

# The River Eden cSAC Conservation Strategy



Conserving Natura 2000 Rivers



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## Conserving Natura 2000 Rivers

This conservation strategy for the River Eden has been produced as part of **Life in UK Rivers**, a project to develop methods for conserving the wildlife and habitats of rivers within the Natura 2000 network of protected European sites.

The project's focus has been the conservation of rivers identified as Special Areas of Conservation (SACs) and of relevant habitats and species listed in annexes I and II of the European Union Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) (the Habitats Directive).

Conservation strategies have been produced for seven SAC rivers in the UK to meet the need for management plans. The strategies demonstrate how the statutory conservation and environment agencies have developed conservation objectives, and drawn up action plans with their local partners for achieving 'favourable conservation status' under the terms of the directive for its listed habitats and species.

For SAC sites, the directive requires:

- Conservation measures to be established that correspond to the ecological requirements of the Annex I and II habitats and species present.
- Appropriate steps to avoid the deterioration of habitats and the habitats of species, as well as the disturbance of the species.
- Appropriate assessment – in view of the site's conservation objectives – of the implications of any plan or project likely to have a significant effect on the SAC.

Each river conservation strategy identifies the conservation measures necessary for its SAC, describes appropriate safeguards against deterioration or disturbance, and represents an aid to assessing any plan or project affecting the SAC.

In essence, the strategies set out a management plan for securing conditions whereby an SAC site can contribute to achieving favourable conservation status for its designated habitats and species at a national and European level.

To accompany the river conservation strategies, the project has also produced a set of reports collating the best available information on the ecological requirements of each species and habitat, while a further series contains advice on monitoring and assessment techniques. Each report has been compiled by ecologists who are studying these species and habitats in the UK, and has been subject to peer review, including scrutiny by a Technical Advisory Group established by the project partners. In the case of the monitoring techniques, further refinement has been accomplished by field-testing and workshops involving experts and conservation practitioners.

**Life in UK Rivers** is a demonstration project and, although the reports have no official status in the implementation of the directive, they are intended as a helpful source of information for organisations trying to set conservation objectives and to monitor for favourable conservation status for these habitats and species.

Titles in the Conserving Natura 2000 Rivers ecology and monitoring series are listed inside the back cover of this report, and copies of these, together with other project publications are available on the project website: [www.riverlife.org.uk](http://www.riverlife.org.uk).

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## Summary

The River Eden candidate Special Area of Conservation (cSAC) Conservation Strategy sets out a vision for the River Eden, a longer-term goal to which this document will contribute.

The strategy identifies a series of actions that, when taken step by step, will help towards achieving the vision, by furthering the conservation of the species and habitats for which the river has been designated a cSAC.

The strategy refers to the Joint Nature Conservation Committee's (JNCC) draft Conservation Objectives and Favourable Condition Tables to identify the ecological requirements of these special interest features with respect to the following series of attributes:

- Flow levels
- Water quality
- Substrate quality
- Channel morphology
- Bankside vegetation
- Access
- Interspecies competition
- Human exploitation.

For each of these attributes, the strategy identifies a series of management aims specific to each interest feature, highlights any existing initiatives that are already working towards achieving these aims, and where necessary proposes a series of further actions. These actions have then been prioritised according to their importance for delivery and favourable condition.

This strategy has been prepared with the involvement of a partnership formed from representatives of different interest groups involved in or around the River Eden.

## I. Introduction

### I.1 The conservation designations of the River Eden

The nature conservation value of the River Eden and many of its tributaries is recognised at both a national and European level. Its value in the British context was recognised in 1997 when the river was designated as a Site of Special Scientific Interest (SSSI), notified under Section 28 of the Wildlife and Countryside Act 1981. At a European level it is designated as a candidate Special Area of Conservation (cSAC), in response to the Habitats Directive. The areas covered by these SSSI and cSAC designations follow similar boundaries, but place different emphasis on the species and habitats that they protect, reflecting the variation in conservation status of the different features from a national and international perspective (Figure 1).

The SAC designation includes the River Eden in a network of designated wildlife conservation sites across the European Community, known as the Natura 2000 network. There are two types of Natura 2000 sites:

- 1) SACs that have been selected for their habitats, plants or animals
- 2) Special Protection Areas (SPAs), which are selected because they support significant numbers of wild birds or their habitats.

The Habitats Directive was brought into British law in October 1994 by the *Conservation (Natural Habitats, & etc.) Regulations 1994*, more commonly known as the Habitat Regulations. The River Eden was proposed as an SAC in 1997, and following a period of consultation was notified as a candidate SAC in 1998. In August 2000 three additional features of otter, floodplain woodland and mesotrophic lakes were added to the notification. The 'candidate' designation is now awaiting final European confirmation, when the site will become known as a Site of Community Importance. Before confirmation UK candidate sites are afforded the same level of legal protection as fully confirmed sites.

In addition to the Habitat Regulations, the River Eden also receives protection under British law through the Countryside and Rights of Way Act 2000 (the CROW Act), which incorporates the Wildlife and Countryside Act 1981. Many national initiatives are currently underway to implement this legislation, working to secure the conservation of the river.

### I.2 The role of the conservation strategy

The principal aim of this conservation strategy is to assist in securing favourable conservation status for the interest features for which it is notified as a cSAC.

It fulfils Article 6.1 of the Habitats Directive, which states that:

“For Special Areas of Conservation member states shall establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans...”

It focuses on concerns that are impacting on the SAC interest features but are not currently being addressed via other statutory means. It also seeks to highlight, in one document, the numerous other initiatives that are underway across the catchment that are working towards the same aims.



Figure 1. The River Eden cSAC and tributaries

## 1.3 The strategy and the partnership group

The Eden is the subject of much local interest and activity. The strategy recognises that there are many different organisations concerned with the conservation of the interest features of the River Eden (see Appendix II). A partnership was established to bring together these organisations, and to ensure their close involvement in the development of the strategy. The role of the partnership was to provide input into the contents of the strategy, and to ensure that the identified actions are implemented and progressed. The success of the strategy is dependant on the continued support of the partnership; and continued communication and liaison between all interested stakeholders.

The strategy is intended to be a working document, which can be reviewed and modified to take into account future developments, new initiatives, and additional actions. However, the basic aim will remain to work towards ensuring the conservation of the cSAC interest features, to be achieved through the careful management of the river, the river corridor and the broader river catchment.

The strategy is based around the requirements of the interest features as identified in the draft JNCC Favourable Condition Tables ([www.riverlife.org.uk](http://www.riverlife.org.uk)). An initial issues report was drafted to examine any potential impacts that could interfere with these requirements. This was refined through consultation with the partnership organisations, and existing initiatives and required actions identified.

## 2. The River Eden cSAC

### 2.1 Special interest features

The River Eden has been designated as a candidate Special Area of Conservation (cSAC) because it supports significant populations of some of the species and habitats listed in the annexes to the Habitats Directive. These key habitats and species are referred to as the River Eden interest features and are listed below with the annexes in which they appear<sup>1</sup>:

- Watercourses characterised by *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation communities (*Ranunculus* communities) Annex I
- Residual alluvial woodland Annex I
- Populations of Atlantic salmon (*Salmo salar*) Annex II & V
- Sea lamprey (*Petromyzon marinus*) Annex II
- River lamprey (*Lampetra fluviatilis*) Annex II & V
- Brook lamprey (*Lampetra planeri*) Annex II
- Bullhead (*Cottus gobio*) Annex II
- White clawed crayfish (*Austropotamobius pallipes*) Annex II & V
- Otter (*Lutra lutra*) Annex II & IV

<sup>1</sup> Annexes I and II of the Habitats Directive list habitats and species respectively that are of community interest whose conservation requires the designation of SACs.

Annex IV lists species of community interest in need of strict protection, and Annex V lists those whose taking and exploitation may be subject to management measures.

The Habitats Directive seeks to conserve European species and habitats that are either considered to be endangered, vulnerable, or rare within a European context; or because they are endemic to Europe and their exploitation would have a detrimental impact either on their conservation status, or on the habitat where they occur. Thus, some of the River Eden interest features may be regarded as fairly common locally or nationally, but these populations are important strongholds for the species across Europe.

### 2.1.1 Atlantic salmon

**International status:** The Atlantic salmon is listed under Appendix III of the Convention on the Conservation of European Wildlife and Natural Habitats 1979 (the convention), and (in freshwater only) under annexes II and V of the Habitats Directive. The North Atlantic Salmon Conservation Organisation (NASCO) has serious concerns regarding its declining status.

**UK status:** Identified by the UK Steering Group for Biodiversity as a Species of Conservation Concern<sup>2</sup>.

**River Eden status:** The River Eden is considered one of the top salmon rivers in England. However, as with many rivers in England and Wales, there has been a decline in the numbers of salmon returning to the river to spawn, and in particular the spring-returning fish. Spawning occurs on the length of the River Eden from Carlisle upstream to Kirkby Stephen, (upstream of this point waterfalls at Stenkrith render salmon access impassable), and throughout its tributaries.

The Environment Agency uses anglers' catch data to monitor the salmon stocks. It also carries out a programme of electric fishing, uses *in-situ* fish counters and traps, and carries out annual redd counts. The Salmon Conservation Limit (SCL) is calculated according to a national Environment Agency methodology, and is based on assumptions regarding the percentage of returning salmon caught. These assumptions are considered inaccurate for the River Eden and in need of review.

### 2.1.2 Lamprey

**International status:** All three species of lamprey are listed under Appendix II of the convention, and under annexes II and V of the Habitats Directive. They are regarded as being in unfavourable conservation status in Europe.

**UK Status:** Identified by the UK Steering Group for Biodiversity as a Species of Conservation Concern<sup>2</sup>.

**River Eden status:** Information on the conservation status of lamprey across the Eden catchment is patchy, with most data coming from Environment Agency electric-fishing surveys, specific *ad hoc* surveys, and anecdotal reports. Sample sites on the Eden and some of its tributaries were electric-fished for ammocoetes by APEM (1996), where positive results were found in most of the tributaries surveyed. River and brook lamprey were widespread and common, and sea lamprey were found down below Carlisle, near the tidal limit.

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<sup>2</sup> Ranking as 'Species of Conservation Concern' means that at present these have not been the subjects of any species action plans, but the implementation of the action plans for priority species will have benefits for the species of concern.

A more recent survey (APEM 2000) highlighted sea lamprey spawning grounds from Wetheral downstream to the M6, and they have recently spawned further upstream at Eden Lacy and Lazonby. An Eden survey was completed in 2002.

### 2.1.3 Bullhead

**International status:** The bullhead is listed under Annex II of the Habitats Directive. It is regarded as being in unfavourable conservation status in Europe.

**UK status:** Identified by the UK Steering Group for Biodiversity as a Species of Conservation Concern.<sup>2</sup>

**River Eden status:** Information on the conservation status of bullheads across the Eden catchment is patchy, but they seem to be present throughout the Eden cSAC. The Environment Agency Minor Coarse Fish Surveys, 1992–94, gave positive results for 55 out of the 69 sites surveyed in the upper catchment, with particularly high abundances in the Upper Eden tributaries and parts of the Lowther, Eamont and Irthing catchments. The ecological requirements of bullhead are likely to be met by those for crayfish and salmon, and this is reflected in their distribution.

### 2.1.4 Crayfish

**International status:** The white-clawed crayfish is listed under Appendix III of the convention, and annexes II and V of the Habitats Directive. It is classed as globally threatened by IUCN red data book. Formerly widespread across Europe, populations are now confined to a diminishing number of areas.

**UK status:** This is the only crayfish native to the UK. It used to be commonly found in clean calcareous streams, but numbers are now significantly reduced, with a 25–49% decline in numbers and range in the last 25 years<sup>3</sup>. It has been identified by the UK Steering Group for Biodiversity as a Priority Species<sup>4</sup>, and is listed under Schedule 5 of the Wildlife and Countryside Act 1981 in respect of taking from the wild and sale. The native UK crayfish is threatened by crayfish plague and competition from non-native crayfish species.

**River Eden status:** The River Eden supports one of the strongest native crayfish populations in the North West. Most records have originated from the number of one-off investigations of the Eden populations (Robinson 1996 and Turnbull 1999); and records from the Environment Agency water quality invertebrate monitoring programme and electric-fishing surveys. Notable crayfish populations are found on Scandal, Helm and Hoff Becks and the Rivers Leith, Lowther and Lyvennet. The Pennine stream, Briggie Beck, also supports good populations. The main River Eden supports patchy crayfish populations from Kirkby Stephen downstream to Temple Sowerby (Scott Wilson 2000). There are no confirmed records of any alien crayfish species or cases of crayfish plague.

### 2.1.5 Otter

**International status:** The otter is listed under Appendix III of the Bern Convention; annexes II and IV of the Habitats Directive, and CITES Appendix I. The European sub-species is listed as globally threatened on the IUCN red data list.

<sup>3</sup> Biodiversity: The UK Steering Group Report 1995.

<sup>4</sup> All Priority Species (formerly the short and middle lists from the Biodiversity Report) now have UK Biodiversity Action Plans (BAPS).

**UK status:** The otter is protected by Schedule 5 of the Wildlife & Countryside Act 1981. It is identified by the UK Steering Group for Biodiversity as a Priority Species, which states that global conservation status is probably of concern. The UK otter population is slowly recovering from the well-documented losses in the 1950s and 1960s. Pollution of watercourses, insufficient prey due to poor water quality, loss of bankside habitat and incidental mortality, primarily by road deaths, continue to be of issue in some areas.

**River Eden status:** Cumbria now supports a steadily recovering otter population. A comprehensive survey of the Eden catchment carried out by Twiss 1992, showed a healthy, but patchy otter distribution in the lower Eden catchment. McBride repeated this, in part, in 1996; and in 2000 the EA carried out another catchment-wide bridge-monitoring survey. Results show a population that is now present throughout most of the catchment from downstream of Carlisle upstream to Kirkby Stephen and on most major and many minor tributaries.

### 2.1.6 Residual alluvial woodland

This habitat type describes low-lying riverside alder-dominated woodland, that is periodically inundated during times of high river levels, yet remains well-drained during lower flows. In the UK this habitat type falls within the National Vegetation Classification (NVC) communities W5 (alder with tussock sedge), W6 (alder with nettles) and W7, (alder with ash and yellow pimpernel). Its current rare status is due to numerous factors such as:

- Lack of management.
- Conversion to pasture.
- Intensive livestock grazing.
- River engineering.
- Land drainage that isolates the woodland from the river processes on which it depends.

**International status:** Residual alluvial forest is listed under Annex I of the Habitats Directive as a natural habitat type of community interest whose conservation requires the designation of an SAC.

**UK status:** Wet woodland includes residual alluvial woodland, and is identified by the UK Steering Group for Biodiversity as a Priority Habitat, and as such is the subject of a UK habitat action plan. This habitat is now extremely rare, both in the UK and in Cumbria, and is included in the Cumbria Biodiversity Action Plan.

**River Eden status:** The best examples of alder-dominated woodland in the Eden catchment are on the rivers Irthing and Kingwater. In the upper reaches of these active rivers, the woodland is associated with large shifting gravel deposits within the mobile channel. Further downstream, smaller patches occur on accumulating gravels on the inside of meanders. There are also occasional patches on relic meanders now cut off from the main channel.

### 2.1.7 Watercourses characterised by *Ranunculion-fluitantis* and *Callitricho-Batrachion* vegetation communities (*Ranunculus* communities)

This refers to the river type that supports floating mats of water crowfoots, starworts, aquatic mosses and associated plant species. They form an important structural feature of the river channel. The vegetation can modify river flow patterns, promote silt deposition, and provide important habitat for fish and invertebrates. Within this broad habitat type the

composition of different crowfoot and associated species varies with changes in geology and trophic status.

**International status:** This feature is listed under Annex I of the Habitats Directive as a natural habitat type of community interest whose conservation requires the designation of an SAC. Component species of this habitat type include *R. fluitans*, which is regarded as being in unfavourable conservation status in Europe, and *R. penicillatus*, which is in favourable conservation status in Europe.

**UK status:** Both species have been identified by the UK Steering Group for Biodiversity as Species of Conservation Concern. Rivers and streams as a broad habitat type are the subject of a national habitat statement, and are included in the Cumbria BAP.

**River Eden status:** The Eden has a diversity of ecological conditions, ranging from oligotrophic to mesotrophic, and the *Ranunculus* species include stream water crowfoot (*R. penicillatus* subsp. *penicillatus*) and river water crowfoot (*R. fluitans*). This vegetation has been the subject of several specific surveys, in particular Holmes (1983) who defined its national importance. This work was revisited in 1990 and 1995, with further site-specific work on the Caldew and the lower Eden around Carlisle in 2000. Earlier records are included in the Cumbria Flora. A trial survey was undertaken on the Eden catchment in 2002.

## 2.2 Conservation objectives

The conservation objectives for the interest features on the River Eden cSAC are as follows:

**To maintain\*, in favourable condition, the river as a habitat for:**

- ***Ranunculus* communities**
- **Populations of Atlantic salmon and bullhead**
- **Populations of sea, river and brook lamprey**
- **Populations of white-clawed crayfish**

**And the river and adjoining land as habitat for:**

- **Populations of otter**

**And to maintain\* the following features in favourable condition:**

- **Residual alluvial woodland**
- **Oligotrophic to mesotrophic standing waters of plains to sub-alpine levels.**

\* Maintenance implies restoration if the feature is not already in favourable condition.

## 3. Management aims

### 3.1 Introduction

The JNCC draft favourable condition tables ([www.riverlife.org.uk](http://www.riverlife.org.uk)) highlight how attributes such as water quality and substrate are important to each of the interest features of the River Eden cSAC. Section 3 identifies the management aims required to achieve these ideals.

### 3.2 Water quality management in agriculture and development

#### 3.2.1 Overview

- The Environment Agency (2000) General Quality Assessment showed that 906 km out of a 962 km of classified watercourse in the Eden was of 'Good' water quality, GQA Class A or B. Of this, 749.6 km were Class A.
- Threats to water quality on the Eden are from domestic sources, development within the catchment, and from agricultural sources. Contamination can come from point discharges, or as diffuse inputs.
- The Environment Agency carried out a review of discharge consents (required by the Habitats Regulation) for the Eden in 2003.
- United Utilities' Asset Management Plan (AMP) is the Environment Agency's programme of capital expenditure and investment. Schemes are assessed according to their costs and resulting environmental benefits. Example improvements include phosphate stripping at wastewater treatment works that discharge into rivers designated as a 'sensitive area' under the Urban Wastewater Treatment Directive, and upgrades for wastewater treatment works that are near or at capacity.
- The rural nature of much of the catchment means that many settlements are not connected to the main sewerage system and rely on septic tanks. A high concentration of septic tanks in a particular area can result in localised water quality problems. While local councils can seek the provision of first-time rural sewerage, it is assessed on a cost-benefit basis and can be prohibitively expensive due to the distance from sewerage infrastructure.
- Increases in rural housing can overload existing sewerage systems. The Environment Agency works with planners and United Utilities to ensure sewerage provision is taken into account with new housing. However, progressive development can have a gradual impact, resulting in increased frequency of discharges from overflows.
- Surface water runoff discharging into watercourses from roads can be contaminated with accumulating salt, hydrocarbons, heavy metals, phenols, etc. A survey is underway to assess the impact of runoff from major trunk roads.
- The risk of pollution from major road accidents and spillages has been reduced through agreements between the Environment Agency and the emergency services.
- In a principally rural catchment, there is a risk to water quality from agricultural sources. Landowners and managers must be responsible for minimising this risk

through careful land management, good farm housekeeping, and the implementation of best agricultural practice guidelines.

- Quality advice and assistance is available from a network of farm advisors, and the Environment Agency carries out a programme of farm inspections and can seek infrastructure improvements where water quality is at risk.
- Much could be done to directly improve water quality through a programme of simple relatively inexpensive farm infrastructure improvements. Others can be cost-beneficial in the long term but may require high initial capital investment.
- Risks from discrete sources include toxic chemicals such as pesticides (notably sheep dips), herbicides and diesel fuel, and organic sources such as slurry tanks or silage clamps.
- Risks from diffuse sources include nutrient inputs from heavy spreading of slurry or mineral fertilizers, and silt contamination from field runoff and excessive riverbank erosion.

### 3.2.2 Water quality targets

The River Eden draft conservation objectives Favourable Condition Table states that: “For the River Eden cSAC the general target will be Class A. In addition there should be no drop in class from the existing situation. The River Ecosystem target will be Class RE1; the suspended solids target will be <10 mg l<sup>-1</sup>; the soluble reactive phosphate will be 0.02mg l<sup>-1</sup>, 0.04mg l<sup>-1</sup> or 0.06 mg l<sup>-1</sup> depending on stream size and underlying geology.”

**Table 1. Target water quality parameters.**

Features affected	Requirements *
Salmon	DO >7 mg l <sup>-1</sup> at all times & >9 mg l <sup>-1</sup> 50% of the time. BOD <3 mg l <sup>-1</sup> 95% of the time. Unionised ammonia <0.025 mg l <sup>-1</sup> 95% of the time. pH 6-9 95% of the time.
Lamprey	DO >5 mg l <sup>-1</sup> at all times & >8mg l <sup>-1</sup> 50% of the time. BOD <3 mg l <sup>-1</sup> 95% of the time. Unionised ammonia <0.025 mg l <sup>-1</sup> 95% of the time. pH 6–9 95% of the time.
Bullhead	DO >5 mg l <sup>-1</sup> at all times & >8 mg l <sup>-1</sup> 50% of the time. BOD <3 mg l <sup>-1</sup> 95% of the time. Unionised ammonia <0.025 mg l <sup>-1</sup> 95% of the time. pH 6–9 95% of the time.
Crayfish	pH 6.5–9 at all times. Calcium > 10 mg CaCO <sub>3</sub> l <sup>-1</sup> as annual average (unless catchment geology. naturally generates a lower value). General water quality within Class A/B of GQA scheme. Extremely vulnerable to pesticides.
<i>Ranunculus</i> community	Orthophosphate < 0.06 mg l <sup>-1</sup> .
Otters	Directly and indirectly vulnerable to pesticides.
Alluvial floodplain forest	None

\* Taken from River Eden conservation objectives (draft)

## 3.1.3 Attribute: Water Quality

**Water quality management: Agriculture and development**

Vision	Management Aims	Current Intensity and Location	Existing Initiatives <sup>1</sup>
<i>Agricultural sources</i>			
Watercourse free from contamination from sheep dips (organophosphate and synthetic pyrethroid) that are toxic to aquatic life.	Ensure no sheep dip enters the watercourse. Potential sources of dip include: Disposal of spent dip; wet sheep fording the watercourse; or poor management of ageing dipping facilities.	Extensively used, especially across the upper catchment tributary areas. Has caused problems when misused, e.g. has impacted on:- <ul style="list-style-type: none"> <li>• 20 km of River Irthing 1996.</li> <li>• 5 km Swindale Beck 1997.</li> <li>• 7 km River Lowther 1998.</li> <li>• Gill Beck 1999.</li> </ul>	NFU guidance leaflet distributed to all members. EA's* Best Practice farm guidelines distributed during farm visits. EA Groundwater Regulations include the disposal of spent dip, with database of records maintained and reviewed every 4 years. Problems with dipping can be reported via the EA's free-phone number for pollution reporting. DEFRA Code of Good Practice
Watercourse free from contamination from other agrochemicals: herbicides and pesticides.	Minimise the risk of accidents, e.g. due to poor handling or storage; and ensure the impact from any incidents is minimal.  Ensure the correct disposal of, and minimal impact from, spent chemicals.	Such agrochemicals have limited use across the catchment.	EA's free-phone number for pollution reporting. Farm visits highlight poor practice and promote BASIS type stores.  EA Groundwater Regulations include the disposal of spent agro-chemicals.
Watercourse free from contamination from diffuse pollution from NPK fertilizers	Correct timing and rates of application limits run-off into watercourse.	Routinely used on intensive pasture.	EA, CFL currently working on nutrient budgets with 12 farms on Crosby Fell. National FWAG nutrient budget project DEFRA / EN / EA study of diffuse pollution and geology due April 2002. CSS /ESA agreements

<sup>1</sup> General initiatives to prevent farm pollution: EA Best Practice Guide 2001; EA free-phone number for incident reporting; MAFF Water Code; EA water quality monitoring; programme of EA proactive farms visits and inspections (400 visits across Eden & Solway scheduled over 2003/04.); Farm Assurance; "FWAG Landwise" reports.

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
EA routine chemical and biological water quality monitoring programme.	<b>WQ1</b> Farm visits / grant scheme for promotion of farm infrastructure improvements.	ERT	FWAG, CFL, EA Env. Mgmt. NFU, RDS	Top
	<b>WQ2</b> Investigate advantages and risks of a trial subsidised sheep-dip neutraliser scheme, and implement if suitable.	EA national Env.Mgt		Medium On-going
	<b>WQ3</b> Training in pollution prevention & control for farm advisors.	EA Env.Mgt	FWAG, CFL, ERT, RDS	Medium
EA routine chemical and biological water quality monitoring programme.	<i>Limited risk –watching brief by EA.</i>			
EA routine chemical and biological water quality monitoring programme.	<b>WQ4</b> Nutrient budgeting to reduce fertilizer application in targeted sub-catchments. <i>Watching brief by EA.</i>	FWAG	ERT, CFL, EA, RDS, NFU	High

Vision	Management Aims	Current Intensity and Location	Existing Initiatives <sup>1</sup>
<b>Developmental sources</b>			
Watercourse free from contamination from road run-off.	<p>Spillages from road traffic accidents contained and prevented from entering watercourse.</p> <p>Contaminated surface water discharges prevented from entering watercourse.</p>	Potential problem areas include M6 and A66 between Brough and Penrith.	EA and Highways Agency audit of M6 & A66 drains – in progress Implementation of EA guidelines on new road schemes e.g. Temple Sowerby bypass.
Watercourse free from impacts of pollution from discharges from the sewerage system.	<p>All rural sewerage systems (e.g. Septic tanks, packet STWs) functioning efficiently, with no adverse impact on the watercourse.</p> <p>No adverse impact from discharges from STW .</p> <p>Increasing pressure on existing sewerage systems is managed and controlled.</p> <p>Contamination of surface water discharges is minimised.</p>	e.g. Maulds Meaburn and Crosby Ravensworth, affecting Dale Bank Beck and the Lyvennet, Great Salkeld, Cliburn.	EA Simulated Catchment Modelling (SIMCAT) AMP process of prioritised improvements, together with Habitats Regulations led Review of Consents. EA / EN input into the Planning control process. EA promotion of Sustainable Urban Drainage Schemes (SUDs).
No adverse impact from reservoir impoundments, with sufficient, appropriately timed compensation discharges of suitable water quality.	Discharge of compensation flow water must avoid the bottom waters of the reservoir with associated high silt content.	Localised impacts immediately downstream of reservoirs.	EA impoundment, abstraction and discharge consents.

<sup>1</sup> General initiatives to prevent farm pollution: EA Best Practice Guide 2001; EA free-phone number for incident reporting; MAFF Water Code; EA water quality monitoring; programme of EA proactive farms visits and inspections (400 visits across Eden & Solway scheduled over 2003/04.); Farm Assurance; “FWAG Landwise” reports.

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
EA routine chemical and biological water quality monitoring programme.	<b>WQ1</b> Farm visits / grant scheme for promotion of farm infrastructure improvements.	ERT	FWAG, CFL, EA Env. Mgmt. NFU, RDS	Top
	<b>WQ5</b> Promotion of best practice using demonstration farms and seminars.	FWAG	EA, ERT	Top
EA routine chemical and biological water quality monitoring programme.	<b>WQ1</b> Farm visits / grant scheme for promotion of farm infrastructure improvements.	ERT	FWAG, CFL, EA Env. Mgmt. NFU, RDS	Top
	<b>WQ5</b> Promotion of best practice using demonstration farms and seminars.	FWAG	EA, ERT. NFU, RDS	Top
	<b>WQ6</b> Implementation of LIFE project silt sampling strategy, to assess impacts from soil run off, bank erosion, forestry and the aggregates industry.	EN, EA		Medium
	<b>WQ5</b> Promotion of best practice using demonstration farms and seminars.	FWAG	EA, ERT, RDS, NFU	Top
	<i>Limited risk – no further actions proposed.</i>			

Vision	Management Aims	Current Intensity and Location	Existing Initiatives <sup>1</sup>
<i>Agricultural sources</i>			
Watercourse free from contamination from diffuse or concentrated discharges of slurry.	<p>Correct timing, conditions and rates of application limits run-off into watercourse.</p> <p>Awareness of the risks of, and prevention of contamination via percolation over large distances in limestone areas.</p> <p>Ensure all farms have adequate suitable storage capacity to minimise the risk of catastrophic pollution incidents.</p>	Extensive use across the catchment	ADAS (through Farm Link) provide farm waste management advice to premises affected by FMD.
Watercourse free from the impacts of pollution from silage liquor.	Ensure all farms have adequate suitable storage facilities to minimise the risk of pollution incidents.	Extensive use across the catchment	
Watercourse free from the impacts of diffuse pollution from siltation.	Land managed to prevent silt entering the watercourse e.g. from arable land, or localised heavy trampling on bank sides, tracks & at watering points.	Actual intensity unknown, but extensive risks from arable and livestock agriculture across the catchment.	MAFF Guidelines "Soil Code of Good Agricultural Practice" CHASM project EA's Best Practice farm guidelines distributed during farm visits.
Watercourse free from the impacts of pollution from forestry chemicals.	Accidents prevented due to correct handling and storage of chemicals.	Localised use in the establishment of new plantings.	Forestry Commission Guidelines

<sup>1</sup> General initiatives to prevent farm pollution: EA Best Practice Guide 2001; EA free-phone number for incident reporting; MAFF Water Code; EA water quality monitoring; programme of EA proactive farms visits and inspections (400 visits across Eden & Solway scheduled over 2003/04.); Farm Assurance; "FWAG Landwise" reports.

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
	<b>WQ7</b> Use results from road drainage survey to highlight and prioritise discharges requiring remedial works.	EA		Medium
	<b>WQ8</b> Implement a prioritised programme of retrofitting pollution prevention drainage systems to motorway and trunk roads and accident black spots.	EA	Highways Authority, County Highways	Medium
EA routine chemical and biological water quality monitoring programme.	<i>Watching brief</i>	EA	UU, EN, Local Authorities.	
	<b>WQ9</b> Survey to identify the extent of any potentially detrimental discharges of reservoir compensation flow with high silt loading.	REDFA	EA	Low

### 3.3 Water resource management

#### 3.3.1 Overview

- There are many licensed borehole and surface water abstractions in the Eden catchment as well as numerous exempt smaller unlicensed domestic and agricultural abstractions. By far the largest abstractor is United Utilities for domestic and industrial use across the North West.
- In 2003 work will start on an Environment Agency Catchment Abstraction Management strategy (CAMS) for the Eden that will assess all needs, uses and supplies of water in the catchment.
- CAMS will provide a consistent approach in managing water resources throughout England and Wales. The strategies will be reviewed every six years. All new licences will be time-limited and the strategy will act as a tool to review these. CAMS will highlight areas where further abstraction may take place, and areas where current levels of licensed abstraction exceed the water available. Where abstraction is too high it will identify options for correcting the situation.
- The Eden valley has an extensive sandstone aquifer, which is under increasing demand for licensed abstraction as a less expensive alternative to mains supply, particularly to satisfy the needs of agriculture.
- The draft objective given below for the impact of abstractions being less than 10% of the naturalised daily flow is still under discussion, especially with respect to the Review of Consents under the Habitats Regulations 1994.
- Improvement works under United Utilities AMP3 programme have relocated the discharge for an abstraction point's compensation flow on the River Gelt, now rewetting a 500m section of dry bed. This combined with the installation of a new fish pass and channel works by the Agency now facilitates upstream migration of salmonids.
- A series of abstraction from various streams into Haweswater, Wet Sleddale and Swindale reservoirs causes low flows in the Lowther subcatchment. This results in loss of stream habitat, and both reduced flow and weirs prevent access to spawning areas for migrating fish. A series of mitigation measures have been implemented to assist upstream migration including alteration to abstraction structures, fish pass works and controlled water banking and releases.
- The Environment Agency have an input into the planning process to try and ensure that new development is served by an adequate water supply and does not have a detrimental impact on the water environment.

#### 3.3.2 Targets

The draft favourable condition table currently states that:

“Flow regime should be characteristic of the river. As a guideline, the impact of abstractions should be less than 10% of the naturalised daily flow throughout the year. Flow criteria already set for the river (e.g. for passage of salmon) should also be complied with. Springs are characteristic of the limestone streams in the upper Eden, and their flow characteristics should be maintained.”

## 3.3.3 Attribute: Flow

Table of Management Aims:  
**Water Resource Management.**

Vision	Management Aims	Current Intensity and Location	Existing Initiatives
Sufficient surface and ground waters to maintain the integrity of the river and associated features.	<p>Maintain baseline river flows at a level to protect site integrity and associated features.</p> <p>Sufficient flows to ensure dilution of contaminating discharges.</p> <p>Sufficient flows to maintain high dissolved oxygen levels and cool water temperatures.</p> <p>Sufficient water depth in pools and over spawning and nursery areas.</p>	<p>Numerous groundwater abstractions across the catchment.</p> <p>Surface water abstractions from the Eden, Gelt, Lowther and Ullswater systems.</p>	<p>EA in on-going negotiations with UU.</p> <p>EA Catchment Abstraction Management Scheme starting April 2003 to March 2005.</p> <p>Habitats Directive led Review of Consents.</p> <p>EA input to planning control process</p>
The integrity of the upper catchment is unaffected by abstractions feeding into reservoirs and water supply systems.	<p>Maintain a varied flow regime with appropriate timing of peak spate flows.</p> <p>Ensure no loss of headwater spawning habitat available for salmonids.</p> <p>Ensure access is made available over barriers to salmonid migration that were previously impassable due to abstractions and low flows.</p> <p>Compensation discharge from reservoirs managed to avoid reduction in water quality, or discharges of silt.</p>	Headwater abstraction from Lowther subcatchment into Haweswater reservoir.	Mitigation salmon stocking on Lowther system.

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
Strategic EA water resources monitoring programme.	<b>WR1</b> Active involvement in CAMS stakeholder group.	EA	REDFA, ERT, EN, UU	Medium
Routine EA Fisheries survey and ERT survey will help highlight areas of concern.	<b>WR2</b> Investigate possibility of remedial works where low flows are restricting fish movement over barriers.	REDFA	ERT, EA, EN	Medium
	<b>WQ6</b> Implementation of LIFE project silt sampling strategy, to assess impacts from soil run off, bank erosion, forestry and the aggregates industry.	EA, EN		Medium

## **3.4 Flood defence and river channel management**

### **3.4.1 Overview**

- Throughout the catchment, flood defence systems have been constructed to minimise flood risk to land and property, many of which are maintained and operated by the Environment Agency.
- At various locations, in-river flow-measuring structures provide information for the Environment Agency's flood warning service.
- In some locations, river maintenance such as weed cutting and tree maintenance are undertaken to reduce flood risk.
- Localised small-scale gravel extraction is carried out by landowners, controlled by Environment Agency Land Drainage Consent.
- Hard engineering bank erosion control techniques can be found in localised areas across the whole catchment.
- There is increasing use of soft engineering to control bank erosion, which reduces the environmental impact and can improve habitats for other species, but needs commitment to long-term management.
- Wetland flood plain storage areas have been reduced by drainage.

### **3.4.2 Targets**

The targets listed in the draft Favourable Condition Table can be summarised as “maintain, and where necessary restore” the different habitat elements identified for each interest feature.

## 3.4.3 Attribute:- Habitat structure

**Management aims: Flood defence and river channel management**

Vision	Management Aims	Current Intensity and Location	Existing Initiatives
Gravel extraction from river shoals to be at a managed and sustainable level.	Ensure that any extraction is not disruptive to natural fluvial processes, is carefully managed to limit any impact on wildlife, and is carried out at a sustainable frequency.	Limited localised extraction by landowners.	EA Land Drainage Consent.
Floodplain wetlands and woodlands restored and reinstated as an integral component of the river, connected to the river channel.	Ensure that wetlands can act as a nutrient sink; and provide capacity for water retention and storage.		CSS Restoring Water Meadows option. CSS Wetting up option. Riparian fencing schemes.
Unrestricted river channel movement across the floodplain wherever possible, with minimal use of river erosion control.	Allow fluvial processes to shape the form and direction of the river channel, with associated range of geomorphological features and related habitats.		EA fluvial audit and RHS of Goldrill Beck catchment.

\* **Sub-catchments:** 1. Scandal, Hoff and Helm Becks. 2. Rivers Leith and Lyvennet. 3. Rivers Lowther and Eamont 4. Ullswater and tributaries. 5. River Caldew. 6. River Belah, Hilton, Trout and Swindale (Mill) Becks. 7. Crowdundle, Milburn & Briggles Becks. 8. River Kingwater, Irthing & Gelt. 9. Upper Eden – Hell Gill to Kirkby Stephen (Stenkrith Falls). 10. Upper Eden - Kirkby Stephen to Temple Sowerby (A66 Eden Bridge). 11. Mid Eden - Temple Sowerby to Kirkoswald (Raven Beck). 12. Lower Eden – Kirkoswald to Wetheral. 13. Lower Eden – Wetheral to Rockcliffe.

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
Top 6 priority sub-catchments* for fluvial audit:- 6 & 10 – severe erosion 8 – dynamic channel of high conservation value 1 – highly mobile channels 3 – cessation of gravel clearance has led to concerns over flooding 12 – localised gravel extraction by landowners.	<b>FD1</b> A prioritised series of sub-catchment fluvial audits	EN, EA	ERT	Medium
Previous EN, EA, RSPB funded study: Northern England Wetland Restoration Project.	<b>FD2</b> Catchment-wide desk study to identify historic intermediate-scale wetlands suitable for restoration; and to identify existing initiatives in progress.	ERT		Medium
(See prioritised list above)	<b>FD1</b> A prioritised series of sub-catchment fluvial audits	EN, EA	ERT	Medium

Vision	Management Aims	Current Intensity and Location	Existing Initiatives
<p>Where engineered erosion control is unavoidable:</p> <p>1) Minimal use of “hard” engineering techniques.</p> <p>2) Preferential use of “soft” engineering techniques.</p>	<p>Ensure any works do not disrupt any existing fluvial patterns and processes.</p> <p>Minimise any loss of bank side or adjacent wetland habitat.</p> <p>Ensure any works are supported by a commitment to long-term maintenance.</p>	<p>Catchment-wide</p>	<p>New structures controlled by EA Land Drainage Consent</p> <p>Bank fencing &amp; planting schemes under ESA or CSS.</p>
<p>New and historic bridges and culvert structures managed and maintained to have minimal impact on the integrity of the river.</p>	<p>Ensure any new works are designed to minimise impact, and provide ecological benefits wherever possible.</p> <p>Historic structures need to be maintained to avoid disruption to river flow patterns and resultant localised bank erosion.</p>	<p>Catchment-wide</p>	<p>New structures controlled by EA Land Drainage Consent</p> <p>EA policy of presumption against culverting.</p> <p>Bridge repair works require EA Land Drainage Consent.</p>

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
(See prioritised list above)	<b>FD1</b> A prioritised series of sub-catchment fluvial audits	EN, EA	ERT	Medium
	<b>FD3</b> Proactive survey of historic bridge structures to identify where / what remedial works are required.	REDFA	County archaeologist, County Council.	Low

## 3.5 Land management in the river corridor and wider catchment

### 3.5.1 Overview

- Land use in the Eden catchment is predominantly agricultural, with sheep, beef and dairy cattle and some arable.
- There is a limited amount of commercial plantation forestry, managed by the Forestry Commission, which is concentrated around the River Irthing sub-catchment.
- There is a significant amount of mixed amenity woodland planting across the catchment, established for a variety of reasons – for example, to provide shooting, for landscaping, to stabilise riverbanks, as provision for wildlife, and for general amenity.
- Land use and management can have a direct impact on many aspects of the river environment, affecting water quality (detailed previously), flow, habitat integrity, bank stability, and the geomorphological river processes of erosion and deposition – for example, influencing the rate of surface water runoff, affecting soil erosion and stream silt loading, and increasing organic loading.
- Landowners and land managers must be responsible for minimising any detrimental impact from their activities, and a range of best-practice guidelines, grant schemes and sources of advice are available from EN, EA and DEFRA to support them.
- The main centres of population are at Carlisle, Penrith, Appleby and Kirkby Stephen; and there are numerous rural villages, hamlets and farms.
- There are a number of underground mining and surface extraction quarrying sites, for sand and gravel, limestone, and minerals.
- There are numbers of licensed landfill sites across the Eden catchment.

### 3.5.2 Targets

In the draft Favourable Condition Table the common targets river substrate for river habitat and selected species state that river channels should be dominated by clean gravels. Of all the interest features on the Eden, salmon have the strictest target for silt levels, and as they are found throughout the area, their target of <10% silt in the top 10 cm of mid-channel gravels applies across the catchment.

The target for habitat structure is to maintain, or where necessary restore, the specified habitats for the different species.

## 3.5.3 Attributes: Habitat structure; River substrate

**Management aims: Land management in the river corridor and wider catchment**

Vision	Management Aims	Current Intensity and Location	Existing Initiatives
Arable and set-aside crops managed to prevent impact on the river.	Ploughed fields managed to prevent silt runoff into the watercourse.	Most arable land is found in the mid and lower reaches, below Appleby d/s towards Carlisle.	CSS arable buffer strip option. EA Best-practice guidelines. ESA in qualifying areas.
Forestry operations managed to prevent impact on the river.	Timber production managed to prevent silt runoff into the watercourse.	Wark Forest at head of R. Irthing.	Forestry Commission Forest and Water Guidelines.
Bank stability and integrity maintained with dense semi-natural riparian vegetation.	<p>Ungrazed, or non-intensively grazed riverbanks allowing the development of dense and diverse vegetation growth.</p> <p>Amenity woodland established along riverbanks and on the floodplain to stabilise the river channel.</p>	Catchment-wide.	Riverbank fencing schemes: WES, CSS, ERT, ESA. Schemes to control stocking levels: WES, CSS, ESA.
Moderated gradual release of rainfall from land to watercourse with minimal associated silt runoff.	<p>Reduced intensity of livestock grazing on pastures, moors and commons to minimise soil compaction and allow denser vegetation to improve water retention.</p> <p>Encourage water retention on riverside lowland wet pasture by redirecting or removing field drains.</p> <p>Reverse the previous practice of moorland gripping, to encourage water retention on the uplands, and limit silt discharge into watercourses. Minimise silt input from localised heavy trampling – e.g. on tracks and around watering points.</p>	Catchment-wide.	<p>Control of stocking level schemes: WES, CSS, ESA.</p> <p>CSS Grip blocking option.</p> <p>EA Best Practice Guide 2001</p>

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
No current programme of silt monitoring.	<b>WQ6</b> Implementation of Life in UK Rivers silt sampling strategy, to assess impacts from soil run off, bank erosion, forestry and the aggregates industry.	EN, EA		Medium
No current programme of silt monitoring.	<b>WQ6</b> Implementation of Life in UK Rivers silt sampling strategy, to assess impacts from soil run off, bank erosion, forestry and the aggregates industry.	EN, EA		Medium
A similar scheme has been proposed for the River Petteril, which could be used as a model to be applied to other sub-catchments.	<b>LMI</b> Funding scheme to promote riverbank fencing and/or tree planting where existing schemes are inadequate or cannot apply.	ERT	EA, EN, FWAG, CLA, NFU, RDS, CFL, ECCP	Top
Strategic planning of programme of erosion control will follow on from fluvial geomorphological surveys.	<b>LMI</b> Funding scheme to promote riverbank fencing and/or tree planting where existing schemes are inadequate or cannot apply.	ERT	EA, EN, FWAG, CLA, NFU, RDS, CFL, ECCP	Top
	<b>LM2</b> Revise agri-environment schemes to address upland overgrazing and gripping, and to facilitate a reduction in grazing pressure; the provision of bank side wildlife corridors extended corridors.	EN	FWAG, RSPB, RDS, NFU, ERT	Top
	<b>LM3</b> Project to identify and block/fill key areas of historic gripping on uplands and lowland mires.	ERT, EN Moorland Restoration Project.	NFU, CLA, Moorland Association	High
	<b>WQ6</b> Implementation of Life in UK Rivers silt sampling strategy, to assess impacts from soil run off, bank erosion, forestry and the aggregates industry.	EN, EA		Medium

Vision	Management Aims	Current Intensity and Location	Existing Initiatives
<p>Riparian trees, riverside woodland and fluvial floodplain woodland (actively managed where appropriate) in self-sustaining stands of diverse age structure with related under storey vegetation.</p>	<p>Active management of existing tree canopy where required to maintain diversity of age structure; and to prevent over shading of watercourse.</p> <p>Natural woodland regeneration not impeded by livestock grazing.</p> <p>Re-establishment of wet floodplain woodland in riverside pastures.</p> <p>Control of aggressive alien bank side plant species (e.g. Himalayan Balsam) that can over-run native plant communities.</p>	<p>Not fully known</p> <p>Catchment wide.</p>	<p>Forestry Commission WGS. CSS Upland Ghyll Woodland option.</p> <p>CSS tree management and tree planting capital grants. ESA, ERT&amp; WES planting schemes.</p> <p>EA responsible for giant hogweed control.</p> <p>EA booklet <i>Guidance for the control of invasive plants near watercourses</i>.</p>
<p>Quarrying managed to avoid any detrimental impact to the river.</p>	<p>All suspended solids removed from quarry water prior to discharge into watercourse.</p>	<p>Several mineral extraction sites across the catchment.</p>	<p>Environment Agency Discharge Consents.</p> <p>Review of Consents.</p> <p>Life in UK Rivers silt monitoring strategy.</p>

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
Basic outline woodland information available from EN SSSI boundary determination and monitoring; EA RCS; and RHS surveys.  An ongoing process of raising awareness.	<b>LM4</b> Survey to identify areas of bank side tree cover requiring management; and areas of invasive weed cover requiring control.	ECCP	ERT, REDFA, EA, EN, FTA.	High
	<b>LM1</b> Funding scheme to promote riverbank fencing and/or tree planting where existing schemes are inadequate or cannot apply..	ECCP		Top
	<b>LM5</b> Survey of fluvial floodplain woodland of Irthing sub- catchment.	EN	FTA	Low
	<b>LM6</b> Promotion of Himalayan balsam control by angling clubs.	REDFA	EA, EN, ERT	High
	<b>LM7</b> Inclusion of weed control as a CSS or ESA option & WES payment.	EN, RDS	landowners	Top
	<b>LM8</b> Local control of invasive alien plant species.	All riparian owners.	EA, NFU, FTA	High
	<b>LM9</b> Use local media to increase local awareness of alien plant species, and encourage their control.	EN, EA	NFU, CLA, RDS	Medium ongoing
	<b>WQ6</b> Implementation of Life in UK Rivers silt sampling strategy, to assess impacts from soil run off, bank erosion, forestry and the aggregates industry.	EN, EA		Medium

### **3.6 Fisheries management, recreation and amenity**

#### **3.6.1 Overview**

- The River Eden supports an important salmon and sea trout fishery, is one of the finest brown trout fisheries in the North of England, and is also fished for dace, chub and grayling.
- Salmon stocking on the Eden is now only carried out for mitigation, restoration, science and emergency work. All stocked salmon fry are reared from local broodstock to maintain the genetic integrity of the population.
- A current ERT project is underway to rear brown trout from local broodstock, for enhancement stocking of local fly fisheries. This will help preserve local genetic integrity, and limit the risks of introduction of disease into the catchment.
- Native crayfish are found over much of the catchment, with no records of the non-native signal crayfish, and no recorded instances of crayfish plague. To maintain this status the whole catchment is designated as a 'no-go' area for holding alien crayfish species.
- Canoeing on the river is limited to reaches with formal access arrangements, involving agreements between landowners and canoeing interests such as the BCU. Ullswater is open to canoeing.
- The river is also a popular focus for general quiet recreation and short and medium-distance walks.

#### **3.6.2 Targets**

Under the Freshwater Fisheries Directive, 926 km of the Eden catchment is designated as salmonid waters, meaning that the water quality in those reaches should be suitable for supporting salmonid fisheries.

## 3.6.3 Attributes: Access and biological disturbance

**Management aims: Fisheries management, recreation and amenity**

Vision	Management Aims	Current Intensity and Location	Existing Initiatives
All native species contributing to a balanced predator/prey food web.	Eliminate mink as a non-native predator that has a detrimental impact on fish stocks and crayfish.	Catchment wide  Impact from avian predation is most significant on stillwater fisheries.	Some degree of control by gamekeepers in lower catchment.  Leaflet: <i>Otter predation: Is Your Fishery at Risk?</i> .
Catchment maintained as a clear zone free from non-native crayfish and crayfish plague.	Prevent introduction of non-native crayfish and crayfish plague.	(See Section 2.2.4 for summary of crayfish distribution.)	EA/EN raising awareness of risk posed by fish stocking, controlled via Section 30 fish-stocking applications. Establishment of 'no-go' areas for non-native crayfish farms.
Unrestricted fish passage over artificial barriers up and downstream.  Recognition of the importance of natural barriers in restricting fish movement.	Provision of access over artificial barriers limiting the movement of salmon and sea and river lamprey	Locations identified in Salmon Action Plan.  Incomplete existing information.	Major barriers identified by EA Salmon Action Plan, bid for improvement works submitted to Cumbria RAZ. Life in UK Rivers Eden lamprey survey undertaken in 2002.
Plentiful supply of invertebrate insect life as prey for fish population.	Ascertain reasons for the perceived reduction in fly life – possible factors include poor water quality or climate change.		EA routine macroinvertebrate monitoring.
A healthy self-sustaining salmon population maintained with sufficient adult salmon returning to spawn to each year.	Determine the reasons for low numbers of returning adults, (which may reflect environmental changes out at sea).	Catchment-wide	Current salmon conservation limit used to calculate the success of salmon in the Eden is misleading.

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
Mink population is not currently monitored.	<b>FM1</b> Assisted programme of mink elimination across upper catchment.	EN	Riparian owners, fishing clubs	High
	<b>FM2</b> Survey to investigate impact of predation by piscivorous birds on salmonids.	REDFA to draft project specification		Low
	<b>FM3</b> Continued crayfish plague awareness campaign to angling & canoeing clubs.	EN, EA	REDFA, BCU	High
	<b>FM4</b> Disinfection or thorough drying of angling equipment prior to fishing on catchments carrying crayfish.	All anglers and canoeists.		Medium
Barriers to be identified during routine work at low flow conditions.	<b>FM5</b> Survey to identify minor barriers to salmonid migration and prioritise for remedial works.	EA	EN, REDFA	Medium & On-going
	<b>FM6</b> Use results from lamprey surveys to determine significance of any existing potential barriers to lamprey migration.	EA	EN	Low
	<b>FM7</b> Eden Fly life Survey to determine any historic changes in fly life.	ERT, EA		Low & On-going
	<b>FM8</b> Revise the River Eden salmon conservation limit.	EA	EN, ERT, REDFA	Medium

Vision	Management Aims	Current Intensity and Location	Existing Initiatives
Salmonid populations present at maximum sustainable carrying capacity across the catchment.	Secure a managed policy of fish stocking to avoid any potential detrimental impact on existing populations of indigenous fish.  Trout stocking		EA national policy on fish stocking. EN draft national policy on fish stocking. EN guidance paper re impact of stocking on resident SAC fish populations is in preparation. EA proposal for research under Habitats Directive All parties agree that trout stocking should be with native stock; and use of triploids is inappropriate.
A catchment-wide comprehensive set of salmon population data available as a basis for management decisions.	A co-ordinated shared pool of all sources of data relevant to salmonid fisheries management.	Catchment-wide	EA rolling programme ERT electric-fishing monitoring programme.
Canoeing and fishery interests co-existing across the catchment.	Management of canoeing activity to limit the potential for damage to salmonid redds.	River Eamont. River Eden from Lazonby to Armathwaite.	ERT campaign working with canoeists on the River Eamont. BCU access agreement with Lazonby Estate
Otter populations able to disperse freely across the whole catchment.	Network of undisturbed watercourses, banks and associated terrestrial strip retained on new developments.  Any 'black spots' for otter road deaths identified and suitable remedial works installed.	Catchment wide	EA and EN input into the planning process. Land drainage consents.

Comments / Current Monitoring	Proposed Actions	Organisational Involvement		Priority
		Lead	Other Partners	
	<b>FM9</b> Stocking policy for the Eden Catchment to be agreed between all parties.	EA	EN, REDFA, ERT	Medium
Initial campaign to focus on R. Eamont.	<b>FM10</b> Liaison and general awareness campaign with canoeists regarding risks of habitat disturbance.	ERT	BCU, REDFA, EA	Low
	<b>FM11</b> Completion of planned otter fencing project at Wetheral STW.	CWT		Low

## 4. Summary of actions

Actions	Organisational involvement	
	Lead	Others
<i>Water Quality</i>		
<b>WQ1.</b> Farm visits/grant scheme for promotion of farm infrastructure improvements.	ERT	CFL, FWAG, EA, NFU, RDS.
<b>WQ2.</b> Investigate advantages and risks of a trial subsidised sheep dip neutraliser scheme, and implement if suitable.	EA	
<b>WQ3.</b> Training in pollution prevention & control for farm advisors.	EA	FWAG, CFL, ERT, RDS. CFL, ERT, EA, RDS, NFU.
<b>WQ4.</b> Nutrient budgeting to reduce fertilizer application.	FWAG	EA, ERT, RDS.
<b>WQ5.</b> Promotion of best-practice using demonstration farms and best practice seminars.	FWAG	
<b>WQ6.</b> Implementation of Life in UK Rivers silt sampling strategy, assessing impacts from soil runoff, bank erosion, forestry and the aggregates industry.	EA, EN	
<b>WQ7.</b> Use results from road drainage survey to highlight and prioritise discharges requiring remedial works.	EA	
<b>WQ8.</b> Implement a prioritised programme of retrofitting pollution prevention drainage systems to motorway and trunk roads and accident black spots.	EA	
<b>WQ9.</b> Survey to identify the extent of any potentially detrimental discharges of reservoir compensation flow with high silt loading.	REDFA	HA, County Highways
<i>Water Resources</i>		
<b>WR1.</b> Active involvement in CAMS stakeholder group.	EA	All
<b>WR2.</b> Investigate possibility of remedial works where low flows are restricting fish movement over barriers.	REDFA	EA, EN, ERT.

Actions	Organisational involvement	
	Lead	Others
<i>Flood defence and river channel management</i>		
<b>FD1.</b> A prioritised series of sub-catchment fluvial audits.	EN, EA	ERT
<b>FD2.</b> Catchment-wide desk study to identify historic intermediate-scale wetlands suitable for restoration.	ERT	
<b>FD3.</b> Proactive survey of historic bridge structures to identify where / what remedial works are required.	REDFA	County archaeologist County Council
<i>Land management in the river corridor and wider catchment</i>		
<b>LM1.</b> Funding scheme to promote riverbank fencing and /or tree planting and management where existing schemes are inadequate or cannot apply.	ERT	EN, EA, ECCP, CLA FWAG, NFU, RDS.
<b>LM2.</b> Revise agri-environment schemes to address issue of upland overgrazing and gripping, and to facilitate a reduction in grazing pressure; the provision of bank side wildlife corridors and extended corridors.	EN	RDS, FWAG, RSPB, NFU, ERT, RDS.
<b>LM3.</b> Project to identify key areas of historic gripping on uplands and lowland mires.	ERT, EN	NFU, CLA, Moorland Association
<b>LM4.</b> Survey to identify areas of bank side tree cover requiring management; and areas of invasive weed requiring control.	ECCP	ERT, REDFA, EA, EN, FTA.
<b>LM5.</b> Survey of fluvial floodplain woodland of Irthing sub-catchment.	EN	FTA
<b>LM6.</b> Promotion of Himalayan balsam control by angling clubs.	REDFA	EA, EN, ERT.
<b>LM7.</b> Inclusion of weed control as a CSS option & WES payment.	EN	RDS, landowners
<b>LM8.</b> Local control of riparian invasive alien plant species.	All riparian owners	EA, NFU, FTA.
<b>LM9.</b> Use local media to increase local awareness of alien plant species, and encourage their control.	EN, EA	NFU, RDS, CLA.

Actions	Organisational involvement	
	Lead	Others
<i>Fisheries management, recreation and amenity</i>		
<b>FM1.</b> Assisted programme of mink elimination across whole catchment.	EN	Riparian owners, EA
<b>FM2.</b> Survey to investigate impact of predation by piscivorous birds on SAC spp.	REDFA	Fishing clubs.
<b>FM3.</b> Continued crayfish plague awareness campaign to angling & canoeing clubs.	EN, EA	REDFA, BCU.
<b>FM4.</b> Disinfection or thorough drying of angling equipment prior to fishing on catchments carrying native crayfish.	All anglers & canoeists.	
<b>FM5.</b> Survey to identify minor barriers to salmonid migration and prioritise for remedial works.	EA	
<b>FM6.</b> Use results from lamprey surveys to determine significance of any existing potential barriers to lamprey migration.	EA	
<b>FM7.</b> Eden fly life survey to determine any historic changes in fly life.	EA, ERT	EN, ERT, REDFA
<b>FM8.</b> Revise the River Eden Salmon Conservation Limit.	EA	
<b>FM9.</b> Stocking policy for the Eden catchment to be agreed between all parties.	All	
<b>FM10.</b> Liaison and general awareness campaign with canoeists regarding risks of habitat disturbance.	ERT	(On hold pending SCL review)
<b>FM11.</b> Completion of planned otter fencing project at Wetheral STW.	CWT	BCU, REDFA, EA.

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## Appendix I: Conservation objectives and favourable condition tables

### AI. Conservation objectives for the interest features on the cSAC/SSSI

The conservation objectives for the European interests on the cSAC/SSSI are:

To maintain\*, in favourable condition, the river as a habitat for:

- Floating formations of water crowfoot (*Ranunculus*) of plain and sub-mountainous rivers;
- Populations of Atlantic salmon (*Salmo salar*) and bullhead (*Cottus gobio*);
- Populations of brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*);
- Populations of white-clawed crayfish (*Austropotamobius pallipes*);

and the river and adjoining land as habitat for:

- Populations of otter (*Lutra lutra*);

and to maintain\* the following features in favourable condition:

- Residual alluvial woodland;
- Oligotrophic to mesotrophic standing waters of plains to sub-alpine levels.

\* *maintenance implies restoration, if the feature is not currently in favourable condition.*

The conservation objectives for the River Eden cSAC are the reasons for which the SAC was classified/designated.

#### SSSIs within the River Eden cSAC:

##### River Eden & Tributaries SSSI

The River Eden candidate SAC covers 410 km and, along with the main channel, includes 12 tributary systems. The features of interest are not evenly spread across the site. In addition, the main channel and the tributary systems differ in their natural characteristics, for example, flow regime, aquatic and marginal flora and substrate types. Further fine-tuning of the objectives may be required to take account of this variation.

## **A2. Favourable condition tables**

The favourable condition tables will be used by relevant authorities to determine if a site is in favourable condition. Favourable condition is achieved when the targets given below are met.

The favourable condition tables should inform the scope and nature of any 'appropriate assessment' under the Habitats Regulations, but an 'appropriate assessment' will also require consideration of issues specific to the individual plan or project. The table by itself does not provide a comprehensive basis on which to assess plans and projects as required under Regulations 20–21, 24, 48–50 and 54–85. The scope and content of an 'appropriate assessment' will depend upon the location, size and significance of the proposed project. English Nature will advise on a case-by-case basis.

Following an appropriate assessment, competent authorities are required to ascertain the effect on the integrity of the site. The integrity of the site is defined as the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified. The determination of favourable condition is separate from the judgement of effect upon integrity. For example, there may be a time-lag between a plan or project being initiated and a consequent adverse effect upon integrity becoming manifest in the condition assessment. In such cases, a plan or project may have an adverse effect upon integrity even though the site remains in favourable condition.

**Common targets for river habitat and selected species (there are separate tables for the features residual alluvial forest and oligo-mesotrophic lakes)**

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Floating formations of water crowfoot ( <i>Ranunculus</i> ) Atlantic salmon bullhead sea/river/brook lamprey white-clawed crayfish Otter Residual alluvial forests Oligo-mesotrophic lakes	Flow	Limits on licensed abstractions after modelling impacts. Audit every 6 years, if possible via CAMS.	Flow regime should be characteristic of the river. As a guideline, the impact (at any point in the SAC) of abstractions should be less than 10% of the naturalised daily mean flow throughout the year.  Flow criteria already laid down for the river (e.g. for passage of migrating salmon) should also be complied with.	River flow affects a range of habitat factors of critical importance to designated interest features, including current velocity, water depth, wetted area, substrate quality, dissolved oxygen levels and water temperature. The maintenance of both flushing flows and baseflows, based on natural hydrological processes, is vital. Detailed investigations of habitat-flow relationships may indicate that a more or less stringent threshold may be appropriate for a specified reach. However, a precautionary approach would need to be taken to the use of less stringent values. Naturalised flow is defined as the flow in the absence of abstractions and discharges. The availability and reliability of data is patchy – long-term gauged data can be used until adequate naturalised data become available, although the impact of abstractions on historical flow records should be considered. There is no current modelling of naturalised flow regimes on the River Eden. This needs further work. Springs are characteristic of the limestone streams in the upper Eden. Their flow characteristics should be maintained.
	Floating formations of water crowfoot ( <i>Ranunculus</i> ) Atlantic salmon bullhead sea/river/brook lamprey white-clawed crayfish Otter Residual alluvial forests Oligo-mesotrophic lakes	Water quality	Biological class – Environment Agency’s General Quality Assessment scheme. Assess every 5 years.  River Ecosystem class. Assess against Environment Agency monitoring results.  Suspended solids (annual average). Assessment methods to be agreed with Environment Agency.	For the River Eden cSAC the general target will be Class A.  In addition, no drop in class from existing situation.	Generally, water quality should not be injurious to any life stage. A wide range of water quality parameters can affect the status of interest features, but standard biological monitoring techniques provide a reasonable integrated picture in relation to many parameters. The biological module of the Environment Agency’s General Quality Assessment scheme is based on assessment of the macroinvertebrate community. All classified reaches within the site that should contain the interest feature under conditions of high environmental quality should comply with the targets given.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Floating formations of water crowfoot ( <i>Ranunculus</i> ) Atlantic salmon bullhead sea/river/brook lamprey white-clawed crayfish Otter Residual alluvial forests Oligo-mesotrophic lakes.	Water quality	River Ecosystem class. Assess against Environment Agency monitoring results.  Suspended solids (annual average). Assessment methods to be agreed with Environment Agency.	For the River Eden cSAC the general target will be Class RE1  In addition, no drop in class from existing situation  Since salmon are found throughout the site, the general target for this attribute is $\leq 10 \text{ mg l}^{-1}$ (see notes).	The River Ecosystem Classification 1995 sets standards for dissolved oxygen, biochemical oxygen demand, total and un-ionised ammonia, pH, copper and zinc. It therefore covers a number of water quality parameters that can cause problems within river systems. All classified reaches within the site that should contain the interest feature under conditions of high environmental quality should comply with the targets given.  Elevated levels of suspended solids can clog the respiratory structures of the listed species, with salmon being the most susceptible. Suspended solids measurements are also essential to the estimation of particulate loads within the river network (in combination with gauged flow data), which provides an indication of the risk of siltation problems. The target of $25 \text{ mg l}^{-1}$ is based on the Freshwater Fish Directive. A more precautionary figure has been used for salmon ( $\leq 10 \text{ mg l}^{-1}$ ) to help protect substrates used for salmon spawning.
River	Floating formations of water crowfoot ( <i>Ranunculus</i> ) Atlantic salmon bullhead sea/river/brook lamprey white-clawed crayfish Otter Residual alluvial forests Oligo-mesotrophic lakes.	Water quality	Soluble reactive phosphorus (annual mean)  (Total reactive phosphorus as measured by the Environment Agency is acceptable)	$0.02 \text{ mg l}^{-1}$ - upland watercourses $0.06 \text{ mg l}^{-1}$ mid-altitude watercourses on hard substrates. Lowland, small and medium-sized watercourses on limestone and sandstone.  See notes.	Elevated phosphorus levels interfere with competitive interactions between different higher plant species and between higher plants and algae, leading to the loss of characteristic higher plants and large diurnal sags in dissolved oxygen levels. <i>Ranunculus</i> habitat is extremely vulnerable.  The respiration of artificially large growths of benthic algae may generate poor substrate conditions for species such as the lampreys (in the larval stage).  Further work is required to define which parts of the site will fall into which of the two categories. The upper River Eamont, River Lowther system and the River Caldew will have targets closer to the $0.02 \text{ mg l}^{-1}$ .

Operational feature	Criteria features	Attribute	Measure	Target	Comments
River	Floating formations of water crowfoot ( <i>Ranunculus</i> ) Atlantic salmon Bullhead Sea/river/brook lamprey White-clawed crayfish Otter Residual alluvial forests Oligo-mesotrophic lakes	River substrate	Silt content (Optimal form of measurement to be decided in consultation with the Environment Agency.)	Channels should be dominated by clean gravels.  Maximum silt content: <i>Ranunculus</i> beds – <20% in top 10 cm of mid-channel gravels; salmon and lamprey spawning areas, <10% in top 30cm of spawning substrates. Since salmon are found throughout the areas where lamprey, bullhead and crayfish are found, <10% will be the general target.	Siltation of riverine sediments, caused by high particulate loads and/or reduced scour within the channel, is a major threat to interest features. Elevated silt levels can interfere with the establishment of <i>Ranunculus</i> spp., and with egg and fry survival in salmon, lamprey and bullhead.  The requirements of species vary depending upon use of the substrate. Some relate to the level of aeration within the substrate and some to the ability of the substrate to physically catch eggs or plant fragments in surface interstices. The target for salmon has been used for lamprey species in the absence of species-specific information (although it is recognised that lamprey utilise only the top few centimetres for spawning).  Where there are upwelling springs within the riverbed, the target for salmon can be revised upwards, due to increased substrate aeration.  Sources of silt include runoff from arable land and land trampled by livestock, sewage and industrial discharges.

## **A2.1 Extra targets for floating *Ranunculus* communities**

This habitat is found on the main channel of the River Eden, the River Eamont, River Caldew and on many of the smaller streams, particularly those draining off the limestone and Pennines. The most extensive areas are found on the River Eamont and on the River Eden downstream from Appleby. However, the smaller limestone streams also have outstanding examples of this habitat.

On the River Eden this community comprises *Ranunculus penicillatus* subsp *penicillatus*, *R. fluitans* and, on some of the headwaters, *R. aquatilis*. Associated species include *Myriophyllum spicatum* and/or *M. alterniflorum*, *Sparganium emersum* and pondweeds (*Potamogeton* spp). Some of the limestone headwaters also have beds of *Groenlandia densa*. Patches of the mosses *Cinclodotus fontinaloides*, *Fontinalis antipyretica*, *Rhynchostegium riparoides* and the red alga *Hildenbrandia rivularis squamosa* often occur on submerged stones. The following species often occur along the river margins: *Phalaris arundinacea*, *Sparganium erectum*, *Mentha aquatica*, *Myosotis scorpioides*, *Butomus umbellatus* and *Caltha palustris*.

At present there are no mapped data on the extent of this habitat on the River Eden or on the dynamics of individual stands and their associated species. The objective for habitat extent is therefore necessarily vague.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Floating formations of water crowfoot ( <i>Ranunculus</i> )	Extent and composition	Mapping of representative sample stretches (to be identified) in June or July every 3 years.	<p>Presence of characteristic aquatic and marginal plant species; absence of indicators of unfavourable condition.</p> <p>No net loss of the habitat within each river stretch.</p>	<p>See above.</p> <p>In-channel vegetation of the river should be dominated by this community. The absence of <i>Ranunculus</i> and presence of blanketweed and other algae, or dominance of <i>Potamogeton pectinatus</i> are signs of unfavourable condition.</p>
River	<i>Ranunculus</i>	Reproduction	Mapping of flowering <i>Ranunculus</i> in sample stretches (to be identified) every 3 years. Annual observations in June/July. Audit of consents every 3 years (Environment Agency and English Nature).	<i>Ranunculus</i> should be able to flower and set seed, in suitable habitat. No net loss of flowering <i>Ranunculus</i> .	Flowering later than mid-July and weed cutting or other activities that do not leave patches (at least 25% in every 100 metres of river) to flower and set seed are indicators of unfavourable condition. Use of herbicides should be avoided.
River	<i>Ranunculus</i>	River form	Measure channel profile as baseline by RHS and identify stretches for restoration. Audit progress with restoration every 6 years.	Channels should be generally characteristic of river type and appropriate to naturalised flow conditions.	Widening or deepening of channels, and extensive artificial reinforcement of banks, are indicators of unfavourable condition. Headwater sections are particularly vulnerable to reprofiling. Restoration of degraded channels to a more characteristic state should be undertaken, where practical, within a strategic framework and using techniques that work with nature. This may include removal of man-made structures within rivers, after individual assessment.
River	<i>Ranunculus</i>	Flow		See common targets	
River	<i>Ranunculus</i>	Water quality		See common targets	
River	<i>Ranunculus</i>	River substrate		See common targets	

## **A 2.2 Extra targets for Atlantic salmon (*Salmo salar*)**

Atlantic salmon are found throughout the cSAC. Spawning occurs or has occurred in all 12 of the tributary systems and the main channel downstream to Carlisle. In recent decades, catch returns suggest a major change in run timing on the river, with a shift from pre-June to post-June runs. The reasons for this are unclear. Ongoing research into the movement of salmon within the catchment may inform further development of the objectives for this species.

There has been very little work done on the role of sediment quality for salmon spawning and nursery grounds on the Eden, or on the composition of gravel bed sediments. Therefore, at the moment, the objective for this attribute is necessarily largely based on the generic objective.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Atlantic salmon	Flow		See 'common targets'	.
River	Atlantic salmon	Water quality		See 'common targets'	
River	Atlantic salmon	River substrate		See 'common targets'	.
River	Atlantic salmon	Habitat structure	Area of spawning habitat. <i>(Form of assessment to be decided for measures in this column.)</i>	Maintain and where necessary restore	This habitat is defined as stable coarse substrate without an armoured layer, in the pebble to cobble size range (16–256 mm) but with the majority being <150 mm. Water depth during the spawning and incubation periods should be 15–75cm.
River	Atlantic salmon	Habitat structure	Area of nursery habitat.	Maintain and where necessary restore	Fry habitat is indicated by water of less than 20cm deep and a gravel/pebble/cobble substrate. Parr habitat is indicated by water of 20–40 cm depth and similar substrate.
River	Atlantic salmon	Habitat structure	Number of adult holding areas.	Maintain and where necessary restore	Holding areas are defined as pools of at least 1.5 m depth, with cover from features such as undercut banks, vegetation, submerged objects and surface turbulence.
River	Atlantic salmon	Habitat structure	Area of submerged and marginal plants	Maintain patchy cover and restore where necessary.	Submerged and marginal vegetation is used by juvenile salmon in sandstone and limestone rivers. In some reaches, marginal and overhanging vegetation may be an important food source. Cutting operations should aim to leave at least 50% of the vegetation.
River	Atlantic salmon	Habitat structure	Extent of bankside tree cover with submerged tree root systems	Maintain existing extent and restore where appropriate for the river type.	Overhanging trees provide valuable shade and food sources, while tree root systems provide important cover and flow refuge for juveniles.
River	Atlantic salmon	Habitat structure	River form	Maintain and where necessary restore the characteristic physical form of the river channel and its natural processes.	The characteristic channel morphology provides the diversity of water depths, current velocities and substrate types necessary to fulfil the spawning, juvenile and migratory requirements of the species. The close proximity of different habitats facilitates movement to new preferred habitats with age. Operations that widen, deepen and/or straighten the channel reduce variations in habitat. New operations that would have this impact are not acceptable within the SAC, whilst restoration may be needed in some reaches.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Atlantic salmon	Access	Artificial obstructions (Baseline survey, then check every 6 years).	No artificial barriers significantly impairing adults from reaching existing and historical spawning grounds, and smolts from reaching the sea.	In all river types, artificial barriers should not exceed 3 m in height, less where this is inadequate depth below the obstruction for salmon to leap effectively (in limestone rivers, the height should not exceed 45cm). Appropriate steps should be taken to ensure that migrating smolts are not entrained in off-takes from the river (such as in fish-farm intakes).
River	Atlantic salmon	Biological disturbance	Fish introductions (Check against Environment Agency licences.)	No stocking of salmon, unless agreed by English Nature to be in the best interests of the population.	Genetic differences have been found between Atlantic salmon populations in different catchments, and between different tributaries within a single catchment. These differences may have adaptive significance and, therefore, need to be conserved. Population enhancement by habitat improvement and control of exploitation is the main nature conservation focus; stocking should only be considered as an emergency interim measure, and it is not currently considered to be in the best interests of the SAC.
River	Atlantic salmon	Biological disturbance	Fish introductions (Check against Environment Agency licences.)	No stocking of other species at excessively high densities in salmon spawning and nursery areas.	The presence of artificially high densities of other salmonids creates unacceptably high levels of predatory and competitive pressure on juvenile salmon.
River	Atlantic salmon	Biological disturbance	Fish introductions (Check against Environment Agency licences.)	Effective screening on all fish farm intakes and discharges.	Escapes from fish farms are a form of uncontrolled introduction and should be prevented.
River	Atlantic salmon	Biological disturbance	Exploitation (Application of voluntary agreements and Environment Agency byelaws.)	Steps taken to ensure that exploitation does not interfere significantly with the ability of the river to achieve its Minimum Biological Acceptable Limit.	Where an SAC is not achieving its MBAL 4 years out of 5, river-specific controls on exploitation need to be put in place irrespective of the underlying causes of poor performance. These should consist of a package of measures operating over a period of 10 years, to be implemented as a matter of urgency (preferably within 1 year). The choice of exploitation controls depends on the degree of non-compliance with the MBAL and a range of river-specific considerations. For the River Eden, the three year mean percentage (1997-99) egg deposition rate is only 77% of the calculated egg target. Controls on exploitation should cover migratory passage to the SAC within territorial waters, including estuarine and coastal net fisheries.

### **A2.3 Extra targets for bullhead (*Cottus gobio*)**

Bullhead are found mainly in the smaller headwaters of the River Eden and in the upper part of the main channel. This species is a particular feature of the limestone headwaters in association with white-clawed crayfish. Quantitative data on populations are restricted to abundance classes in the NRA/Environment Agency strategic coarse fish surveys. There are no data on recruitment.

There has been very little work done on the role of sediment quality for bullhead spawning grounds on the Eden, or on the composition and quality of riverbed sediments where bullhead spend much of their lives.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Bullhead	Flow		See 'common targets'	
River	Bullhead	Water quality		See 'common targets'	
River	Bullhead	Substrate		See 'common targets'	
River	Bullhead	Habitat structure	Extent of gravel/pebble-dominated substrate. (Assessment methods in this column to be agreed with Environment Agency.)	Maintain and where necessary restore	Females lay sticky eggs on the underside of stones. Larger stones on a hard substrate, providing clear spaces between the stream bed and the underside of pebbles/cobbles, are therefore important. There should be >5 cm water depth over riffles in the summer.
River	Bullhead	Habitat structure	Extent of slack-water refuges	Maintain and where necessary restore	These provide important refuge against high flow conditions. Suitable refuges include pools, submerged tree root systems and marginal vegetation with >5 cm water depth.
River	Bullhead	Habitat structure	Extent of high canopy tree cover	Maintain existing intermittent cover and where appropriate restore.	The relative importance of shade compared to the provision of woody debris is unclear, but the maintenance of intermittent tree cover in conjunction with retention of woody debris ensures that habitat conditions are suitable.
River	Bullhead	Habitat structure	Extent of submerged higher plants	Maintain patchy cover where appropriate for the river type.	The importance of submerged higher plants to bullhead survival is unclear, but it is likely that where such vegetation occurs it is used by the species for cover against predators. Weed-cutting should be limited to no more than half channel width in a pattern of cutting creating a mosaic of bare substrate and beds of submerged plants.
River	Bullhead	Habitat structure	Extent of woody debris	Should be retained where characteristic of the river type/reach.	Bullheads are particularly associated with woody debris in lowland reaches, where it is likely that it provides an alternative source of cover and spawning substrate.
River	Bullhead	Habitat structure	River form	Maintain and, where necessary, restore the characteristic physical form of the river channel.	The characteristic channel morphology provides the diversity of water depths, current velocities and substrate types necessary to fulfil the spawning, juvenile and migratory requirements of the species. The close proximity of different habitats facilitates movement to new preferred habitats with age. Operations that widen, deepen and/or straighten the channel reduce variations in habitat. New operations that would have this impact are not acceptable within the SAC, while restoration may be needed in some reaches.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Bullhead	Access	Artificial obstructions	No significant impediment to movement between reaches.	Vertical drops of more than 18–20 cm are sufficient to prevent upstream movement of adult bullheads. They will therefore prevent recolonisation of upper reaches affected by lethal pollution episodes, and will also lead to constraints on genetic interactions that may have adverse consequences.
River	Bullhead	Biological disturbance	Introductions	No stocking/transfers of bullhead unless agreed by English Nature to be in the best interests of the population.	Bullheads are relatively sedentary, and interactions between populations in different parts of the catchment and in different catchments are likely to be limited, suggesting the existence of genetically discrete populations. Since they are of no angling interest, deliberate transfers between sites are unlikely to have been undertaken in the past, such that the genetic integrity of populations is likely to be intact.
River	Bullhead	Biological disturbance	Introductions	No stocking of other fish species at excessively high densities in bullhead spawning and nursery areas.	The presence of artificially high densities of salmonids and other fish will create unacceptably high levels of predatory and competitive pressure on juvenile and adult bullhead.
River	Bullhead	Biological disturbance	Introductions	Effective screening on all fish farm intakes and discharges	Escapes from fish farms are a form of uncontrolled introduction and should be prevented.
River	Bullhead	Biological disturbance	Introductions	Absence of non-native crayfish	Bullhead densities have been found to be negatively correlated with densities of non-native crayfish in the River Great Ouse, suggesting competitive and/or predator-prey interactions.

#### **A2.4 Extra targets for brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*)**

Sea lamprey are found in the lower reaches of the River Eden main channel, with records upstream to Armathwaite and Lazonby. They may also enter the Irthing system. River lamprey have been recorded from the same places as sea lamprey, and also more widely across the catchment in the larger tributaries and main channel. Brook lamprey have been recorded from many of the smaller tributaries, headwaters and the upper part of the main channel. There are no quantitative data on the strength of populations, numbers of spawning adults or recruitment. It is therefore not possible to set targets for these attributes.

There has been very little work done on the role of sediment quality for lamprey spawning grounds on the Eden, or on the composition of gravel bed sediments.

The fine silt and sandy beds used by juvenile lamprey are a common feature on the Eden, particularly where it flows over sandstone. However, there are no data on the extent of these areas or on the precise conditions that juvenile lampreys require within the silt beds.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Flow		See 'common targets'	
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Water quality		See 'common targets'	
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	River substrate		See 'common targets'	
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Habitat structure	Area of spawning habitat. (Assessment methods in this column to be agreed with the Environment Agency.)	Maintain and where necessary restore	This habitat is defined as well-oxygenated gravel/pebble-dominated (1.5–11 cm) substrate of at least 10 cm depth, overlain by a range of water depths (0.2–1.5 m). Typical spawning locations are upstream of riffles and downstream of weirs. River and sea lamprey typically spawn in deeper water than brook lamprey, but in larger river reaches brook lamprey also spawn in deeper areas.
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Habitat structure	Area of nursery habitat	Maintain and where necessary restore	This habitat is defined as open-structure, aerated, silty and sandy substrates, between 2 and 40 cm depth, typically overlain by less than 0.5 m of water. Slack-water channel margins are particularly important, while silt accumulations behind weirs can also be valuable in impounded sections. The requirements of the three species are similar and so they are often found in the same nursery beds, but in deeper water (up to 2.2 m) sea lamprey are more likely to dominate. Brook lamprey will be the only species present above impassable obstructions.
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Habitat structure	Area of emergent vegetation	Maintain a high extent throughout the river system	Emergent vegetation within marginal nursery habitat stabilises the substrate and greatly increases habitat suitability.
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Habitat structure	Extent of bankside tree cover	Maintain existing extent characteristic of the river type and, where appropriate, restore.	This helps to provide temperature micro-gradients within the channel, which provides greater flexibility in habitat selection.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Habitat structure	River form	Maintain and where necessary restore the characteristic physical form of the river channel	The characteristic channel morphology provides the diversity of water depths, current velocities and substrate types necessary to fulfil the spawning, juvenile and migratory requirements of the species. The proximity of different habitats facilitates movement to new preferred habitats with age. Operations that widen, deepen and/or straighten the channel reduce variations in habitat. New operations that would have this impact are not acceptable within the SAC, while restoration may be needed in some reaches.
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Access	Artificial obstructions	No artificial barriers significantly impairing adults from reaching existing and historical spawning grounds.	Lampreys can pass some potential barriers by attaching themselves to structures or river banks by their suckorial discs and creeping up by strong bursts of swimming. The passability of barriers by different species and sizes of lampreys should be assessed on a site-specific basis, most sensibly by survey of the upstream limit of distribution of each species.
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Biological disturbance	Introductions	No stocking/transfers of lampreys unless agreed by English Nature to be in the best interests of the population.	It is uncertain whether there are significant genetic differences between lamprey populations of the same species. Since they are of no angling interest, deliberate transfers between sites are unlikely to have been undertaken in the past, such that the natural genetic character of populations is likely to be intact. The degree of fidelity to natal spawning grounds is unclear. Any agreed introductions should involve local stock as a precaution.
River	Brook lamprey ( <i>Lampetra planeri</i> ), River lamprey ( <i>Lampetra fluviatilis</i> ) and Sea lamprey ( <i>Petromyzon marinus</i> )	Biological disturbance	Exploitation	Zero exploitation until further notice	Lamprey have recently become popular in the UK as bait for pike-fishing. There are also indications that UK populations are sought after as a delicacy in Europe, where stocks are declining. Adult lampreys are usually caught by trapping, while juvenile lamprey can be removed by sieving, netting or digging out nursery habitat. Anecdotal evidence of adult trapping suggests heavy losses of fish on some rivers. In the absence of adequate knowledge of population dynamics and sustainable yields, exploitation is not acceptable within cSACs.

## **A 2.5 Extra targets for white-clawed crayfish (*Austropotamobius pallipes*)**

White-clawed crayfish are found in the limestone headwaters of the River Eden, notably the streams between Scandal Beck and the River Lowther. They are also found in the River Eamont, Dacre Beck, the main channel of the Eden around and upstream from Appleby, and some of the streams on the Pennine side of the catchment. Densities vary between sites and types of streams, with the pure limestone streams of Potts Beck and Scandal Beck appearing to support particularly high densities.

White-clawed crayfish in the Eden system inhabit quite a wide variety of stream types with variable amounts of in-channel and river margin habitat. Therefore, the interpretation of the objectives for habitat structure and quality will vary depending on the particular watercourse or part of watercourse being referred to.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	White-clawed crayfish	Flow		See common targets	
River	White-clawed crayfish	Water quality		See common targets	
River	White-clawed crayfish	Habitat structure	Extent of cobbles/ boulders	Retain where characteristic of the river type	Where they are present, fallen branches and trunks are used extensively by crayfish as refuge. Woody debris is typically removed during maintenance operations, but it is important to retain as much as possible, particularly where other forms of refuge are in short supply.
River	White-clawed crayfish	Habitat structure	Extent of large woody debris	Retain where characteristic of the river type	Where they are present, fallen branches and trunks are used extensively by crayfish as refuge. Woody debris is typically removed during maintenance operations, but it is important to retain as much as possible, particularly where other forms of refuge are in short supply.
River	White-clawed crayfish	Habitat structure	Density of bankside refuges	Submerged tree root systems and/or crevices in banksides should be available at intervals	These provide important refuges and are often lost during engineering operations. Any works should at least replace the pre-works availability of refuges.
River	White-clawed crayfish	Habitat structure	Extent of submerged and marginal vegetation	Maintain patchy cover where characteristic of the river type.	Submerged higher plants provide cover away from the banks, and also represent a valuable food source. Marginal emergents also provide important cover and feeding opportunities. Vegetation management should be limited to no more than 50% of the channel width (submerged plants) and 50% of bank length (marginal fringe).
River	White-clawed crayfish	Habitat structure	Extent of overhanging riparian vegetation	Should be present intermittently along the bank throughout the year.	This should cover at least 10% of bank length, distributed in patches along the margins, and considerably more where other forms of refuge are in short supply.
River	White-clawed crayfish	Habitat structure	Extent of bankside tree cover	Maintain existing extent characteristic of the river type and restore where appropriate.	Overhanging trees provide valuable shade and food sources, and additionally supply woody debris to the river. Submerged tree-root systems provide important cover and refuges from flood flows.
River	White-clawed crayfish	Habitat structure	River form	Maintain and, where necessary, restore the characteristic physical form of the river channel	A natural channel morphology provides a diversity of refuge and feeding opportunities. The proximity of different refuges facilitates foraging and the movement of individuals to different habitats with age. Operations that widen, deepen and/or straighten the channel reduce variations in habitat. New operations that would have this impact are not acceptable within the SAC, while restoration may be needed in some reaches.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
River	White-clawed crayfish	Biological disturbance	Introductions	No stocking/transfers of white-clawed crayfish unless agreed by English Nature to be in the best interests of the population.	Little work has been undertaken on crayfish genetics. This advice takes the precautionary principle and assumes genetic diversity needs to be maintained and that there may be genetic differences between populations that could be of conservation significance. Care should be taken in any captive breeding programmes that genetic diversity is not reduced by in-breeding.
River	White-clawed crayfish	Biological disturbance	Introductions	No stocking of fish species at excessively high densities or of fish from catchments with non-native crayfish or crayfish plague.	The presence of artificially high densities of fish creates unacceptably high levels of predatory pressure on juvenile crayfish. A protocol for determining excessively high densities needs to be determined. In the absence of this, any stocking exercise raising fish densities within the stocked reach by more than 10% of the estimated carrying capacity for the size class being stocked should be regarded as high risk.
River	White-clawed crayfish	Biological disturbance	Introductions	Effective screening on all fish farm intakes and discharges	Escapes from fish farms are a form of uncontrolled introduction and should be prevented.
River	White-clawed crayfish	Biological disturbance	Introductions	Absence of non-native crayfish species	Once non-native crayfish species are established in a waterbody, native populations are usually eliminated quite rapidly, if not by competition and predation then by crayfish plague. If already present in the SAC, measures should be taken to control their spread and, if possible, reduce their numbers.
River	White-clawed crayfish	Biological disturbance	Introductions	Absence of individuals infected with crayfish plague	Crayfish plague can be introduced by the entry of non-native crayfish species into a site, but also by a variety of other routes, including contaminated equipment (nets, boots, etc.) and stocked fish from infected waters. Outbreaks of crayfish plague typically result in 100% mortalities, unless there are isolated headwaters with crayfish in the catchment. <b>This target requires that the utmost care is taken in terms of fish stocking and general surveying/monitoring to ensure that plague vectors are not introduced.</b> Disinfection or thorough drying of equipment (or perhaps dedicated equipment for use only in native crayfish rivers) and sourcing of stocked fish from uninfected waters are vital elements.
River	White-clawed crayfish	Biological disturbance	Introductions	Thelohaniasis (porcelain disease) should not affect more than 10% of the population	This disease rarely causes mass mortalities and may be present in a population at low levels without apparent harm. However, a prevalence higher than 10% is of concern.

## **A2.6 Extra targets for otter (*Lutra lutra*)**

After a long period of restricted distribution, otters are currently spreading into the headwaters of the River Eden from the area around Carlisle and the Irthing catchment. There are now records of otters from most of the lower catchment and into the upper catchment around Appleby, Ullswater and the Lowther catchment.

There are no data on otter densities on the River Eden and most of the survey information is based on otter signs.

Operational feature	Criteria features	Attribute	I.1 Measure	Targets	Comments
River	Otter	Water quality		See common targets	
River	Otter	Flow		See common targets	
River	Otter	Site integrity	Total area	No net loss of bankside habitats suitable for otter holts and lying up areas.	Thick vegetation cover, riverside woodland and vegetated islands are important holt habitats and areas for otters to shelter and rest during the day.  See also common targets for river form and bankside cover.
River	Otter	Fish stocks	EA assessment	No significant decline in fish biomass or species diversity characteristic for the River Eden.	Refer to Environment Agency for sample data
River	Otter	Disturbance	Extent of public access to river	No net loss in quiet river stretches not affected by access or disturbance of riparian habitats.	Although otters are found in close proximity to public areas, they still need quiet areas for resting and breeding.
River	Otter	Presence of otters	Signs of otters	No evidence of a decrease in extent of populations in a five year period.	Use data from national or county surveys

## **A2.7 Targets for Oligotrophic to mesotrophic standing waters of plains to sub-alpine levels**

The River Eden cSAC includes Ullswater. This is the second largest lake in Cumbria, with an area of 8.94 km<sup>2</sup> and a mean depth of 25.3 m. The lake is classed as transitional oligotrophic-mesotrophic, in terms of mean chlorophyll A and total phosphorus.

The aquatic flora of Ullswater suggests there are both oligotrophic and mesotrophic elements. Data from 1997 suggest that the lake falls between Type 3 and Type 5a with a Mean Trophic Ranking Score of 6.8. There are at least eight species of pondweed present, and notable species include *Elatine hexandra*. As yet, the invasive *Crassula helmsii* has not been recorded.

Ullswater is one of four lakes in the Lake District supporting a population of schelly. Arctic charr was also present but became extinct some time before 1940, possibly because its spawning grounds in an inflow stream were vulnerable to pollution and silt deposition from lead mines.

Sediment core records give some evidence of past conditions and recent changes. Estimates of recent sedimentation rates suggest a slight increase between the 1920s and 1970s. There is also evidence of recent inputs of lead-enriched material associated with past mining activities in the catchment. Since about 1900, changes in the diatom flora suggest some nutrient enrichment.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
Oligo-mesotrophic lake	Oligotrophic to mesotrophic standing waters of plains to sub-alpine levels of the continental and alpine region and mountain areas of other regions with amphibious vegetation belonging to <i>Littorelletae uniflorae</i> and/or <i>Isoeto-Nanorancetea</i> .	Composition and extent of plant community	Increase in species indicative of enrichment – e.g. <i>Juncus bulbosus</i> var <i>fluitans</i> and <i>Elodea</i> spp.	The plant community should remain stable in extent and composition and in accordance with Type 3 and Type 5a, and there should be no deterioration from the survey of 1997.	The present plant community comprises 'awns of <i>Littorella uniflora</i> , with <i>Isoetes lacustris</i> and <i>Myriophyllum alterniflorum</i> . Sheltered bays have a rich pondweed flora, along with water crowfoots, bur-reeds, water starworts and, occasionally, <i>Elatine hexandra</i> .  The 1997 survey can act as a baseline.
Oligo-mesotrophic lake	Oligotrophic to mesotrophic standing waters of plains to sub-alpine levels of the continental and alpine region and mountain areas of other regions with amphibious vegetation belonging to <i>Littorelletae uniflorae</i> and/or <i>Isoeto-Nanorancetea</i> .	Water quality	Total phosphorus. Monitor annually in July/August once a baseline has been established through quarterly monitoring (2–3 years).	Maintain water quality of annual mean total P not more than 20 µg l <sup>-1</sup> *	*Current total P is thought to be between 5 and 15 µg l <sup>-1</sup> . This is an acceptable range for this type of lake. The target may be adjusted downwards once an accurate figure has been established through monitoring.
Oligo-mesotrophic lake	Oligotrophic to mesotrophic standing waters of plains to sub-alpine levels of the continental and alpine region and mountain areas of other regions with amphibious vegetation belonging to <i>Littorelletae uniflorae</i> and/or <i>Isoeto-Nanorancetea</i> .	Water quantity	Lake levels in summer and flushing rate.	Maintain present range of fluctuation in lake levels, avoiding excessive drawdown in summer months.	Define current range of fluctuation (data from EA lake level recorders). Agree trigger level for cessation of abstraction during dry periods. Prevent modifications to outfall which may cause lowering or raising of lake levels.
Oligo-mesotrophic lake	Oligotrophic to mesotrophic standing waters of plains to sub-alpine levels of the continental and alpine region and mountain areas of other regions with amphibious vegetation belonging to <i>Littorelletae uniflorae</i> and/or <i>Isoeto-Nanorancetea</i> .	Sediment	Significant changes in agriculture and other uses of land in the catchment – e.g. construction projects – which could generate run-off of particulates.	No increases in sediment inputs	Further investigations and measures may be required to ameliorate against the possible consequences of eutrophication and release of heavy metals from deep sediments.

## **A2.8 Targets for residual alluvial woodland**

There are an estimated 60 ha of residual alluvial woodland in the River Eden cSAC. Most of this is on the River Irthing in association with sedge swamp, exposed river gravels and actively migrating channels. There are also smaller areas on Briggle Beck.

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
Semi-natural woodland	Residual alluvial woodland (mainly parts of NVC types 5,6,7)	1. Area	Extent/ location of stands	<ul style="list-style-type: none"> <li>* No loss of ancient semi-natural stands</li> <li>* At least current area of recent semi-natural stands maintained, although their location may alter.</li> </ul>	<ul style="list-style-type: none"> <li>* Stand loss due to natural processes – e.g. in minimum intervention stands – may be acceptable.</li> <li>* A high proportion of this type of woodland may be recent and hence a dynamic interchange with open wet communities may occur.</li> <li>* Stand destruction may occur if the understorey and ground flora are irretrievably damaged even if the canopy remains intact.</li> <li>* Loss = 0.5 ha or 0.5% of the stand area, whichever is the smaller.</li> <li>* 20% canopy cover is conventionally taken as the lower limit for an area to be considered as woodland. Stands of willow scrub may pose difficulties of definition.</li> <li>* Area and location of stands may be assessed remotely or by site visit.</li> <li>* There is a need to map and survey the extent of stands on the Eden system.</li> </ul>
Semi-natural woodland	Residual alluvial woodland (mainly parts of NVC types 5,6,7)	2. Natural processes and structural development	<p>Age/size class variation within and between stands; presence of open space and old trees; dead wood lying on the ground; standing dead trees</p> <p>Structures associated with the hydrological regime also need to be considered.</p>	<ul style="list-style-type: none"> <li>* At least the current level of structural diversity maintained.</li> <li>* Understorey (2-5m) present over at least 20% of total stand area</li> <li>* Ground flora present over at least 50% of area excluding temporary pool areas</li> <li>* Canopy cover present over 30-90 % of stand area</li> <li>* Age class structure appropriate to the site, its history and management.</li> <li>* A minimum of 3 fallen lying trees or major branches per ha and 4 trees per ha allowed to die standing.</li> <li>* At least the current level of natural hydrological features should be maintained (channels, pools, periodic flooding)</li> </ul>	<ul style="list-style-type: none"> <li>* Any changes leading to exceedance of these limits due to natural processes are likely to be acceptable.</li> <li>* There is generally a good structural variety in these stands although veteran trees may be under-represented because of past treatment and the unstable nature of some sites.</li> <li>* The ground flora may appear sparse, particularly where periodic flooding leaves areas of bare mud etc. Its composition may be variable ( see attribute 5).</li> <li>* In coppiced stands a lower canopy cover (of standards) can be accepted.</li> <li>* See JNCC guidance note for the sorts of age structure likely to be appropriate for different types of management regime.</li> <li>* Dead wood is often abundant but because there tend to be fewer big trees the size of the fallen wood is often small. Flooding may lead to local accumulations with other areas totally lacking fallen wood.</li> <li>* Assess this attribute by field survey.</li> <li>* Where possible the hydrological regime should be allowed to revert to a more natural state.</li> <li>* River targets for river form and bankside habitats are also relevant here.</li> </ul>

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
Semi-natural woodland	Residual alluvial woodland (mainly parts of NVC types 5,6,7)	3. Regeneration potential	Successful establishment of young stems in gaps or on the edge of a stand	<ul style="list-style-type: none"> <li>* Signs of seedlings growing through to saplings to young trees at sufficient density to maintain canopy density over a 10 yr period (or equivalent regrowth from coppice stumps).</li> <li>* No more than 10% of areas regenerated by planting.</li> <li>* All planting material of locally native stock</li> <li>* No planting in stands where it has not occurred in the last 15 years.</li> </ul>	<ul style="list-style-type: none"> <li>* A proportion of gaps at any one time may develop into permanent open space; equally some current permanent open space/glades may in time regenerate to closed canopy.</li> <li>* Regeneration may often occur on the edges of stands rather than in gaps within it.</li> <li>* In coppice most of the regeneration will be as stump regrowth. See JNCC Guidance Note on likely desirable levels of regeneration.</li> <li>* The minimum level of regeneration to be acceptable from a nature conservation viewpoint is likely to be much less than that needed where wood production is also an objective.</li> <li>* Assess this attribute by walking through the wood in spring/summer.</li> </ul>
Semi-natural woodland	Residual alluvial woodland (mainly parts of NVC types 5,6,7)	4. Composition	<p>Cover of native versus non-native species (all layers)</p> <p>Death, destruction or replacement of native woodland species through effects of non-native fauna or external unnatural factors</p>	<ul style="list-style-type: none"> <li>* At least the current level of site-native species maintained.</li> <li>* At least 90% of cover in any one layer of site-native or acceptable naturalised species.</li> <li>* Death, destruction or replacement of native woodland species through effects of introduced fauna or other external unnatural factors not more than 10% by number or area in a five-year period.</li> </ul>	<ul style="list-style-type: none"> <li>* In sites where there might be uncertainty as to what counts as site-native or as an acceptable naturalised species this must be made clear (e.g. the position of poplar).</li> <li>* Where cover in any one layer is less than 100% then the 90% target applies to the area actually covered by that layer.</li> <li>* Factors leading to the death or replacement of woodland species could include pollution, including eutrophication from adjacent farmland; new diseases (e.g. alder dieback).</li> <li>* Damage to species by non-native species that does not lead to their death or replacement by non woodland species (e.g. damage from squirrels to trees that still survive) is not necessarily unacceptable in nature conservation terms.</li> <li>* Excessive browsing/grazing by even native ungulates may be considered an unnatural external factor where it leads to undesirable shifts in the composition/structure of the stand, although this may be picked up by attributes 2 or 5.</li> <li>* Assess this attribute by a walk through the site.</li> </ul>

Operational feature	Criteria features	Attribute	Measure	Targets	Comments
Semi-natural woodland	Residual alluvial woodland (mainly parts of NVC types 5,6,7)	5. Species, habitats, structures characteristic of the site.	<p>Ground flora type</p> <p>Distinctive and desirable elements for a given site eg. sedge-rich wetlands; veteran trees or rich invertebrate assemblages.</p> <p>Patches of associated habitats and transitions – e.g. to ash wood or to open fen, shingle banks and open water</p>	<p>* 80% of ground flora cover referable to relevant NVC wet woodland community (W 1–7)</p> <p>* Distinctive elements maintained at current levels and in current locations (where appropriate).</p> <p>* Patches and transitions maintained in extent and where appropriate location.</p>	<p>* Changes leading to these targets not being met may be acceptable where this is due to natural processes.</p> <p>* Distinctive elements and patches should be marked on maps for ease of checking in the field wherever possible.</p> <p>* If there are species groups/assemblages that cannot be assessed directly on a general site visit then surrogate features should be given where possible – e.g. dead wood concentrations for associated invertebrates.</p>

## **Appendix II: The River Eden cSAC Partnership Group**

The broad spectrum of partners involved in work on the River Eden is illustrated by the organisations that are involved in the Partnership Group, and have worked on developing the strategy.

### **Country Land and Business Association**

The CLA is the only organisation in England and Wales that represents the complete breadth of the rural economy, including private landowners, agriculture and rural business. It has two main functions – to exert political pressure through authoritative briefing and lobbying of policy-makers, and to provide the best advice and services for its members.

Dalton Hall Stable Yard  
Burton  
Carnforth  
Lancashire  
LA6 1NJ  
01524 782209  
[www.cla.org.uk](http://www.cla.org.uk)

### **Cumbria Farm Link**

Cumbria Farm Link (CFL) is a partnership in which the lead agency is Business Link for Rural Cumbria. It provides integrated business and ecological advice to farmers within the Objective 5b area. English Nature is part of this partnership and aims to ensure that conservation advice is part of this integrated approach.

Rural Enterprise Centre  
Redhills  
Penrith  
Cumbria  
CA11 0DT  
01768 891444  
[www.crea.co.uk/farm](http://www.crea.co.uk/farm)

### **Cumbria Farming and Wildlife Advisory Group**

Cumbria Farming and Wildlife Advisory Group (FWAG) is the local branch of FWAG UK, a national charity founded in 1969. Cumbria FWAG provides practical and confidential on-farm conservation advice to farmers and landowners. The aim is to help farmers integrate good environmental practice with sound commercial farming. In the Eden Valley the Farm Conservation Advisers work closely with partner organisations to encourage and help farmers maintain and improve the wildlife value of the River Eden and countryside around it.

Anderson Court  
Sullart street  
Cockermouth  
Cumbria.  
CA13 0EB  
Tel./ Fax: 01900 828684  
email: [cumbria@fwag.org.uk](mailto:cumbria@fwag.org.uk)  
[www.fwag.org.uk](http://www.fwag.org.uk)

### **Cumbria Wildlife Trust**

Cumbria Wildlife Trust (CWT) is part of the national network of wildlife trusts, together forming the Royal Society for Nature Conservation. CWT aims to achieve the protection and enhancement of rare and common wildlife species and to develop public understanding of the need for biodiversity and sustainable management.

It works to raise environmental awareness, encouraging people to take positive conservation action. It has input into statutory and non-statutory plans, strategies and planning proposals., undertakes species monitoring, and manages local nature reserves.

Plumgarths  
Crook Road  
Kendal  
Cumbria  
LA8 8LX  
01539 816300  
email: [mail@cumbriawildlifetrust.org.uk](mailto:mail@cumbriawildlifetrust.org.uk)

### **East Cumbria Countryside Project**

East Cumbria Countryside Project (ECCP) was formed in 1985 as a partnership between Carlisle City Council, Eden District Council and Cumbria County Council. ECCP's remit includes:

- To increase people's enjoyment and understanding of the countryside.
- To improve opportunities for access to the countryside.
- To enhance and conserve the landscape and wildlife of the area.
- 

The ECCP's operating area extends from the Scottish border to the Yorkshire Dales and Lake District National Park boundaries. The Eden catchment forms a significant portion of this area.

Warwick Mill  
Warwick Bridge  
Carlisle  
Cumbria  
CA4 8RR  
Tel. 01228 561601  
[www.cumbria.gov.uk/atoz](http://www.cumbria.gov.uk/atoz)

### **Eden Rivers Trust**

The Eden Rivers Trust was formed in 1996 to help to conserve the biodiversity of the River Eden catchment. The trust's goal is to protect and provide appropriate management for the habitats and species within the riparian corridor and those adjacent habitats that directly influence the watercourses of the Eden catchment. The trust works closely with landowners, riparian owners and other land managers to implement projects to protect habitats, and to encourage the regeneration of degraded habitats. In order to achieve its aims, the trust works in close partnership with other organisations to seek ways of reducing damaging impacts from a wide range of land management practices.

The Whitehouse  
25 Boroughgate  
Appleby  
Cumbria  
CA16 6XF  
017683 53992  
[www.edenriverstrust.co.uk](http://www.edenriverstrust.co.uk)

### **English Nature**

English Nature is the government agency that champions the conservation of England's wildlife and natural features. Using the wildlife legislation, English Nature identifies sites that hold features of national or international importance, notifies them for statutory protection, and then works in partnership with the individuals who own and manage them. The work of these owner/occupiers is vital in conserving and improving the conservation value of the land. English Nature also advises the UK government on nature conservation issues, and works with many other organisations, seeking to influence their plans and policies.

Juniper House  
Murley Moss  
Oxenholme Road  
Kendal  
LA9 7RL  
01539 792800  
[www.english-nature.org.uk](http://www.english-nature.org.uk)

### **Environment Agency**

The Environment Agency was set up by the 1995 Environment Act as a non-departmental public body, to be the leading public body for protecting and improving the environment in England and Wales. The Environment Agency achieves its aims through a combination of issuing authorisations, providing advice, monitoring the environment, and, where necessary, enforcement of the environmental legislation. It tackles flooding and pollution incidents; makes sure industry keeps its impacts on air, land and water quality to a minimum; cleans up rivers, coastal waters and contaminated land; and looks after fish and wildlife habitats.

North Area Office  
Ghyll Mount  
Gillan Way  
Penrith 40 Business Park  
Penrith  
CA11 9BP  
Tel. 01768 866666  
[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

### **National Farmers Union**

The National Farmers' Union is the democratic organisation representing farmers and growers in England and Wales. It encourages environmentally friendly and welfare-conscious farming practices, and seeks to ensure the long term survival of viable rural communities. The NFU takes a close interest in the whole range of rural affairs and works with politicians, officials and other organisations to advance rural interests.

The NFU works to encourage a greater understanding of farming and rural life among the wider public. As well as representing its members' interests, the NFU provides a wide range of services to them including help with legal, planning and taxation matters, marketing and food promotion.

Agriculture House  
207 Tadcaster Road  
York  
YO24 1UD  
[www.nfu.org.uk](http://www.nfu.org.uk)

### **River Eden and District Fisheries Association**

The River Eden and District Fisheries Association (REDFA) is the consultative body formed to advise, protect and inform all fishing interests in the River Eden catchment, including its lakes and tributaries. It represents the various local fishing Associations, the riparian owners and independent fishermen. REDFA is an unaffiliated voluntary organisation.

The Secretary,  
24 Cammock Avenue  
Upperby  
Carlisle  
Cumbria  
01228 539752

### **Rural Development Service**

The Rural Development Service (RDS) promotes, delivers and manages the England Rural Development Programme (ERDP) on behalf of DEFRA. Staff are locally based and provide a face to face service to farmers, landowners and other rural businesses wishing to participate in the agri-environment and rural economy schemes. These may be schemes to conserve and improve the environment; or schemes to enable farming, forestry and other rural businesses and communities to develop and adapt to changing circumstances. RDS also delivers other non-ERDP services notably dairy hygiene inspections and wildlife management. RDS works with partners in other parts of government and its rural agencies, and in consultation with wider rural interests.

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Unit 5  
Cowper Road  
Gilwilly Industrial Estate  
Penrith  
CA11 9BN  
01768 865900  
[www.defra.gov.uk](http://www.defra.gov.uk)

### Appendix III: Action prioritisation table.

CRITERIA (each action scored against each criteria)							
	Medium rating		Actions requiring a low weighting				
	What is the extent of impact of the action? (1=local, 2=sub-catchments, 3=whole catchment)	To what extent is the need for the action backed up by reliable evidence? (1=anecdotal 2=observed 3=recent data available)	What benefits can the action deliver to other river features or the biodiversity of the wider countryside? (1=no additional benefits, 2=benefits due to general improvement of conditions, 3=direct benefits)	Will the action promote the conservation value of the River Eden to a wider general audience? (1=no promotion, 2=raise some awareness, 3=direct promotion)	To what extent will the action drive real change? (1=minor 2=moderate 3=significant)	Priority: Top High Med Low	Criteria score I
ACTIONS							
<b>LM2.</b> Revise agri-environment schemes to address upland overgrazing and gripping, and to facilitate a reduction in grazing pressure; the provision of bankside wildlife corridors and extended corridors.	3	3	3	I	3	T	49
<b>LMI.</b> Funding scheme to promote riverbank fencing and /or tree planting and management where existing schemes are inadequate or cannot apply.	3	2	3	I	3	T	47
<b>WQ1.</b> Farm visits / grant scheme for promotion of farm infrastructure improvements.	3	2	2	I	3	T	46
<b>LM7.</b> Inclusion of weed control as a CSS option & WES payment.	3	2	2	I	2	T	45
<b>WQ5.</b> Promotion of best practice using demonstration farms and seminars.	3	2	2	I	3	T	43
<b>FMI.</b> Assisted programme of mink elimination across whole catchment.	3	2	3	I	I	H	42

CRITERIA (each action scored against each criteria)								
ACTIONS	Medium rating		Actions requiring a low weighting			Priority: Top High Med Low	Criteria score I	
	What is the extent of impact of the action? (1=local, 2=sub-catchments, 3=whole catchment)	To what extent is the need for the action backed up by reliable evidence? (1=anecdotal 2=observed 3=recent data available)	What benefits can the action deliver to other river features or the biodiversity of the wider countryside? (1=no additional benefits, 2=benefits due to general improvement of conditions, 3=direct benefits)	Will the action promote the conservation value of the River Eden to a wider general audience? (1=no promotion, 2=raise some awareness, 3=direct promotion)	To what extent will the action drive real change? (1=minor 2=moderate 3=significant)			
<b>FM3.</b> Continued crayfish plague awareness campaign to angling & canoeing clubs.	3	3	1	3	1	H	41	
<b>LM4.</b> Survey to identify areas of bankside tree cover requiring management; and areas of invasive weed requiring control.	3	2	2	1	1	H	41	
<b>LM6.</b> Promotion of Himalayan Balsam control by angling clubs.	3	2	2	3	2	H	41	
<b>LM3.</b> Project to identify and block key areas of historic gripping on uplands and lowland mires.	2	3	3	1	3	H	41	
<b>WQ4.</b> Nutrient budgeting to reduce fertilizer application.	2	3	2	1	3	H	40	
<b>LM8.</b> Local control of invasive alien plant species.	3	2	2	1	2	H	39	
<b>WQ8.</b> Implement a prioritised programme of retrofitting pollution prevention drainage systems to motorway and trunk roads and accident blackspots.	2	3	2	1	3	M	37	

<b>CRITERIA (each action scored against each criteria)</b>								
<b>ACTIONS</b>	<b>Medium rating</b>		<b>Actions requiring a low weighting</b>			<b>Priority:</b> Top, High, Med, Low	<b>Criteria score I</b>	
	What is the extent of impact of the action? (1=local, 2=sub-catchments, 3=whole catchment)	To what extent is the need for the action backed up by reliable evidence? (1=anecdotal 2=observed 3=recent data available)	What benefits can the action deliver to other river features or the biodiversity of the wider countryside? (1=no additional benefits, 2=benefits due to general improvement of conditions, 3=direct benefits)	Will the action promote the conservation value of the River Eden to a wider general audience? (1=no promotion, 2=raise some awareness, 3=direct promotion)	To what extent will the action drive real change? (1=minor 2=moderate 3=significant)			
<b>LM9.</b> Use local media to increase local awareness of alien plant species, and encourage their control.	3	2	2	3	1	M	37	
<b>WQ3.</b> Training in pollution prevention & control for farm visitors.	3	2	2	1	3	M	37	
<b>FD2.</b> Catchment-wide desk study to identify historic intermediate-scale wetlands suitable for restoration.	3	2	3	1	1	M	36	
<b>FM4.</b> Disinfection or thorough drying of angling equipment prior to fishing on catchments carrying crayfish.	3	3	1	3	1	M	35	
<b>FM8.</b> Revise the River Eden Salmon Conservation Limit.	3	3	1	1	3	M	35	
<b>FD1.</b> A prioritised series of sub-catchment fluvial audits.	3	3	1	1	1	M	33	
<b>WQ2.</b> Investigate advantages and risks of a trial subsidised sheep dip neutraliser scheme, and implement if suitable.	3	2	2	1	1	M	32	
<b>WR2.</b> Investigate possibility of remedial works where low flows are restricting fish movement over barriers.	2	2	1	1	1	M	35	

CRITERIA (each action scored against each criteria)							
ACTIONS	Medium rating		Actions requiring a low weighting			Priority: Top, High, Med, Low	Criteria score I
	What is the extent of impact of the action? (1=local, 2=sub-catchments, 3=whole catchment)	To what extent is the need for the action backed up by reliable evidence? (1=anecdotal 2=observed 3=recent data available)	What benefits can the action deliver to other river features or the biodiversity of the wider countryside? (1=no additional benefits, 2=benefits due to general improvement of conditions, 3=direct benefits)	Will the action promote the conservation value of the River Eden to a wider general audience? (1=no promotion, 2=raise some awareness, 3=direct promotion)	To what extent will the action drive real change? (1=minor 2=moderate 3=significant)		
<b>WQ6.</b> Implementation of Life in UK Rivers silt sampling strategy, to assess impacts from soil runoff, bank erosion, forestry and the aggregates industry.	3	2	1	1	1	M	31
<b>WQ7.</b> Use results from road drainage survey to highlight and prioritise discharges requiring remedial works.	2	3	1	1	1	M	31
<b>FM5.</b> Survey to identify minor barriers to salmonid migration and prioritise for remedial works.	3	2	1	1	1	M	31
<b>WR1.</b> Active involvement in CAMS stakeholder group	1	1	1	1	1	M	31
<b>FM9.</b> Stocking policy for the Eden catchment to be agreed between all parties.	3	2	3	3	2	M	30
<b>FMI1.</b> Completion of planned otter fencing project at Wetheral STW.	1	2	1	1	1	L	27
<b>LM5.</b> Survey of fluvial floodplain woodland of Irthing sub-catchment.	2	2	1	1	1	L	26

CRITERIA (each Action scored against each criteria)								
ACTIONS	Medium rating		Actions requiring a low weighting			Priority: Top Med Low	Criteria score I	
	What is the extent of impact of the action? (1=local, 2=sub-catchments, 3=whole catchment)	To what extent is the need for the action backed up by reliable evidence? (1=anecdotal 2=observed 3=recent data available)	What benefits can the action deliver to other river features or the biodiversity of the wider countryside? (1=no additional benefits, 2=benefits due to general improvement of conditions, 3=direct benefits)	Will the action promote the conservation value of the River Eden to a wider general audience? (1=no promotion, 2=raise some awareness, 3=direct promotion)	To what extent will the action drive real change? (1=minor 2=moderate 3=significant)			
<b>FD3.</b> Proactive survey of historic bridge structures to identify where / what remedial works are required.	2	I	2	2	I	L	26	
<b>FM10.</b> Liaison and general awareness campaign with canoeists regarding risks of habitat disturbance.	I	I	I	3	I	L	24	
<b>FM2.</b> Survey to investigate impact of predation by piscivorous birds on salmonids.	3	I	I	I	I	L	23	
<b>FM6.</b> Use results from lamprey surveys to determine significance of any existing potential barriers to lamprey migration.	3	I	I	I	I	L	23	
<b>FM7.</b> Eden Flylife survey to determine any historic changes in flylife.	3	I	I	I	I	L	23	
<b>WQ9.</b> Survey to identify the extent of any potentially detrimental discharges of reservoir compensation flow with high silt loading.	2	I	I	I	I	L	21	

## Appendix IV: Glossary

**Ammocoetes** The blind, undeveloped larvae of lamprey. They live burrowed into silt beds for several years prior to metamorphosis into adult form.

**Annex I Habitats** A natural habitat listed on Annex I of the Habitats Directive for which Special Areas of Conservation are selected.

**Annex II Species** A species listed on Annex II of the Habitats Directive for which Special Areas of Conservation are selected.

**Attribute** A component of the river ecosystem that can be measured. Together, the assessment of a series of attributes can be used as a surrogate indicator of the status of a Special Interest Feature species or habitat – for example, water quality, substrate, river flow.

**Compensation discharge** Water released from a reservoir to maintain the flow required downstream for other users and for the needs of the environment.

**Conservation Objectives** A statement of nature conservation aspirations for the interest features of a site, expressed in terms of the favourable condition that the features should attain.

**Endangered** A taxon is endangered when it is facing a very high risk of extinction in the wild in the near future, as defined by the IUCN criteria for Critically Endangered, Endangered and Vulnerable species (IUCN 1994).

**Epiphytic algae** Algae growing on the surface of aquatic plants.

**Eutrophication** The enrichment of a water body by nutrients, such as nitrogen or phosphorus, leading to accelerated plant growth, changes in the species composition of the plant community, and deterioration in the ecological balance of the waterbody.

**Favourable condition** A species or habitat Special Interest Feature is said to be in favourable condition when all the targets for the *attributes* specified in the Favourable Condition Table are met.

**Hard engineering** Bank stabilisation techniques that seek to fix the course of the river channel, involving solid materials such as gabion baskets, rock armour, walling or wooden piling.

**Interest Feature** A habitat or species for which the site has been nominated as a Special Area of Conservation.

**Mesotrophic** A water body containing a moderate amount of nutrients – e.g. nitrogen or phosphorus.

**Nutrient budget** A calculation examining the varying levels of nutrient inputs, their usage, and nutrient outputs within a defined area e.g. a river catchment, or a single field.

**Oligotrophic** A waterbody containing a low level of nutrients – e.g. nitrogen or phosphorus.

**Oxygen sag** A significant drop in the dissolved oxygen levels of a water body, generally happening at night, caused by the respiration and oxygen consumption of excessive plant or algal growth.

**River corridor** The strip of linear habitat comprising river channel and margins, riverbank and bank top, and land immediately adjacent that is associated with the river.

**Salmon fry** The second developmental stage of young salmon, developed from the egg-sac carrying alevins, which emerge from the gravels as actively feeding fish.

**Salmon parr** The third developmental stage, young immature fish that develop in the rivers for several years prior to smoltification.

**Salmon smolt** The fourth developmental stage. Silvery immature salmon, ready to migrate down river and out to sea.

**Soft engineering** Bank stabilisation techniques that seek to significantly slow down, but not stop, the processes of erosion and deposition that cause a river channel to migrate across the floodplain. Involves 'soft' materials such as living vegetation and dead brushwood.

**Spawning redd** Excavation in the gravel dug by salmonid fish in which it deposits its eggs.

**Sustainable recruitment** Sufficient young entering into and surviving in a given population to ensure its overall continued survival.

**Trophic** Nutrient levels.

**Vulnerable** A taxon is *vulnerable* when it is facing a high risk of extinction in the wild in the medium-term future, as defined by the IUCN criteria for Critically Endangered, Endangered and Vulnerable species (IUCN 1994).