



RIVER SEVERN LOWER REACHES CATCHMENT MANAGEMENT PLAN

CONSULTATION REPORT SUMMARY 1995

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*National Rivers Authority
Severn-Trent Region*

RIVER SEVERN LOWER REACHES CATCHMENT MANAGEMENT PLAN

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ENVIRONMENT AGENCY



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INTRODUCTION

The National Rivers Authority (NRA) was created in 1989 as an independent agency in England and Wales to protect and improve the water environment. The NRA has a wide range of responsibilities for the control of the water environment, in particular:

- conservation of water resources
- pollution control
- flood defence and flood warning
- maintenance and improvements of fisheries
- nature conservation in water related habitats
- promotion of water based recreation
- control of navigation in some areas

CATCHMENT MANAGEMENT PLANNING

The NRA's vision for the future is of a healthy and diverse water environment managed in an environmentally sustainable way, balancing the needs of all users of water. To achieve this vision, the NRA is taking an integrated approach (ie bringing together its own activities and those of other groups and organisations) to management of river catchments.

A river catchment is an area of land which is drained by a river system. In the case of the River Severn the catchment has been split into three plans to cover its Upper, Middle and Lower reaches. River Severn Lower Reaches covers the lower River Severn below its confluence with the River Teme near Worcester to its tidal limit at Gloucester. The plan includes the Forest of Dean, Leadon, Frome, Cam and Little Avon sub-catchments and also Avonmouth for which NRA Severn-Trent Region has flood defence, fisheries, conservation and recreation responsibilities. Some of these sub-catchments surround the upper estuary, but the estuary itself will be the subject of its own CMP in 1996.

It is the NRA's view that the most effective way of balancing all interests is through the production of Catchment Management Plans (CMPs). This involves the NRA using its powers and working with others to ensure that the rivers, lakes, coastal and underground waters are protected and improved for the sake of future generations.



THE CATCHMENT MANAGEMENT PLAN PROCESS

The production of a CMP is a two stage process. The first stage is The Consultation Report of which this summary forms a part. The second stage is the production of the Action Plan following a formal consultation period. The Action Plan includes a programme of actions to be undertaken by the NRA and other groups in the catchment over the next 5 years. The implementation of the Action Plan will be monitored and annual monitoring reports produced. A full review of the catchment will be made at the end of the plan period.

Using this approach the NRA can assess the current state of the water environment and the uses made of it. Comparisons can then be made with the relevant standards and targets. Where the objectives are not being met, the shortfalls together with the options to resolve them, are presented as issues. Catchment Management Plans provide the link between the NRA and users of water, in order for the Authority to better reflect their interests while carrying out its duties.

This booklet summarises the Consultation Report and highlights the major issues in the catchment. A detailed analysis of the catchment and the issues, is contained in the main report which can be obtained from the address below.

The Report will be available for public consultation for a 2 month period between 22 May 1995 and 28 July 1995.

YOUR VIEWS

The CMP is the NRA's review of the catchment and identifies the key issues that we believe should be resolved.

We need your views to help us with the Action Plan and in particular:

- Have we identified all the issues?
- What do you think about the options proposed?

To comment on the report please write to:

DR RICHARD BAILEY, AREA MANAGER,
NRA LOWER SEVERN AREA,
RIVERSMEET HOUSE, NEWTOWN INDUSTRIAL ESTATE,
NORTHWAY LANE, TEWKESBURY,
GLOUCESTER GL20 8JG

Please send your comments in writing.
The closing date for response is 28 July 1995.

Requests for further copies of this summary document, the full Consultation Report or further information should be made to:
Dr J Everard at the above address
or by calling Tewkesbury (01684) 850951.

VISION STATEMENT

This vision for the catchment describes what the NRA would wish the catchment to be and how it might work toward that vision. This vision is long term and while it may only be partly achieved in the next five years, it is something we can all work towards.

The NRA aims

To ensure that water quality is appropriate for the current and future uses of the catchment. This includes:

- Seeking additional safeguards to protect water supplies by submission of proposals to the Department of Environment that the River Severn and Gloucester-Sharpness Canal should be designated as Water Protection Zones.
- Working in conjunction with other authorities to control mining activities in the Forest of Dean.
- Ensuring that development or use of contaminated land in Cheltenham, Gloucester, the Forest of Dean and Avonmouth is accompanied by responsible remedial measures.
- Upgrading the quality of the Rivers Chelt and Frome by sewage treatment works' improvements and enhancing the quality of the major tributary of the Severn - the Warwickshire Avon, by actions detailed in the Avon's Catchment Management Plan.
- Seeking adequate rural sewerage systems to serve areas where pollution is evident. Support will be given to local schemes which will employ sensitive and sustainable methods of treatment.
- Reduction of diffuse nitrate and phosphate pollution by assisting the Ministry of Agriculture in managing Nitrate Vulnerable Zones and proposing to the Department of the Environment that the Gloucester-Sharpness Canal and the Rivers Severn and Leadon be designated as Eutrophic Sensitive Areas.

To protect ground and surface water resources. Particular aims are to:

- Manage the residual flow in the Severn at Gloucester to meet requirements for water supply, navigation and fish migration.
- Restore flow in the Glynn Brook in dry summers.

To provide flood defences to reduce the risk to people and property from flooding where this is cost effective and environmentally acceptable, to improve the system of flood warning in non-tidal rivers and to establish a warning system on the tidal River Severn. Particular aims are to:

- Establish a strategy with Gloucester City using a combination of new roadworks, redevelopment of flood plain fringes, removal of redundant structures and installation of new flood defences.
- Provide flood alleviation works in Cheltenham in co-operation with Cheltenham Borough Council to give increased flood protection to more than 700 properties.
- To reinstate degraded sections of river corridor to their full potential especially on the Rivers Cam and Frome and the Hatherley, Norman's and Horsebere Brooks.
- To support and develop recreational activities including restoration of the Stroudwater, Thames and Severn and Herefordshire & Gloucestershire Canals where this does not adversely affect other uses.
- To seek the return of otters to the catchment and protect native stocks of brown trout, especially in the Forest of Dean, and crayfish in the Little Avon, from introduced species.
- To improve and protect the fisheries in the catchment, in particular the elver fishery, via fisheries management, habitat and environmental quality improvements.
- To support the development of small scale hydropower schemes where it can be demonstrated that they do not adversely affect other uses of the River Frome or other Cotswold streams.
- To ensure that development at Avonmouth does not reduce the present flood storage capacity or adversely affect wetland ecology by co-operation with Bristol and Northavon Councils, the South Gloucestershire Internal Drainage Board and English Nature.
- To forward the principles of sustainability and environmental protection and enhancement by consultation with local authorities, agencies and developers within the planning process. This includes participation in the formal planning system and via Water Level Management Plans, Coastal and Catchment Management Planning.

The final overall aim encompassing all of these aspects is a sustainable water environment.

RIVER SEVERN LOWER REACHES CATCHMENT



KEY DETAILS

	CATCHMENT DETAILS	Area	2022km ²
		Population	512,200
	TOPOGRAPHY	Minimum Level	<10m Above Ordnance Datum
		Maximum Level	425m Above Ordnance Datum
	Tidal Range (Avonmouth)	Mean Spring Tides	12.3m
ADMINISTRATIVE DETAILS	COUNTY COUNCILS	Avon County Council Gloucester County Council Hereford & Worcester County Council	
	DISTRICT COUNCILS	Northavon District Council	
		Cheltenham Borough Council	
		Cotswold District Council	
		Forest of Dean District Council	
		Gloucester City Council	
		Stroud District Council	
		Tewkesbury Borough Council	
		Malvern Hills District Council	
		South Herefordshire District Council	
		Wychavon District Council	
	NRA	Severn-Trent Region, Lower Severn Area South Western Region, North Wessex Area	
	WATER COMPANIES	Severn Trent Water plc Bristol Water Co plc Welsh Water plc Thames Water plc Wessex Water plc	
	INTERNAL DRAINAGE BOARDS	Longdon & Eldersfield IDB North Gloucestershire IDB West Gloucestershire IDB South Gloucestershire IDB	
	BRITISH WATERWAYS	Gloucester-Sharpness Canal River Severn	

MAIN TOWNS AND LAND USE

The total population of the catchment is approximately 540,000. Main towns and settlements in the catchment are Gloucester, Cheltenham, Malvern, Avonmouth and Thornbury, Stroud, Ledbury, Cinderford, Lydney and Newent. The main land uses in the catchment are grass 40%, arable 33%, woodland 12% and the urban area 7%.

WATER QUALITY

Total classified length 363.8 km

Lengths of classified watercourse in each GQA Grade (km.)

Grade A	6.2
Grade B	137.5
Grade C	154.6
Grade D	39.4
Grade E	23.6
Grade F	2.5

WATER RESOURCES

Average annual rainfall	790mm/yr
Mean flow of Severn at Haw Bridge	8,980 ML/d
Total licensed abstraction	307,039 ML/yr
Number of licensed abstractions	605
Comprising groundwater	283
surface water	322

FLOOD DEFENCE

Length of main river in catchment	349.7 km
Length of raised flood defences	162 km
Area of land at risk from tidal flooding	25,200 ha
Number of properties at risk	2000

FISHERIES

Length of watercourses designated under EC Directive for Freshwater Fisheries (78/659/EEC).	
Salmonid	40.6 km
Cyprinid - Rivers	51.3 km
- Canals	5.0 km

CONSERVATION

Number of Sites of Special Scientific Interest (SSSIs)	105 (42 water based)
Number of Scheduled Ancient Monuments (SAMs)	148

CATCHMENT OVERVIEW

INTRODUCTION

This River Severn Lower Reaches CMP covers the River Severn Corridor from its confluence with the River Teme, just south of Worcester, to just below its tidal limit at Gloucester plus the Avonmouth and Severnside areas. The latter have been included in this plan as NRA Severn-Trent Region have Flood Defence responsibilities and associated conservation activities there.

For the purposes of this CMP and because of its characteristics, the catchment has been split into 6 sub-catchments as detailed below:

1. River Severn Corridor.
2. River Leadon.
3. Forest of Dean.
4. River Frome.
5. River Cam and Little Avon.
6. Avonmouth.

The River Severn Corridor includes the Malvern Hills and the main towns of Malvern, Cheltenham, Gloucester and at the confluence with the Warwickshire Avon, Tewkesbury. Historically, the River Severn has featured highly in the landscape characteristics of this area and is a focal point for many recreational activities. It is an historic navigation and now provides water supplies to around 1.5 million people. Malvern is world famous for its bottled water source, and "Regency" Cheltenham has some of the finest architecture in the country. Gloucester old docks have in recent years been renovated with the river now a feature again. Perhaps the most characteristic feature of the area is the Severn Bore which occurs at times of high tide, attracting many sightseers.

The River Leadon is a rural catchment and traditionally an area for hop-growing. This sub-catchment thus generates issues relating to agriculture, in particular the effects of farm pollution and water abstraction. The adjacent Forest of Dean is a popular area for visitors, but has historic and potential problems related to opencast and deep mining.

The River Frome is characterised by its shape. The steep-sided profile of the river valley with its resultant fast flows has been exploited for wool milling and is currently under scrutiny for its potential for hydropower generation. There is also considerable interest in canal restoration. The Gloucester-Sharpness Canal is not only of interest as a recreational feature, but also, along with the River Severn, supplies drinking water to Bristol and towns in this catchment.

The south west sub-catchments of the Cam, Little Avon and Avonmouth are areas where coastal defence predominates to protect from flooding. Avonmouth is criss-crossed by small drainage channels or "Rhines" which have been culverted in many cases to act as discharge channels from the extensive chemical works in Avonmouth.

Land Use

The catchment is predominantly rural, with the population centred on the main urban areas of Avonmouth, Cheltenham, Cinderford, Gloucester, Great Malvern, Lydney, Stroud, and Thornbury. The total population within the catchment is approximately 512,000, of which 41% is located around Gloucester and Cheltenham.



The majority of development is concentrated around the existing urban areas. Future development within the catchment is to be led by the Statutory Development Plans of the local Planning Authorities.

A large proportion of the total area is under grass cover. The Forest of Dean and areas of the Leadon, Frome and Cam sub-catchments contribute to 11.6% of the catchment being forested. There is also a significant area of arable farmland. Although a proportion of the Avonmouth sub-catchment is rural, the impact of the Avonmouth chemical industries is highly significant.



Geology

The characteristics of the Severn in its south-westerly course is governed by two main geological features. The Welsh border hills to the west are formed of old Palaeozoic rocks and are resistant to erosion, while to the south east, the Cotswold ridge is composed of limestone. In between, the low lying areas of Severn Vale are made of softer clays which make up the main Severn Valley. 70% of the catchment is dominated by clays and mudstones which lie in a broad central band from Worcester southwards to Dursley. Owing to their low permeability these strata are classified as Non-Aquifers. The Jurassic Limestones (Inferior Oolite Series) forming the Cotswold escarpment are Major Aquifers and owing to their fissured nature are highly vulnerable to surface derived pollution. Triassic Sandstones outcrop in a narrow, fault bounded block north of Newent. The Triassic Sandstone is a Major Aquifer which produces high yields and good quality water.

Along the south-western boundary of the catchment in the Forest of Dean are a series of Carboniferous strata consisting of limestones and cyclic sequences of shale, coal seams, sandstone and clays. The limestones are classified as Major Aquifers which produce variable yields and support surface water. These limestones are highly vulnerable to pollution from, amongst other sources, the mine workings in this area. Devonian Old Red Sandstone and Silurian limestones and shales exist as a narrow band along the western boundary between Ledbury and Ross-on-Wye, and are classified as Minor Aquifers. The Malvern Hills form a prominent ridge of Pre-Cambrian volcanic rocks forming the north-western boundary of the catchment.

Quaternary deposits occur throughout the region and include glacial and fluvioglacial clays and gravels, terrace gravels and river deposits. These superficial deposits are thin and variable in nature, and produce small quantities of groundwater at a local scale. In most cases these deposits are in hydraulic continuity with adjacent surface watercourses, and are classified as Minor Aquifers.

Hydrology

The range in topography of the River Severn Lower Reaches area gives a slight variation in hydrology. The Cotswolds, rising to over 400m in places, have an average higher mean rainfall than the Severn River valley and Leadon Catchment to the west - the rainfall varies from 655 mm/year at Ledbury to 900 mm/year at Miserden. The average catchment rainfall is 720 mm/year and average July soil moisture deficit is 100mm. The River Severn is supported by the Clywedog reservoir in Mid Wales and in times of low flow the Shropshire Groundwater Scheme.

Water Resources

The Severn below Worcester provides the water supply for around 1.5 million people. Cities and towns supplied include Bristol, Coventry, Gloucester and Cheltenham. The Rivers Frome and Cam are also major water supply rivers as they provide a significant proportion of the supply to Bristol in winter months.

The main uses of surface and ground water as a percent of total water quantity are as follows; Public Water Supply (64%), Power Production (21%), Fish Farming (5.5%) Cooling Water (2%) Industrial Use (2%), Transfer of Water (1.5%), Spray Irrigation (1%), Miscellaneous (3%).



The catchment area is subdivided into five catchments for water abstraction licensing purposes, Lower Mid Severn, Severnside below Tewkesbury, Leadon, the Frome and the Little Avon. There are a total of 627 abstraction licences within these subcatchments allowing for a maximum 20,715 Ml/a (megalitres per annum) to be abstracted from groundwater and 286,324 Ml/a from surface water sources.

There are major abstractions for public water supply from the River Severn at Upton-on-Severn for Coventry, at Tewkesbury for Gloucestershire and from the Gloucester-Sharpness Canal for Bristol.

The majority of licences (405) are for agricultural purposes and spray irrigation, giving a total potential abstraction of 3,414 Ml/a, of which 1,087 Ml/a is from groundwater and 2,327 Ml/a from surface water for these purposes.

The catchment has two main sources for groundwater abstraction. These are Oxenhall and Bromsberrow units, both in the Newent area. The NRA has a duty to protect this resource

which is vulnerable to over abstraction and is important in supporting surface waters through springs and base flows to rivers. There are also other limited groundwater abstractions such as in the Cotswold area where an increasing number of licences has prompted the need for further monitoring.

Water Quality

The watercourses of the lower Severn reaches include a wide variety of rivers and streams. Quality similarly varies from totally unpolluted streams to nutrient rich rivers suffering oxygen depletion in summer and to streams whose quality is dominated by sewage and trade effluents.

The majority of rivers within this catchment, including the Gloucester-Sharpness Canal, fall into the categories "Good" and "Fair" under the NRA General Quality Assessment Scheme. This means that they can support game and coarse fisheries respectively.

Some tributaries of the Leadon and a stretch of the Chelt downstream of Cheltenham fall into the "Poor" category, owing

mainly to sewage inputs. The Avonmouth rhines can be considered in a practical sense to be drainage channels or, as on industrial sites, culverts for effluent disposal. As such they are not classified under this scheme. 40% of current classified reaches fall into the highest GQA Chemical Grades, 53% into Fair GQA Grades and 7% into Poor Grades.

As the River Severn enters the catchment below Worcester, it is subject to opposing influences, i.e. the polluting effect of Worcester sewage works and the diluting effect of the clean river



Teme. Quality remains good throughout the stretch to Tewkesbury and the Avon confluence. Although of lower chemical quality than the Severn, the Avon has limited immediate impact because of the much greater flow in the Severn. However, the disproportionate nutrient load from the Avon contributes to the periodic incidence of algal blooms in the Severn from this point on. The River Chelt, contains the treated effluent from Cheltenham Sewage Works, adding to the effects of nutrient enrichment.

Below the tidal limit at Maisemore, the Severn ceases to be an inland water and becomes a tidal river, with unstable bed and

physical conditions changing violently during tide cycles. Vast quantities of silt are re-suspended and subsequently deposited with the passage of the tidal bore, which brings estuary water up to Gloucester. The discharge from Gloucester Sewage Works into this stretch has been an important influence on quality, now much improved as installation of full treatment proceeds.

The Leadon catchment is predominantly agricultural. Its quality is affected by pollution incidents from farms, including run-off of pesticides. At Ledbury it receives effluent from the sewage works, plus urban and industrial drainage, which promotes evidence of eutrophication, exacerbated by slow flowing conditions. Quality improves as it nears the River Severn.

Streams in the Forest of Dean are mostly fast flowing and uncontaminated, except where they receive minewaters from abandoned coalmines, e.g. Cannop Brook. There are also a number of continuing industrial influences.

The Frome starts as an excellent quality river, but urban influences and historic industrial use throughout the Stroud valleys lead to a lowering of quality. At Stanley Downton, it receives the treated effluent from Stroud Sewage Works but recovers its quality before reaching Whitminster, where it flows partly into the Gloucester-Sharpness Canal and partly into the Severn Estuary.

The Cam is also of excellent quality in its upper reaches, but is affected by the discharge from Coaley Sewage Works. Quality improves again by the time it enters the Gloucester-Sharpness Canal.

The Little Avon is mostly of good quality with some stretches of fair quality.

Flood Defence

In the Severn valley from Worcester to Tewkesbury there are a total of 28 km of flood defence embankments protecting 4,600 ha of flood plain to a nominal 1 in 5 year standard. The remaining flood plain areas at Kempsey, Upton and Longdon Marsh still flood annually. All these flood plain areas provide essential protection or relief from flooding for property both in this reach and downstream. Impoundment for navigation purposes (e.g. weirs) can impede drainage of low lying areas.

In the Severn valley from Tewkesbury to Gloucester there are 34 km of embankments protecting 5,000 ha of flood plain to an annual standard. Unprotected areas around Tewkesbury and the Avon confluence flood more frequently. Again these areas are vital to flood protection and impounded navigation levels inhibit drainage.



The Estuary lowlands, from Gloucester to Beachley on the west and Avonmouth on the east, are protected by 100km of sea/tidal defences, with 15,600 ha of land lying below high tide level. This area contains around 2000 properties. Drainage of these areas is a problem due to low levels, tide-lock, slack gradients and "foreign water" drainage from the extensive uplands which back them. Defences in the tidal reach have to cope with the second largest tidal range in the world - the mean spring tidal range at Avonmouth is 12.3m.

There are of course a host of other tributaries and lesser watercourses on which the drainage of the farthestmost parts of the catchment depends. Many of these are "ordinary watercourses" and as such primarily the concern of District Councils. Over the winters of 1992-93 and 1993-94 there was extensive local flooding on these minor drainage systems which caused much alarm and distress to the property owners involved.

LOWLAND DRAINAGE:

The lowlands of the Severn comprise the flood plain above Gloucester and the coastal lowlands below. Both lie below river or tide flood levels and have local drainage problems. This problem is illustrated by the fact that all four Internal Drainage Boards (IDBs) which lie within Lower Severn area are located along this part of the Severn.

The Boards are: Longdon & Eldersfield IDB, North Gloucestershire IDB, West Gloucestershire IDB and South Gloucestershire IDB.

These are all sovereign authorities wholly responsible for the internal drainage within their own areas.

FLOOD WARNING SERVICE:

A full flood warning service to NRA national standards is operated on three reaches of the Severn:

Reach	Location
S10	Powick to Mythe Bridge
S11	Mythe Bridge to Ashleworth Quay
S12	Ashleworth Quay to Minsterworth.

A storm tide warning service, limited to the immediate area of the settlement, is provided for Severn Beach near Avonmouth to the national standard.

A limited flood warning service is provided on the Frome below Stroud. This does not cover the main urban areas but is targeted primarily at the Gloucester & Sharpness canal to enable flood control sluices to be operated for the protection of the canal. At present there are no flood warnings in operation in the estuary.

Fisheries

A broad variety of fish species are present in the catchment. Both coarse(cyprinid) and game(salmonid - salmon and trout) fish are fished by anglers. In addition, there are commercial fisheries for eels and elvers as well as salmon in the estuary. Stretches of the Rivers Leadon, Frome and Little Avon are designated as salmon fisheries under the EC Fisheries Directive. Stretches of the Rivers Severn, Leadon, Longdon Brook, Cannop Brook and the Gloucester-Sharpness Canal are designated cyprinid fisheries under this Directive.

Conservation, Landscape and Heritage

The lower reaches of the Severn contains a wide variety of habitats and landscape features as well as being a popular tourist area. The attractive upland landscape of Areas of Outstanding Natural Beauty (AONBs) such as the Malvern Hills contrasts with the broad expansive floodplain of the Severn. However, there are a number of watercourses which, owing to past maintenance practices are in need of renovation and improvement.

In the Forest of Dean, both the quality and landscape value of the environment are affected by mining activities. In the urban areas the rivers have in the past been canalised or culverted for various reasons which has degraded the river habitat. The Avonmouth sub-catchment is characterised by the rhine system which, in itself, is of habitat interest. It does, however, carry a legacy of industrial land usage. In addition to renovation or restoration, riverside amenity development is a feature in the lower Severn area. The integrated management of aquatic habitats via 'Water Level Management Plans' will be an important aspect of equating land drainage and conservation needs.



Recreation and Navigation

The catchment area varies greatly in actual or potential recreational opportunities depending upon the locality and the mix of natural and man-made resources.

The Forest of Dean has possibly the greatest identity and individual character as a recreational and tourist area, with other highlights being the Wildfowl Trust at Slimbridge and the restored Gloucester Docks. Some recreational activities are land based, but by their nature attract people to the river environment, eg. walking, picnicking and bird watching. Angling is prevalent throughout the area. There is a steadily increasing demand for water sport activities and various forms of boating and sailing. The 'Severn Way' long distance footpath follows the river throughout Gloucestershire and is currently being extended.

The River Severn is navigable from Stourport in the north (outside of this CMP area) to Gloucester in the south ie. above the Gloucester Weirs and links via the River Avon and various canals into the inland waterway system. British Waterways are the Navigation Authority. Navigation of the river below Gloucester is possible but hazardous. The navigable waterway below Gloucester Docks, therefore, is the Gloucester- Sharpness Canal which gives access via Sharpness Docks to the Bristol Channel and the open sea.



Infrastructure

There are 3 County Councils and 10 Borough/District/City Councils in the Catchment.

Three motorways cross the catchment, the principal motorway is the M5, which conveys traffic north and southwards. Two motorway arteries radiate from the M5, the M50 which joins north of Tewkesbury and the M4 joins north of Bristol. These motorways are served by an extensive network of A and B roads.

Major new infrastructure for the catchment includes the Second Severn Crossing at English Stones which is currently under construction.

Rail transport consists of main lines to Bristol and Birmingham, Gloucester to Swindon via Stroud, Gloucester to South Wales via the Severn Tunnel, Filton to Avonmouth and the predominantly industrial link to Severn Beach.

SUMMARY OF ISSUES



ISSUES AND OPTIONS

The following tables list the 37 issues which the NRA has identified within the River Severn Lower Reaches Catchment. (The sites of these are numbered on the map). We would like to hear from you if:

- You think that there are other issues which have been missed.
- You think that we have not considered all the options available.
- You have any views on the options suggested.
- You have any other information about the catchment or any other comments about its future management.

ISSUE NO:1 Achievement of River Water Quality Objectives

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Pursue achievement of medium term quality class within timescale set, by pollution prevention, liaison with public and other bodies and enforcement of pollution legislation	NRA/ Severn Trent Water plc/ Farmers/ Industry	Quality targets achieved	Costs of improvements
2. Establish reasons for non-compliance with all long-term targets during period of Plan	NRA	Preparation for future target setting	Resources

ISSUE NO:2 Extension of designated fishery reaches

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Resolve apparent mis-match between actual fishery status and water quality	NRA	Extend designations	May not be possible

ISSUE NO: 3 Protection of water supplies from River Severn and Gloucester-Sharpness Canal and designation as a Water Protection Zone

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Consider designation of Severn and Gloucester-Sharpness Canal as Source Protection Zones	NRA/DOE	Increased powers to control potentially polluting activities	
2. Install additional automatic water quality monitors at Kempsey and Slimbridge	NRA	Early warning of water quality changes	
3. Establish targeted programme of inspections of potentially polluting premises and act on deficiencies identified	NRA/Farmers/Industry	Identify sources of potential pollution and reduce risk	Resources
4. Initiate publicity campaigns to mobilise pollution prevention effort in Agriculture and Industry	NRA/Farmers/Industry	Greater awareness of pollution risks and commitment to remedies	Resources
5. Liaise with Planning Authorities and Developers to minimise pollution risk from development	NRA/Planning Authorities/Developers	Secure pollution prevention measures	None

ISSUE NO: 4 Impacts of the Urban Wastewater Treatment Directive & designation of Eutrophic Sensitive Areas

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Monitor Severn Trent Water plc implementation of agreed capital programme of specified timetable	NRA/Severn Trent plc	Compliance with UWWTD and upgrading of the River Chelt	Resources
2. Review consents in line with agreed programme	NRA/Severn Trent Water plc	Compliance with UWWTD and upgrading of the River Chelt	Resources
3. Gather data to enable decisions to be made on proposed Eutrophic Sensitive Areas	NRA	Improved long term water quality	Resources
4. Carry out Eutrophication Project to assess impact and benefits of nutrient removal from sewage works in eutrophic sensitive areas	NRA	Quantify benefits of nutrient removal	Resources

ISSUE NO: 5 The impact of the River Chelt on the water quality of the River Severn

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Liaise with Severn Trent Water plc to define optimum schemes to upgrade quality in line with AMP 2 commitments	NRA/Severn Trent Water plc	Upgrade of water from RE5 to RE4 by year 2000	None
2. Assess need for nutrient removal at Cheltenham STP during 1995/6 in connection with proposed ESAs for the River Severn and Gloucester-Sharpness Canal	NRA	Determine impact of discharge on nutrients in the River and Canal	Resources

ISSUE NO:6 Impact of investments & improvements at Gloucester Sewage Works on the tidal River Severn

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Monitor completion of new works and improvements in effluent quality	NRA/Severn Trent Water plc	Quantify reduced pollution load	None
2. Continue to monitor effect of improvements to estuarine water quality	NRA	Upgrade Estuary Quality Class	Resources
3. Assess effects on migratory fish	NRA	Minimised mortality and improved migratory passage	None

ISSUE NO:7 Sewage and industrial discharges

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Recommend appropriate controls on new development in Ledbury and impose controls on Ledbury STP to minimise potential pollution.	NRA/Malvern Hills District Council/ Severn Trent Water plc/ Developers	Maintain and improve water quality below Ledbury	Costs to developers & the water company
2. Address upgrading of Hatherley Brook at next water company price fixing round (1999/2000)	NRA/ Severn Trent Water plc	Improved water quality by 2005	Cost
3. Assess need for nutrient removal at Coaley STP during 1995/6 in connection with proposed ESAs for the River Severn and Gloucester-Sharpness Canal	NRA	Determine impact of discharge on nutrients in the River and Canal	Resources
4. Oppose development where inadequate sewerage is likely to lead to pollution	NRA/District Councils	No deterioration on existing situation	Pressure for development. Local Authority decision

ISSUE NO:8 Upstream impacts on water quality in the River Severn

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Environmental assessment into question of extension of navigation in Upper Severn	Developer NRA to make scoping suggestions	Maintenance of water quality	Cost of study
2. Continue to monitor impact of colour	NRA	Ability to warn abstractors and inform public	Resources
3. Continue to monitor the River Avon	NRA	Identifies impact of Avon on Severn	Resources

ISSUE NO:9 Pollution from inadequate rural sewerage

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Promote action by District Councils and others to provide sewerage	NRA/ District Councils	Lower pollution and benefit to householders	Cost of schemes
2. Oppose development where inadequate sewerage is likely to lead to pollution	NRA/District Councils	Prevention of pollution	Local Authority planning decision
3. Explore feasibility of alternative sewage treatment methods e.g. reed-beds	District Councils/ Developers/Water plcs	Widens options available	None

ISSUE NO:10 The impact of pesticides on water quality

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Target farm visits and inspections. Prosecute polluters when found	NRA	Educate users to reduce impact on water quality	Resources
2. Continued monitoring of eels in the catchment for Dieldrin etc.	NRA/MAFF	Ensure eels are not carrying excessive levels of dieldrin	

ISSUE NO:11 Farm pollution including the effects of ammonia & nitrate.

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Maintain targeted farm inspections and identify remedial action needed	NRA/Farmers	Identify sources of potential pollution and reduce risk	NRA resources
2. Serve Notices under 1991 Farm Waste Regulations to secure remedial action	NRA/Farmers	Response required within defined timescale	Appeal procedure
3. Prosecute identified polluters	NRA	Publicity for enforcement policy Penalty for offences committed	None
4. Monitor effectiveness of Nitrate Vulnerable Zones in reducing nitrate in local watercourses and groundwater	NRA	Quantify benefits of NVZ	Resources

ISSUE NO:12 Pollution risks from contaminated land

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Impose planning conditions and secure associated Section 106 obligations on redevelopment of affected sites	NRA/ Local Authorities	Establish appropriate monitoring and ensure remediation protects water resources	Resources NRA input to Planning Agreements not always accepted
2. Encourage engineering and waste management solutions	NRA/HMIP/ Landowners/ Local authorities Waste Regulation Authorities	Controls existing problems. Good schemes may save energy and money. Sites can be made fit for development	Requires co-operation of landowners. Initial capital cost
3. Maintain liaison with Waste Regulation Authorities	NRA/Waste Regulation Authorities	Co-ordination of effort with better inspection and monitoring of sites	Recent legislative changes exempt some contaminated sites from licensing
4. Maintain database of information on existing contaminated land sites	NRA/ Local Authorities	Identifies possible problems with development proposals. Identifies possible source of pollution problems	Reduction of of land if data misused
5. Recommended environmental assessment and scope of study on significant planning application concerning contaminated land	NRA/ Local Authorities	Full identification of environmental problems	Contaminated land register rejected by government. Costly and time consuming, not relevant for all sites
6. Implement intensive survey of rhines & groundwaters around Avonmouth	NRA	To identify those areas most contaminated with metals from slag disposal	

ISSUE NO:13 Pollution from mining and quarrying in the Forest of Dean

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Enforce legislation for discharges to controlled waters, including underground waters, where justified by available evidence	NRA/ Mining Companies	Safeguard groundwater and surface water quality	Legal restrictions. Additional resources required in tracing discharges underground
2. Liaise with companies to secure improved pollution prevention measures	NRA/Mining Companies	Minimise accidental pollution	
3. Assess possibility of remedial measures to the riverbed habitat, including removal of iron-contaminated substrate	NRA	Improved ecosystem and fishery	Resources

ISSUE NO:14 Water contact sports and relevant quality standards

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Education on problems of contact sports in relation to water quality	NRA/ Environmental Health Department Local Authority	Prevention of disease	Still a very uncertain area not statutory NRA responsibility
2. Identify Water Quality Standards for contact sports	NRA/ Environmental Health Department Local Authority	Identification of suitable reaches of rivers for sports	Not statutory responsibility some liability may be implied

ISSUE NO:15 Impacts of marinas & oil pollution from boats on water quality

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Press for polluting discharges from vessels to become an offence	DOE	Quality improvement in rivers & canals	Requires legislation
2. Adherence to boat standards prescribing separation of engine compartment & provision of oil spill trays. (Voluntary since Jan 1993; may be made mandatory within Waterways Bill)	BW/Navigation & Canal Trusts	Ensures that oil spills are contained within the engine compartment	Costs to builders and owners of boats

ISSUE NO:16 River Litter

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Better security at industrial sites to prevent vandalism	Site Owner	Crime prevention and reduction of pollution risk	Cost
2. Educate and organise preventative action	NRA/Police/Local Groups (e.g. Neighbourhood Watch)/Tidy Britain Group	Prevention rather than cure	Needs support of statutory changes and enforcement of existing litter laws
3. Change in legislation to clarify responsibilities	Lobbying by interested parties and public.	Would provide statutory duty for an agency to be responsible for litter in rivers	Extra cost

ISSUE NO:17 Seasonal effects of blue-green algae on the Stroudwater Canal and Frampton Lakes

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Continue to monitor all reported occurrences and notify interested parties when reportable levels found	NRA	Increased awareness of problem	None

ISSUE NO:18 Pollution risks associated with Hempstead Tip Gloucester

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Use powers under Water Resources Act 1991 to enforce pollution control and preventative measures	NRA/ site owner	Improved environmental quality	None
2. Liaise with the Waste Regulation Authority on appropriate Licence conditions to minimise potential pollution	NRA/Waste Regulation Authority	Minimise pollution risk	None

ISSUE NO:19 Impacts of large industrial plant

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Frequent consent reviews to ensure continued tightening of legitimate discharges to rhines & estuary	NRA/HMIP	Improvements in environmental quality.	Cost
2. Identify, regulate & control discharges from industrial & trading estates	NRA/HMIP	As above	Cost. Acceptance of legal responsibility by dischargers
3. Increase range & frequency of chemical & biological monitoring	NRA/HMIP/ Discharger	Better assessment of effects. Will assist options 1 & 2	Cost Resource implications
4. Close co-operation with Fire Services to ensure that environmental hazards are known and action plans agreed	NRA/Local Fire & Rescue Services Industrial Site Owners	Minimise impacts on the water environment	None

ISSUE NO:20 Maintenance of flows at Gloucester for abstraction to the Gloucester-Sharpness Canal & other environmental uses.

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Review of operation of Clywedog and Shropshire Groundwater to provide required flows at Gloucester	NRA	More efficient use of available water resources. Maintains required flows at Gloucester	Cost if increased flow support required
2. The use of Gloucester - Sharpness Canal to store water for use during periods when pumping at Gloucester is restricted	BW/ Bristol Water/ NRA	Small increase in resource	Risk of deterioration of water quality & canal ecology with possible construction effects. Does not meet requirements
3. Bankside storage equivalent to 5 days of the Purton (Bristol Water) abstraction	BW/ Bristol Water/ NRA	Any new reservoir could be designed for conservation /recreation uses	The reservoir may have visual impact and problems with access road
4. Review the operation of the Sharpness Docks to prevent freshwater being released from the canal during operation	BW/ Bristol Water	Small increased resource may be achieved through pumping	Risk of saline intrusion and possible construction effects
5. River storage in the River Severn by adjustment of weirs at either Maisemore, Llanthony, Upper Lode or a tidal exclusion barrier below Lower Parting	NRA/BW	Would meet most requirements and provide a control of flow to the to the estuary A tidal barrier may improve water quality for abstraction at Gloucester	Risk of contamination of water retained inpond. Threat to ecology & fisheries during construction. Mechanised control structure. Bank protection. required. Interference with drainage of riverside land
6. Installation of new flow monitoring site	NRA	Better assessment of flows	Cost

ISSUE NO:21 Potential effects of a Severn-Thames Transfer scheme

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Appraisal of environmental implications of the scheme for Severn	NRA	Allow full implications of the scheme to be realised	Possible time constraints & cost of study
2. Investigations into biology and chemistry of Severn to assess impact on Thames	NRA	Allows NRA to establish policy on transfer	Costs
3. Promote best use of present resources	NRA/ Water Companies	No environmental impacts	Does not allow for contingency planning

ISSUE NO:22 Impact of low flows in the Leaddon, Forest of Dean, Frome and Cam/Little Avon

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
LEADON (GLYNCH BROOK)			
1. Provide compensation borehole	Severn Trent Water plc	Compensation flow to the Glynych Brook during dry periods. Improved habitat, ecology and fish stocks	No practical long term solution to over abstraction of groundwater.
2. Reduce licensed quantity in unit		Long term improvement	Other water sources needed to supply local requirement
3. Provide new flow measurement capacity to Glynych Brook	NRA	Monitor and enforce compensation discharges	Cost

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
FOREST OF DEAN			
1. Provide new flow measurement on River Lyd	NRA	Improvement to flow predictions and safeguard supplies to abstractors.	Costs of new gauging station
2. Monitoring of flows to be part of planning agreement in any opencast mining operation		Early warning of flow changes	
FROME			
1. River bed maintenance	Riparian Owner/ Canal Society/ NRA	Reinstate and preserve flows	Costs and continued maintenance may be prohibitive
2. Appraise effect of local abstractions.	NRA	Identify real causes of problems	Costs
3. Operating agreement with landowners to control flows to Canal and River.	Riparian Owner/ Canal Society/ NRA	Improved flow in Frome Possible flooding relief	
LITTLE AVON			
1. Conduct seasonal flow monitoring investigations and compare with historical records	NRA	More control and accurate monitoring	None
2. Ensure all licence abstractions operate within specified conditions	NRA/ Abstraction licence holders	Establish whether real problem exists	None
3. Increase frequency of checks for non-licenced abstractors	NRA		Resources

ISSUE NO:23 Severn Exempt Area Order

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. NRA to review policy of exempt area to support proposals for legislative changes	NRA Abstractors	Clarification of the exempt area and possible protection of existing abstractors	Reappraisal of existing abstractors requires a substantial administrative input

ISSUE NO:24 Local issues relating to fish farms in Little Avon Catchment

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Review of flow management practices	NRA	More accurate reflection of actual practices. Enforcement against transgressors	None
2. Chemical & biological survey upstream & downstream of fish farms to determine any change in water quality. <i>Sites for Action: Ozleworth Brook and Little Avon</i>	NRA	Basis for consent enforcement or revision	Resources

ISSUE NO:25 Major flooding from the River Severn and Chelt

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Complete investigation of possible flood alleviation works at Upton-upon-Severn and Kempsey	NRA	Provision of defences in priority areas	Practicability of works, economic and acceptability to beneficiaries
2. Develop river and flood plain management strategy for Gloucester	NRA/Local Authorities	Provision of defences in priority area. Control of development. Flood plain restoration	Economic appraisal. Availability of funds

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
3. Complete Severn Tidal Defences Improvement Scheme in accordance with NRA capital works programme agreed by Regional Flood Defence Committee	NRA	Improvement of tidal defences in priority areas	Economic appraisal. Availability of funds
4. Complete registration of Chelt through Cheltenham as "main river"	NRA/MAFF	NRA authorised to carry out maintenance and improvement works	Objections raised to maining
5. Develop flood alleviation scheme on River Chelt through Cheltenham	NRA/ Cheltenham Borough Council	Provision of flood protection in priority area	Practicability of works, economic appraisal and acceptability to beneficiaries

ISSUE NO:26 Flood Warning

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Complete improvement of existing flood warning scheme	NRA	Improve flood warning	Accuracy of forecasting model. Cost
2. Investing etc. in extension of flood warning scheme	NRA	Provide flood warning for areas not previously covered	Practicability (especially lead times). Economics. Cost
3. Develop new tidal flood warning scheme for estuary	NRA/ Government Depts/ External Agencies	Provide flood warning areas not previously covered	Practicability. Forecasting/modelling limitations. Economics. Cost

ISSUE NO:27 Flood plain management

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Accurate definition of the floodplain for Rivers Frome and Chelt	NRA	Gives baseline information or "terms of reference" for management purposes for NRA & other parties	Shortfall in basic data will be costly and time consuming to address.
2. Promotion of Buffer Zones particularly in areas of arable farming. <i>Leadon, Ell Brook, Swilgate, Normans Brook, lower reaches of Cam, Chelt and Frome.</i>	NRA/EN/ Conservation bodies/ CoCo/MAFF/ CPRE/CLA Landowners/NFU	Protection and improvement of the riverside habitat. Reduced pollution effects	Inadequate grant emphasis to encourage landowners
3. Managed Retreat. Severn Estuary Strategic Study has identified potential sites <i>e.g. Berkeley Estate land at Slimbridge</i>	MAFF/EN/ NRA/NFU	Creation of new wildlife habitat while maintaining flood or sea defence	Reduced land availability for development. Very little appropriate area
4. Better incentives for landowners to take up grants for environmental improvements	Government/ MPs (as advised by NFU/ MAFF/others)	Puts 2 & 3 higher on the priority list for land management	None
5. Investigate removal of redundant structures at Gloucester	NRA/Gloucester City Council/ British Rail	Potential increase in flood storage area	None

ISSUE NO:28 Rehabilitation of river corridors

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
LANDSCAPE/VISUAL QUALITY			
a) Landscape Appraisal programmes using established methodologies. <i>Cbelt, Frome, Cam</i>	NRA/Local Authorities	Allows prioritisation and a baseline for planning improvements.	Cost.
b) Planned programme and strategy to improve character, e.g. planting willows to pollard, hedgerows and re-creation of flood plain river corridor vegetation "wildlife corridor" <i>Lower reaches of Cam, Frome, Hatherley, Norman's, Horsbere Brooks</i>	NRA/MAFF/Landowners/FWAG/LA's etc.	Follows on from a) Can incorporate costs at source. b) Re-creation of historically more typical landscape.	Economic - available funding generates priorities. Land ownership
CHANNEL REHABILITATION			
RECREATING NATURAL PROFILE/GEOMORPHOLOGY			
Development of a collaborative strategy for deculverting and/or removal of redundant structures	NRA/LA's/Landowners/Developers	Restores river habitat	Cost
HABITAT VALUE			
a) Restoration of habitats by strategic management, particularly otter habitat and wetland/salt marsh/reed bed	NRA Landowners EN/Wildlife Trusts	Improved natural state of the river corridor	Cost Land uptake. Flood Defence requirements
USES & ACCESS			
a) Survey of existing recreational needs and potential requirements as a result of improvements	NRA	Allows formulation of a strategy	May need to reach a compromise between access & conservation
b) Collaboration with user groups to identify needs and resolve conflicts of interest	NRA/Sports Council CLA/Conservation Bodies/National Trust	As above, plus development and conservation of built and natural environment	As above
c) Promotional/ collaborative projects to extend provision and access	CC's/LAs/EH/CoCo		

ISSUE NO:29 Competing requirements of river engineering and other uses

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. NATURE CONSERVATION			
Protection of Habitats. Methods:			
a) Environmental assessment of proposed sites for works	NRA/EN/ Developers/ Local Authorities CoCo/ landowners	Allows the ecology of the river to be protected and new habitats to be created. Separation of potentially conflicting uses. Provision of advice on best practice	Flood Defence requirements. Land uptake requirements
b) Grant schemes			Local Authority planning concerns
c) Countryside Stewardship			Communication.
d) Managed Retreat			Resource implications
e) Zoning			
f) Maintenance of advisory role			
2. THREATENED SPECIES			
a) As above plus			
b) Surveys of particular species or groups at risk	NRA/EN/RSPB/ Wildlife Trusts	Provides information upon which to plan for works and/or mitigative procedures. Can be an active means of compromise either on site or elsewhere	Can be lengthy and costly
c) Habitat recreation (e.g. River Severn Otter Project)	As above		
3. LANDSCAPE/VISUAL IMPACT			
a) Environmental Assessment	NRA/Landowners Developers/ Local Authorities	Provide an assessment of the overall impact of works & provides basis for consultation between interested parties	Cost
b) Programme of Landscape Appraisal	NRA/Local Authorities	Protects the cultural heritage of the river landscape	None
c) Consultation	As above	As above	

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
d) Use of appropriate designs and materials for the locality	NRA/Local Authorities/ designers /engineers	Blends with surroundings	May add cost to the project
RECREATION			
a) Provision when designing projects to incorporate access for recreational uses	As above	Allows the works themselves to become a recreation asset.	As above
b) Integration of recreational requirements with existing land use	NRA/Local Authorities/Wildlife Trusts/EN/CoCo	Increased recreational access/activity	Needs careful design - has to be matched up with existing uses
MAINTENANCE OF WATER LEVELS			
See Issue 37			
PHYSICAL GEOMORPHOLOGY/ CHANNEL PROFILE			
a) De-culverting wherever possible (See Issue 28)	NRA/Landowners/ Developers/Local Authorities	Re-creation of wildlife habitats	Flood Defence requirements
b) Appropriate design of features to allow compromise between efficient flood water conveyance and natural structure of channel		Improved river landscape Protection of channel geomorphology	
PUBLIC INTEREST			
a) Consultation via Environmental Statements (where appropriate) /press releases/notice boards/etc	NRA	Allows local interest to be accommodated at an early stage	Can be a lengthy process with not all interests accommodated fully. Must follow government finance rules
b) Full use of tendering procedures to allow best local facilities to be used	As above	Ensures that the full benefit of the project locally is realised	

ISSUE NO:30 Reconciliation of competing requirements between recreational users and conservation interests

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Survey present recreational uses and assess on-site conflicts arising	NRA/ User Groups	Gives information upon which to formulate a strategy	Cost
2. Formulate a strategy for action at specific sites - in conjunction with rehabilitation and landscape strategies (cf Issue 29)	As above	Provides a framework for discussion and resolution of conflicts	May not be able to resolve all user conflicts
3. Investigate options for zoning of activities to geographically separate uses	As above	Removes conflicts between different user requirements	May not be possible to link with footpaths etc. or get access permission

ISSUE NO:31 Development of Recreational Access

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Collaborative projects within Tewkesbury, Upton and other potential sites	NRA & Others	Fulfilment of NRA aim to improve access and promote recreation	Cost. Agreement with landowners
2. Continuation of Severn Way Project	NRA/ Landowners	As above	As above
3. Investigation of potential cycle tracks	NRA/ Sustrans	As above	As above
4. Analysis of recreational use and development of nodal points with facilities such as parking, interpretation, etc.	NRA	As above	As above
5. Promote access to or along all rivers within catchment where appropriate and where opportunities arise	NRA/ Landowners / Local Authorities	As above	As above

ISSUE NO:32 Protection of rare species

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
SHAD			
1. Preparation and adoption of Shad Conservation Strategy to include e.g identification and protection of spawning habitat, provision and assessment of use of fish passes	EN/CCW/NRA	Maintenance of species diversity	Cost
2. Quantification of numbers and exploitation rates			
CRAYFISH			
1. Liaise with MAFF to limit further consents under Section 30 of Salmon & Freshwater Fisheries Act 1975 plus Wildlife & Countryside Act 1981	MAFF/NRA	Allows control over introduction of alien species	Relies on NRA being informed of proposals
BROWN TROUT			
1. As above	NRA	As above	
OTTER			
1. Reintroduction and development of otter habitats via the Severn Otter Project	Worcestershire Wildlife Trust/ NRA	Otters on the Severn	Costs of proactive projects

ISSUE NO: 33 The Elver Fishery - associated problems

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Continued enforcement of the requirement for a licence and compliance with the fishery legislation	NRA	Regulation of the elver fishery	Cost
2. Increased patrol work and prosecution of boat owners contravening the navigation legislation	BW	Fewer complaints from fishermen	
3. Provision of eel & elver passes on weirs and sluices in the catchment	NRA	Improved eel stocks	Cost
4. Elver station should be encouraged to make catch data available to the NRA on an annual basis	NRA/MAFF	Improved data on elver numbers for better management of the fishery	

ISSUE NO:34 Canal Restoration

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
FROME			
1. Restoration of Stroudwater Canal	Cotswold Canals Trust/NRA	To encourage recreational amenities in the area	The impact on water resources to supply the canals with water. Flood defence
2. Review of status of old connections and use of existing channels	NRA/Canal Trust/Landowners	Protection of existing requirements	Protection of environmental quality. Impact on other abstractors (present & future)
SEVERN-THAMES CANAL			
Water requirements met by gravel extractions dewatering	NRA/ Canals Trust/Wiltshire County Council	Less pressure for water on River Frome	May have environmental quality implications. Requires further study
HEREFORDSHIRE & GLOUCESTERSHIRE CANAL			
1. Restoration	Herefordshire & Gloucs. Navigation Trust/NRA/Council	Improve the navigation in the area	New route is required in certain areas and impact on water resources and flood defence
2. Use of river channels			Protection of ecology

ISSUE NO:35 Hydropower Development

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
RIVER CAM			
Make an agreement with the existing user to create a water resources bank upstream for future applicants	NRA/ Abstractor	To support an alternative form of power generation but at the same time maintain the availability of water resources	Possible costs to compensate for loss of power production
RIVER FROME			
Ensure agreements are made with developers to ensure long term maintenance and protect river gauging record	Developer/ NRA/ Landowners	Long term protection of river	None

ISSUE NO:36 Development Issues

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Ensure all reasonable pollution prevention devices are included within design specifications	NRA/ Developers/ Local Authorities	Protection of water based environment	Costs involved
2. Ensure all outfalls are properly authorised	NRA/HMIP/ Dischargers	As above	As above
3. Ensure maintenance is conducted in a manner to avoid problems with aquatic environment	As above	As above	As above
4. To be proactive with regard to land use strategies, development plans and proposals	NRA/ Local Authorities/ Developers	Protection of the water based environment	Resources
5. Develop good communications with groups/organisations involved in land use issues	NRA Local Authority/ Developers/ Other organisations /HBF/Public	Promote a proactive approach to development issues affecting the water environment	Resources

ISSUE NO:36 Continued Development Issues

AVONMOUTH

1. Maintenance and protection of sea defences and outfalls	NRA/ Local Authorities	Existing flooding situation not made worse	Limitations of developable land High cost of infrastructure
2. Protection of rhine system	South Gloucs. IDB/ Local Authorities	Retention of wildlife corridors and wetland habitats	As above
3. Protection of available storage capacity for flood waters in tide-lock conditions	NRA/South Gloucs. IDB/ Local Authorities	Ensure that new and existing properties are not put at greater risk	As above
4. Contaminated land surveys and remediation works required for contaminated sites	Developer	Avoid putting both the watercourse system and those living or working in the area at risk from contaminants that could be mobilised by development	

ISSUE NO:37 Water Level Management Plans (WLMP)

OPTION/ACTIONS	RESPONSIBILITY	BENEFITS	CONSTRAINTS
1. Produce WLMPs	EN/IDBs/ NRA as agreed	Allows appropriate land drainage management whilst also providing for other uses	Conflicts of user requirements; Difficult to sustain unless there are water level controls (sluices, valves, gates etc.)
2. Do not produce WLMP's	As above	None	Cannot achieve the aim of management for drainage & conservation uses.
3. Provide Hydrological information to produce plans. <i>Sites for Action:</i> <i>Walmore Common</i>	NRA/ IDB	Appraise effect of abstractions and potential development	



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