland, heathland is a notable habitat type within the High Weald, and corresponds in distribution with the sandstone geology. Distinct assemblages of aquatic plant and animal species are likely to occur where acid water conditions prevail.


**Protected Habitats**

2.89. There are many areas throughout the High Weald that have been designated to protect their nature conservation interest (see Figure 6). These include in excess of 40 Sites of Special Scientific Interest (SSSIs), related to a range of wildlife interests but most notably woodland and heathland habitats.

2.90. Two candidate Special Areas of Conservation (cSAC) occur within the High Weald - one at Ashdown Forest, and the other at Rye Harbour near Hastings. Both are protected under the European Habitats Directive. The Ashdown Forest cSAC relates to a mosaic of woodland and heathland habitat, whereas the Rye Harbour cSAC relates specifically to the vegetation associated with coastal shingles.

2.91. There are two proposed Special Protection Areas (pSPAs) - at Winchelsea and Ashdown Forest - that are protected under the European Birds because they support populations of protected bird species in numbers that are nationally and internationally important. There is also one RAMSAR designated wetland of international importance, located on the Pevensey Levels, just outside of the AONB area that regularly supports over 20,000 wintering waterfowl.

**Non Native (Alien) Species**

2.92. Non-native plants and animals are found across the High Weald and, in some cases, threaten the survival of native species and habitats. Alien invasive plants associated within riverbanks in the AONB include Japanese knotweed, Himalayan balsam, and giant hogweed. Australian stonecrop, parrots' feather and floating pennywort are alien aquatic plants have also been recorded in more slow-flowing rivers and floodplain drainage ditch habitats.

2.93. Non-native invasive animal species particularly associated with the High Weald's rivers, and which threaten the long-term future of native species and can, in some instances, damage river banks include mink, Chinese mitten crab and signal crayfish.

2.94. The extent and distribution of aquatic alien species is not well known.

**FISHERIES**

2.95. The High Weald supports coarse and salmonid fisheries, including stretches of river that are designated by the EU Freshwater Fisheries Directive. Reaches of the Rivers Rother, Brede, Eden, Teise, Ouse, Cockhaise Brook and Wallers Haven have been designated as ‘cyprinid’ fisheries under the EU Fisheries Directive. While, Bewl
Water, Ardingly Reservoir and certain reaches of the River Rother are designated as ‘salmonid' fisheries under the Directive.

**Coarse Fisheries**

2.96. There are a wide range of self-sustaining coarse fish present within the regions rivers, including bullhead, stoneloach, dace, chub, tench, bream, roach, pike, ruffe, perch, minnow, gudgeon, bleak, rudd, carp, grayling, barbel and eel.

**Salmonid Fisheries**

2.97. Salmonid species (salmon and trout species) only thrive in river waters of high chemical quality and geomorphological naturalness that lack barriers to fish migration. Salmonids are dependent upon silt-free riverbed gravels for spawning. The distribution of migratory salmonid species (namely sea-trout) within the AONB is restricted by the presence of water control structures that act as barriers to fish migration, and a general lack of suitable spawning substrates (silt free, well oxygenated gravel) in accessible river reaches.

2.98. Sea trout are found in the Cuckmere, Pevensey Levels, Ouse and Rother catchments, where they are noted for spawning on gravel-rich ford crossing. Salmon are not thought to be present in any of the catchments within the High Weald.

2.99. Non-migratory wild brown trout occur in most of the AONB catchments, and rainbow trout that have been stocked are also a notable feature, and an important still water target species for anglers fishing the regions reservoirs.
3. OPTIONS FOR FUTURE RIVER MANAGEMENT

Background

3.1. The River Rother is the only large river that is located virtually entirely within the High Weald AONB (see Figure 4) and is therefore best suited to highlighting the main concepts and principals behind options for future river management. Because of this, and the obvious limitations in field survey time imposed by the current study, this report focuses only on the River Rother. However many of the broad principles discussed can be equally applied to other rivers within the AONB.

3.2. The following chapter is primarily based on a rapid inspection of the River Rother catchment over the course of two short days, the 13th/14th November 2002. The inspection followed prolonged rain when the catchment was saturated, and rivers were running at high level or in flood. Some additional information was gained from ordnance survey maps and from brief consultation with Environment Agency (EA) and AONB personnel.

3.3. Because of the concise nature of the catchment appraisal undertaken, it is only possible to advise in general terms using similarly general topographic and other data. Nevertheless, this is considered sufficient to highlight some of the key opportunities and constraints that are evident. It is envisaged that more thorough appraisal of specific issues can be better targeted in the future as a result of this initial study.

3.4. The report examines the topography of the catchment and the related hydraulic characteristics and current flood management practices before considering possible concepts for modifying these aspects.

Catchment Topography

3.5. Topography is important because it is a fundamental physical characteristic that uniquely influences the way in which each river responds to rainfall and runoff. The rocks and soils within the catchment are similarly influential and these will also have influenced the nature of sediments deposited in the river valleys.

3.6. Chapter 2 provides an overview of topography and geology from which it is clear that clay is the dominant soil within the steeper catchment landforms and alluvium in the flatter valley bottoms. Tidal flat deposits extend well inland from Rye over the Rother Levels.
3.7. **Figure 8** shows the profile of riverside land levels over the Rother’s entire length between Five Ashes (A267 road) and Scots Float Sluice (tidal barrier) near Rye, a distance of 43km and a descent of 100m.

3.8. The profile descends steeply down to Witherenden (B2181 road) where a major tributary, The Tide Brook, joins the Rother. The profile then moderates noticeably down to the town of Robertsbridge that is, unusually, the only major settlement located on the river.

3.9. Downstream of Robertsbridge the profile follows a gentle transition towards the tidal flats near Newenden (A28 road). The tidal flats now represent an extensive area of former marshland that has been comprehensively drained for agriculture.

3.10. The Rother is conveyed across the tidal flats in a man-made channel that closely follows the southern edge being the shortest, most direct route to the sea outfall at Scots Float. This channel is embanked on both sides to contain the Rother, and to sustain a shallow water gradient towards the sea during favourable low tide conditions.

3.11. Channels of this nature are known as highland carriers, because they convey upland water direct to sea, isolating it from surrounding tidal flats, or levels.

3.12. The profile of the lower reaches of the river, between Robertsbridge and Scots Float, is also shown on **Figure 8** at a larger scale in order to highlight the sensitive topographic relationship between the descending fluvial floodplain, the levels, and tidal conditions at the outfall.

3.13. The extent to which the river is managed for the efficient conveyance of floodwater varies considerably with the changing gradient, or profile, en-route to the sea. It is therefore convenient to examine river management in four reaches, each representatives of significantly different profiles. Those selected for the Rother are listed below and are located in plan on **Figure 9**.

- Upper Reach – a 10km length from the top of the catchment down to Witherenden.
- Middle Reach – a 10km length from Witherenden down to Robertsbridge
- Lower Reach – a 10km length from Robertsbridge down to Newenden
- The Levels – a 13km from Newenden to Scots Float
Hydraulic Characteristics and Current River Management

Overview

3.14. Rainfall and runoff in the upper reach is gathered in a dense array of small, steeply incised, tributary streams that flow swiftly down towards Witherenden from a catchment of about $75 \text{km}^2$. Run-off characteristics will be 'flashy' because of the clay soils and the typical gradients of 1 in 60.

3.15. At Witherenden the river has developed a significantly wide floodplain (c.300m) built up from sediments washed down from above that deposit over millennia as the river becomes less steep and its speed of flow slackens. It continues flowing down to Robertsbridge at a fairly uniform gradient of c 1 in 500 over a middle reach floodplain that is typically 300m wide but varies between 200m and 400m. Although the speed of flow has moderated in the middle reach it is still noticeably swift and is sustained by several tributary flows en-route. The largest of these tributaries is the River Dudwell. The catchment area has doubled at Robertsbridge to c.150km$^2$.

3.16. In the lower reach, down towards Newenden, the gradient progressively slackens until it is flat but an average bed gradient of 1 in 2000 appears typical at the mid point around Bodium. This marked slackening of gradient also coincides with a marked increase in the width of the floodplain to c.600m.

3.17. In its natural state, the lower reach would be characterised by expansive slow-moving, floodwater continually swelled, and reluctantly driven forward, by the faster flowing floodwater, from above. Further tributaries join in the lower reach, notably just downstream of Bodium where the Kent Ditch enters from the north coincident with another stream from the south. These confluences probably mark the point where the freshwater, fluvial waters were historically influenced by tides and began to merge and to spread out towards the marshes.

3.18. These lower reach flood patterns are now heavily modified by riverside embankments that extend far upstream of the levels, at least to the B2244 road within 3km of Robertsbridge. Thus it is clear that the highland carrier across the levels intercepts fluvial flows within the lower reaches of river, and not at the natural interface with the levels, which is located around the Kent Ditch confluence.

3.19. This arrangement obviously serves to protect the wide fluvial floodplain from frequent inundation. This has enabled arable cropping to be sustained and helped to reduce road flooding at Bodium, in particular.
3.20. The highland carrier across the levels does not simply serve to convey flood waters but also stores these during periods when tide levels at the outfall are too high to permit discharge. When tide-locked, floodwater in the carrier will begin to pond and rise in level with the obvious risk that embankments can be overtopped, flooding the protected lands alongside.

3.21. A purpose built overspill point has been constructed alongside Wet Level at Blackwall Bridge to control this situation (Figure 8). The overspill is c.0.5m lower in level than the embankments, enabling a discreet compartment of land that is bounded by the sloping valley sides to be inundated. This increases the storage capacity of the highland carrier substantially.

3.22. The size of the highland carrier will have been optimised to convey reasonable volumes of floodwater at a reasonable speed when the gates at Scots Float Sluice are fully open during low tide. This ensures that silts and mud do not accumulate unduly as they are flushed through. The need to sustain ‘flushing velocities’ means that the carrier cannot be sized to provide all of the flood storage needed, so additional flood storage within the system is an essential feature.

3.23. The land protected by the highland carrier appears to vary in level, perhaps between 1m and 3m OD, with a suggested average of 2.5m which is 1m or more below the embankments. This land is drained by a system of deep drains that feed water to pumping stations alongside the highland carrier, where it is lifted clear. Over 20 pumping stations exist across the levels.

3.24. During summer, water is held in the highland carrier at a penning level of c.1.2m OD to create a linear reservoir that enables Rother water to be diverted out into the drains across the levels where it can be used for summer irrigation of the fields or simply to enable the drains to serve as wet fences, controlling livestock. Limited navigation on the highland carrier is supported by penning.

3.25. It is not clear at this stage whether or not circumstances arise whereby the levels can drain into the highland carrier under gravity, rather than by pumping. Gravity drainage is certainly evident in the lower reach of the river around Bodium which suggests it may also be sustainable in places at least down as far as Newenden. This aspect is important when considering alternative land management concepts.

3.26. The above summary for the highland carrier is restricted to fundamentals and makes no attempt to expand into the complexities of its role in respect of large areas of levels to the north and west of the Isle of Oxney. Whilst it is known that a great history of drainage works is available, time did not permit anything but a cursory
inspection. It should however be noted that the Hexden and Newmill channels both feed into the highland carrier downstream of Newenden and each will contribute significant flows.

3.27. A reasonable picture of the river Rother that encapsulates the above overview might be as follows:

A 40km long river that speeds water down from wooded upland gills to fill floodplain meadows over but half its course before it is rudely ushered into the confines of embankments that regiment its timely progress to the sea when once it spread and took a more leisurely and picturesque ramble to its ultimate marriage with the ebb and flow of tides.

3.28. None of the four reaches described can function in isolation from each other and management practice in one should be influenced by consideration of the other three. These influences are explained below:

**Management Principles**

3.29. River management has been historically exercised to a greater or lesser degree depending largely on the extent to which river conditions disrupted agricultural activities on adjoining land. Generally speaking, the larger the floodplain, the more intense the management. In the case of the Rother this culminated in total management of the river across the levels.

3.30. If the river adversely affects people and property, including roads and other infrastructure, management can be equally intense e.g. at Robertsbridge.

3.31. Flood protection of agricultural floodplain land has, in recent years, been substantially reduced as river maintenance is scaled back by the EA, and rivers that were enlarged in the post-war period are now very slowly recovering patterns of shoaling and vegetation. This is partially in response to economic factors but it also recognises that speeding up flood runoff by intensive channel maintenance increases the flood risk to people and property downstream, which is clearly undesirable.

3.32. The recent spate of major flood events across the UK has raised awareness and understanding of the benefits to urban communities and infrastructure of actively seeking to attenuate rates of flood runoff by various means. This involves reviewing land and river management practices across whole catchment areas. Typical
measures that are currently promoted through farming grants or are being piloted, include the following:

- Improved infiltration of rainfall into the ground rather than surface run-off, particularly, on arable land.
- Reducing livestock densities that otherwise denude land of vegetation.
- Planting and managing vegetation buffer strips alongside watercourses to reduce polluting runoff and soil loss.
- Woodland planting to reduce soil loss and runoff.
- Retention of in channel obstructions such as debris dams to reduce scour and subsequent channel enlargement.
- Re-planting of riverbank (riparian) corridors and fencing out livestock
- Physical river restoration involving replacing lost features such as gravel riffles, historic meanders and many other measures to re-create natural characteristics.
- Removing or lowering flood embankments to open up floodplains and increase flood storage.
- Obstructing floodplains with dense hedgerows and fencing to build up flood depths and increase temporary water storage.

3.33. All of the above measures can provide wider environmental and biodiversity benefits as well as involving diversification of land use in line with broad government strategies for agriculture.

3.34. The applicability of such measures to the Rother catchment depends largely on whether or not there is a need to attenuate flood run-off or to seek the associated environmental benefits.

3.35. The major flood risks noted during the inspection were to roads crossing the floodplains in the middle and lower reaches and to the lower part of the town of Robertsbridge. At Robertsbridge a flood alleviation scheme was under construction that is understood to involve floodwalls and embankments around the high-risk areas of development.

3.36. Measures to attenuate flood run-off would be beneficial because the effect of these is to reduce the peak rate of flow at the height of any flood, which is the main factor that determines how high flood water levels rise. If attenuated, floods would take longer to build up and longer to subside but peak levels would be reduced.

3.37. Recent trends in flood patterns show a disturbing increase in both frequency and peak flows, which cannot be satisfactorily explained by any single phenomenon such
as global warming. Measures to offset the impact of this trend may therefore be regarded as a prudent strategy for the longer term whilst more immediate measures are implemented at for example, Robertsbridge. The effectiveness and sustainability of works at Robertsbridge can only be enhanced by flood attenuation measures upstream of the town.

3.38. Downstream of Robertsbridge in the lower reaches of the river and across the levels, where riverside embankments are dominant, flood attenuation would be equally beneficial.

3.39. The effect here is to reduce the risk of embankment over-spill because of lower peak flows and therefore a delay in the rate at which floodwaters go into storage during tidelock periods. This delay provides more time to evacuate waters to sea during the intermediate low tide periods, reducing the overall storage needed.

3.40. This assumes that flood conveyance down through the embanked reaches remains at present capacity, whereas consideration might reasonably be given to reducing conveyance in order to restore more ecologically attractive characteristics to the river channel, e.g. through in-channel restoration works, riparian planting etc.

3.41. Although less river maintenance work would be needed under this scenario it would be necessary to offset the reduced conveyance by providing more flood storage capacity. This can be achieved by removing embankments in the lower reaches to restore floodwater to the natural floodplains and by creating additional over-spill areas along the highland carrier crossing the levels. The effect of floodplain restoration in the lower reaches, downstream of Robertsbridge, should be a general lowering of the maximum flood levels presently experienced that result from the confinement of the river between embankments. Floods that are spread over large areas do not build up as high as floods that are confined to narrow corridors.

3.42. It is possible that by lowering flood levels downstream of Robertsbridge, floodwaters can be drawn clear of the town more readily, further increasing the effectiveness and sustainability of current flood alleviation works.

3.43. The provision of more overspill points along the highland carrier could not only achieve a less intensive (and costly) channel maintenance regime but it is conceivable that some small reduction in the height of the embankments could be tolerated also. In practice, this could be achieved by simply relaxing the maintenance regime of the southside embankments.
3.44. There is, however, a practical limitation on flood storage by overspill from the highland carrier if water has to be pumped back into the carrier rather than draining back by gravity. Much depends on actual land levels and the intended land use over the flooded areas. An ultimate ‘blue sky’ scenario for the highland carrier might conceivably be the removal (or lowering) of the southern embankment entirely allowing a chain of washlands to develop up to the natural boundary defined by the indented profile of the near parallel valley slopes. Roads crossing this narrow corridor would, however, need to be raised in level and any riverside properties safeguarded.

3.45. Although the above offers a whole range of general principles and measures that appear to merit consideration as part of any strategy for future river management, the practicalities of implementing them can be a severe limiting factor.

**Preliminary Management Suggestions**

3.46. Brief consideration of alternative options to manage the River Rother has been given at the few locations it was possible to visit during the inspection. Some preliminary ideas have accordingly been indicated on the plans for each reach (Figures 10-13) and illustrate a number of the various options for flood attenuation highlighted above.
Conclusions

3.47. At least half (over 20km) of the River Rother’s entire length, comprising the lower reach and levels below Robertsbridge, has successfully been canalised to support intensive agriculture on nearly all of the adjoining floodplains.

3.48. Although the impact of this success on the ecology and landscape of the river environment has not been specifically studied as part of this report it is reasonable to conclude (or perhaps is self evident) that these aspects are badly degraded as a result.

3.49. It appears from the inspection and evaluation undertaken that there is considerable scope for improving the present ecological (habitat) status whilst sustaining the fundamental objective of current river management.

3.50. This objective is to convey the Rother waters safely across the levels to the tidal outfall at Scots Float without undue inundation of the extensive low-lying land and infrastructure alongside. To achieve ecological improvement some riverside land would need to be restored to its natural function as floodplain washland and the river channel enhanced to support more hydraulic and habitat diversity.

3.51. The engineering concept involved would be to marginally shift the present balance between the quantity of floodwater conveyed directly to the outfall and the quantity diverted into temporary storage on the floodplains i.e. less conveyance, more storage.

3.52. Such a shift would be a reasonable basis for future strategy development by both the AONB Unit and the Environment Agency because it is beneficial to both the ‘natural beauty’ and ‘good ecological status’ of the river and its environs (see above paragraphs 1.9-1.10).

3.53. Other potential benefits include a reduction in the present level of land drainage and flood defence operating costs and a move towards extensification of rural land use in line with current government policy.

3.54. The river upstream of Robertsbridge does not appear to be intensively canalised and has a reasonably natural appearance based upon the very limited inspection undertaken.

3.55. It was however evident during the inspection, when flood conditions prevailed, that flood waters drain from the steep, clay covered, upper reach with significant speed
and readily move forward through the middle reach with increasing volume towards the town and the canalised reaches below it.

3.56. This lively pattern of flood migration is characteristic of the topography and geology of the catchment and accounts, in part, for the regular flooding of roads and the significant flood risk to parts of Robertsbridge.

3.57. Recent Europe-wide trends towards more frequent occurrence of damaging floods are particularly evident in small 'flashy' catchments of this type, which suggests that it is appropriate to consider measures to reduce the rate at which floodwaters are shed and conveyed downstream.

3.58. Measures that attenuate the rate of flood run-off and conveyance would result in floods being of longer duration but less damaging because of reduced peak flows, helping to arrest or reverse current trends.

3.59. Several diverse methods of flood attenuation that are appropriate to the catchment above Robertsbridge are described previously, but the common purpose of each is to contribute towards reducing the rate at which this part of the catchment delivers floodwater to the remainder.

3.60. The potential benefits of flood attenuation measures include improvements to the effectiveness of flood defences at Robertsbridge and a general reduction in the flood threat to roads as well as reducing the pressure on the extensive flood defence infrastructure across the Rother Levels.

3.61. The measures are all based upon restoring, where practical, the natural hydrological and geomorphological characteristics of the catchment and they therefore intrinsically contribute towards good ecological status and sustainable management practices.
NEXT STEPS

3.62. It will firstly be essential to engage the active participation of those with statutory responsibilities for flood defence and land drainage in developing any of the revised river management concepts suggested.

- Establish a discussion forum with the EA flood defence team and with the Internal Drainage Boards (IDB) for the Rother Levels. The IDB will have good landowner representation in the lower reaches.

3.63. The report has necessarily relied upon a good deal of subjectivity in drawing conclusions.

- Utilise the above forum to verify that there are no fundamental errors or omissions.

3.64. Modifying the existing relationship between conveying floodwater directly to sea via the embanked river channels, and spilling water into floodplain storage, depends on a proper understanding of the prevailing system before changes can be contemplated.

- Research any existing mechanistic hydraulic modelling of the Rother and develop this to generate a model that can verify the scope for change and the anticipated risks and rewards.

3.65. Attenuating the rate at which floods pass down towards Robertsbridge embraces changes in the way riparian corridors, waterways and floodplain land are managed. Such change will depend upon the active participation of many landowners and on organisations able to support change through technical advice and through financial support via agri-environment grants etc.

- Enlist the support of other organisations having established links with the farming community e.g. FWAG and DEFRA.

3.66. Experience of the techniques of attenuating flood flows through farm scale measures is limited at present but this is increasing through several initiatives that are planned or are in progress across the UK.

- Membership of the River Restoration Centre can provide regular information updates on relevant projects e.g. the Parrett Catchment Project, where EU funding has been secured to pioneer enhanced floodplain storage via lateral levees/hedging/fencing techniques (attenuates run-off onto the Somerset Levels).

3.67. Progress demands a strategic approach that is supported by all bodies showing an interest in the future of the AONB but action on the ground is normally initiated
through small-scale, opportunistic, projects that demonstrates the potential benefits of the strategy.

- Focus on promoting demonstration sites that are representative of each of the main measures suggested in this report as well as building a strategic framework for future policy and practice.
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Rother

East Sussex Rother Catchment Management Plan Action Plan (August 1995), National Rivers Authority

Eastern Rother Local Environment Agency Plan Environmental Overview (December 1999), Environment Agency.

Medway

River Medway Catchment Management Plan Phase 1 (December 1991) National Rivers Authority.

Medway Local Environment Agency Plan (January 1999), Environment Agency.

The River Medway (July 1993), National Rivers Authority.

**General**


Landscape Assessment of West Sussex Section One (1995), West Sussex Council and Countryside Commission.
### CATCHMENT: ROTHER/Sub-catchment Rother

<table>
<thead>
<tr>
<th>REACH</th>
<th>Lower Rother</th>
<th>Mid Rother</th>
<th>Upper Rother</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>River Rother, east of Newenden; Lower Sussex; Channel Lower Newmill/Channel</td>
<td>River Rother between Whitecraigs Hill and Newenden; Lower River Darwell from Crowhurst.</td>
<td>Headwaters and Secondary Rivers including The Bexley, River Lunden, Kent Ditch, upper Heveningham Channel and upper Newmill Channel.</td>
</tr>
<tr>
<td>PHYSICAL LANDSCAPE</td>
<td>Hastings Beds: sandstones, siltstones and clays.</td>
<td>Hastings Beds capped with alluvial drift.</td>
<td>Hastings Beds capped with alluvial drift and talus fan deposits.</td>
</tr>
<tr>
<td>Elevation</td>
<td>Below 25m AOD.</td>
<td>Below 50m AOD.</td>
<td>Up to 150m AOD.</td>
</tr>
<tr>
<td>Landform</td>
<td>Flat to shelving, wide valley landscape.</td>
<td>Undulating with well-defined valleys.</td>
<td>Steeply incised with ghylls.</td>
</tr>
<tr>
<td>Channel Gradient</td>
<td>1 in 2000.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LANDCOVER AND USE</td>
<td>Agricultural landscape with mixed arable and pasture (including sheep and dairy) in large and undivided fields - often farmed close to bank top.</td>
<td>Agricultural landscape including arable farmland and pasture (sheep and cows) set within smaller agricultural fields with hedgerows but often farmed to channel edge. Some ghyll woodlands.</td>
<td>Mostly grazing pasture (mainly sheep) within woodland, including ghylls. Small Wooden ridge-top towns and villages.</td>
</tr>
<tr>
<td>Description</td>
<td>Woodland 1%, Settlement 2%: Other 78%.</td>
<td>Predominantly Grade 3 agricultural land with some Grade 4.</td>
<td>Substantial areas of Grade 4 agricultural land.</td>
</tr>
<tr>
<td>Proportion</td>
<td>Predominantly Grade 3, some areas of Grade 2 agricultural land.</td>
<td>Predominantly Grade 3 agricultural land with some Grade 4.</td>
<td>Few significant modifications: some on-line ponds and lakes.</td>
</tr>
<tr>
<td>ALC</td>
<td>Extensive modifications of rivers and extensive floodplain drainage. Including construction of the Craven Channel, south of life of Chenery. Scots Pool Sluice installed 1731. More recent bank raising works and establishment of Archimedian screw pumps to create flood storage area.</td>
<td>Modern engineering works (1960s) including raising of banks of Rother for floodwater containment in Robertsbridge area.</td>
<td>Highly variable: A-E as a result of numerous sewage discharges and agricultural run-off, exacerbated by low-flow situations.</td>
</tr>
<tr>
<td>HISTORIC INFLUENCES</td>
<td>Highly variable A-C.</td>
<td>Predominantly B and C except a stretch classified as E associated with sewage discharge near Robertsbridge.</td>
<td>Highly variable A-C.</td>
</tr>
<tr>
<td>RECREATION</td>
<td>Footpath alongside channel or at edge of floodplain including section of Sussex Border Path. Long distance footpaths.</td>
<td>Few abstraction points.</td>
<td>Public surface water abstraction (from River Rother) at Robertsbridge supplies Darwell reservoir (also pumped from Bewl Water/Medway). Also a small number of groundwater abstractions.</td>
</tr>
<tr>
<td>HYDROLOGY</td>
<td>Average annual catchment rainfall: 757 mm/annum (Upper Rother receives 780mm/annum more than Lower).</td>
<td>Predominantly C.</td>
<td>Predominantly B and C except a stretch classified as E associated with sewage discharge near Robertsbridge.</td>
</tr>
<tr>
<td>Rainfall</td>
<td>Average annual effective rainfall (after evaporation): 303mm/annum</td>
<td>Predominantly A-C.</td>
<td>Highly variable A-C.</td>
</tr>
<tr>
<td>Water resources</td>
<td>Abstraction: Some agricultural surface water abstraction for spray irrigation.</td>
<td>Few abstraction points.</td>
<td>Public surface water abstraction (from River Rother) at Robertsbridge supplies Darwell reservoir (also pumped from Bewl Water/Medway). Also a small number of groundwater abstractions.</td>
</tr>
<tr>
<td>flooding/flood risk</td>
<td>Tidal: Below mean high tide level and historically subject to tidal flooding. Now tidal only to Scots Float Sluice (north of Rye), therefore not at direct risk.</td>
<td>Non-tidal; as above mean high tide, therefore not at direct risk.</td>
<td>Non-tidal and not at direct risk.</td>
</tr>
<tr>
<td>Fluvial</td>
<td>Water levels serve as a flood storage, but can only discharge intermittently between high tide therefore very susceptible to flooding (e.g. flooded in 1993, 1995, 1999 and 2000).</td>
<td>Contained by embankments but potential susceptibility to over-topping (recent flooding in 2000).</td>
<td>Small scale and localised out of bank flooding – but floodwater mostly contained within deep channels.</td>
</tr>
<tr>
<td>Water quality</td>
<td>Chemical GQA: Predominantly C.</td>
<td>Predominantly B and C except a stretch classified as E associated with sewage discharge near Robertsbridge.</td>
<td>Highly variable A-C.</td>
</tr>
<tr>
<td>Biological GQA</td>
<td>Predominantly A, except C/E around Robertsbridge.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Siting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIODIVERSITY</td>
<td>Key Habitat/Features</td>
<td>RE Target: Falls to achieve RE3 target (i.e. up to RE4). Mostly fail to achieve RE 2 target (i.e. up to RE3). Mostly fail to achieve RE1 target (i.e. up to RE2).</td>
<td>Water Vole known to be present.</td>
</tr>
<tr>
<td>FISHERIES</td>
<td>Threatened from tidal marsh. Trapezoidal channel limits habitat value. Drainage ditches likely to be of high ecological value.</td>
<td>Trapezoidal channel limits habitat value. Drainage ditches may be of value.</td>
<td>Wooded ghylls are important habitats.</td>
</tr>
<tr>
<td>FISHERIES</td>
<td>River and floodplain</td>
<td></td>
<td>Water Vole?</td>
</tr>
<tr>
<td>FISHERIES</td>
<td>Protected (water-related) habitats</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>RE Target</td>
<td>Key wetland BAP HAP Target</td>
<td>Water Vole known to be present.</td>
<td>Water Vole?</td>
</tr>
<tr>
<td>Alien species</td>
<td>Mink are present.</td>
<td>Mink?</td>
<td>Ergaleus sabellarii fish parasite found at Darwell.</td>
</tr>
<tr>
<td>Fish species</td>
<td>Coarse fish, particularly around Robertsbridge including chub and dace. Designated under EU Freshwater Fish Directive as `sympatric' between Crawen Bridge and Stonegate.</td>
<td>Coarse fish include bream, brook lamprey and stone loach.</td>
<td>Coarse fish include bream, brook lamprey and stone loach.</td>
</tr>
<tr>
<td>FISHERIES</td>
<td>Salmonid Migratory</td>
<td>Runs of sea trout. Scots Float Sluice includes a fish pass but sometimes non-operational preventing fish migration.</td>
<td>As for lower Rother.</td>
</tr>
<tr>
<td>FISHERIES</td>
<td>Non-migratory</td>
<td>Designated as a salmonid fishery under EU Freshwater Fish Directive.</td>
<td>Designated as salmonid to Robertsbridge under EU Freshwater Fish Directive.</td>
</tr>
</tbody>
</table>

**Other notes**

- Non-migratory freshwater fish directive.
- Migratory calm waters.
- Steinberg salmonid fishery under EU Freshwater Fish Directive.

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**Key points for Robertsbridge:**
- **Fish species:** Coarse fish, including chub and dace, are present.
- **Habitat:** Wooded ghylls are important habitats.
- **Fishing regulations:** Game fishing on Darwell reservoir.
- **Location:** Headwaters and Secondary Rivers including The Bexley, River Lunden, Kent Ditch, upper Heveningham Channel and upper Newmill Channel.
### Physical Landscape

**Geology**
- Lower Brede: Hastings Beds, sandstones, siltstone and clays.
- Mid Brede: Hastings Beds, sandstones, siltstone and clays.
- Upper Brede: Hastings Beds, sandstones, siltstone and clays.

**Elevation**
- Lower Brede: Below 25m AOD, with the main channel often below 3m AOD.
- Mid Brede: Below 25m AOD.
- Upper Brede: Up to 100m AOD.

**Landform**
- Lower Brede: Flat to sloping within a shallow valley bounded by 'white-back' ridges, includes steeply incised valleys within a hilly context.
- Mid Brede: Flat to sloping within a steeper valley form.
- Upper Brede: Includes steeply incised valleys within a hilly context.

**Channel Gradient**
- Lower Brede: 1 in 2000
- Mid Brede: ?
- Upper Brede: ?

### Landcover and Use

**Agricultural Land Classification**
- Mixed: including Grade 2 associated with tidal flat deposits to the east with Grade 3 and 4 to the west.

**Habitat and Features**
- **Biodiversity**
  - **Protected habitats:** Includes part of pSPA site valued for Bewick’s swan, breeding little and common terns and birds of prey. Also associated with cSAC as Ee Harbour that is valued for coastal shingle communities.

**Recreation**
- **Historic influences:** Settlement at Icklesham and Winchelsea.

### Hydrology

**Rainfall**
- As defined previously (Rother Sub-catchment).

**Water Resources**
- **Abstraction:** None.

**Flows**
- **Typically flashy?**
- **Tidal**
  - Mid Brede: High side has reached 5.3m AOD therefore most of Lower Brede floodplain susceptible to tidal flooding.

**Flood Risk**
- **Tidal**
  - Mid Brede: Currently beyond the upper tidal limit and therefore not directly susceptible to tidal flooding.

**Fluvial**
- **Area of very high flood risk, embankments are vulnerable to overtopping.**

**Chemical GQA**
- **Predominantly Class B.**

**Biological GQA**
- **Class B.**

**Siting**
- ?

### Biodiversity

**Key Habitats/Features**
- **RE Target:** Falls to achieve target of RE3 (i.e. up to RE4). Mostly complies with targets of RE3. Parity complies and partly fails to meet RE2 target.

**River Channel and Floodplain**
- **Transeastial channel form and intensive maintenance limits habitat value. Floodplain drainage ditches likely to support a range of aquatic species.**

**Wider Catchment**
- **None.**

**Protected Habitats**
- **None.**

**BAP/HAP Species/Habitats present**
- **Orangia ditches. Water vole likely.**

**Other Notes**
- **Game fishing associated with Powdermill reservoir.**

### Fisheries

**Coarse**
- **Course species include tench and eels. Designated as a ‘cyprinid’ fishery under EU Fisheries Directive.**

**Salmonid**
- **Supports runs of sea trout from May to June. Spawning on gravel fords and tributaries.**

**Non-migratory**
- ?

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**CATCHMENT: ROTHER/Sub-catchment Brede**

<table>
<thead>
<tr>
<th>REACH</th>
<th>Lower Brede</th>
<th>Mid Brede</th>
<th>Upper Brede</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>R. Brede, east of Brede</td>
<td>R. Brede, between Sedlescombe and Brede</td>
<td>R. Brede, west of Sedlescombe and Brede tributaries</td>
</tr>
<tr>
<td>Geology</td>
<td>Hastings Beds, sandstones, siltstone and clays, capped with tidal flat deposits.</td>
<td>Hastings Beds, sandstones, siltstone and clays, capped with alluvium and head.</td>
<td>Hastings Beds, sandstones, siltstone and clays – relatively impervious leading to high run-off.</td>
</tr>
<tr>
<td>Elevation</td>
<td>Below 25m AOD, with the main channel often below 3m AOD.</td>
<td>Below 25m AOD.</td>
<td>Up to 100m AOD.</td>
</tr>
<tr>
<td>Landform</td>
<td>Flat to sloping within a shallow valley bounded by ‘white-back’ ridges.</td>
<td>Flat to sloping within a steeper valley form.</td>
<td>Includes steeply incised valleys within a hilly context.</td>
</tr>
<tr>
<td>Channel Gradient</td>
<td>1 in 2000</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Agricultural Land Classification</td>
<td>Mixed: including Grade 2 associated with tidal flat deposits to the east with Grade 3 and 4 to the west.</td>
<td>Grade 3.</td>
<td>Grade 3 with patches of Grade 4.</td>
</tr>
<tr>
<td>HISTORIC INFLUENCES</td>
<td>Reclamation of Brede or ‘Ee’ valley from saltmarsh in late eighteenth and early nineteenth centuries. The Great Sea Wall or ‘Barrow’ was constructed across the main channel. Bank raising works in 1960s.</td>
<td>Relatively unmodified.</td>
<td>Relatively unmodified.</td>
</tr>
<tr>
<td>RECREATION</td>
<td>Numerous public rights of way including footpaths and the 1066 Long-distance country walk. Popular area with holidaymakers.</td>
<td>Some public footpaths present.</td>
<td>Not a focus of recreational use?</td>
</tr>
<tr>
<td>HYDROLOGY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water resources</td>
<td>Abstraction None</td>
<td>Public surface water abstraction at Powdermill Reservoir (served by Brede) and one other location. Two Public groundwater abstraction points.</td>
<td></td>
</tr>
<tr>
<td>Flows</td>
<td>Typically flashy?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Tidal</td>
<td>High side has reached 5.3m AOD therefore most of Lower Brede floodplain susceptible to tidal flooding.</td>
<td>Currently beyond the upper tidal limit and therefore not directly susceptible to tidal flooding.</td>
<td>Not susceptible.</td>
</tr>
<tr>
<td>Fluvial</td>
<td>Area of very high flood risk, embankments are vulnerable to overtopping.</td>
<td>Area of high fluvial flood risk.</td>
<td>Only small-scale and localised out of bank flooding.</td>
</tr>
<tr>
<td>Water quality</td>
<td>Chemical GQA</td>
<td>Predominantly Class D. with a small stretch of Class F related to sewage discharge near Winchelsea. Slow-flowing stretches and still waters where nutrient rich discharges are causing eutrophication and excessive weed growth.</td>
<td>Predominantly Class B. Mixed – class B and C.</td>
</tr>
<tr>
<td>Biological GQA</td>
<td>No data available. Class B.</td>
<td>Mixed – class A, B, C, with one point classified D, related to sewage discharge near Brede.</td>
<td></td>
</tr>
<tr>
<td>Siting</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>BIODIVERSITY</td>
<td>Key Habitats/Features</td>
<td>RE Target</td>
<td>Falls to achieve target of RE3 (i.e. up to RE4). Mostly complies with targets of RE3. Parity complies and partly fails to meet RE2 target.</td>
</tr>
<tr>
<td>River channel and floodplain</td>
<td>Transeastial channel form and intensive maintenance limits habitat value. Floodplain drainage ditches likely to support a range of aquatic species.</td>
<td>Transeastial channel form and intensive maintenance limits habitat value. Floodplain drainage ditches likely to support a range of aquatic species.</td>
<td></td>
</tr>
<tr>
<td>Wider catchment</td>
<td>None.</td>
<td>Ancient woodland.</td>
<td>Ancient woodland.</td>
</tr>
<tr>
<td>Protected habitats</td>
<td></td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>BAP/HAP Species/Habitats present</td>
<td>Orangia ditches. Water vole likely.</td>
<td>Water vole?</td>
<td>Water vole?</td>
</tr>
<tr>
<td>Alien Species</td>
<td>Fish parasite Anguillicola crassus affecting eel population.</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>FISHERIES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coarse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course species include tench and eels. Designated as a ‘cyprinid’ fishery under EU Fisheries Directive.</td>
<td>Course fish species include chub and dace. Designated as a cyprinid fishery under the EU Fisheries Directive.</td>
<td>Bullheads, brook lamprey and stone loach present.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmonid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-migratory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Game fishing associated with Powdermill reservoir.</td>
<td></td>
</tr>
</tbody>
</table>
**CATCHMENT: ROTHER/Sub-Catchment Tillingham**

<table>
<thead>
<tr>
<th>REACH</th>
<th>Lower Tillingham</th>
<th>Mid Tillingham</th>
<th>Upper Tillingham</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>R. Tillingham, east of Udimore.</td>
<td>R. Tillingham between Broad Oak and Udimore.</td>
<td>R. Tillingham, west of Broad Oak, and tributaries.</td>
</tr>
</tbody>
</table>

### PHYSICAL LANDSCAPE

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation</td>
<td>Below 25m AOD, channel below 5m AOD.</td>
<td>Below 25m AOD, channel generally above 5m AOD.</td>
<td>Up to 100m AOD.</td>
</tr>
<tr>
<td>Landform</td>
<td>Wide flat to shelving floodplain within shallow valley.</td>
<td>Flat to shelving floodplain within steep valley.</td>
<td>Steeply incised valley landscape within rolling Wealden hills.</td>
</tr>
<tr>
<td>Approximate Average Channel Gradient</td>
<td>1 in 1,000</td>
<td>1 in 350</td>
<td>1 in 100</td>
</tr>
</tbody>
</table>

### LANDCOVER AND USE

<table>
<thead>
<tr>
<th>Landform</th>
<th>Description</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large intensively farmed arable and pastoral fields.</td>
<td>As noted previously (Rother sub-catchment)</td>
</tr>
<tr>
<td></td>
<td>Settlement of Rye – former port – at ‘mouth’ of river.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large farable and pastoral fields continuing onto valley sides with some woodland and shelterbelts.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pasture set within context of small ghyll woodlands.</td>
<td></td>
</tr>
</tbody>
</table>

### HISTORIC INFLUENCES

<table>
<thead>
<tr>
<th>Landform</th>
<th>Historic reclamation of floodplain from saltmarsh.</th>
<th>Relatively unmanaged.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Now tidal up to Tillingham Sluice. Small stretch with bank raising works and re-sectioning from 1970s.</td>
<td>Relatively unmanaged.</td>
</tr>
</tbody>
</table>

### RECREATION

<table>
<thead>
<tr>
<th>Landform</th>
<th>Some footpaths following edge of floodplain but most routes cross the river valley connecting to Rye.</th>
<th>Cross-Weald footpaths.</th>
</tr>
</thead>
</table>

### HYDROLOGY

<table>
<thead>
<tr>
<th>Landform</th>
<th>Flows</th>
<th>Flooding/Flood Risk</th>
<th>Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Below limit of high-tide therefore naturally very susceptible to flooding, although tidal limit currently at Tillingham Sluice.</td>
<td>Tidal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Above tidal limit therefore not directly susceptible to tidal flooding.</td>
<td>Fluvial</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Well above tidal limit therefore not directly susceptible to tidal flooding.</td>
<td>Chemical GQA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not susceptible.</td>
<td>Biological GQA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Very susceptible as a result of low-lying character</td>
<td>Situational Issues</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Very susceptible as a result of low-lying character.</td>
<td>Water vole</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Predominantly Grade B.</td>
<td>Water vole</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Predominantly Grade C.</td>
<td>Water vole</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grade C.</td>
<td>Water vole</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grade B.</td>
<td>Water vole</td>
</tr>
</tbody>
</table>

### BIODIVERSITY

<table>
<thead>
<tr>
<th>Landform</th>
<th>RE Target</th>
<th>Key Habitats/Features</th>
<th>BAP/HAP species and habitats present.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Failed to achieve RE2 (i.e. up to RE3).</td>
<td>Failed to achieve RE2 (i.e. up to RE3).</td>
<td>Failed to achieve RE2 (i.e. up to RE3).</td>
</tr>
<tr>
<td></td>
<td>Ancient woodland including a small number of ghyll woodlands.</td>
<td>Ancient woodland including a small number of ghyll woodlands.</td>
<td>Ancient woodland including a small number of ghyll woodlands.</td>
</tr>
<tr>
<td></td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td>None.</td>
<td>None.</td>
<td>None.</td>
</tr>
</tbody>
</table>

### FISHERIES

<table>
<thead>
<tr>
<th>Landform</th>
<th>Coarse</th>
<th>Migratory</th>
<th>Non-migratory</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coarse fish present but no stretch covered by EC Freshwaters Fisheries Directive.</td>
<td>Sea trout that are reported to spawn on gravel fords.</td>
<td>Brown trout!</td>
</tr>
<tr>
<td></td>
<td>Coarse fish present but no stretch covered by EC Freshwaters Fisheries Directive.</td>
<td>Sea trout</td>
<td>Brown trout!</td>
</tr>
<tr>
<td></td>
<td>Coarse fish present but no stretch covered by EC Freshwaters Fisheries Directive.</td>
<td>Sea trout</td>
<td>Brown trout!</td>
</tr>
</tbody>
</table>

### Other notes
## CATCHMENT: MEDWAY/Sub-catchments Medway and Eden

<table>
<thead>
<tr>
<th>Location</th>
<th>R. Medway</th>
<th>Medway/Eden tributaries</th>
<th>R. Eden</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHYSICAL LANDSCAPE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Elevation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 25 and 75 m AOD (25 and 50m AOD beyond Grovehurst).</td>
<td>Up to 280m AOD.</td>
<td>Between 25 and 50m AOD.</td>
<td></td>
</tr>
<tr>
<td><strong>Landform</strong></td>
<td>Gently shelving wide corridor of low lying land.</td>
<td>Deeply incised with a complex network of ghyll valleys. Culminates in broad ridge of land between Crawley and Wadhurst that defines the catchment’s southern watershed.</td>
<td>Gently shelving floodplain corridor.</td>
</tr>
<tr>
<td><strong>Approximate Average Channel Gradient</strong></td>
<td>1 in 500</td>
<td>1 in 50 - 1 in 100</td>
<td>1 in 1000</td>
</tr>
<tr>
<td><strong>HYDROLOGY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HISTORIC INFLUENCES</strong></td>
<td>Few modifications. However, downstream river engineering works (Leigh Barrier) impact these upper reaches. Medway made navigable from 1531 and locks made between Maidstone and Tunbridge by 1746.</td>
<td>Presence of Hamner Ponds, formed by impounding of steep Wealden streams for the iron industry - provide water to drive waterwheels to power the bellows. Weir Wood reservoir constructed 1870.</td>
<td>No substantial modifications, although the construction of drainage ditches has allowed the floodplain to be culverted.</td>
</tr>
<tr>
<td><strong>LANDCOVER AND USE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Proportion</strong></td>
<td>Woodland 27%, Settlement 3%, Other 70%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ALC</strong></td>
<td>Grade 3 with small areas of Grade 4.</td>
<td>Ghylls are mostly Grade 4 within Grade 3 context.</td>
<td>Grade 4 floodplain in context of Grade 3 with localised pockets of Grade 2.</td>
</tr>
<tr>
<td><strong>BIOLOGY</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Biological QQA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Siltation issues</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FISHES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmonid</td>
<td>Allington Lock prevents upstream movement of fish (bypass work scheduled 2001).</td>
<td>Allington Sluice is a barrier to salmonid migration.</td>
<td>Allington Sluice is a barrier salmonid migration.</td>
</tr>
<tr>
<td><strong>Other notes</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Details

- **Rainfall**
  - Rainfall varies across the catchment averaging 729mm/annum with higher rainfall (766mm/annum) in more elevated areas. This has been as low as 571 mm in drought years.

- **Water resources**
  - Abstraction: Limited groundwater abstraction upstream of Penshurst, Surface Water abstraction from River Medway into Weir Wood reservoir, Surface Water abstraction from River Eden for Reservoir at Rough Beach (outside AONB).
  - Flows: Heavily regulated. Flows controlled by sluice gates and flood storage. Leigh Barrier (located outside AONB) is largest on-river flood storage area in UK. Also moderated by the Medway Scheme (Tate tributaries) therefore less flashy than previously. Residual flow is set at 2750l/day.

- **Flood risk**
  - Tidal: Tidal limit is Allington Lock (or Maidstone) therefore not at direct risk.
  - Fluvial: High flood risk. Leigh Barrier retains water in Medway Valley. 1968 floods caused massive damage to Tunbridge. Only lower reaches subject to significant flood risk – high run off due to topography and geology. High flood risk due to topography and surrounding clay catchment.

- **Water quality**
  - Chemical QQA: Grade B (upper reaches) to Grade C (lower reaches). Area of Grade F downstream of Hartfield. Lower quality reaches due to sewage effluents and pesticides arising from orchards.
  - Biological QQA: Generally good quality – Grade A and B (some C).

- **Biodiversity**
  - Key Habitat/Features: RE Target: Better than RE3 target, some stretches fail to comply with RE2 upstream of Herfield. Variables – but largely comply with targets. Fails to comply with RE2 target (e.g. up to RE3).

- **Key Habitat/Features**
  - River channel and floodplain: | | | |
  - Wider catchment: | | | |
  - Protected habitats: None. | | |
  - SAP/HAP present: Otter and black poplar recorded. | | |
  - Alien Species: Japanese knotweed, Himalayan Balsam, Giant Hogweed (particularly between Tunbridge and Maidstone) and Australian stonewort. Mink, Chinese mitten crab, signal crayfish, terrapin, pumpkinseed and catfish present. | | |

- **FISHES**
  - Coarse: Good coarse fish populations.
  - Migratory: Allington Sluice is a barrier salmonid migration.
  - Non-migratory: Brown Trout found in Eridge stream and other Ashdown Forest streams.

- **Other notes**
  - **Catchment:** Medway/Sub-catchments Medway and Eden
  - **Headwaters of the rivers Medway and Eden including Eridge Stream, Kent Water and Pippingford Stream.**
  - **Medway between Hever and Penshurst.**
  - **River Eden between Hever and Penshurst.**
## Physical Landscape

### Geology
- Hastings Beds – principally Ashdown Beds and Wadhurst Clay overlain by alluvium.

### Elevation
- 25-50m AOD.
- Up to 280m AOD.
- Up to 150m AOD.

### Landform
- Low-lying flat valley landscape comprising a narrow valley enclosed within steep valley sides.
- Steeply incised with a complex network of ghyll valleys.
- Steeply incised with a complex network of ghyll valleys.

### Channel Gradient
- Deep (1.5m) and steep-sided (up to 5m). Some natural riffles. Typically 1 in 450.
- 1 in 100?

### Landcover and Use

#### Agricultural Land Classification
- Grade 3. Grade 3 with localised pockets of Grade 4 and Grade 2.
- Grade 3.
- Grade 3.

#### Historic Influences
- No significant modifications.
- The Bewl Water reservoir near Lamberhurst was constructed in 1977 and involved damming and drowning of the Bewl Stream. Hammer ponds are also present.
- No significant modifications.

#### Recreation
- Coarse, game and mixed fishing on River Teise.
- No long-distance footpath networks.
- Many activities on Bewl Water including sailing, canoeing, angling, windsurfing and rowing. There are few recreational footpaths.
- Not a significant recreation area.

#### Hydrology

##### Rainfall
- As noted previously (Medway sub-catchment).

##### Water Resources

#### Abstraction
- Large-scale surface water abstraction (10 million cubic metres/year) pumped to Bewl Water.
- 'Medway Scheme' - strategic pumped storage and river transfer facility at Bewl Water Reservoir.
- Water abstracted during Winter at Smallbridge and Yalding and pumped to Bewl then released when required for abstraction near Springfield.
- No abstraction.

#### Flows
- Large fluctuations led to the construction of Bewl reservoir which now regulates river flow.
- Flows regulated by the Medway Scheme, and therefore are less flashy than previous.
- Very flashy due to presence of impermeable Wealden Clay.

#### Flooding/Flood Risk
- Subject to flooding. Subject to small scale and localized flooding. Not at risk.

#### Water Quality
- Grade B and C. Mostly grade A (Bewl) and C. Highly variable quality – Grade B to F, poor water quality associated with sewage treatment works.

#### Biological GQA
- Grade B and C. Mostly grade A (Bewl) and C.

#### Biodiversity

##### Key Habitats/Features

#### RE Target
- Relatively high proportion of ancient woodland.
- Ancient woodland

#### River Channel and Floodplain
- Downstream (outside AONB) 25 Km of Beult is designated as SSSI – one of few clay rivers retaining characteristic flora and fauna.

#### Protected Habitats
- Numerous SSSIs.

#### BAP/HAP species/habitats present
- Rivers and Streams, Open Water, water voles.

#### Alien Species
- As for Medway?

### Fisheries

#### Coarse
- R. Teise – Bartley Mill to Yalding designated as Cyprinid Fishery under EU Fish Directive. Includes roach, chub, bream, pike, eels, perch, ruffe, bleak, tench, carp, minnow, gudgeon, rudd and dace.
- Bewl Water is stocked with coarse fish. Coarse fish present throughout tributaries.
- Brown Trout is Beul Water and feeder streams. Rainbow trout stocking from caged stock. Bewl Water designated as a salmon fishery under EC Fisheries directive. Raceways below dam used to propagate rainbow trout, salmon and sea trout.

#### Salmonid
- Allington Sluice is a barrier to salmonid migration.
- Allington Sluice is a barrier to salmonid migration.
- Allington Sluice is a barrier to salmonid migration.
- Brown trout not thought to be present.

### Other Notes
CATCHMENT: OUSE

LOCATION

Upper Ouse/Cockhaise Brook
River Uck Between Betchworth Crossing and the AONB boundary
Headwaters of the River Ouse, Cockhaise Brook and River Uck. Area also includes the Ardingly Reservoir.

PHYSICAL LANDSCAPE

Geology
Principally Tunbridge Wells Sand (Hastings Beds)

Elevation
Below 50m AOD. Between 25 and 75m AOD

Landform
Narrow valley floodplain defined by steep valley sides.

LANDCOVER AND USE

Description
Gentle winding valley with arable fields with reduced hedgerow/whigrow trees.

Proportion
Woodland 30%, Settlements 30%, other 40%

AOC
Grade 4 floodplain, Grade 3 valley sides.

HISTORIC INFLUENCES

A number of water control structures occur within the Upper Ouse. The lower-lying coastal reaches (outside AONB) have been considerably modified, but with limited consequences for the Upper Ouse.

RECREATION

Outdoor activities, fishing

HYDROLOGY

Abstraction
Water pumped into Ardingly reservoir. Public Water abstraction (surface) from Cockhaise Brook.

Flows
Typically less flashy than elsewhere in the Weald due to sandy geology creating moderately well drained loams. Also water released from Ardingly reservoir at times of low flow to maintain acceptable levels.

Tidal
Non tidal therefore not at direct risk.

Areas of flood risk, generally confined to narrow valley floor?

WIDER CATCHMENT

Chemical GQA
Variable - Class A, B and C, generally good quality.

Biological GQA
Class A high quality.

Siltation issues

c

BIOVERSITY

Key habitats/features

RE Target
Complies with RE2. Complies with RE2.

River channel and floodplain
Typical lowland river.

Wider catchment
Some ancient woodland.

Protected habitats
No water related interest.

Key wetland BAP/HAP Species present
Native black poplar(?) and otter.

Allen Species

Fish parasite Ergasila spp is present. Catfish, Zander and Rainbow Trout. Phycophage affecting alder. Mink.

FISHERIES

Good mixed species population including coarse fish, rough, Rudd, perch, pike, tench, gudgeon, roach, carp, bullhead, smelt, char, brook lamprey, lees, greyling, barbel and eel.

Likely to be as for Upper Ouse. Area not designated under EU Freshwater Fish Directive. Juvenile fish may be drawn into water abstraction pipes at Cockhaise and Barcombe.

Course

Migratory

Sea trout, fishery, but thought to be declining (this is little understood).

Non-migratory

Native brown trout. Native brown trout present. Alien rainbow trout present – have escaped from various fisheries.

Other notes

There are a number of closed landfill sites found throughout the catchment.

FLYING/FLOOD RISK

Tidal
Non tidal therefore not at direct risk.

Areas of flood risk, generally confined to narrow valley floor?

Abstraction
None. Some small agricultural groundwater abstractions/spray irrigation. Public Water supply abstraction from Ardingly Reservoir.

Flows
Typically less flashy than elsewhere in the Weald due to sandy geology creating moderately well drained loams. Also water released from Ardingly reservoir at times of low flow.

Tidal
Non tidal therefore not at direct risk.

Areas of flood risk, generally confined to narrow valley floor?

WIDER CATCHMENT

Chemical GQA
Variable - Class A, B and C, generally good quality.

Biological GQA
Class A high quality.

Siltation issues

\( \text{DISCLAIMER: This information is provided as an overview and may not be complete or accurate. For specific information, please refer to the original source.} \)
<table>
<thead>
<tr>
<th>CATCHMENTS: CUCKMERE RIVER AND PEVENSEY LEVELS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REACH</strong></td>
</tr>
<tr>
<td><strong>PHYSICAL LANDSCAPE</strong></td>
</tr>
<tr>
<td><strong>Geology</strong></td>
</tr>
<tr>
<td><strong>Elevation</strong></td>
</tr>
<tr>
<td><strong>Landform</strong></td>
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<tr>
<td><strong>Approximate Average Channel Gradient</strong></td>
</tr>
<tr>
<td><strong>LANDCOVER AND USE</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Proportion</strong></td>
</tr>
<tr>
<td><strong>ALC</strong></td>
</tr>
<tr>
<td><strong>HISTORIC INFLUENCES</strong></td>
</tr>
<tr>
<td><strong>Rainfall</strong></td>
</tr>
<tr>
<td><strong>Water resources</strong></td>
</tr>
<tr>
<td><strong>Flows</strong></td>
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<tr>
<td><strong>Floodings/flood risk</strong></td>
</tr>
<tr>
<td><strong>Fluvial</strong></td>
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<td><strong>Water quality</strong></td>
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<tr>
<td><strong>Biological GQA</strong></td>
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<tr>
<td><strong>Silting</strong></td>
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<tr>
<td><strong>BIODIVERSITY</strong></td>
</tr>
<tr>
<td><strong>Key Habitats/features</strong></td>
</tr>
<tr>
<td><strong>RE Target</strong></td>
</tr>
<tr>
<td><strong>River channel/floodplain</strong></td>
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<tr>
<td><strong>Wider catchment</strong></td>
</tr>
<tr>
<td><strong>Protected habitats</strong></td>
</tr>
<tr>
<td><strong>BAP/HAP species/habitats present</strong></td>
</tr>
<tr>
<td><strong>Allen Species</strong></td>
</tr>
<tr>
<td><strong>FISHERIES</strong></td>
</tr>
<tr>
<td><strong>Coarse</strong></td>
</tr>
<tr>
<td><strong>Salmonid</strong></td>
</tr>
<tr>
<td><strong>Non-migratory</strong></td>
</tr>
<tr>
<td><strong>Other notes</strong></td>
</tr>
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</table>
### CATCHMENT: CATCHMENTS – ADUR, ARUN AND MOLE

<table>
<thead>
<tr>
<th>REACH</th>
<th>ADUR TRIBUTARIES</th>
<th>Arun</th>
<th>Mole</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>Small upper tributaries of the River Adur including the Cowfold Stream and Bolney Sewer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PHYSICAL LANDSCAPE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Geology</strong></td>
<td>Tunbridge Wells Sand (Hastings Bed Formation). Downstream of the AONB, geology becomes predominantly Wealden clay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Elevation</strong></td>
<td>25-150m AOD</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Landform</strong></td>
<td>Steep and hilly with incised tributary valleys/ghylls – typical Wealden landscape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Approximate Average Channel Gradient</strong></td>
<td>1 in 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LANDCOVER AND USE</strong></td>
<td><strong>Description</strong></td>
<td>Woodland, cattle grazing and some sheep grazing. Small fields surrounded by thick shaws and shelterbelts. On sandy acidic soils around Ashdown Forest coniferous plantation and heath present.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Proportion</strong></td>
<td>Woodland 31%, Settlement 0%, Other 69%</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Agricultural Land Classification</strong></td>
<td>Grade 3 and 4</td>
<td></td>
</tr>
<tr>
<td><strong>HISTORIC INFLUENCES</strong></td>
<td>Unmodified</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RECREATION</strong></td>
<td>No significant recreational facilities/attractions</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HYDROLOGY</strong></td>
<td><strong>Rainfall</strong></td>
<td>As defined previously (Rother sub-catchment)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Abstraction</strong></td>
<td>No significant abstractions, although there is a public groundwater abstraction east of Bolney, outside the AONB.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Flows</strong></td>
<td>Watery downstream due to influence of clay but more controlled in upper reaches due to sandy substrates.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Tidal</strong></td>
<td>Non-tidal therefore not at direct risk</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Flooding/Flood Risk</strong></td>
<td>Little flood risk – rapidly draining within bank.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Water quality</strong></td>
<td>Chemical GQA</td>
<td>Not recorded – Bolney Sewer downstream of AONB is Class C.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biological GQA</td>
<td>Not recorded – Bolney Sewer downstream of AONB is Class A.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Siltation Issues</td>
<td></td>
</tr>
<tr>
<td><strong>BIODIVERSITY</strong></td>
<td><strong>Key Habitats/Features</strong></td>
<td>Not recorded – Bolney Sewer downstream of AONB is RE4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>River channel and floodplain</td>
<td>Ancient woodlands including ghylls. No records of Black Poplar.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water catchment</td>
<td>Ancient woodland</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Protected habitats</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Key wetland BAP/HAP Species present</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alien Species</td>
<td></td>
</tr>
<tr>
<td><strong>FISHERIES</strong></td>
<td><strong>Coarse</strong></td>
<td>Not covered by EU Freshwater Fisheries directive. However thought to be as per Ouse/Uck tributaries.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Salmonid</strong></td>
<td>Migratory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-migratory</td>
<td>Brown trout</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other notes</td>
<td></td>
</tr>
</tbody>
</table>
Figure 4: Catchments and Rivers

Key
- High Weald AONB boundary
- Main river
- Tributary

Major Catchment Boundary
- River Medway
- River Rother
- River Adur
- Pevensey Levels
- Cuckmere River
- River Ouse
- River Arun
- River Mole

Tributary Catchment Boundary (with name)
Figure 5: Agricultural Land Classification

Key
- High Weald AONB boundary
- Main river
- ALC Grade (no Grade 1 or 5 within AONB)
  - Grade 2
  - Grade 3
  - Grade 4
  - Non-Agricultural
  - Urban
Figure 8.
Long Profile of the River Rother
**Figure 10: River Rother - Upper**

1: Headwater tributary

- Deeply incised self-regulating channel resulting from bed erosion (cutting down) into soft clays during spate flow events (Photo 1).
- Surrounding land use typically mixed pasture (Photo 2) and intensive arable (Photo 3), riparian corridor frequently unmanaged 'gill' woodland that provides buffer against silt laden run-off from surrounding arable land. Grass pasture and woodland also reduce rate of flood run-off and associated downstream flood peaks compared with intensive arable. Woodland and grassland make little contribution to silt loading as indicated by clear surface road run-off where these land use types are dominant (Photo 4).

2: Headwater tributary

- Silt settles out forming discrete deposits and bars where bed gradient flattens out and velocities are reduced behind woody debris dams (Photo 5); the value of these natural dams with respect to their contribution to sediment capture and as distinct aquatic ecological habitats is high. Encourage riparian woodland planting, and natural unmanaged channels within the upper tributary reaches wherever practicable.

**Key**

- Rother Catchment Boundary

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**2. Unmanaged woodland**

- Provides buffer against silt laden run-off.
- Reduces flood run-off and downstream flood peaks.
- Contributes little to silt loading.

**3. Mixed pasture**

- Adjacent to arable land.
- Helps manage silt load.

**4. Clear surface road run-off**

- Depicts impact of grassland and woodland.

**5. Woody debris dams**

- Natural dams contributing to sediment capture.
- Important ecological habitats.

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Figure 11: River Rother - Middle Reach

1: Rother floodplain - flood attenuation
Inspection was very limited but a significantly wide floodplain is evident at moderate grade of c. 1 in 500, impeding the passage of floodwater down towards Robertsbridge. This has potential to reduce peak flow rates, enhancing the effectiveness of flood protection works. Floodplain restoration strategy suggested.

2: River Dudwell at Etchingham
Potential to create flood impedance upstream of lane, river channel thistle combined with dense hedge/flood fence along line of existing wire fence (Photo 1), increase depth of flooding/storage reducing peakflow rate: road less likely to flood.

3: River Dudwell at Burwash
Flood had cleared this higher reach during inspection but scope for flood impedance as 2 was evident eg. hedge thickening at Photo 2.

4: River Rother at Witherden
Location at top end of the middle reach near confluence of Tude Brook. The open floodplain upstream of road is expansive suggesting that flood impedance would be particularly effective. Investigation needed to locate suitable position for new flood fence/hedge as 2. Noted that roadside hedge has been removed to let floods pass freely over the road. Photo 3 - Road, Photo 4 - Upstream floodplain.

5: Arable riverside land below Willards Hill
A small tributary valley with arable land on the slopes down to the stream edge. Example demonstrates potential for rapid run off (Photos 5 and 6) and soil loss to stream. Establishing buffer strips alongside and woody debris dams within the stream would alleviate the problem and enhance the wildlife corridor.
Figure 12: River Rother - Lower Reach

1: River Rother - embanked channel
The river is embanked both sides of Bodiam Bridge. This embanking represents an extension of the embanked highland carrier referred to in Figure 13. The extension protects the fluvial floodplain and feeds water into the carrier. Additional embanking may exist further upstream than indicated towards Robertsbridge. Floodwater levels are intrinsically higher if contained in embankments than if allowed to spread over floodplain land.

2: Southern embankment below Bodiam
This embankment could be removed or lowered to restore seasonal inundation of floodplain (green); increased flood storage and lower flood levels result enabling more water to be drawn through the road bridge, reducing road flooding. At least 2km of floodplain probably needed to achieve this, but more desirable. N.B. Embankment on south side above Bodiam needs to be retained to protect the road.

3: Northern embankment above Bodiam
This protects arable land on the floodplain but removal or lowering could be considered if land is restored to flood meadow grassland (green). Retain short length at each end to protect gauge station and Bodiam recreation field. Similar benefits as 2 but also potentially contributes to drying water clear of Robertsbridge; see 4.

4: Floodplain below Robertsbridge
This reach was not inspected but view downstream from bypass during flood suggested obstruction to free flow of floodwater were prevalent. O.S. map also indicates some embanking. Floodplain restoration here could help draw water out of Robertsbridge, enhancing the effectiveness of the flood protection works. Photo 4 - Floodplain downstream of bypass road.

Key
- Embanked River
- Tributary Catchment Boundary
Figure 13: River Rother - The Levels

1: River Rother - highland carrier
Man-made embanked channel across the southern edge of the levels: carries highland water direct to the tidal outfall.

2: Wet Level - existing flood storage
When highland carrier is near full of stored floodwater over spills over PS and high river level.

3: New Bridge - new flood overspill potential
A small isolated area of pump drained arable land that is characteristic of the meander profile of the catchment along the southern edge of the highland carrier. Potential to develop additional flood overspill area (green) with enhanced wetland habitats, but length of adjacent road needs to be raised above flood level.

4: Southern edge washlands - general potential
Areas denoted 4.1 - 4.4 conceivably have potential for creating much more open washland and associated wetland habitats along the relatively narrow southern edge of the highland carrier. Achieved by lowering embankments throughout to sustain VLMHP's suitability to grazing marsh agriculture.

Key
- High Weald AONB boundary
- Rother Catchment Boundary
- Embanked River (highland carrier)

Photo 1 - Highland carrier in flood.
Photo 2 - Summer water level in highland carrier.
Photo 3 shows overspill, PS and high river level.
Photo 4 - Main drain to PS and arable field.
Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7