local environment agency plan

AVON AND ERME

ACTION PLAN

DECEMBER 1998

ENVIRONMENT AGENCY

Foreword

The Avon and Erme Local Environment Agency Plan (LEAP) aims to promote integrated environmental management of this important area of Devon. It seeks to develop partnerships with a wide range of organisations and individuals who have a role to play in the management of the Avon and Erme catchment.

This plan embodies the Agency's commitment to realise improvements to the environment.

We are very grateful for the contributions made during the consultation period and are convinced that they represent the spirit of partnership that will be required to implement the plan.

G. R. Bateman

GEOFF BATEMAN
Area Manager, Devon

Map 1 - Key Sites in the Avon and Erme Catchment

Further copies of this Action Plan can be obtained from:

Team Leader LEAPs (Devon)
Environment Agency
Exminster House
Miller Way
Exminster
Exeter EX6 8AS
(01392) 444000

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1. Introduction

1.1 The Environment Agency

Our vision:

- a better environment in England and Wales for present and future generations

Our aims:

- to achieve major and continuous improvements in the quality of air, land and water
- to encourage the conservation of natural resources, animals and plants
- to make the most of pollution control and river-basin management
- to provide effective defence and warning systems to protect people and property against flooding from rivers and the sea
- to reduce the amount of waste by encouraging people to re-use and recycle their waste
- to improve standards of waste disposal
- to manage water resources to achieve the proper balance between the country's needs and the environment
- to work with other organisations to reclaim contaminated land
- to improve and develop salmon and freshwater fisheries
- to conserve and improve river navigation
- to tell people about environmental issues by educating and informing
- to set priorities and work out solutions that society can afford

We will do this by:

- being open and consulting others about our work
- basing our decisions around sound science and research
- valuing and developing our employees
- being efficient and businesslike in all we do

Sustainable development – The Environment Agency has a wide range of duties and powers relating to different aspects of environmental management. These duties together with those areas where we have an interest, but no powers in, are described in more detail in Appendix 1. We are required and guided by Government to use these duties and powers in order to help achieve the objective of sustainable development. The Brundtland Commission defined sustainable development as *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.*

At the heart of sustainable development is the integration of human needs and the environment within which we live. Indeed, the creation of the Agency itself was in part a recognition of the need to take a more integrated and longer-term view of environmental management at a national level. We therefore have to reflect this in the way we work and in the decisions we make.

Taking a long-term perspective will require us to anticipate risks and encourage precaution, particularly where impacts on the environment may have long-term effects, or when the effects are not reversible. We must also develop our role to educate and inform society as a whole, as well as carrying out our prevention and enforcement activities, in order to ensure continuing protection and enhancement of the environment.

One of the key outcomes of the United Nations 'Earth Summit' held in Rio de Janeiro in 1992 was agreement by governments that, in order to solve global environmental problems, local action is crucial: we must all therefore think globally but act locally.

1.2 Local Environment Agency Plans

We are committed to a programme of Local Environment Agency Plans (LEAPs) in order to produce a local agenda of integrated action for environmental improvement. These will also allow us to deploy our resources to best effect and optimise benefit for the local environment.

LEAPs help us to identify and assess, prioritise and solve local environmental issues related to our functions, taking into account the views of our local customers.

LEAPs replace the Catchment Management Plans which were produced by the former National Rivers Authority and build on their success by covering all the Agency's functions.

This LEAP Action Plan has been produced following consultation on the Rivers Avon and Erme LEAP, Consultation Report (January 1998).

Annual Review - We will monitor implementation of this LEAP and report on progress in a published Annual Review. The Annual Review will also identify any additional actions needed to maintain progress in light of any changes in the LEAP area and also whether any actions need removing or amending where they are no longer appropriate. After five years, or sooner if required, we will carry out a major review of the progress we have made.

Review of the consultation process – The issues listed in this Action Plan were either identified in the Consultation Report or resulted from the consultation process. The Consultation Report was launched in January 1998 and the consultation period concluded on 10 April 1998. Responses were received from 47 organisations and individuals; these were collated and summarised in our Summary of Responses to Public Consultation (available on request).

In general, consultees (see Appendix 3) were very supportive of the plan and welcomed the opportunity to comment on environmental issues. Issues receiving most comment included: impact of effluent discharges; impact of farming on rivers; loss and deterioration of key habitats and species. Many of the organisations who responded identified specific areas where they could work in partnership with the Agency to help resolve some of the issues.

2. A Better Environment through Partnership

We outline here the main ways this plan links to the community, to other plans and to initiatives in the catchment.

2.1 The LEAP Steering Group

This group represents a range of commercial, local authority and environmental interests. The group comment upon the Consultation Draft and Action Plan prior to public release. They will monitor the implementation of the Action Plan and provide us with specific advice on the importance of issues within the catchment. They act as a communication link between ourselves and the local community and they will help to promote and develop initiatives of benefit to the environment within the catchment. The steering group members are:

Name	***Representing***
Mr J Bloomer	South Hams District Council
Mr P Bowen	Devon Avon Riparian and Fishery Owners Association
Mr K Carter	Coast and Countryside Service: South Hams – South Devon
Mr K Chell	Field Studies Council - Slapton Ley
Mr J Coombes	River Avon Fishing Association
Mr G Cumming	Local industry
Mrs D Flood	Parish Councils
Ms S Goodfellow	Conservation, Dartmoor National Park Authority
Mr J Longworth-Kraff	The National Trust
Mr A Mildmay-White	Erme and Yealm Riparian Owners Association
Mr N Mortimer	Salcombe and Kingsbridge Estuary Conservation Officer
Mr D Peters	Local Farmers/National Farmers Union
Mr C Pulteney	Conservation/English Nature
Mr S Tooke	Salcombe Harbour Authority (Harbour Master)
Mr C Trant	Local fish farmers
Mr M Williams	South West Water Limited

2.2 Links between LEAPs and other plans and initiatives

Local Environment Agency Plans assist the Agency to achieve its objectives. The LEAPs consider all elements of the environment which the Agency has a role in regulating or can influence through its statutory powers or duties, and find ways of working with others. They also help us to plan future activities to achieve our objectives. LEAPs are part of an ongoing dialogue between ourselves and the various organisations involved in the protection and management of the environment. This Action Plan is a key document in the Agency's local planning process and it contains details of the main actions that we and other organisations will be carrying out over the next five years.

The Environment Agency is committed to establishing strong partnerships with local authorities, other organisations, groups and the public. One of the ways we can do this is by influencing and/or supporting and being directly involved in other plans and initiatives.

Development Plans – We can control some of the factors influencing the quality of the environment, but we have limited control over the way that land is developed. This is the responsibility of local planning authorities.

Local authorities prepare statutory development plans. The policies in these plans will guide the way that land is developed in the future. We provide advice and guidance to local planning authorities and work with them to develop and adopt policies which minimise the impact of any development upon the environment. We will reinforce these policies, where we can, when commenting on planning matters or in making our own decisions. LEAPs are one way we aim to influence the content of local authority plans.

Other statutory plans – Dartmoor National Park Authority is obliged under the Environment Act 1995 to prepare and publish a Dartmoor National Park Management Plan[35]; this will replace the current Dartmoor National Park Plan - Second Review (1991). We will be consulted by the National Park Authority regarding the content of the plan. This LEAP, along with other LEAPs covering Dartmoor National Park, will form a significant part of our input to the Dartmoor National Park Management Plan.

Non-statutory plans – This LEAP is one of a number of separate but related environmental initiatives and non-statutory plans in the area. The protection and management of the environment requires the Agency and other organisations to work together in partnership. This LEAP gives the basis for a greater understanding of the Agency's work, enabling such partnerships to be developed.

The Agency is working with others to develop partnerships and collaborative work to manage and improve the environment. These initiatives include:

- The Nature of Devon: A Biodiversity Action Plan[1]
- The Nature of Dartmoor: A Biodiversity Profile[2]
- Devon's Local Agenda 21 Network Issues Report[3]
- South Devon Area of Outstanding Natural Beauty Management Plan[4] (see Appendix 2)
- Lyme Bay and South Devon Shoreline Management Plan (see Appendix 9)

Links with South Devon AONB Action Programme 1997 – The Agency is a member of the Joint Steering Committee for the South Devon AONB. There are a number of Actions within the AONB's Management Plan[4] Action Programme that are covered by this LEAP; these are indicated in Appendix 2.

Local Agenda 21 – Agenda 21 is the global action plan endorsed at the United Nations Conference on Development and the Environment in 1992. It has been designed to achieve sustainable development within all levels of our society - from national government to individuals in their homes and workplaces.

Local authorities are assisting their local communities in developing strategies and action plans for sustainable development. South Hams District Council have supported an independently produced Agenda 21 Plan, a series of recommendations for action that will act as a 'signpost' for organisations and individuals to follow. Dartmoor National Park Authority endorse the Statement on National Parks, Sustainability and Work on Local Agenda 21; this statement provides a commitment to the pursuit of sustainability and Local Agenda 21 and forms the basis for future action.

In Devon, we have nominated an officer with responsibility for Agenda 21 who will liaise with the above local authorities and other individuals or groups to further progress sustainable development in the county. We are already involved in a number of groups and projects across Devon.

2.3 The Environment Agency and public information

We are committed to being an open organisation; we will provide information about our decisions and actions and ensure consultation for our customers on plans and reports. Our customer charter sets out how we aim to achieve this commitment. We must maintain a set of public registers which hold information on the activities we regulate and the monitoring we carry out; in addition to the information we place on registers, we make available to the public most other environmental information that we hold.

We have produced a guide to information available to the public which sets out what information is accessible and how to obtain it. Information is usually provided free of charge, but for large and complex requests we may charge for staff time and materials. Confidential information, incomplete or draft reports, and information where disclosure may lead to environmental damage are generally not available. Some environmental details and information about our public registers are available on the Internet on http://www.environment-agency.gov.uk.

If you wish to obtain more information about anything presented in this Plan, please contact the LEAPs Team Leader at our Exminster office.

3. The Catchment Area

This plan covers the adjoining catchments of the Rivers Avon and Erme (Map 1). The Avon Catchment is defined by watercourses draining to the Salcombe and Kingsbridge Estuary and to the coast between Stoke Fleming and Kingston.

The Rivers Avon and Erme both rise on South Dartmoor within about one mile of each other, at a height of over 400 metres Above Ordnance Datum (AOD).

Dartmoor is an upland granite mass comprising open moorland with high rainfall and acid, peaty soils. Much of Dartmoor is used for extensive grazing by cattle, sheep and ponies.

As the rivers flow from the open moorland, they have created steep-sided valleys. The area surrounding these valleys is typified by small enclosures, and is mainly used for small scale livestock farming. Major tributaries of the River Avon (the Bala Brook and the Glaze Brook), and the River Erme (Lud Brook) also have their sources on the moor.

The boundary of Dartmoor National Park is marked by the A38 Devon Expressway, which also serves as an appropriate boundary between the granite mass and the relatively low-lying but undulating area known as the South Hams. The South Hams is noted for its rich red soils which support more intensive livestock and arable farming. Slapton Stream and the Gara both have their sources in this area, as do a number of other streams and brooks including those draining to the Salcombe and Kingsbridge Estuary.

The upper reaches of the River Avon are intercepted by the Avon Reservoir , which provides water for public supply to the South Devon area. There are additional public water supply abstractions on the Bala Brook and the River Erme.

Industry in the catchment, apart from agriculture and tourism, is limited. The Salcombe and Kingsbridge Estuary and Dartmoor National Park attract large numbers of visitors, particularly in the summer months.

4. Environmental Strategy

The Agency's principal and immediate environmental concerns are stated in our national strategy 'An Environmental Strategy for the Millennium and Beyond' and relate to nine themes. They are:

Theme 1	Addressing climate change
Theme 2	Improving air quality
Theme 3	Managing our water resources
Theme 4	Enhancing biodiversity
Theme 5	Managing our freshwater fisheries
Theme 6	Delivering integrated river-basin management
Theme 7	Conserving the land
Theme 8	Managing waste
Theme 9	Regulating major industry

We will deliver this strategy at a local level by dialogue between ourselves and the various organisations involved in the protection and management of the environment. In order to achieve our aims and objectives and deliver our strategy in this catchment, issues and actions are presented on the following pages.

5. Activity Tables

The following tables outline the actions needed to address the issues identified in the Consultation Report. They also include some additional issues raised during the consultation process, which give rise to the need to:

- apply for a new consent for Didworthy Sewage Treatment Works (STW) and provide a timetable for improvements;
- investigate the effects of synthetic pyrethroids on invertebrates;
- pursue modifications at Slapton Ley to alleviate flooding of Torcross;
- conduct research into the effects of 'swaling' and changes to moorland vegetation on both catchment hydrology and nutrient leaching.

The tables show the following information:

- organisations which will implement the proposed activities, either in a lead role or as a key supporter (shown in *italics*), are listed under the heading 'Action by Lead *Other*'
- which of the Agency's nine themes from the Environmental Strategy (see section 4) are covered by the activity under the heading 'Strategy Theme'
- a timetable for the activity
- an estimate of cost to us over the next five years, where available (the letters 'n/a' mean that we do not contribute to the funding of the action, 'unknown' means that no cost estimate is available.at present)
- the financial years covered by this plan are represented by a single year, for example, '98 is the financial year April 1998 to April 1999

Please refer to the abbreviations section at the end of the report for the definition of acronyms and abbreviations.

The following points should also be noted:

- Our everyday work commits substantial resources to monitoring and managing the environment. Some of this work was explained in the Consultation Report.
- Some actions will require feasibility studies and cost-benefit appraisal of options prior to work commencing. In some cases, depending on the outcome of these studies, further action may not be justified. The Environment Agency and participating organisations have limited resources and powers. Some work may take longer than indicated owing to funding availability, government policy or changing priorities.
- New issues will be added during the Annual Reviews.

Issue 1: Effluent Discharges

Associated Plans:
Salcombe and Kingsbridge Estuary Environmental Management Plan[5]; South Devon AONB Management Plan[4].

We regulate the disposal of effluent by issuing consents to control discharges, including treated sewage, industrial and farm wastes. Rivers and coastal waters can naturally render the main constituents of many effluents harmless and with proper controls over effluent disposal the environment will not be harmed.

We aim to maintain and, where appropriate, improve the quality of water. We achieve this by setting water quality targets for the catchment based on: River Quality Objectives (RQOs, Appendix 6) to protect recognised uses, standards laid down in EC Directives and international commitments.

South West Water Ltd's improvement plan for the period 1995-2000 is known as Asset Management Plan 2 (AMP2). AMP2 was developed in 1994 along guidelines agreed between the former National Rivers Authority (now the Environment Agency), the former Department of the Environment (now the Department of the Environment, Transport and the Regions, or DETR), the water services companies and the Office of Water Services (OFWAT). OFWAT is undertaking a review of water prices which will result in a review of improvements required for the period 2000-2005; the outcome of this will be AMP3. The Environment Agency is currently reviewing, for agreement with the DETR, those sewage discharges where improvement is required, subject to funding being approved.

Failures of EC Bathing Water Directive[6] - Historically the bathing waters at Salcombe North and South Sands (see Map 1) failed to comply with the Directive for a number of years in the period 1990 to 1996. However, major improvements have occurred with the completion of the SWW Ltd Clean Sweep scheme which removed many crude sewage discharges from the estuary. As a result, local bathing waters complied with the EC Bathing Water Directive Standards in 1997 and 1998.

The bathing water at Mothecombe failed to comply with the Directive in 1986 and 1994. In 1993 an investigation carried out to assess the impact of the discharge from Holbeton STW was inconclusive. However, under the requirements of a separate Directive (the EC Urban Waste Water Treatment Directive[7]), Holbeton STW will receive secondary treatment by 2005. This will afford some protection to the bathing waters at Mothecombe. In order to further protect these bathing waters we are seeking further improvements at Holbeton STW, to include ultraviolet disinfection, subject to funding being approved in AMP3.

The Agency priority is to ensure compliance with the mandatory standards of the EC Bathing Water Directive. We will also seek compliance with guideline standards where this is achievable, taking into consideration costs and benefits.

Deterioration in EC Shellfish Hygiene Directive Classification[8] - The east bank of the Avon Estuary has a classification under the EC Shellfish Hygiene Directive[8] (Appendix 8). During 1998 the Ministry of Agriculture, Fisheries and Food (MAFF) revised the classification of this harvesting area from B to C for mussels and oysters. This has led to a suggestion that water quality in the estuary has deteriorated. As a result, the Environment Agency and SHDC Environmental Health department are jointly investigating water quality in the estuary. SWW Ltd have installed ultraviolet disinfection at Aveton Gifford STW to reduce bacterial inputs to the estuary from this source. The Shellfish Hygiene Directive does not provide this Agency with direct powers to control the quality of polluting discharges; however, we will apply its policy of 'no deterioration' to protect shellfish beds from discharges.

A separate EC Directive, the EC Shellfish Waters Directive[9], sets standards to protect shellfish from the discharge of polluting substances, and includes a guideline standard for bacteria. Currently, the Avon Estuary is not designated under this Directive; however, the DETR has consulted on whether waters, including a site off Bigbury, the Salcombe and Kingsbridge Estuary and the Avon Estuary, should be designated under this Directive. A decision is expected from the DETR by the end of 1998. If these waters are designated, we would control discharges to them to ensure that the requirements of the Directive are achieved.

Impact on biological water quality - Biological water quality in the Bala Brook (see Appendix 8) is classified as 'c' (fairly good). There have been problems in the past with a discharge from Avon Water Treatment Works which contained high levels of suspended solids and aluminium. This may be affecting the biological quality of the watercourse.

Local impacts on water quality - The following do not lead to failures of water quality standards but have local impacts:

There are a number of septic tank discharges into the Buckland Stream which are having an aesthetic impact on water quality and which are likely to be affecting the chemical and biological quality of the watercourse. The Environment Act 1995 introduced new duties on water services companies to provide public sewers for certain domestic properties where environmental or amenity problems exist or are likely to arise. Any owner, occupier, parish or district council may apply to SWW Ltd for such a scheme. The Agency provides information to relevant bodies, and acts as an arbitrator if there is disagreement over the need for a scheme or implementation of the new duty.

There are a number of locations where consented discharges are having an impact and we recommend that development involving connection to the public foul sewer is restricted: Beeson, Brownston, Frogmore, Kingston, East Charleton (pumps to West Charleton), West Charleton, Woolston and East Portlemouth and Mill Bay.

East Portlemouth and Mill Bay are the subject of a proposed SWW Ltd scheme. This is dependent on the purchase of a suitable site at Ditchend which will enable a single scheme to serve East Portlemouth and Ditchend (including the public toilets), with ultraviolet disinfection, to be provided by the 1999 bathing season. If a suitable site is not available, two separate schemes will be built to serve East Portlemouth (by the 1999 bathing season) and Ditchend (by the 2005 bathing season).

Brownston, Frogmore, Kingston, West Charleton and Woolston have been put forward for improvements in AMP3, subject to funding being approved by OFWAT. Options for resolving the situation at Beeson are being investigated.

Didworthy STW discharges into the River Avon. The Agency and local people are concerned at the impact of this discharge. We are currently investigating the impact Didworthy STW has on the River Avon, and are seeking improvements from SWW Ltd.

The development which has taken place in Ivybridge over the past few years has led to an increased volume of effluent being sent to Ivybridge STW. There is concern that water quality in the River Erme is deteriorating as the storm overflow operates more frequently. This stretch of the river has an RQO of RE1 and is designated as a salmonid fishery under the EC Freshwater Fish Directive[10]. The volume of sewage which receives full treatment at the works has been increased recently; however, further investment is required. This works has been put forward for improvements in AMP3.

Any further development in Ivybridge will also increase the volume of effluent being sent to the STW, and could potentially impact on water quality. Any future improvements will be funded by SWW Ltd.

Eutrophication - There are concerns that the discharge from Slapton STW is contributing to elevated nutrient levels in Slapton Ley. This National Nature Reserve and Site of Special Scientific Interest has become nutrient enriched; this in turn is leading to a loss of visual amenity and ecological change (see Issue 10I). The main nutrients are nitrates and phosphates, principally from agricultural activities (see Issue 2) but also from Slapton and Blackawton STWs. We are working with English Nature to assess the level of nutrient loading from these STWs.

There are also concerns that effluent discharges may be contributing to eutrophication in the upper Salcombe and Kingsbridge Estuary (see Issue 2) and in South Milton Ley.

Table 1: Effluent Discharges

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Improvements to be carried out under UWWTD* to Holbeton STW.	6	SWW Ltd, *Agency*	n/a	by 2005				
b	Liaise with the Centre for Environment, Fisheries and Aquaculture Science to obtain more detailed information on the bacterial quality of shellfish.	6	Agency	<1k	●	●	●	●	●
c	Investigate cause of poor biological water quality in the Bala Brook.	6	Agency	unknown	●	●			
d	Carry out investigation to determine the effect of unsatisfactory septic tank discharges on the Buckland Stream.	6	Agency	unknown		●			
e	Continue discussion between SHDC, Parish Councils, SWW Ltd and the Agency regarding improvements to sewage discharge at Buckland.	6	Owners/Occupiers, Parish/District Councils, SWW Ltd, *Agency*	<1k	●				
f	Continue to seek restrictions on development in areas where sewage treatment is inadequate and pursue improvements to such discharges.	6	Agency, SWW Ltd	unknown	●				
g	Investigate options for resolving environmental impact of Beeson STW	6	Agency, SWW Ltd	unknown		●			
h	Investigate impact of Didworthy STW on the River Avon and seek improvements to the discharge.	6	Agency, SWW Ltd	<1k	●				
i	Investigate nutrient loading from Slapton and Blackawton STWs, and seek any required improvements in AMP3.	4,6	Agency, EN, SWW Ltd	unknown		●			

Issue 2: Agriculture

Associated Plans:
The Nature of Devon: A Biodiversity Action Plan[1];
Salcombe and Kingsbridge Estuary Environmental Management Plan[3];
South Devon AONB Management Plan[4].

Over the last ten years farmers have made great improvements in farm waste storage facilities and disposal methods. This has resulted in a significant reduction in the number of point source pollution incidents attributed to dairy and beef cattle farms and contributed to an overall improvement in water quality in the catchment. However, further work is required to solve the problem of diffuse pollution, for example, from fertiliser added to land. This could involve such approaches as nutrient management plans, conservation tillage and strategic grass strips to stabilise soil and act as filters. Guidance to farmers is provided by MAFF through the 'Code of Good Agricultural Practice for the Protection of Water'.

Buffer zones which are created between farmland and riverbanks can be used to achieve a range of benefits; as well as creating wildlife habitats, they act as a livestock exclusion zone which allows the growth of vegetation helping to stabilise river banks; they can reduce soil runoff from farmland during periods of heavy rain, thereby reducing siltation in rivers. Buffer strips can also be effective in reducing nitrate pollution in headwater streams. However, buffer zones can only be effective when properly designed.

RQO non-compliance - The 1997 RE compliance assessment has highlighted the following new failures.

The River Erme from Fawn's Bridge to the normal tidal limit marginally failed to meet its RQO of RE2 and significantly failed to meet its long term RQO of RE1 in 1997 due to a single high Biochemical Oxygen Demand (BOD) result. An investigation failed to find the cause of this high result, but suggested a silage or slurry incident. We intend to monitor the situation and will review the RQO for this watercourse in 1998.

The South Grounds Stream from the source to the Slapton Ley inflow marginally failed to comply with its RQO of RE1 in 1997 as a result of elevated BOD occurring on four occasions. These results do not appear to be caused by the discharge from Slapton STW, the most likely cause being agricultural pollution.

The Small Brook from the source to the normal tidal limit significantly failed to comply with its RQO of RE1 in 1997 as a result of elevated BOD occurring on two occasions. Both these elevated results occurred following rain; the most likely cause is agricultural pollution.

The River Avon from the A38 Bridge, South Brent, to Horsebrook marginally failed to meet its proposed RQO of RE1 in 1997 as a result of elevated BOD occurring on two occasions. Both these elevated results occurred following rainfall; the most likely cause is agricultural pollution. Problems have been found at a farm bordering the river and pollution prevention advice has been given.

The River Avon from Horsebook to the normal tidal limit (two stretches) marginally failed to comply with their RQOs of RE1 in 1997 as a result of elevated BOD. These elevated results occurred on the same days and following rainfall; the most likely cause is agricultural pollution.

Eutrophication - Many parts of the catchment are subject to intensive grassland and arable farming. Nutrients, principally nitrate and phosphates, from these agricultural activities can enter aquatic ecosystems and cause changes to the ecological balance of these systems, mainly resulting in an increase in growth of certain aquatic plants and algae. The main areas of concern in the catchment are Slapton Ley (see below), South Milton Ley and the Salcombe and Kingsbridge Estuary (see below). Nutrients from certain effluent discharges may also contribute to eutrophication (see Issue 1).

Slapton Ley is suffering from a loss of visual amenity and ecological changes (see Issue 10i) as a result of nutrient inputs from the watercourses which drain to it. Research in this area has identified the principal sources of nutrients as: sloping arable land, other fertilised agricultural land (especially riparian fields), stock drinking (resulting in direct inputs of dung to watercourses) and point sources from farmyards. There are concerns that the Ley is approaching a serious change in its level of eutrophication; changes to both the fish population and aquatic plants have been recorded. A major fish kill occurred in the winter of 1984/1985 which dramatically reduced the numbers of all fish species present. This was caused by the Ley icing over and the decomposition of aquatic plants beneath the ice leading to deoxygenation of the water. The magnitude of this fish kill was directly attributed to the eutrophic status of the Ley[11].

The establishment by MAFF of a pilot Habitat Scheme (Water Fringe option), targeted at the land which drains to Slapton Ley, has had limited success in encouraging less intensive grassland and arable management. If this scheme is to have greater success it will need modifying to become more attractive to farmers.

Estuaries tend to be naturally high in nutrients, which are brought in from marine sources. However, if algal production becomes excessive this can affect the chemical, biological and aesthetic quality of the estuary. Our monitoring indicates that overall water quality in the Salcombe and Kingsbridge Estuary is good, but that in the upper estuary elevated chlorophyll levels occur which are frequently associated with high levels of total oxidised nitrogen. Given these elevated nutrient and chlorophyll values and the likely restricted circulation, it seems the upper Salcombe and Kingsbridge Estuary is potentially eutrophic. On the available information, the major landward source of nutrients to the estuary is riverine, presumably from agricultural sources.

We are developing a national strategy for dealing with eutrophication which will focus on a partnership approach to the management of this problem. We are consulting relevant bodies on a draft document in Autumn 1998 and hope to publish a final strategy in 1999.

Sedimentation - Sedimentation from the Gara subcatchment is leading to a loss of wetland habitat at Slapton Ley as the natural processes of succession have been dramatically accelerated by sediment inputs. The principal source of sediment is sloping arable land. Research has shown that significant quantities of topsoil are being lost from arable land in the Gara subcatchment, especially from steeply-sloping ploughed fields many of which are adjacent to watercourses. This sedimentation has also led to severe siltation of spawning gravels, which undoubtedly affects the brown trout fishery there.

There are concerns that sediment may be impacting on the Salcombe and Kingsbridge Estuary. A number of the streams feeding the estuary are discoloured following periods of heavy rainfall, which leads to discolouration in the estuary.

At a number of locations in the Avon and Erme catchments, poaching of the river banks by livestock has resulted in the siltation of spawning gravels. Currently the extent of this damage is limited, and many of the main spawning areas are unaffected.

The Avon Fishing Association has carried out bankside fencing schemes at two sites on the River Avon (about 2 miles upstream of Aveton Gifford) which have proved successful. We have carried out experimental bank protection using willow spiling over a 100 metre length of the River Avon just upstream of Aveton Gifford, at Venn.

Research conducted on the River Torridge in Devon[12] has shown that sediments can have a significant effect on the survival of salmon eggs. We are part sponsoring further work which will examine the processes by which sediments are supplied to river gravels and which will investigate sediment sources.

Research is also being conducted in the Gara subcatchment by Oxford University, who are carrying out an erosion mapping programme. These studies will help to target remedial work to reduce sediment inputs into watercourses in the catchment.

It is proposed that the specific problems of the Slapton/Gara subcatchments will be dealt with through a voluntary action group for the catchment (see Action b for Issue 10i).

Loss/deterioration of key habitats and species - Changes in land management and more intensive agricultural practices have led to the loss and deterioration of key habitats and species; these concerns are covered in Issue 10.

Sheep-dip - As a result of the health risks associated with organophosphate sheep-dips, many farmers have switched to synthetic pyrethroid insecticides. However, there is growing concern about the environmental impact of these substances. Synthetic pyrethroids can be up to 100 times more toxic than organophosphates to aquatic invertebrate fauna, and the number and severity of reported pollution incidents associated with this type of sheep-dip is rising. There have been a number of incidents in England and Wales where invertebrates, including crayfish, have been killed along whole stretches of river by suspected synthetic pyrethroids. A pilot scheme was undertaken on Exmoor during 1998 to determine whether synthetic pyrethroids are entering moorland streams in Devon. Depending on the results and recommendations of this investigation, the study may be extended to include Dartmoor streams.

The controls to minimise the risk to the environment from sheep-dip (the dipping operation and disposal of spent dip) are currently limited. The DETR is intending to introduce new Groundwater Regulations in the Spring of 1999 which will provide a means for comprehensive control of these and other substances. In the meantime the Agency is working with farmers, trade associations, MAFF and other organisations to reduce pollution.

Table 2: Agriculture

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Target the South Hams coastal area for an intensive campaign promoting Farm Waste Management Plans (as recommended by this Agency).	6	MAFF, *Agency*	n/a	●	●			
b	Review results of monitoring of the River Erme from Fawn's Bridge to the Normal Tidal Limit to see if RQO failures recur and take action as appropriate.	6	Agency	<1k		●			

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
c	Investigate the cause of poor water quality in the South Grounds Stream.	6	Agency	<1k	●	●			
d	Modify Habitat Scheme (Water Fringe option) to encourage greater uptake in the Gara and Start catchments.	4	Agency, MAFF, Farming and Rural Conservation Agency (FRCA), EN, Field Studies Council (FSC)	<1k	●	●	●	●	●
e	Consider need to investigate sources of sediment to the Salcombe and Kingsbridge Estuary.	6	Agency, *Estuary Conservation Officer, EN*	unknown		●			
f	Conduct research into sediment intrusion into salmon redds and sources of sediment and use results to help prioritise remedial work.	5	Exeter University, Agency, National Environment Research Council (NERC)	5k	●	●			
g	Continue gravel rehabilitation work to remove the build-up of silt and re-establish the gravels for salmonid spawning.	5	Agency, *Fishing associations*	2k p.a.	●	●	●	●	●
h	Promote measures to reduce excessive bankside erosion (e.g. fencing, tree planting and coppicing) where appropriate.	4,6	Agency, Landowners, fishing interests	unknown	●	●	●	●	●
i	Encourage farmers to use appropriate Best Management Practices for control of soil erosion.	6	Agency, MAFF, FRCA, National Farmers Union (NFU), Country Landowners Association (CLA)	unknown	●	●	●	●	●
j	Review results of erosion mapping survey to be carried out by Oxford University and use results to help prioritise remedial work.	6	Agency, Oxford University, FSC	<1k		●			
k	Explore opportunities for the application of beneficial agri-environment schemes (ESA, Countryside Stewardship, etc.) at relevant locations.	4,6	MAFF, FRCA, *Agency*	<1k	●	●	●	●	●
l	Dependent on the findings of the Exmoor pilot scheme, investigate the presence of synthetic pyrethroids in Dartmoor streams.	6	Agency	unknown		●			
m	Implement new groundwater regulations to control use and disposal of sheep-dip (synthetic pyrethroids).	3,6	Agency	unknown		●	●	●	●

Issue 3: Urban Development

Associated Plans:
The Nature of Devon: A Biodiversity Action Plan[1];
South Devon AONB Management Plan[4];
Dartmoor National Park Local Plan[13];
South Hams Local Plan[14];
Devon County Structure Plan[15];
Devon's Local Agenda 21 Network Report[3];
Lyme Bay and South Devon Shoreline Management Plan.

Development in the catchment is largely restricted to the towns of Kingsbridge, Salcombe and in particular, Ivybridge. We concentrate here on identified current and potential future problems associated with development in the catchment, which are of direct interest to the Agency. Apart from the problems identified here development also generates extra waste and increases demand for water resources. These problems are dealt with separately under Issues 6 and 7.

Although development can cause environmental problems it can also bring benefits, such as the redevelopment of brownfield sites and the clean-up of contaminated land. The planning process can be used to ensure that where damage does occur appropriate mitigation measures are taken.

Town and Country Planning policies contained in the South Hams Local Plan[14] include positive steps to balance development proposals with maintaining and improving the environment. However, the plan does not include policies to prevent pollution of water; initiatives are being taken to develop appropriate policies.

Water quality - There are a number of small industrial estates in the Avon and Erme catchment. The storage, disposal and use of chemicals on these estates has been assessed and improvement measures have been implemented.

Housing construction in Ivybridge is causing localised water quality problems in the River Erme due to high loads of suspended solids. Material from building sites can be washed into the culverted Old Mill Stream which enters the River Erme above the A38 Devon Expressway Bridge. The material can settle out on the river bed, causing a highly visible discolouration downstream.

There are a number of ways such pollution can be limited by incorporating 'source control' methods in the design of new developments. We will work with developers and local authorities to ensure that source control methods are used in new developments. Further information is available in the booklet 'A Guide to Sustainable Urban Drainage', available on request.

There are a number of settlements in the catchment where the existing effluent discharges are having an adverse effect on water quality. The Agency recommends that further development involving connection to the public sewer in these settlements is restricted (see Issue 1).

Contaminated land - The precise nature and full extent of contaminated land within this catchment is not yet known, since the contamination of many sites is only realised when they are redeveloped or when pollution actually occurs. There is a need to clarify the status of contaminated land sites in the catchment.

Risk of flooding - It is preferable to avoid increased flood risk through development control than to have to carry out works to alleviate problems once they occur. We therefore advise planning authorities on development and flood risk matters.

The Government expects the Environment Agency to ensure that planning authorities have sufficient information on flood risk matters to enable them to make informed and sound planning decisions. This information may come from the Agency or it may have to be provided by the potential developer.

Clearly, close collaboration is required between the Agency and the planning authorities. Effective floodplain protection must recognise the conflicts which exist between development and natural uses of the floodplain and then seek to reconcile them in a way which is both balanced and sustainable. This requires comprehensive floodplain land use planning which takes a holistic view.

To assist in this, we are in the process of producing up-to-date and consistent maps of floodplains as part of our survey duties under Section 105(2) of the Water Resources Act 1991[16].

The first stage, 'Level A', of the survey has now been completed and this shows the indicative floodplain areas for all the main rivers in the Area. Work has now started on the 'Level B' studies which are concentrated in areas of proposed development or sensitive flood risk areas. They will therefore be carried out in specific areas and will involve a greater amount of hydraulic modelling and investigation. Because the 'Level B' studies are more closely related to development, closer liaison and consultation with the planning authorities will be required.

We will provide local authorities with the above information to assist them to ensure that wherever possible development does not occur in the floodplain. We shall continue to oppose all developments that would exacerbate flooding until satisfactory mitigation works are implemented.

Torcross is a well known flood risk location. Surface water runoff fills up the Ley which then overflows and floods surrounding properties. We are carrying out a pre-feasibility study which will identify a number of options for discussion with the local authorities.

Coastal defence - Coastal defence works need to be considered within an overall strategy for the coastline. Disruptions to the natural sediment movements along the coastline can have disastrous consequences. There is concern that the road which runs along the crest of Slapton Beach may be affecting the physical processes at that site. The shingle bar at Slapton has been identified as a key site in the catchment for both its biological and earth science importance (see Issue 10j).

Table 3: Urban Development

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Work with local planning authorities to ensure that policies to protect the environment from pollution are included in Local Plans.	6	Agency, *SHDC, DNPA*	<1k p.a.	●	●	●	●	●
b	Work with others to reduce impact on water quality in the River Erme from drainage from construction.	6	Agency, *Developers, SHDC*	unknown	●	●			
c	Encourage local authorities to incorporate conditions in planning permissions which reduce the risk to the environment from construction.	6	Agency, *SHDC, DNPA*	<1k p.a.	●	●	●	●	●
d	Produce database on contaminated land sites in the catchment and ensure there is effective consultation with local authorities regarding contaminated land sites.	6,7,8	SHDC, West Devon Borough Council (WDBC), Agency	unknown	●	●	●	●	●
e	Consult and liaise with planning authorities regarding 'Level B' studies and provide floodplain mapping information as it becomes available (S.105 Water Resources Act 1991[16]).	6,7	Agency, SHDC, DNPA	as required	●	●	●	●	●
f	Agree programme for works at Slapton Ley to alleviate flooding of Torcross.	7	SHDC, DCC, Agency, *FSC, EN*	unknown	●	●			
g	Produce Shoreline Management Plan for South Devon coastline taking full account of the importance of the shingle bank.	7	Agency, Lyme Bay and South Devon Coastal Group	36k	●				

Issue 4: Barriers to Fish Migration

There are 34 weirs and other obstacles in the Avon and Erme Catchment, some of which are complete barriers to the migration of salmon and trout. Many of the works required on weirs call for considerable expenditure. The Agency has limited resources to carry out these improvements and is now very reliant on external contributions and collaborative schemes to ensure that they are achieved.

The steep nature of the catchment means that natural pools are limited on most rivers. The artificial pools created upstream of weirs may therefore be of some importance as a habitat. In addition, weirs are often of significant historic interest, although they do not tend to be designated or have protected status. These considerations should be taken into account in any proposals for improvement to weirs.

There are abstractions at some sites in the system which create problems for the downstream migration of smolts. The installation of screens has proved an effective means of alleviating the problem, and recent changes in legislation make it a requirement for many abstracters to have screens installed to our satisfaction by 1 January 1999. Where major works are required additional time may be allowed at the discretion of the Agency.

The River Avon Catchment – The Lower and Higher Glazebrook weirs inhibit migration under low flows. There is no abstraction from either weir, and both are of a similar rock construction. It would be beneficial to make some low-cost modifications to both weirs to allow fish to pass them under a greater range of flows.

Two minor obstructions associated with the Newhouse fishery prevent fish migrating up the Cocks Brook under low flows. Some modifications made by the owner in 1995 improved conditions but there has been no spawning assessment since. The 1997 juvenile survey will demonstrate whether there has been any successful spawning above the site.

Curtisknowle Weir is a man-made rock weir and is used for an abstraction to the Newhouse Fishery trout-rearing ponds. Under high flows, the weir presents no obstacle, but when flows recede during the summer, there is no obvious route which can be used by migrating fish. Salmon would not tend to run on these flows, but sea trout - which are important in the Avon - would have their passage obstructed. Curtisknowle Weir is gradually falling into a state of disrepair, and this will reduce the obstruction to fish passage in time. There are concerns that some unauthorised works have taken place to reinstate the weir. An Agency group comprising staff from Fisheries, Development Control and Water Resource Licensing will investigate this matter. The group aims to identify a solution acceptable to all parties involved and will organise appropriate action.

The Avon Dam is a complete barrier and, because of the prohibitively high cost associated with the installation of a fish pass on a structure such as this, is likely to remain so. There is approximately 8 km of watercourse upstream of the reservoir which is likely to contain a good proportion of quality spawning gravels. There are several natural falls between South Brent and the dam which are only passable under a very limited range of flows.

The River Erme Catchment – As a result of the installation of several fish passes on the Erme in recent years, migrating fish now have free access to the headwaters of the main river.

In 1995, the fish pass at the Harford Moor intake weir was rebuilt by SWW Ltd - a pool and overspill structure being replaced by a Denil fish pass. The current pass appears to have been constructed at a level below that required to maintain a sufficient head of water to supply the intake. As a result, in 1996, the top of the structure was altered to increase the head without impacting on the efficiency of the pass. It is not yet known how effective this pass is, but monitoring, and if necessary further modifications, will be required to make sure fish are able to gain access to the valuable spawning areas further upstream.

During low flows the abstraction by Arjo Wiggins paper mill at Stowford Weir results in a deprived reach of river downstream to where the mill leat rejoins the Erme. Under these conditions, fish migration over Stowford Weir can be severely inhibited. However, although their licence (which is a Licence of Right under the Water Resources Act 1963[17]) has no condition for any residual flow to be maintained in the river below the weir, when the flow in the Erme above the mill is less then 10,000 cubic metres per day Arjo Wiggins, in consultation with the Agency, has acted to reduce their abstraction thus lessening their impact on the river.

In 1995 Arjo Wiggins funded the installation of a fish pass in Bell Weir, immediately upstream of Stowford Weir. This allows migrating fish free passage through this reach when flows are sufficient for them to negotiate Stowford Weir.

Table 4: Barriers to Fish Migration

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Make abstractors aware of problems caused by inadequate screening and ensure screens are installed to Agency satisfaction and timetable.	5	Agency, *Abstractors*	unknown	●	●	●	●	●
b	Modify man-made barriers in the system to permit fish passage.	5	Agency, fishing associations, riparian owners, *others (for possible sources of funding)*	unknown	●	●	●	●	●
c	Investigate and resolve unauthorised reinstatement works at Curtisknowle Weir.	5	Agency	unknown	●				

Issue 5: Additional Threats to the Salmonid Fishery

We deal here with threats to the salmonid fishery which are not covered by the other issues.

Many of the factors which influence numbers of migratory fish (salmon and sea trout) returning to the river to spawn fall outside our statutory responsibilities: for example, distant water fisheries and the Irish drift net fishery. This places particular importance on measures adopted locally to maximise the number of fish returning to spawn, and to ensure that conditions in the river system are favourable for successful spawning and survival. We will continue to campaign for a reduction in high seas netting, particularly the Greenland, Faroes and Irish Drift Net Fisheries.

We have produced a National Strategy for the Management of Salmon[18], prepared by the former National Rivers Authority in consultation with many other interested parties. The aim of this strategy is to safeguard salmon stocks in England and Wales and to maximise the economic and social benefits they provide. The strategy seeks to ensure the sustainable and cost-effective exploitation of our salmon, which will conserve this species for future generations. The Strategy has been developed nationally, but will be implemented locally through Salmon Action Plans.

Need for a comprehensive plan for salmon management in the catchments - We intend to develop Salmon Action Plans for the Rivers Avon and Erme in the financial year 2000/2001, to be circulated for consultation in April 2001. Each plan will examine the salmon fishery in detail and set fishery targets and fishing effort controls (where appropriate) and outline a programme of improvement.

Need to protect good water quality required for salmonid fish - The EC Freshwater Fish Directive[10] ensures that water quality in designated stretches of water is suitable for supporting salmonid fish. We would like to see an increase in the number of river stretches designated under this Directive, and will be providing relevant information to the DETR.

Poaching - Migratory fish are legally taken by rod from freshwater stretches in both the Avon and the Erme. Adult fish may also be taken through illegal poaching activity in the river, estuary, or at sea. There are several locations in the catchment which are good holding areas for migratory fish. These areas require regular surveillance when fish are present as they can be vulnerable to poaching activity.

Poaching, unless controlled, can have a dramatic effect on migratory fish stocks. The Agency maintains a programme of regular enforcement on the Avon and Erme and the adjacent coastal waters to minimise the numbers of fish taken illegally. Presently the extent of poaching in the catchment is thought to be limited.

Angling pressure - on both rivers is relatively light and this is not at present seen as a threat to fish stocks. The cessation of the Avon net and trap fisheries, and the lack of any net operating on the Erme means that levels of exploitation on both rivers is appreciably lower than other migratory fish rivers in the south west.

Fish-eating birds - In common with many rivers in the area, there has been a marked increase in the numbers of cormorants observed in the catchment. Concerns are regularly expressed by various fishing interests that this increase in levels of predation is adversely affecting fisheries. The most significant impact is thought to occur during the smolt run in March where large numbers of salmonids descend the river into the estuary at a size that makes them particularly vulnerable.

The MAFF, DETR and the Environment Agency manage and fund the national research programme into fish-eating birds. The contractors undertaking the research report on progress annually. The most significant research is investigating the perceived short- and long-term damage caused by cormorants to inland fisheries in England and Wales. Interim findings from two of the four Agency Regions included in the investigation have been presented:

- In Midland Region at Holme Pierrepoint, feeding success was high. Favoured prey were coarse fish of less than 10 cm in length. The lake contains large populations of fast-growing fish which appear unaffected by predation. On the River Trent, feeding success was much lower, but preferred species were again small coarse fish, mainly roach.

- At Grimsargh reservoir in the Agency's North West Region, feeding success was high with most of the prey coarse fish of less than 15 cm in length.

An interim report on the research programme is due in December 1998.

Research is also being undertaken into the effectiveness of predation control measures. The population, distribution, and movement of fish-eating birds, and the feeding behaviours of cormorants will be studied using radio tracking techniques.

Table 5: Additional Threats to the Salmonid Fishery

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Develop Salmon Action Plan	5	Agency	5k				●	●
b	Seek designation of additional stretches of river under the EC Freshwater Fish Directive[10].	5,6	Agency, DETR	<1k	●	●			
c	Continue research into the effects of fish-eating birds. Disseminate findings of research and develop actions if appropriate.	5	Agency, MAFF	unknown	●	●	●		

Issue 6: Waste Management Activities

Associated Plans:
Salcombe Harbour Waste Management Plan[19];
A Waste Strategy for Devon[20];
Devon County Waste Local Plan[21];
National Waste Strategy[22].

The National Waste Strategy[22] sets out the government's policy framework for the management of waste. It identifies ways in which waste can be managed in a more sustainable way, and sets out targets for achieving that aim. The strategy sets out the following hierarchy of options for the management of waste: reduce, re-use, recover, dispose.

In the past the disposal of waste to landfill has been an attractive option, because it is initially inexpensive and suitable for many types of waste. However, landfill sites have the potential to cause pollution, particularly older sites which have had fewer pollution control measures built into their original design. Stricter controls on landfill operations and the introduction of the Landfill Tax have begun to shift the balance in favour of alternative means of waste management.

Uncontrolled and illegal tipping of waste, known as fly-tipping, can pose hazards to wildlife, may attract vermin and can cause pollution as well as ruining the appearance of an area. Media attention is often focused on fly-tipping and the identification of problem sites.

Planning for waste management in Devon is guided by several documents. 'A Waste Management Strategy for Devon'[20] is a non-statutory document which focuses on household waste and its management over the 25 year period from when it was produced in 1996. It was produced by Devon County Council and the Local Authorities with assistance from the Environment Agency. The strategy reflects the policies and key targets in International, European and National advice and their imperative that waste management becomes more sustainable. Due to the rapidly changing technologies in the waste field, the strategy will need to be regularly reviewed and updated so that decisions are based on the best available information and take into account changes in technique, costs and environmental impacts.

The strategy recognises that all of the options in the hierarchy - reduction, re-use, recycling, composting, energy recovery and final disposal - will have a role and that there will always be some unavoidable waste that can only be dealt with by disposal. The objectives of the strategy are:

- the minimisation of household waste by individuals;
- the establishment of the facilities necessary to manage and dispose of the household waste produced within the county over the next 25 years;
- the beneficial use of as much household waste as possible through the recycling of materials, composting and energy recovery, with the recycling/composting of at least 25 per cent of household waste by the year 2000 and 40 per cent by 2005;
- the use of waste management methods which represent the optimum balance between environmental and economic costs and benefits, and which minimise the risks of immediate and future environmental pollution and harm to human health.

In the short term, over the next 5 - 8 years, the strategy suggests that landfill will continue to be the main disposal route, as the lead time for new waste management facilities, e.g. waste to energy, can be between 5 and 8 years. Over the long term, the strategy is based on four waste management areas: North, South, East and West Devon. Proposals such as composting and recycling schemes are intended to deal with waste at higher levels within the waste hierarchy.

Devon County Council is also required to produce a Waste Local Plan[21]. This document will contain policies covering the land-use issues associated with the provision of waste management facilities. An initial draft of the plan has been produced and has been to public consultation. Its approach is to specify the criteria by which the planning system will guide the provision of waste management facilities.

The Environment Agency has begun a National Survey of Waste Production. The survey will involve some 3 per cent of all businesses. In Devon, 144 companies will be included, and these will be visited before the end of March 1999. The aim is to generate reliable information on the types and quantities of industrial and commercial waste being produced, and on the facilities currently being used. This can then be used to assist in the process of planning for waste management in the future.

Waste reduction - We are keen to promote the reduction of waste at source; a project was run in South Devon as part of a wider initiative covering the whole county. The aim is to minimise waste generated by local companies. The scheme is driven by the PAYBACK business environment association in partnership with Business Link and the Environment Agency. Case studies and a report on the progress with the initiative will be produced over the next few months. The project in South Devon may be re-run in the future for a new set of companies.

New legislation aims to make those that produce waste more responsible for how it is managed. The Producer Responsibility Obligations (Packaging Waste) Regulations 1997[23] came into force on 6 March 1997. This requires certain companies who handle packaging to ensure that a percentage of that packaging is recovered and recycled. In the future, producer responsibility is likely to be applied to other waste streams.

The first composting site to be licensed in Devon by the Agency is located in the catchment. Vegetation waste from South Hams District Council works and from private individuals is composted at the site for agricultural use. This is an excellent example of the type of initiative which diverts waste from landfill to a beneficial use.

Remediation of closed landfill sites - Recently Devon County Council's Policy Committee agreed to allocate £12 million over the next ten years for the remediation of a number of closed landfill sites across the county. The council is liaising with us to ensure that the sites are dealt with in order of risk to the environment. We have collected details of closed landfill sites and rubbish tips using information obtained from Parish and District Councils; so far there are 637 identified sites in Devon. The sites have been prioritised according to proximity to buildings and watercourses. The top priority sites are currently being visited to establish their potential to pollute the environment and cause harm to human health and to verify the information supplied by the Councils.

The landfill site at Molescombe used to take most of the collected household waste from the catchment until its closure in 1994. Some problems with the migration of landfill gas from the site have been identified. Discussion is now underway between the Agency and the Waste Disposal Authority (WDA) to decide the best way to control the gas migration and to ensure that the site is comprehensively monitored and thoroughly restored.

Fly-tipping - We have recently discovered a very bad instance of fly-tipping at a site at Chillington. This site is a wooded quarry into which wastes have been tipped over many years. Investigations to identify those responsible have been unsuccessful. Any information relating to fly-tipping at this site would be gratefully received.

Recently fly-tipping has been occurring outside the gates to the Civic Amenity sites at Ivybridge and Kingsbridge. This is because the WDA has limited the opening hours of these sites due to cuts in the Local Authority budget. We are negotiating with the WDA over this problem and are advising householders that waste must not be deposited outside the sites when they are closed.

Table 6: Waste Management Activities

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Support PAYBACK/Business Link initiative to reduce waste at source.	8	PAYBACK, Business Link, *Agency, DCC, SHDC, Teignbridge District Council (TDC), Torbay Council (TC)*	10k	●				
b	Provide advice to those companies affected by the Producer Responsibility Obligations.	8	Agency	<1k	●	●	●	●	●
c	Investigate closed landfill sites and take action as appropriate.	6,8	Agency, LAs	<1k	●				
d	Liaise with the WDA to provide a system of control of migration of landfill gas from Molescome tip, and ensure a comprehensive monitoring and restoration plan is implemented.	8	Agency, WDA	<1k	●				
e	Investigate any new information relating to fly-tipping at a site at Chillington and seek to prosecute offenders if possible.	8	Agency	<1k	●				
f	Investigate options for cleaning up Chillington site with owner, Parish/District Councils.	8	Agency, site owner, Parish/District Councils	unknown	●				
g	Publicise the problem of fly-tipping to encourage the public to give information about suspected illegal waste tipping and to discourage them from tipping waste outside Civic Amenity Sites when they are closed.	8	Agency	unknown	●	●			

Issue 7: Water Abstraction

Our aim is to ensure that there is enough water available for public and private water supply now and in the future, ensuring an appropriate balance between the needs of the environment and those of the abstracters is maintained.

Overall the catchment is not stressed by abstraction; however, there are some areas where abstraction for public water supply is considered to have a local impact.

Forecasts have been made of public demand for water up to the year 2021. These demand forecasts are only available for a Strategic Supply Area (SSA) level and do not directly relate to individual catchments. The Avon and Erme Catchment falls within SWW Ltd's Roadford SSA. The total demand for public water in the Roadford SSA during 1992 was 246 Ml/d.

The extent to which demand for potable supply will increase over the next 25 years will depend on a number of factors including population growth, numbers of new dwellings, personal use of water, level of economic activity, measures to reduce demand and climate change.

In forecasting demand we have used two scenarios. Under the 'high' scenario of a high growth rate in domestic, industrial and commercial consumption and current levels of demand management (i.e. no improvement to current leakage levels), demand in the Roadford SSA is forecast to increase to 347 Ml/d by 2021. Under the 'low' scenario of low growth in domestic, industrial and commercial consumption coupled with a reduction in water company leakage, demand will only increase to 291 Ml/d.

Compared with the current reliable yield for the Roadford Zone of 326 Ml/d, under the high scenario there would be a deficit of 21 Ml/d whereas under the low scenario there would be a surplus of 35 Ml/d in 2021. These forecasts are detailed in 'Tomorrow's Water', the Agency's Regional Water Resources Development Strategy[24].

The water companies have a duty to apply and demonstrate water efficiency to their business and customers. Before any new resources could be developed we would have to be satisfied that an appropriate range of resource and demand management options have been applied by SWW Ltd and that leakage is reduced to an economic level. SWW Ltd aim to reduce leakage from their distribution system by 15 per cent by the year 2000 and they are currently on target to meet this.

In parallel with OFWAT's current third periodic review of water company charges, the Agency requires that water companies produce a Water Resources Plan for the next 25 years. This will include revised demand forecasts, a review of resource availability and a consideration of any potential resource options to meet forecasted deficits over the 25 years. This information will enable the Agency to revise its Water Resources strategy. The internal draft of SWW Ltd's plan was submitted to the Agency in June 1998. A national review of all the draft plans is due for publication in October 1998. This Agency expects that SWW Ltd will wish to make public the key aspects of their draft plan before completing the final plan in April 1999. We expect to publish our revised Regional Water Resources Strategy by the end of 1999.

In addition, in May 1998 this Agency published 'A Price Worth Paying'[25] which sets out the National Environmental Programme – the improvements in the environment that the Agency expects from the third periodic review.

Both SWW Ltd and the Agency produce and distribute publicity material to promote efficient water use by customers.

There are concerns that public water supply abstraction is having localised impacts within the catchment. There are also concerns that the moorland parts of the catchment which slowly release water during dry periods may be affected by management practices on the moor (see Issue 10b).

Low flows in watercourses can affect wildlife and fisheries and exacerbate water quality problems due to reduced dilution.

Most of the flow in the catchment is derived from surface water, and as a result river flows drop markedly during prolonged dry periods. This can have a number of effects particularly on the salmonid fishery by causing spawning gravels to dry up and by restricting salmonid migration, either through failing to stimulate fish to migrate or through preventing their passing through obstacles on the river.

In addition, fish may become trapped in isolated pools, reducing the quality of fishing available.

On the Erme the most vulnerable reach is below the Harford Moor intake weir, where SWW Ltd abstract water for public supply. The conditions of the licence prescribe that the river flow below the point of abstraction must be at least 0.049 m^3/s. For several weeks during the summer, the flow does not rise above the prescribed rate, which is now considered to be too low to adequately protect the river.

Similarly, below the Avon Dam the river can be entirely dependent on the compensation water release of 0.068 m^3/s which is again considered less than adequate. Some of the water retained in the Avon Reservoir is available to benefit the fishery, provided as part of the mitigation measures when the reservoir was built. This has been used on one occasion but has had little positive effect. It is now considered that more benefit could be derived if the water was used to increase the compensation flow from the reservoir during the spring and summer months. A similar action at Meldon Reservoir on the West Okement River resulted in much improved juvenile salmonid production downstream of the reservoir.

Table 7: Water Abstraction

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Negotiate with SWW Ltd for increase in prescribed flow at Harford Moor intake.	3,6	Agency, SWW Ltd	n/a		●			
b	Negotiate with SWW Ltd for increase in compensation flow from Avon Reservoir.	3,6	Agency, SWW Ltd	n/a		●			

Issue 8: Cryptosporidium

Cryptosporidium is a microscopic animal which can affect the intestines of mammals, birds and reptiles. One species *Cryptosporidium parvum* can cause the disease Cryptosporidiosis, a symptom of which is prolonged severe diarrhoea in humans. This can be fatal in individuals with suppressed immune systems, such as the elderly or infirm. It is transmitted via an environmentally resistant form called an oocyst, shed in the faeces of infected individuals or animals. Oocysts are resistant to most water treatment processes and enter new hosts via the mouth. *Cryptosporidium parvum* is thought to be widely present in the environment and may be found extensively in cattle and sheep.

Occasionally outbreaks of Cryptosporidiosis occur in human populations, and the public water supply is often implicated in these situations (recent outbreaks have taken place in Torbay in 1995 and in Hertfordshire and North London in 1997). The risk of *Cryptosporidium* entering the water supply is thought to be greatest where there is a direct river abstraction, particularly in an agricultural catchment. There are two direct river abstractions used for public water supply, on the Bala Brook and in the headwaters of the River Erme.

In recognition of the national increased awareness of the potential risk to public health posed by this organism we are working with SWW Ltd, MAFF and local authority Environmental Health Departments on a task group which will assess the risk of *Cryptosporidium* entering the public water supply. This task group will also examine the feasibility of introducing measures to reduce the input of the organism to watercourses in catchments where public supplies are at risk, such as the Avon and Erme Catchment. We are currently awaiting their report, and will publish its conclusions and any resultant actions in the first annual review of this plan.

Issue 9: Air Pollution

Associated Plans:
The Nature of Devon: A Biodiversity Action Plan[1];
UK National Air Quality Strategy[26].

Air pollution can damage flora, fauna and buildings and can have significant effects on soils and water. It can also cause serious problems for those with asthma, bronchitis and other respiratory diseases. Sources of air pollution include: traffic, industrial processes and power generation. These sources may be present within or outside the catchment. Ambient concentrations of air pollutants are generally lower in the South-west of England than in other parts of England and Wales, although data on local air quality are somewhat limited.

The National Air Quality Strategy[26] requires local authorities to review air quality in their district. These reviews will contribute to the knowledge of air quality in the catchment.

Effects of air pollution on sensitive species - Dartmoor has an extremely rich lichen flora with a number of rare species. These lichen grow on both rocks and trees and are particularly sensitive to atmospheric sulphur. Estimated annual mean sulphur dioxide concentrations for the catchment are less than 5 microgrammes per cubic metre; this is lower than the standard of 10 microgrammes per cubic metre proposed for the protection of sensitive lichen[27]. However, this estimate is based on limited local data and there is still concern that, particularly around the southern edge of the moor, loss and damage to these species is occurring, especially in the most sensitive areas. There may also be some damage to other lower plants such as mosses, which grow well in the moist climate of the area. More information is required to establish the status of these sensitive communities in the catchment.

Acidification - Moorland areas are typically acid due to the underlying geology and soil. The acidity of Dartmoor, however, is exacerbated by atmospheric acid deposition. The main sources of acid deposition are sulphur dioxide and oxides of nitrogen, which dissolve in water to produce acid rain. These compounds come mainly from burning fossil fuels, but also from natural sources such as organic decay, volcanic eruptions and lightning strikes. Natural sources account for less than 5 per cent of acid deposition in the UK.

Emissions of nitrogen oxides are thought to be responsible for about one third of the acidity of rainfall, and the proportion appears to be increasing. Road vehicles are responsible for about half of the emissions of nitrogen oxides in the UK.

Research in the UK over the last 20 years has led to the development of 'effects-based' emission control policies, using a 'critical loads' approach. This approach involves assigning a critical load of acidity to particular ecosystems: that is the amount of acid deposition below which harmful effects do not occur according to present knowledge. Some ecosystems, for example moorland and moorland streams, are very sensitive to acid deposition and therefore have a low critical load. Current or predicted acid deposition over an area can be compared with its critical load to see if it has been, or will be, exceeded.

Map 3 shows modelled critical load exceedences for soils in 1995 and 2005. The data for 2005 is based on the predicted emissions of sulphur dioxide and oxides of nitrogen from the major sources. It can be seen that the critical loads are notably exceeded over Dartmoor. The predicted exceedences in 2005 are mainly due to the international commitments to reduce sulphur emissions which have been agreed under the Second Sulphur Protocol of the United Nations Economic Commission for Europe[28]. Under the terms of this protocol the UK has agreed to reduce its sulphur dioxide emissions by 80 per cent by 2010 from a 1980 baseline. The UK's Sulphur Strategy published in December 1996[29] indicates that the UK will meet interim targets for 2000 and 2005. Compliance is also expected with the 80 per cent reduction target for 2010.

Table 9: Air Pollution

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Review air quality in the area, in line with National Air Quality Strategy[26].	2	Agency, SHDC, *DNPA*	n/a	●	●			
b	Improve knowledge of status of communities sensitive to air pollution in the catchment.	2	EN, DNPA, Agency	unknown	●	●	●		
c	Co-operate in development of clean air quality standards to protect key species.	2,4	EN, Joint Nature Conservation Committee (JNCC), Agency, DNPA	<1k p.a.	●	●	●	●	●
d	Conduct and support research to improve understanding of effects of airborne acidification and eutrophication on semi-natural habitats and species.	2,4,6	Universities, Agency, EN, DNPA, Institute of Terrestrial Ecology	unknown	●	●	●	●	●
e	Ensure all proposals for forestry development within the areas of critical load exceedences receive an environmental impact assessment where appropriate.	2,4,6	Agency, Forestry Authority	<1k p.a.	●	●	●	●	●

Issue 10: Biodiversity and Earth Science

Associated Plans:
Biodiversity: The UK Steering Group Report, Volume 2: Action Plans 1995[30];
The Biodiversity of the South West: An Audit of the South West Biological Resource[31];
Action for Biodiversity in the South-West: A Series of Habitat and Species Plans to Guide Delivery June 1997[32];
The Nature of Devon: A Biodiversity Action Plan[1];
The Nature of Dartmoor: A Biodiversity Profile[2];
Dartmoor National Park Authority Biodiversity Action Plan[33];
Dartmoor National Park Management Plan[35];
South Devon AONB Management Plan[4];
Salcombe and Kingsbridge Estuary Environmental Management Plan[5].

Biodiversity Action Plans – Wildlife and, to a lesser extent, earth science conservation are now being directed through a series of Biodiversity Action Plans (BAPs). These plans are derived from a national document[30] and use a prioritisation process to determine on which key features, habitats and species the effort of all bodies involved in conservation should be targeted. An audit, to determine the extent of the resource, and action plans containing objectives, targets and actions for a range of habitats and species have been produced for the South-west. Action plans are now being developed for selected habitats, species and earth science features at a county level in Devon.

The Natural Areas programme is led by English Nature and divides the whole of England into areas defined by their physical attributes, wildlife, land use and culture. Profiles for these areas are being produced in which key habitats and species are identified; conservation objectives are also proposed. The Avon and Erme Catchment is divided between the Dartmoor and South Devon Natural Areas. The shore and sea also lie in two areas: east of Start Point in the Lyme Bay Maritime Natural Area (MNA) and to the west in the Start Point to Land's End MNA.

We recognise that resources are limited and that we must concentrate our efforts where we can be most effective. Therefore, using established priorities, we have selected features, habitats and species (see Table A on the following page) which are influenced by or closely associated with the water environment, waste management and regulation, or process industry regulation. Where appropriate we have proposed catchment specific targets and actions in this plan (see Table A for relevant issues).

There are various criteria which must be met for key status to apply. Earth science features must be recognised as nationally important: that is to say they must be a significant proportion of the county resource. We include habitats or species which are under threat in the catchment or globally, present in the catchment as more than a trivial area or population and a significant proportion of the county area or population. In order to cover all interests we also include some habitats and species which have high popular appeal or concern.

Appropriate targets for promoting and implementing biodiversity action are listed after the relevant issue's action table.

Table A: Key Habitats, Features and Species in the Avon and Erme Catchment

Habitat / Feature / *Species*	Threats	Relevant Issues
Blanket bog	Burning, acidification	9, 10b
extensive peat deposits	Drying, shrinkage	
Sphagnum imbricatum (moss)	Uncertain	
Valley mire	Acidification, drainage	9, 10c
scarce blue-tailed damselfly	Drainage, habitat neglect	
keeled skimmer	Drainage	
Upland heathland	Burning, grazing	10d
heather		
Rhôs pasture	Agricultural improvement, neglect	10e
marsh fritillary		
Rivers and streams	Eutrophication, acidification	2, 9, 10f
otter	Habitat loss, disturbance	12
dipper	Acidification, bridge works	10g
sand martin	Bank protection works	10g
kingfisher	Bank protection, water quality	10g
salmon		4
brook, river and sea lamprey		10h
bullhead		10h
Freshwater marsh and lagoon	Eutrophication, water levels	1, 2, 10i
aquatic warbler	Uncertain	
Cetti's warbler	Habitat loss	
bittern	Loss of large reedbeds, water quality	
strapwort	Water levels, management	
Estuarine habitats: saltmarsh, mudflats, sandflats	Development, recreation, coastal/flood defence	3, 10k, 12
dwarf spike rush	Uncertain, specialised	10l
pennyroyal	Uncertain, specialised	10l
Shingle bars	Recreation, coastal defence	3, 10j
shingle bars and beaches	Interrupted material supply	
Lowland heath		10a
heath lobelia	Agricultural improvement	10l

Issue 10a: Loss/deterioration of key habitats and species in general

Many of the habitats and species for which the catchment is still an important location have declined in their extent or abundance. Often this has been as a result of human activities, typically driven by economic factors. Thus, incentives intended to improve agricultural production, together with new technology and practices, have also encouraged higher stocking densities, conversion of permanent pasture to short term leys or arable, improved drainage or greater application of fertilisers and pesticides. Similarly, development, whether for industry, housing or infrastructure, often results in a direct loss or fragmentation of habitat. River and wetland habitats are vulnerable not only to direct effects but also to activities elsewhere in the catchment.

We need to ensure that our input to strategic plans reflects our priorities. We also need to encourage uptake of schemes that encourage sustainable use of the catchment and to work with the scheme providers to make sure that incentives and management requirements are set appropriately. Much attention has been focused on the success of the Somerset Levels Environmentally Sensitive Area (ESA), but it is important to note the elevated rates of payment which have allowed this to happen. While the Dartmoor ESA has been well received by individual landowners, there have been few agreements over the commons where the majority of key habitats are present. In addition, management of the commons is generally poorer and there is significant overgrazing. Modifications to the scheme may result in improved uptake.

Table 10a: Loss/deterioration of key habitats and species

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Continue to develop the Biodiversity Action Planning process at regional, county and more local levels to establish priorities for wildlife and earth science conservation.	4,6	Agency, EN, Royal Society for the Protection of Birds (RSPB), SHDC, Dartmoor National Park Authority (DNPA), DCC, Devon Wildlife Trust (DWT), *others*	2k	●	●	●	●	●
b	Promote and implement action plans, particularly for those features, habitats and species which may be affected by our operational or regulatory activities.	4,6,7	Agency	5k	●	●	●	●	●
c	Work with others to ensure that prescriptions and payments, under agri-environment schemes such as ESA and Countryside Stewardship, are set so as to allow objectives to be met.	4,6,7	MAFF, FRCA, Agency, landowners	2k	●	●	●	●	●
d	Encourage uptake of agri-environment schemes, particularly where there are benefits for target features, habitats or species.	4,6,7	Agency, FRCA, landowners, managers, others	1k	●	●	●	●	●

Targets:

(i) Promote the uptake of ESA so that 80 per cent of eligible land is under agreement by 2005.

(ii) Outside the ESA area, 80 per cent of all County Wildlife Sites larger than 5 hectares to be entered into management agreements, or other protective ownership, by 2005.

Issue 10b: Loss/deterioration of blanket bog

Blanket bog is a scarce habitat for which Dartmoor is internationally important. It is found here at its southernmost location in Britain and there is little further south anywhere in Europe - much of it is no longer in a natural condition. Extensive and frequent burning, especially by summer fires, can kill the mosses which form the peat. One moss species, *Sphagnum imbricatum*, is now nationally scarce and, on Dartmoor, is found only on Cater's Beam and at one other location in the adjoining Dart catchment. The deterioration of blanket bog is not only an issue for wildlife conservation; it also reduces the ability of the moorland to absorb and slowly release rainfall, resulting in more rapid rise and fall of water levels in the rivers (see Issue 7). In addition the extensive peat deposits which underlie the blanket bog are a key earth science feature as they contain an extremely important and detailed record of the past ecology of the area. The peat may shrink when the hydrology of the area is altered and the record can become confused. Blanket bog is also vulnerable to acidification (see Issue 9).

SWW Ltd hold a licence allowing them to abstract water from Red Lake and Left Lake under extreme drought conditions. There are concerns that these sites are hydrologically linked to the surrounding blanket bog, and that abstractions of water from these sites could lead to the drying out of this wetland habitat. An area of Dartmoor which includes Red Lake and Left Lake has been designated as a candidate Special Area of Conservation (SAC) under the EC Habitats Directive[34]. As a competent authority for this Directive we will be obliged to review all existing authorisations and activities that we license within SACs, including abstraction licences. Assessment of the above abstractions will be completed by 2004, within the national review programme.

Table 10b: Loss/deterioration of blanket bog

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Increase pubic awareness of dangers of uncontrolled fires.	4,7	DNPA, Devon Fire Brigade, Agency	<1k	●	●	●	●	●
b	Conduct research into effects of 'swaling' and changes to moorland vegetation on both catchment hydrology and nutrient leaching.	3,4,6	Plymouth University, *EN, Agency, DNPA*	2k p.a.	●	●	●		
c	Promote and implement action plans for blanket bog and associated species from forthcoming Dartmoor BAP.	4	DNPA, EN, Agency, MAFF	2k	●	●	●	●	●
d	Review all existing authorisations and activities that we license within Dartmoor proposed SAC.	3,4,6,8	Agency, EN	<1k			●	●	●

Targets:

(i) No further net loss of blanket bog.

Issue 10c: Loss/deterioration of valley mire

Valley mire is a wetland habitat which occurs where waterlogged peats are found in valley bottoms. Unlike blanket bog, peat formation is continuing in the mires on Dartmoor which are of particularly high quality. They support a number of key dragonfly species, including keeled skimmer and scarce blue-tailed damselfly. There are a few locations in the catchment where breeding takes place; further survey work is required to establish the status of dragonflies at other suitable sites. Mires are at risk from drainage which not only disturbs the habitat generally but may also affect the particular needs of associated species. Valley mire is also vulnerable to acidification (see Issue 9).

Table 10c: Loss/deterioration of valley mire

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Promote and implement action plans for valley mire and associated species from forthcoming Dartmoor BAP.	4	DNPA, EN, Agency, MAFF	2k	●	●	●	●	●
b	Support survey to determine dragonfly interest.	4	British Dragonfly Society (BDS), DNPA, *Agency*	<1k	●	●			

Targets:

(i) No further net loss of valley mire.

Issue 10d: Loss/deterioration of upland heathland

The upland heathland of Dartmoor is another habitat of national importance. It is found on much of the open moor which is not covered by blanket bog and is dominated by dwarf shrubs, in particular heather and western gorse. In the Avon and Erme Catchment upland heathland is found on Ugborough Moor. The general decline in extent and quality of heather moorland is indicative of changes in management and more intensive agricultural practices. Swaling (rotational burning of small areas of moorland to provide a flush of new growth for grazing) is a useful management tool when properly carried out, but frequent burning and/or heavy grazing tends to encourage grass moor at the expense of heath.

Table 10d: Loss/deterioration of upland heathland

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Promote and implement action plans for upland heathland and associated species from Dartmoor National Park Authority Biodiversity Action Plan[33].	4	DNPA, EN, Agency, MAFF	1k	●	●	●	●	●

Targets:

(i) No net loss of upland heath, where possible.

(ii) Restore 20 hectares of degraded heath by 2005.

Issue 10e: Loss/deterioration of Rhôs pasture

Rhôs pastures are species-rich purple moor grasslands with a very restricted distribution. However, about 90 per cent of the resource which remained at the turn of the century has now been lost. On Dartmoor they are found in valley systems away from the open moor and are usually present as small fragments. Rhôs pasture is particularly important habitat for the marsh fritillary butterfly; almost 25 per cent of the English population of this butterfly is found on Dartmoor. Agricultural improvement or neglect are probably the greatest threats to this habitat and its associated species, but as with many wetland habitats changes such as the creation of ponds can lead to the loss of existing high quality habitat. The Agency and Dartmoor National Park Authority are embarking on a project of Rhôs pasture enhancement in the Erme Catchment; work being undertaken includes the provision of fencing to control grazing.

Table 10e: Loss/deterioration of Rhôs pasture

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Promote and implement action plans for Rhôs pasture and associated species from DBAP[1] and Dartmoor National Park Authority Biodiversity Action Plan[33].	4	DNPA, EN, Agency, MAFF	3k	●	●	●	●	●

Targets:

(i) No net loss of Rhôs pasture.

Issue 10f: Key catchment habitats and species associated with the freshwater environment

South Devon's rivers and streams are unusual in that they are considered as key habitats within both the Dartmoor and South Devon Natural Area profiles. They also provide a link between those two very different parts of the county. Perhaps more than any other habitat, rivers are vulnerable to the effects of activities well away from the habitat itself. The rivers reflect what is occurring over the whole catchment. Thus, agricultural improvement and higher stocking densities, or application of fertilisers, is likely to be apparent in the nature of the rivers.

The Avon and Erme support a range of species typical in Devon rivers, but no less valuable for that. Indeed, several of those species are particularly well represented in Devon. Otters, for example, are thriving here but in much of England they are rare or absent. This population provides a base from which to expand. There are concerns about continued loss of undisturbed habitat for lying up sites. Although evidence from other rivers suggests that otters can cope with a reasonable level of recreational disturbance, breeding sites in particular are more vulnerable. Slapton Ley provides undisturbed areas for breeding, together with an abundant food supply, although breeding has never been proven to occur here. We need an improved information base for the South Devon area, which is not included in the seven-yearly national surveys. The volunteer network being established by Devon Wildlife Trust will assist with that aim. The Agency has carried out a programme of detailed examination of otter road casualties reported; some twenty five are recovered annually. This gives us good information on the health of the population and can tell us whether there are problems with pesticide pollution, the main cause of the otter's decline.

Freshwater seepages can be found at the base of cliffs in the Prawle Point to Start Point and Bolt Head to Bolt Tail SSSIs. These habitats support uncommon invertebrate communities that are vulnerable to changes in hydrology and nutrient levels. Further information is required on the abundance and distribution of these invertebrates from English Nature. We will ensure that these habitats and species, like others of value, are protected when we authorise the activities of others.

Table 10f: Key catchment habitats and species associated with the freshwater environment

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Rivers and streams - implement flood plain policy, identify additional stretches of river bank that require active management to conserve or enhance wildlife, ensure Drought Orders and Permits do not compromise wildlife and ecology of watercourses.	4	Agency, SWW Ltd, *DWT*	unknown	●	●	●	●	●
b	Freshwater reedbed – encourage development of sympathetic water abstraction policies and appropriate coastal zone management plans in order to protect existing reedbeds. Advise on economic benefits of reedbed management as well as wildlife value. Encourage use of reedbeds for pollutant/sewage effluent treatment.	4	Agency, Estuary Conservation Officer	unknown	●	●	●	●	●
c	Otters - promote and implement action plan for otters from DBAP, including continued post-mortem analysis and habitat reinstatement.	4	Agency, DWT, *Riparian owners*	3k	●	●	●	●	●

Targets:

(i) Review and enforce waste/pollution regulations and discharge consents to control the spread of waste to land and reduce the pollution of watercourses, by 1999.

(ii0 Assess the feasibility of increasing the storage time of waste on land within the catchment by 2010.

(III) Create 40 hectares of new reedbed, in blocks of at least 20 hectares, by 2010.

(iv) Create 20 hectares of new reedbed on small sites across the county by 2010.

(v) Maintain existing populations of otter and expand use to all suitable areas of the catchment.

Issue 10g: Threats to key bird species

Dippers have a western distribution and have been shown to be affected by acidification of streams (see Issue 9). Their nest sites are often under bridges and therefore at risk from repairs or strengthening works. Sand martins and kingfishers use steep earth cliffs for their nest holes; changes to erosion patterns can result in a loss of suitable sites. Sand martins also use quarries and pits; however, redundant sites are often favoured locations for waste disposal. We need to ensure our regulatory activities take account of all known sites. We are working with others to improve the understanding of distribution.

Also see Issue 10i.

Table 10g: Threats to key bird species

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Carry out county-wide survey of sand martin and kingfisher nest sites.	4,6	Devon Bird Watching and Preservation Society (DBWPS), Agency, volunteers	unknown	●				
b	Support research to determine effects of acidification on dipper populations.	4,6	Agency, British Trust for Ornithology (BTO), Universities	<1k	●				
c	Record dipper nest sites and pass information to county highways section in relation to bridge repairs.	4,6	Agency	<1k	●	●	●	●	●

Issue 10h: Threats to key fish species

Salmon are threatened by a range of activities. Our actions for this species are covered in Issues 2, 4 and 5 of this plan. Other fish such as brook, river and sea lamprey and bullhead are also species of conservation concern. However, information relating to the distribution and importance of these species in Devon is limited.

Table 10h: Threats to key fish species

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Improve knowledge of distribution and abundance of bullhead and lamprey species, ensuring lamprey are identified to species level in fisheries surveys.	4,5,6	Agency	<1k			●		

Issue 10i: Threats to freshwater lagoon habitats

Freshwater lagoons are a scarce habitat in the South-west and almost the entire Devon resource is found in this catchment. Slapton Ley is the largest natural freshwater body in Devon, while there are other sites with reed swamp at Beesands Ley and South Milton, with remnants at Hallsands and South Huish. A wide variety of species are present (see also Issue 10f), notably several uncommon bird species. Cetti's warbler has a very restricted distribution in Britain and the catchment's population is the largest in the region. Aquatic warbler is also regularly recorded on passage; this bird is rarely found in Britain and its requirements are poorly known. Bittern has declined by 50 per cent over the last 25 years, so that there were fewer than 20 pairs breeding in 1994. Breeding was assumed in this catchment in 1996. Slapton Ley is the only British site for strapwort, a plant which grows on muddy areas at lake margins, subject to some trampling. There are serious concerns about the deterioration of the ecology of the Ley as a result of sedimentation and eutrophication which has gone on since the 1950s (see Issues 1 and 2).

Table 10i: Threats to freshwater lagoon habitats

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Investigate changes to flora and fauna of Slapton Ley through an agreed programme.	4,6	FSC, EN, Universities, Agency	unknown	●	●	●	●	●
b	Promote and support establishment of voluntary action group with input from statutory agencies to tackle recognised problems in the Ley through collaborative approach.	4,6	EN, FSC, Agency, MAFF, FRCA, NFU, CLA	1k p.a.	●	●	●	●	●
c	Establish/agree suitable habitat management to encourage the spread of strapwort around the Ley.	4,6	FSC, EN, Agency	3k	●	●			

Issue 10j: Loss/deterioration of shingle bar habitats

Shingle bars have both biological and earth science importance. The shingle bank at Slapton is part of the National Nature Reserve and has been identified as an internationally important site in the Geological Conservation Review, a 12-year programme carried out by the Nature Conservancy Council to assess all the most significant earth science sites in Great Britain. There are several unusual species which are adapted to the harsh conditions which prevail and a clear transition can be seen across the bar. Plants are often vulnerable to damage by excessive recreation pressure; at the same time the physical feature is also open to damage or disturbance by human activity. Shingle bars are also vulnerable to changes in sediment processes. The actions relating to this issue are shown in Table 3 (Actions f and g).

Issue 10k: Threats to estuarine habitats

The catchment has a particularly fine and varied resource of estuaries and associated habitats. Within the estuaries are areas of saltmarsh, mudflat and sandflat. There are also rich and diverse communities of intertidal and subtidal flora, invertebrate fauna and breeding and wintering birds. The Erme Estuary is largely privately owned but the Avon and Salcombe and Kingsbridge estuaries are at risk from a number of pressures. Both sites are heavily used for recreation, with large numbers of boats and moorings present. There are also fairly frequent, usually minor, works to protect property from wash or erosion or to facilitate access to and from the water. These works may have a cumulative effect when considered together. The designation of the Salcombe and Kingsbridge Estuary as a Local Nature Reserve and the development of a management plan[5] under the guidance of the Estuary Conservation Officer will help to reduce the impact and to promote opportunities for enhancement. We will continue to work closely with the Estuary Officer and to seek ways of improving both estuarine and fringing habitats such as grazing marsh. There are several areas where water level management could be very useful in protecting such sites.

The number of swans on the Salcombe and Kingsbridge Estuary has been declining, against a regional trend of increasing populations. In addition, there have been some unexplained deaths, particularly amongst juvenile birds.

Table 10k: Threats to estuarine habitats

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Promote and implement action plans for estuaries and associated habitats and species from DBAP.	4,6	Agency, SHDC, Estuary Conservation Officer, DWT, Landowners	2k	●	●	●	●	●
b	Support initiatives to enhance fringing habitats (grazing marsh, reed swamp) around Salcombe and Kingsbridge Estuary.	4,6	Agency, SHDC, Estuary Conservation Officer	1k	●	●	●	●	●
c	Investigate possibilities for water level management, particularly on grazing marshes alongside the Avon and Erme estuaries.	4,6	Agency, EN, Landowners	unknown		●			
d	Support investigations to determine reasons for decline in number of swans on Salcombe and Kingsbridge Estuary.	4	Agency, Estuary Conservation Officer	1k	●	●	●	●	●

Issue 10l: Threats to key plant species

Two particular plants occur in the catchment which are very localised in the UK and considered to be vulnerable overall. Dwarf spike rush occurs in a few areas in tidal mud in the Avon Estuary while pennyroyal is found only in damp grassland around the Salcombe and Kingsbridge Estuary. We will work with others to ensure that these species remain in their present sites and increase if possible.

Heath lobelia, a plant of damp lowland heath, is threatened in Europe. Its largest regional population is found in the Avon catchment. Although the site is protected there is a need for careful management to protect the population and agricultural improvement outside the protected area is also a threat.

Table 10l: Threats to key plant species

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Contribute to local action plans to protect and encourage spread of dwarf spike rush and pennyroyal.	4	Agency, SHDC, Botanical Society of the British Isles (BSBI), Estuary Conservation Officer	<1k	●	●	●	●	●
b	Manage site to maintain and if possible promote increase of heath lobelia colony.	4	DWT, EN	unknown	●	●	●	●	●

Issue 11: Spread of Non-native Invasive Plants

Associated Plans:
South Devon AONB Management Plan[4];
Dartmoor National Park Management Plan[35].

Several plant species are causing concern at the way in which they are spreading. Some, like Himalayan balsam, Japanese knotweed and Giant hogweed, are terrestrial plants which are often, but not exclusively, found alongside watercourses. They often spread at the expense of other, native plants, creating dense single species stands which are of lower wildlife value. Himalayan balsam and Japanese knotweed die back in winter to leave bare banks which are vulnerable to erosion. Japanese knotweed does not set viable seed in this country but is able, rather like bindweed, to grow from small pieces of root or stem. It can be spread with soil from one site to another and presents problems for control and disposal. Giant hogweed is less common than the other two species but also has a significant health risk attached. Contact with the sap or coarse hairs can result in severe blistering of the skin and even sensitisation which causes problems in subsequent years. The Agency cannot undertake to eradicate these plants at all sites but we can advise on the best methods of control and will control them where they are growing on land which we own or manage.

Rhododendron is an alien species introduced as an ornamental plant which is now spreading through woodlands at an alarming rate. It casts dense shade and excludes native ground flora. Rhododendron has been identified as a particular problem in the oak woodland found along the banks of the River Avon, below the Avon Dam.

In addition there are also several aquatic plants which are spreading rapidly. Many exotic plants have been sold by garden centres and other suppliers for use in ponds or even fish tanks. These include parrot's feather, Australian swamp stonecrop and the alien marsh pennywort. The first of these has colonised a pond very close to Slapton Ley and much time and effort has been spent to prevent further spread. The Agency will try to encourage owners to remove these plants from ponds and to discourage suppliers from selling them to the public.

Table 11: Spread of Non-native Invasive Plants

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Record all occurrences of invasive species on sites owned or managed by the Agency and implement control programmes.	4,6	Agency, Coast and Countryside Service	3k p.a.	●	●	●	●	●
b	Collaborate with Japanese knotweed control programmes initiated by others.	4,6	Agency, DNPA, SHDC, Coast and Countryside Service	unknown	●	●	●	●	●
c	Encourage removal/ control programmes for invasive plants (bankside and aquatic) to be carried out by riparian owners, pond owners and other interested bodies.	4,6	Agency, Coast and Countryside Service	<1k	●	●	●	●	●

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
d	Raise awareness among general public and distributors of problem of introduced aquatic plants, and discourage suppliers from making invasive species available.	4,6	Agency, Garden Centre Trade Assocs, Coast and Countryside Service	1k	●	●	●	●	●
e	Check ponds for presence of alien species as part of routine operations.	4,6	Agency, Coast and Countryside Service	1k	●	●	●	●	●

Issue 12: Recreational Use of the Catchment

Associated Plans:
South Devon AONB Management Plan[4];
Dartmoor National Park Local Plan[13];
South Hams Local Plan[14];
Salcombe and Kingsbridge Estuary Environmental Management Plan[5];
Lyme Bay and South Devon Shoreline Management Plan.

Many people spend their spare time enjoying our rivers and coasts. We have a duty to promote the use of inland and coastal waters and associated land for recreational purposes, and to take account of the needs of the less able. In carrying out this duty we balance carefully the potential conflicts between conservation and recreation. We will not encourage new access routes or promote the use of particular rights of way without considering the needs of landowners or other countryside interests.

1999 Solar Eclipse - Concerns have been raised in Devon and Cornwall regarding the anticipated influx of visitors to the area to watch the total solar eclipse in August 1999. The number of visitors is expected to be in the region of 6 million; this will put a great strain on the local infrastructure. We have an Agency representative who sits on the Waste and Water Quality Working Group, along with others from the County Councils for both Devon and Cornwall. This working group reports to the overall eclipse contingency group and has a strong stance not to relax any consent conditions for the period of the eclipse.

Public access to water and associated land - We will seek to promote access for people to appreciate the water environment where that can be achieved without adversely affecting features of conservation value or the interests of landowners and others.

The Erme Valley path follows the river for about 5 miles to Sequer's Bridge. There are plans to extend it to Plymouth, completing a coast-to-coast route. Opposing views have been expressed about a possible footpath running along the River Avon and its estuary. There are some existing riverside sections of public footpath and it has been suggested that these could be extended. However, there are concerns about the additional disturbance to wildlife that this might bring.

There are also plans to develop a National Cycle Network, part of which would run across the catchment, mainly on existing roads or other rights of way.

Disturbance to wildlife - Too many people in one area can adversely affect the conservation value of the site. In addition some species and habitats may be vulnerable to disturbance from walkers or dogs, such as wintering birds on the Salcombe and Kingsbridge Estuary for example.

Canoeing - The River Erme is popular with canoeists and many travel long distances to use it. At peak times demand exceeds the river's capacity and problems may occur with unauthorised access. Presently, access for canoeing in the catchment is restricted to part of this river (Harford Bridge to Ivybridge); there may be opportunities to extend access agreements to other rivers or reaches in the catchment. The Agency is well placed to act as an unbiased and independent arbitrator in discussions between canoeists and riparian owners.

The Agency has recently launched a contact telephone number, Rivercall 0930 107705, which provides information which should be useful to canoeists regarding river levels and whether conditions are suitable for canoeing.

Damage to estuarine habitats from boat wash - There are some indications that boat wash is causing erosion of saltmarsh in the Avon Estuary. There may be a need for improved control over speed limits. Initially there is a need to find out more about the causes of the erosion.

Impact of sewage and litter from boats - Some concerns have been expressed over the impact of large numbers of boats in the Salcombe and Kingsbridge Estuary on water quality and amenity. This is being addressed through actions in the Estuary Management Plan[5].

Impact of marine anti-fouling paints - Paints to prevent the fouling of boats with various marine organisms, such as barnacles and algae, are mainly based on copper oxides although diuron, copper thiocyanate and Irgarol 1051 are also used[36]. There are concerns that Irgarol 1051 could have adverse environmental effects. In one study conducted in the estuaries of Kent, Sussex and Hampshire the compound was detected at significant levels in areas of high boating activity, particularly in marinas[37]. There is currently no monitoring of Irgarol 1051 in the Salcombe and Kingsbridge Estuary, an area of high boating activity. The toxicity of this herbicide to aquatic organisms is poorly understood. We are involved in both national and local studies on Irgarol 1051 and we will consider their relevance to the Salcombe and Kingsbridge Estuary when completed.

Until recently, most anti-fouling paints were based on the compound tributyltin (TBT). Field and laboratory studies have shown that TBT has had an environmental impact in a number of locations around England and Wales[38,39]. In 1987 the Government introduced a number of controls on the sale of TBT based paints and banned their use on boats less than 25 metres in length. Data collected by MAFF (1986-1992) show that TBT levels in the water at Frogmore Creek and Salcombe Harbour substantially decreased following the ban. Studies have shown that TBT concentrations are often high in harbour sediments and that TBT is very persistent. This gives rise to concerns regarding any management practice, such as agitation dredging, which results in significant re-suspension of sediments.

Salcombe Harbour Authority is intending to introduce a scheme whereby all anti-fouling scrapings will be required to be collected on sheeting and disposed of to a dedicated skip, along with empty anti-fouling tins and contaminated rags, brushes etc.

Table 12: Recreational Use of the Catchment

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Work with others to develop sustainable recreation in the catchment which does not conflict with wildlife interests.	4,6	Agency, Estuary Project, DNPA, South Devon Coast and Countryside Service (SDCCS)	1k	●	●	●	●	●
b	Take part, as a neutral party, in any discussions over access agreements for canoeists.	4,6	Agency, *DNPA, British Canoe Union (BCU), Riparian Owners*	>1k	●	●	●	●	●
c	Carry out further investigation into causes of saltmarsh erosion in Avon Estuary.	4,6	SHDC	unknown	●	●	●	●	●

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
d	Develop and encourage use of shore based disposal systems to reduce impact of sewage and litter from boats.	6,8	SHDC	n/a	●	●	●	●	●
e	Support research into the anti-fouling paint Irgarol and its environmental effects.	6	Agency	unknown	●	●			
f	Consider relevance of local and national studies on Irgarol 1051[17] to the Salcome and Kingsbridge Estuary.	6	Agency, *Estuary Project*	1k		●			
g	Provide advice on the disposal of boat scrapings.	6,8	Agency, *Estuary Project*	<1k p.a.	●	●			
h	Support Salcombe Harbour Authority's initiative regarding the controlled collection of anti-fouling scrapings and contaminated materials.	6,8	Salcombe Harbour Authority, *SHDC, Agency*	n/a	●				
i	Draw up contingencies for the influx of visitors viewing the 1999 solar eclipse.	3,8	Local Authorities, Agency, SWW Ltd	unknown	●	●			

Issue 13: Lack of Information on the Archaeological/Historic Value of the Catchment

Associated Plans:
South Devon AONB Management Plan[4];
Dartmoor National Park Local Plan[13];
South Hams Local Plan[14].

The catchment contains many sites of historic and archaeological value, the majority of which are found on Dartmoor. There are 148 Scheduled Ancient Monuments within the catchment, and two Historic Parks and Gardens: Flete (originally a Saxon estate) and Overbecks. Buildings and structures of county importance are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990. Thirty-one Built Conservation Areas have been declared in the catchment.

Dartmoor is one of the most important prehistoric landscapes in North-west Europe and the archaeology here has been extensively studied. In the south of the catchment around Thurlstone and Bigbury evidence of human activity dating from the Mesolithic period has been found amongst the remains of submerged forests. By the Bronze Age there were many settlements on Dartmoor and the land division system of reaves was being used, remains of which can be found along the upper reaches of the River Erme.

Much of the catchment remained rural for many centuries, but by the eighteenth century industries such as wool and paper had become established partly due to the ready supply of water. The majority of these mills have since ceased operation but Stowford Mill, built in the late eighteenth century on the banks of the River Erme at Ivybridge, is still in operation today. The towns of Kingsbridge and Salcombe had also become established by this time as ports and centres for shipbuilding.

By the nineteenth century mining and quarrying had become established in the higher and lower reaches of the catchment and this continued until the early part of the twentieth century. Tin working and milling were carried out in some areas and the remains of buildings can still be seen. There was a silverlead mine outside Ivybridge and clay works at Redlake and Leftlake. A mineral railway was built to bring men and supplies to Redlake; the remains of this railway now form part of the Two Moors Way. During the mid-nineteenth century Brunel's Great Western Railway was built which crossed the River Erme by way of a viaduct at Ivybridge.

We have a duty to have regard to the protection and conservation of buildings, sites and objects of archaeological or historic interest when considering any proposal relating to our functions. Archaeological/historic features as yet unidentified are at risk from new development or changes in land use.

Table 13: Lack of Information on the Archaeological/Historic Value of the Catchment

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Support production of document(s) covering entire area; investigate potential for collaboration.	6,7	DCC, LAs, English Heritage, (EH), DNPA, Devon Archaeological Society (DAS), Agency, Royal Commision on the Historical Monuments of England (RCHME), University of Exeter, NT	unknown	●	●	●	●	●

Issue 14: Estuary Management Plans

Associated Plans:
The Nature of Devon: A Biodiversity Action Plan[1];
Salcombe and Kingsbridge Estuary Environmental Management Plan[5];
South Devon AONB Management Plan[4];
Lyme Bay and South Devon Shoreline Management Plan.

The Salcombe and Kingsbridge Estuary has an Environmental Management Plan[5] which was produced (by consultants) for English Nature and South Hams District Council in 1994. This plan is managed on behalf of the partnership by an Estuary Conservation Officer based at the Harbour Offices in Salcombe. Although we are not a member of the partnership for the management of this estuary, we are represented on the Estuary Conservation Forum and have a close working relationship with the Estuary Conservation Officer (see Issue 10k).

Consideration is being given by SHDC to widening the remit of the Conservation Officer of the estuary to cover the South Hams coastal area (from Sharkham Point in the east to Wembury in the west). He would then operate as a marine conservation officer within the South Devon Coast and Countryside Service, and his remit would include a project to produce a Management Plan for the Avon and Erme Estuaries. The Agency will consider giving this project financial support, and would wish to become a partner in the project as there are many areas where management of the estuary will be covered by this LEAP. Any management plan for these estuaries will be complementary to this LEAP.

Table 14: Estuary Management Plans

	Actions	Strategy Theme	Action By Lead *Other*	Cost to Agency (£)	Financial Year 98	99	00	01	02
a	Continue to contribute to Salcombe and Kingsbridge Estuary Conservation Forum.	4,6	Agency	<1k	●	●	●	●	●
b	Prepare an Estuary Management Plan for the Avon and Erme Estuaries in partnership with relevant organisations, landowners and estuary users in order to ensure and maintain the sustainable use of the estuaries.	4,6	Agency, SHDC, DCC, EN, Duchy of Cornwall, Flete & Evans Estates, users, *others*	<1k		●	●	●	●
c	Consider financial support towards producing an Estuary Management Plan for the Avon and Erme Estuaries.	4,6	Agency	5k	●	●	●	●	●

Appendices

1. The Role of the Environment Agency

Flood Defence has the role of protecting people and the developed environment from flooding by providing effective defences and protection of floodplains. Safeguarding life is our highest priority and to meet this aim we provide a flood forecasting and warning service. Flood defence also aims to protect and enhance the natural environment by promoting works that are sustainable and work with nature.

The **Water Resource** function comprises the conservation, redistribution and augmentation of surface and groundwater supplies. It includes the powers to encourage water conservation and to promote transfer schemes and to balance the needs of water users and the environment by issuing licences for users to abstract water from rivers and boreholes.

The **Pollution Control** function includes:

Integrated Pollution Control (IPC) regulating the most polluting, or technologically complex, industrial and other processes in air, on land or in water.

Water quality and pollution control which prevents and controls pollution and monitors the quality of rivers, estuaries and coastal waters.

Radioactive Substances regulating the disposal of radioactive material, including that from licensed nuclear sites, and regulating the accumulation, keeping and use of radioactive materials, except from licensed nuclear sites.

Waste Regulation setting consistent standards for waste management practice to regulate the treatment, storage, movement and disposal of controlled waste. The Agency also has a requirement to register and monitor those who produce waste imposing obligations to re-use, recover or recycle products and materials.

Reporting on the extent of contaminated land and contributing to its management (primarily undertaken by local authorities).

Abandoned mine operators are also required to work with the Agency so that steps can be taken to prevent mine-water pollution in the future.

The Environment Agency is responsible for maintaining, improving and developing **Fisheries.** This is carried out by licensing, regulation and enforcement schemes which cover salmon, sea trout, non-migratory trout, coarse and eel fisheries. The Agency also carries out improvements to fisheries by improving the habitat and fish stocks and providing advice to fishery owners. The Agency is also the sea fisheries committee for some estuaries. We have statutory duties with respect to commercial fishing for sea fish and shellfish in these waters.

The Agency has statutory duties under the Environment Act 1995 to promote the **Conservation** of wildlife and landscape of inland and coastal waters and associated land, and to further the conservation of wildlife, landscape and heritage features when carrying out its operational or regulatory actions. We also have duties to promote the use of such water and land for **Recreation**, and to consider the need to maintain public access to such sites.

These duties apply wherever our actions take place or have an effect, not just within the water environment. We have a role to play in the conservation of any species, habitat or feature that may be affected by our activities. We will seek to protect not only those interests which have official protection, but also others which are nevertheless considered important for nature conservation.

The Environment Agency will **not** be dealing with:

Waste collection and litter - responsibility remains with local authorities;

Noise pollution – responsibility remains with local authorities' environmental health departments;

Drinking water quality – responsibility remains with private water companies and local authorities;

Public health – responsibility remains with local authorities;

Those aspects of the control of air pollution which remain with local authorities;

Planning permission – this is the responsibility of the local planning authority who will contact us when necessary. The local authorities also deal with contaminated land issues in liaison with us.

2. Links with South Devon AONB Action Programme 1997

ACTION	ISSUE - SOUTH DEVON AONB ACTION PROGRAMME 1997 - 2002	AVON & ERME	COMMENTS
A10	Monitor the effects of invasive plant species and provide advice on appropriate effective control Japanese knotweed, Himalayan balsam, laurel and rhododendron, Giant hogweed	Issue 11	
A24	Waterways and Wetland Management Plans for Estuaries and catchments (LEAPs), Dart, Salcombe and Kingsbridge, Yealm, Avon and Erme, Tamar AONB - production and implementation of proposals - wildlife corridors - wet woodland survey		EA = Lead
A25	Implement Slapton NNR management plan including silt and nutrient management targets	Issue 2	
A26	Dart and Avon Valley - establish wetland/waterside habitat targets linking where appropriate with Dartmoor		
A27	Species of conservation concern Habitat management and where appropriate use of reintroduction programmes in line with Biodiversity Action Plan targets for: lesser and greater horseshoe bats, barn owl, dormouse, cirl bunting, otter, water vole, salmon, Cetti's warbler, large blue butterfly, heath lobelia, strapwort, shore dock, bastard balm, golden hair lichen	Issue 10	Species named in plan otter, salmon, Cetti's warbler, heath lobelia, strapwort.
A28	Marine habitat conservation programme to be developed Target areas to be identified within Natural Area Profiles and Marine Surveys Kingsbridge Estuary Plan (1 year); Yealm and Avon Estuary Plans (3-5 years)		
A48	Complete LEAPs and introduce implementation/action programme for the following catchments: Avon and Erme (including Salcombe and Kingsbridge Estuary and Slapton)		EA = Lead
A49	Identify and deal with unlicensed (?) discharges of waste		EA = Lead This is ongoing for EA
A50	Make further improvements to the quality of bathing waters, rivers, estuaries and coastal waters	Issue 1	
A52	Establish buffer zones alongside rivers and estuaries to reduce levels of nutrient, bacterial and sediment runoff resulting from agricultural operations	Issue 2	
A53	Guide and influence waste management on farms through whole-farm plans, grant incentives and advice	Issue 2	
A54	Inform public of water quality issues and improvement programmes		EA = Lead

ACTION	ISSUE - SOUTH DEVON AONB ACTION PROGRAMME 1997 - 2002	AVON & ERME	COMMENTS
A58	Establish management structures/forums to implement estuary plans and review annual programme of proposed actions for all estuary plans		
A60	Support adoption of Shoreline Management Plan where proposals are consistent with AONB Plan objectives. Prepare specific coastal protection plan for Slapton Line/Start Bay	Issue 3	
A61	Develop and review the contingency plans for dealing with oil pollution. Identify sensitive marine sites in all estuaries and incorporate in emergency planning. Make booms available at short notice to protect estuaries. Carry out Annual Review		
A65	Support moves at national and international level to reduce quantity of sea-borne refuse washed ashore	Issue 12	
A66	Promote responsible public action to reduce litter	Issue 12	
A160	Co-ordinate information provided to the public on water quality		EA = Lead
A169	Provide advice/guidance to developers upon Environmental Impact Assessments covering energy use, air and water pollution, habitat loss or degradation, traffic generation/ congestion		
A222	Support policy of Structure and Minerals and Waste Local Plans as they relate to the AONB, Heritage Coast, Nature Conservation and sites of historic importance		EA = Lead
A223	Implement proposals within LEAPs as they relate to the Yealm, Dart, Avon and Erme catchments		EA = Lead

3. Consultees

National Organisations

Atlantic Salmon Trust

Clean Rivers Trust

English Nature

Farming and Rural Conservation Agency

Institute of Freshwater Ecology

The Forestry Authority

The Inland Waterways Association

Ministry of Agriculture, Fisheries and Food

National Farmers Union

The Ramblers' Association

Royal Society for the Protection of Birds

Royal Yachting Association

Regional and Local Organisations

Avon Fishing Association

Brent Island Trust

Cleeve Angling Club (of Ivybridge)

Cranfield University

Dartmoor National Park Authority

Devon Sea Fisheries Committee

Salcombe and Kingsbridge Estuary Conservation Officer

Slapton Ley Field Studies Centre

South West Federation of Sea Anglers

South West Water Limited

University of Cambridge

University of Durham

Local Authorities

South Hams District Council

Diptford Parish Council

Holbeton Parish Council

Loddiswell Parish Council

Modbury Parish Council

South Pool Parish Council

Stokenham Parish Council

Further responses, including questionnaires, were received from members of the public.

4. Former Actions from the Rivers Avon and Erme Consultation Report

Issue	Proposed Action	Number in this Action Plan
1	Conduct monitoring to ensure that desired improvements have been achieved at Salcombe North and Salcombe South Sands.	Routine activity (Bathing water monitoring)
1	Make improvements to Holbeton STW by 2005.	1a
1	Liaise with CEFAS to obtain more detailed information on the bacterial quality of shellfish.	1b
1	Ensure there is no deterioration to water quality through discharge consenting procedures.	Routine activity (Effluent monitoring)
1	Review sites designated under Shellfish Waters Directive[9].	Agency has responded; awaiting decision of DETR
1	Carry out investigation of the Bala Brook and take remedial action if required.	1c
1	Carry out investigation to determine the effect of unsatisfactory septic tank discharges on the Buckland Stream.	1d
1	Seek improvements to sewerage system at Buckland.	1e
1	Seek improvements to discharges in areas where development is constrained.	Replaced by 1f
1	Investigate nutrient loading from Slapton STW and seek any required improvements.	1i
1	Develop strategy for Devon rivers and estuaries that are eutrophic or may become eutrophic in the future.	Overtaken by the national eutrophication strategy
2	Ensure all problem farms identified during catchment inspections carry out remedial measures to improve water quality.	Routine activity
2	Encourage farmers to use appropriate Best Management Practices for control of soil erosion.	2i
2	Facilitate the securing of funding for bankside fencing to reduce erosion, where appropriate.	Replaced by 2h
2	Coppice bankside trees to reduce risk of collapse into river.	Replaced by 2h
2	Consider modifications to Habitat Scheme (Water Fringe option) to encourage greater uptake in the Gara and Start catchments.	Replaced by 2d
2	Explore opportunities for the application of other beneficial agri-environment schemes at relevant locations.	2k
2	Consider establishment of buffer zones alongside rivers to reduce damage to banks by stock.	Not to be progressed (National policy)
2	Continue gravel rehabilitation work to remove the build-up of silt and re-establish the gravels for salmonid spawning.	2g
2	Consider the transport of surplus gravel shoal material from lower reaches of River Avon to middle reaches to improve salmonid spawning habitat.	Not to be progressed

Issue	Proposed Action	Number in this Action Plan
3	Consider carrying out further monitoring to determine whether the Salcombe and Kingsbridge Estuary is a Polluted Water under the EC Nitrates Directive.	Overtaken by the national eutrophication strategy
3	Continue routine monitoring of the Salcombe Kingsbridge, Avon and Erme estuaries.	Discontinued (National policy to monitor for specific Directives or initiatives only)
3	Develop strategy for Devon rivers and estuaries that are eutrophic or may become eutrophic in the future.	Overtaken by the national eutrophication strategy
4	Identify sites which create problems for the downstream migration of smolts.	Replaced by 4a
4	Following National Guidance on screening criteria, advise abstractors of Agency screening requirements and work towards implementation.	Replaced by 4a
4	Seek to modify man-made barriers in the system to permit fish passage.	4b
5	Develop Salmon Action Plan.	5a
5	Seek to designate additional stretches of river under the EC Freshwater Fish Directive[10].	5b
5	Co-operate with the licensing authority to progress further research into fish-eating birds and implement appropriate recommendations once research is complete.	Replaced by 5c
5	Consider the installation of artificial beds or bed check weirs to increase spawning area, taking into account effect on habitat.	Not to be progressed
6	Work with local planning authorities to ensure that policies to protect the environment from pollution are included in Local Plans.	3a
6	Conduct pollution risk assessments and risk reduction at industrial sites in the catchment.	Routine activity
6	Work with others to reduce impact on water quality in the River Erme from drainage from construction.	3b
6	Encourage local authorities to incorporate conditions in planning permissions which reduce the risk to the environment from construction	3c
6	Produce database on contaminated land sites in the catchment and ensure there is effective consultation with local authorities regarding contaminated land sites.	3d
6	Provide floodplain mapping information to the planning authorities.	Replaced by 3e
6	Produce Shoreline Management Plan for South Devon coastline taking full account of the importance of the shingle bank.	3g
6	Take account of physical processes when considering modification or maintenance of existing flood or coastal defence structures.	Routine activity
7	Support PAYBACK/Business Link initiative to reduce waste at source.	6a
7	Provide advice to those companies affected by the Producer Responsibility Obligations.	6b
7	Agency to liaise with the WDA as licence holder to provide a system of control of migration of landfill gas from the site, and to ensure a comprehensive monitoring and restoration plan is implemented.	6d

Issue	Proposed Action	Number in this Action Plan
7	Investigate any new information relating to fly-tipped site at Chillington and seek to prosecute offenders if possible.	6e
7	Investigate options for cleaning up the site.	Replaced by 6f
7	Publicise the problem to encourage the public to give information about suspected illegal waste tipping and to discourage them from tipping waste outside of Civic Amenity Sites when they are closed.	6g
8	Encourage water company demand management and leakage control.	National initiative
8	Encourage consumers to undertake water saving actions.	National initiative
9	Negotiate with SWW Ltd for increase in prescribed flow at Harford Moor intake.	7a
9	Negotiate with SWW Ltd for increase in compensation flow from Avon Reservoir.	7b
10	Assess risk in catchment and examine feasibility of introducing catchment controls.	Not relevant to this catchment
11	Review air quality in the area, in line with National Air Quality Strategy[26].	9a
11	Improve knowledge of status of communities sensitive to air pollution in the catchment.	9b
11	Co-operate in development of clean air quality standards to protect key species.	9c
11	Conduct and support research to improve understanding of effects of airborne acidification and eutrophication on semi-natural habitats and species.	9d
11	Ensure all proposals for forestry development within the areas of critical load exceedence receive an environmental impact assessment where appropriate.	9e
12a	Continue to develop the Biodiversity Action Planning process at regional, county and more local levels to establish priorities for wildlife and earth science conservation.	10a-a
12a	Promote and implement action plans, particularly for those features, habitats and species which may be affected by our operational or regulatory activities.	10a-b
12a	Work with others to ensure that prescriptions and payments, under agri-environment schemes such as ESA and Countryside Stewardship, are set so as to allow objectives to be met.	10a-c
12a	Encourage uptake of agri-environment schemes, particularly where there are benefits for target features, habitats or species.	10a-d
12b	Increase public awareness of dangers of uncontrolled fires.	10b-a
12b	Carry out research into effects of grazing and burning on moorland vegetation and soils.	Replaced by 10b-b
12b	Promote and implement action plans for blanket bog and associated species from forthcoming Dartmoor BAP.	10b-c
12b	Review all existing authorisations and activities that we license within Dartmoor proposed SAC.	10b-d
12c	Promote and implement action plans for valley mire and associated species from forthcoming Dartmoor BAP.	10c-a
12c	Support survey to determine dragonfly interest.	10c-b1

Issue	Proposed Action	Number in this Action Plan
2d	Promote and implement action plans for upland heathland and associated species from Biodiversity Action plan for Devon (DBAP)[1].	10d-a
12e	Promote and implement action plans for Rhôs pasture and associated species from DBAP.	10e-a
12f	Promote and implement action plan for otters from DBAP.	Replaced by 10f-c
12f	Continue programme of post-mortem and tissue analysis on otter corpses.	Replaced by 10f-c
12f	Encourage habitat creation or management as part of any suitable enhancement schemes or projects.	Routine activity
12g	Carry out county-wide survey of sand martin and kingfisher nest sites.	10g-a
12g	Support research to determine effects of acidification on dipper populations.	10g-b
12g	Record dipper nest sites and pass information to county highways section in relation to bridge repairs.	10g-c
12h	Improve knowledge of distribution and abundance of bullhead and lamprey species.	Replaced by 10h-a
12h	Identify lamprey to species level when found in fisheries surveys.	Replaced by 10h-a
12h	Raise awareness of conservation importance of other fish species among field staff.	Routine activity
12i	Investigate changes to flora and fauna of Slapton Ley through an agreed programme.	10i-a
12i	Promote and support establishment of voluntary action group with input from statutory agencies to tackle recognised problems in the Ley through collaborative approach.	10i-b
12i	Establish better control over water levels in Slapton Ley to benefit strapwort and other flora and fauna.	Replaced by 10i-c
12k	Promote and implement action plans for estuaries and associated habitats and species from DBAP.	10k-a
12k	Support initiatives to enhance fringing habitats (grazing marsh, reed swamp) around Salcombe and Kingsbridge Estuary.	10k-b
12k	Continue to contribute to estuary steering group.	Agency not on steering group
12k	Investigate possibilities for water level management, particularly on grazing marshes alongside the Avon and Erme estuaries.	10k-c
12k	Support investigations to determine reasons for decline in number of swans on Salcombe Kingsbridge Estuary.	10k-d
12l	Contribute to local action plans to protect and encourage spread of dwarf spike rush and pennyroyal.	10l-a
12l	Manage site to maintain and if possible promote expansion of heath lobelia colony.	10l-b
13	Record all occurrences of invasive species on sites owned or managed by the Agency and implement control programmes.	11a
13	Collaborate with Japanese knotweed control programmes initiated by others.	11b
13	Encourage control of invasive plants by riparian owners and other interested bodies.	Replaced by 11c
13	Raise awareness of problem of introduced aquatic plants among general public and distributors.	Replaced by 11d

Issue	Proposed Action	Number in this Action Plan
13	Discourage suppliers from making invasive species available.	Replaced by 11d
13	Encourage removal of invasive aquatic plants where already established.	Replaced by 11c
13	Check ponds for presence of alien species as part of routine operations.	11e
14	Seek opportunities for improved public access to water and associated land in appropriate locations.	Replaced by 12a
14	Encourage development of sustainable transport links to allow public access.	Replaced by 12a
14	Raise public awareness of problems associated with disturbance to wildlife.	Replaced by 12a
14	Look for sites where improved visitor management can alleviate problems.	Replaced by 12a
14	Improve information available to canoeists by progressing implementation of national Rivercall project within Devon area.	'Rivercall' project launched
14	Take part, as a neutral party, in any discussions over canoe access.	12b
14	Carry out further investigation into causes of saltmarsh erosion.	12c
14	Develop and encourage use of shore based disposal systems to reduce impact of sewage and litter from boats.	12d
14	Support research into the anti-fouling paint Irgarol and its environmental effects.	12e
14	Consider the need to conduct monitoring of Irgarol levels in the Salcombe and Kingsbridge Estuary.	Replaced by 12f
14	Consider the need to assess current levels of TBT in the Salcombe and Kingsbridge Estuary.	Pilot programme initiated on Teign & Dart estuaries
15	Support production of document(s) covering entire area; investigate potential for collaboration.	13a

5. New Actions from the Consultation Process

Issue	Action
1g	Investigate options for resolving environmental impact of Beeson STW
1h	Investigate impact of Didworthy STW on the River Avon and seek improvements to the discharge.
2a	Target the South Hams coastal area for an intensive campaign promoting Farm Waste Management Plans (as recommended by this Agency).
2b	Review results of monitoring of the River Erme from Fawn's Bridge to the normal tidal limit to see if RQO failures recur and take action as appropriate.
2c	Investigate the cause of poor water quality in the South Grounds Stream.
2e	Consider need to investigate sources of sediment to the Salcombe and Kingsbridge Estuary.
2f	Conduct research into sediment intrusion into salmon redds and sources of sediment and use results to help prioritise remedial work.
2j	Review results of erosion mapping survey to be carried out by Oxford University and use results to help prioritise remedial work.
2l	Dependent on the findings of the Exmoor pilot scheme, investigate the effects of synthetic pyrethroids on aquatic invertebrates.
2m	Implement new groundwater regulations to control use and disposal of sheep-dip (synthetic pyrethroids).
3f	Agree programme for works at Slapton Ley to alleviate flooding of Torcross.
4c	Investigate and resolve unauthorised reinstatement works at Curtisknowle Weir.
6c	Investigate closed landfill sites and take action as appropriate.
10f-a	Rivers and streams - implement flood plain policy, identify additional stretches of river bank that require active management to conserve or enhance wildlife, ensure Drought Orders and Permits do not compromise wildlife and ecology of watercourses.
10f-b	Freshwater reedbed – encourage development of sympathetic water abstraction policies and appropriate coastal zone management plans in order to protect existing reedbeds. Advise on economic benefits of reedbed management as well as wildlife value. Encourage use of reedbeds for pollutant/sewage effluent treatment.
12g	Provide advice on the disposal of boat scrapings.
12h	Support Salcombe Harbour Authority's initiative regarding the controlled collection of anti-fouling scrapings and contaminated materials.
12i	Draw up contingencies for the influx of visitors viewing the 1999 solar eclipse.
14a	Continue to contribute to Salcombe and Kingsbridge Estuary Conservation Forum.
14b	Prepare an Estuary Management Plan for the Avon and Erme Estuaries in partnership with relevant organisations, landowners and estuary users in order to ensure and maintain the sustainable use of the estuaries.
14c	Consider financial support towards producing an Estuary Management Plan for the Avon and Erme Estuaries.

6. River Quality Objective – River Ecosystem Classification

The water quality targets that we use in all rivers are known as River Quality Objectives (RQOs). RQOs are used for managing water quality and are based on the River Ecosystem (RE) classification scheme (NRA 1994), which replaces the former National Water Council (NWC) scheme. The RE classification has five classes, as shown in the table below. These classes reflect the chemical quality needed by different types of river ecosystem including the types of fishery they can support. We set RQOs based on the need to protect current water quality and future use. We eventually plan to introduce Statutory Water Quality Objectives to supersede these River Quality Objectives.

RQO (RE) Class	Class Description
RE1	Water of very good quality suitable for all fish species
RE2	Water of good quality suitable for all fish species
RE3	Water of fair quality suitable for high class coarse fish populations
RE4	Water of fair quality suitable for coarse fish populations
RE5	Water of poor quality which is likely to limit coarse fish populations

7. Biological GQA (General Quality Assessment) Classification

The GQA Scheme is our classification system designed to provide an absolute measure and show trends in water quality over time (NRA 1994); it has replaced the earlier NWC scheme for this purpose.

The GQA Biology sampling programme is carried out every 5 years. Each river stretch to be classified is then assigned the site that most accurately represents its biological status; the system is unsuitable for lakes, reservoirs and canals.

Biology is linked to water quality by biotic indices; we use the Biological Monitoring Working Party (BMWP) score (NRA 1994) for this purpose. Different watercourses, and different sites on the same watercourse, will support different invertebrates because of the differences in their geography, climate, geology, and the habitats that occur. The values of biotic indices derived from different sites will therefore vary, even when their water is of similarly good quality. Biotic indices cannot be used to compare the water quality of different sites, unless the sites are very similar morphologically and geographically. This suggests that it is best to describe biology in terms of a shortfall from that expected under conditions of good water quality.

To overcome the problem as detailed above, the GQA Biological classifications are based on Environmental Quality Indices (EQI):

Biological Class	Class Description	Lower Class Limits	
		EQI ASPT	EQI N-taxa
Class a	Very Good	1.00	0.85
Class b	Good	0.90	0.70
Class c	Fairly Good	0.77	0.55
Class d	Fair	0.65	0.45
Class e	Poor	0.50	0.30
Class f	Bad	0.00	0.00

The RIVPACS III computer programme was used to predict the composition of the fauna, and hence the values of biotic indices, expected at any site under natural, unpolluted conditions, based on its physical and geographical characteristics. The EQIs of ASPT (Average Score Per Taxon) and number of taxa (N-taxa) are used to classify rivers into bands, the worst predictor determining the GQA classification.

8. EC Shellfish Hygiene Directive[a] Classification – CEFAS/MAFF

Classification of Shellfish Harvesting Waters

Category A	<230 E.coli/100g <300 faecal coliforms/100g	Flesh may go for direct human consumption
Category B	<4600 E.coli/100g <6000 faecal coliforms/100g	(in 90 per cent of samples) Must be depurated, heat treated or relayed to meet category
Category C	<60,000 faecal coliforms/100g	Must be relayed for long periods (2 months) to meet category A or B (may also be heat treated by approved method)
Category D	above 60,000 faecal coliforms/ 100g or at discretion of Member State	Prohibited

9. Lyme Bay and South Devon Shoreline Management Plan

The Agency, in conjunction with local authorities, County Councils and English Nature, is preparing a Shoreline Management Plan (SMP) which will set out a strategy for coastal defence for the South Devon Coastline between Portland Bill and Rame Head. This plan will consider conservation and recreation issues and the preservation and enhancement of the landscape interest of the coastline in relation to sea defence and coast protection policies.

Glossary

Above Ordnance Datum (AOD) – land levels are measured relative to the average sea level at Newlyn in Cornwall. This average level is referred to as 'Ordnance Datum'. Contours on Ordnance Survey maps of the UK show heights in metres above Ordnance Datum.

abstraction – removal of water from surface or groundwater.

abstraction licence – licence issued by the Environment Agency under s.38 of the Water Resources Act 1991 to permit removal of water from a source of supply.

acidification – the detrimental effect of acid rain on soils and freshwater.

algae – a diverse group of simple aquatic plants, some microscopic, which may grow in rivers and the sea in great profusion (blooms).

alien – plant or animal not native to the country concerned.

aquatic plants – a term given to plants that grow entirely covered by water, like water-milfoil, or at the surface, such as yellow water-lily. Some plants have both aquatic and emergent forms.

Area of Outstanding Natural Beauty (AONB) – designated by the Countryside Commission under the National Parks and Access to the Countryside Act 1942, to conserve and enhance the natural beauty of the landscape, mainly through planning controls.

augmentation – the addition of water by artificial input, usually to 'top up' low river flows in the summer by either groundwater pumping or via reservoir release.

bar – an accumulation of sediment in a river, formed underwater in floods and subsequently exposed at lower flows.

biodiversity – variety of life.

buffer zone – strip of land, 10-100 m wide, alongside rivers which is removed from intensive agricultural use.

catchment – the total area from which a single river and tributaries collects surface runoff.

coarse fish – cyprinid fish and other commonly associated species such as pike, perch and eels of angling significance. The term does not normally refer to minor species such as bullhead, stone loach, minnow and stickleback.

confluence – the point at which two rivers meet.

controlled waste – defined by the Control of Pollution Act 1974, Part 1 Section 30. It includes household, industrial and commercial waste.

Countryside Stewardship Scheme – an initiative funded by MAFF to enhance and conserve farming landscapes, wildlife habitats and cultural heritage.

critical load – the annual quantity of acidity, in hydrogen ion equivalents per hectare per year, which can be neutralised by soil or the natural buffering capacity of freshwater.

demand management – activities to manage the amount of water required from a source of supply; includes measures to control waste and/or discourage use.

diffuse pollution – pollution without a single point source e.g. acid rain, pesticides, urban runoff etc.

diversity – relates to the number of species present and their abundance.

ecosystem – a functioning, interacting system composed of one or more living organisms and their effective environment, in a biological, chemical and physical sense.

Environmental Quality Standards (EQS) – the concentration of a substance found in the environment which should not be exceeded in order to protect the environment or human health. An EQS is set by the EC through EC Directives and also by the government.

eutrophication – the enrichment of water by nutrients, such as compounds of nitrogen or phosphorus. It causes an accelerated growth of algae and higher forms of plant life.

floodplain – parts of river valleys or coastal plains which are inundated during floods.

groundwater – water contained in the void spaces in pervious rocks and also within the soil.

Groundwater Protection Policy – an Environment Agency policy to protect groundwater from pollution.

habitat – natural home of plant or animal.

Integrated Pollution Control (IPC) – an approach to pollution control in the UK which takes account of potential effects upon all environmental media. Applies to prescribed processes and uses the principles of Best Available Technology Not Entailing Excessive Cost (BATNEEC) and Best Practicable Environmental Option (BPEO).

invertebrates – animals without a backbone e.g. insects, worms and spiders.

landfill site – site used for waste disposal into/onto land.

leaching – the washing out of a soluble constituent.

lichen – a group of lower plants consisting of a fungus which enfolds an alga, the two living together to their mutual benefit.

Local Nature Reserve (LNR) – nature reserves established and usually managed, by district/borough councils. Local authorities are empowered to designate such sites under the National Parks and Access to the Countryside Act 1949.

Main River – designated under the Water Resources Act 1991 by the Ministry of Agriculture, Fisheries and Food. Formal consent is required for all activities that interfere with the bed or banks of the river or obstruct the flow.

maintenance works – regular river maintenance such as desilting or weed control.

margin – a term used to describe the junction of the water and the bank.

mire – area of peatland; includes bog (acid) and fen (alkaline).

National Nature Reserve (NNR) – sites owned or leased and managed by English Nature and established as reserves under the National Parks and Access to the Countryside Act 1949.

Nitrate Vulnerable Zone – an area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding, the limit of 50 mg/1 laid down in the 1991 EC Nitrate Directive, and where compulsory, un-compensated agricultural measures were introduced from 1996 as a means of reducing those levels.

outfall – the point where a river or pipe discharges.

pH – a measure of the concentration of hydrogen ions in solution. Water with a pH less than 7 is acid and water with a pH of more than 7 is alkaline.

poaching – trampling by livestock causing land to break up into wet muddy patches (not to be confused with the illegal taking of fish).

reach – a length of channel.

rehabilitation – the partial return to a pristine state.

residual flow – the flow remaining in the watercourse after abstractions have taken place.

restoration – the return to a pristine state.

riparian – relating to or situated on the bank of a river or stream.

riparian owner – owner of land next to river; normally owns river bed and rights to mid-line of channel.

River Quality Objective (RQO) – the level of water quality that a river should achieve in order to be suitable for its agreed uses.

runoff – water leaving a river catchment. Normally regarded as rainfall minus evapotranspiration (evaporation and loss of water by plants) but commonly used to mean rainwater flowing across the land (also known as overland flow).

salmonid fish – game fish, e.g. trout and salmon.

septic tank – an underground tank used to treat sewage from properties without mains drainage. The sewage is settled and some bacterial treatment occurs. Discharge of effluent is usually to a soakaway system.

sewage – liquid waste from cities, towns and villages which is normally collected and conveyed in sewers for treatment and/or discharge to the environment.

sewerage – a system of underground pipes designed to carry sewage to Sewage Treatment Works.

shoal – exposed gravel/pebble-bar deposit.

silage – a winter feed for cattle produced by bacterial action on freshly cut grass.

siltation – the deposit of material carried in suspension.

Site of Special Scientific Interest (SSSI) – sites of national importance designated under the Wildlife and Countryside Act 1981 by English Nature in England. Sites may be designated to protect wildlife, geology or land forms.

smolt – young salmon migrating to sea for the first time.

soakaway – system for allowing water or effluent to soak into ground, commonly used in conjunction with septic tanks.

Special Area of Conservation (SAC) – areas designated under the EC Habitats Directive[34].

spiling – willow twigs woven around winter-cut willow stakes and used to protect steep or vertical banks. Cut twigs and stakes will regrow.

surface water – general term used to describe all the water features such as rivers, streams, springs, ponds and lakes.

sustainable development – development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

wetlands – areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt.

Abbreviations

Agency	Environment Agency
AMP	Asset Management Plan
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
BATNEEC	Best Available Technique Not Entailing Excessive Cost
BCU	British Canoe Union
BDS	British Dragonfly Society
BOD	Biochemical Oxygen Demand
BPEO	Best Practicable Environmental Option
BSBI	Botanical Society of the British Isles
BTO	British Trust for Ornithology
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CLA	Country Landowners Association
DAS	Devon Archaeological Society
DBAP	The Nature of Devon – A Biodiversity Action Plan'
DBWPS	Devon Bird Watching and Preservation Society
DCC	Devon County Council
DETR	Department of Environment, Transport and the Regions
DNPA	Dartmoor National Park Authority
DO	Dissolved Oxygen
DoH	Department of Health
DWT	Devon Wildlife Trust
EC	European Council
EH	English Heritage
EN	English Nature
EQI	Environmental Quality Indices
EQS	Environment Quality Standard
ESA	Environmentally Sensitive Area
EU	European Union
FRCA	Farming and Rural Conservation Agency
FSC	Field Studies Council
GQA	General Quality Assessment
IPC	Integrated Pollution Control
JNCC	Joint Nature Conservation Committee
LA	Local Authority
LBSDCG	Lyme Bay and South Devon Coastal Group

LEAP	Local Environment Agency Plan
MAFF	Ministry of Agriculture Fisheries & Food
MNA	Marine Natural Area
NERC	National Environment Research Council
NFU	National Farmers Union
NRA	National Rivers Authority
NT	National Trust
NWC	National Water Classification
RCHME	Royal Commission on the Historical Monuments of England
RE	River Ecosystem
RIGS	Regionally Important Geological Site
RQO	River Quality Objective
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SDCCS	South Devon Coast and Countryside Service
SHDC	South Hams District Council
SMP	Shoreline Management Plan
SSA	Strategic Supply Area
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWW Ltd	South West Water Limited
TBT	Trybutyltin
TC	Torbay Council
TDC	Teignbridge District Council
UK	United Kingdom
UWWTD	Urban Waste Water Treatment Directive[7]
WDA	Waste Disposal Authority
WDBC	West Devon Borough Council

Units

°C	degrees centigrade
g	grammes
ha	hectare
km	kilometres
km^2	square kilometres
l	litres
m	metre
m^3/day	cubic metres per day
m^3/s	cumecs; cubic metres per second
mg	milligrammes
Ml	megalitre
Ml/d	megalitres per day
Ml/yr	megalitres per year
mm	millimetre
ng/l	nanogrammes per litre
ppb	parts per billion
ug/m^3	microgrammes per cubic metre
<	less than
>	greater than
≥	greater than or equal to
%	per cent

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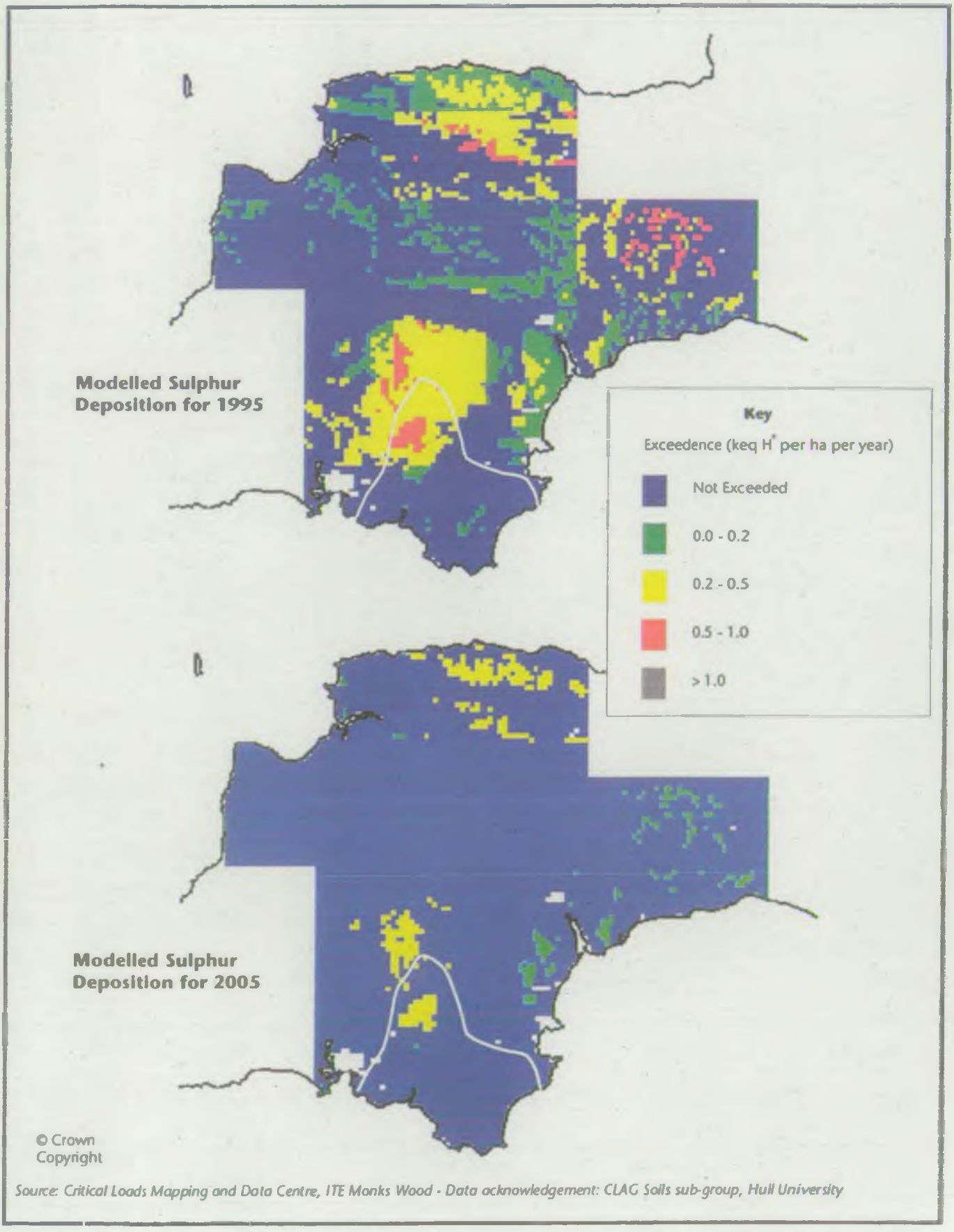
Map 2 - 1997 Compliance with River Quality Objectives (River Ecosystem Classification)

Map 3 - Exceedences of critical loads of acidity for soils



Source: Critical Loads Mapping and Data Centre, ITE Monks Wood - Data acknowledgement: CLAG Soils sub-group, Hull University

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Head Office is responsible for overall policy and relationships with national bodies including Government.

Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol BS12 4UD
Tel: 01454 624 400 Fax: 01454 624 409

ENVIRONMENT AGENCY REGIONAL OFFICES

ANGLIAN
Kingfisher House
Goldhay Way
Orton Goldhay
Peterborough PE2 5ZR
Tel: 01733 371 811
Fax: 01733 231 840

NORTH EAST
Rivers House
21 Park Square South
Leeds LS1 2QG
Tel: 0113 244 0191
Fax: 0113 246 1889

NORTH WEST
Richard Fairclough House
Knutsford Road
Warrington WA4 1HG
Tel: 01925 653 999
Fax: 01925 415 961

MIDLANDS
Sapphire East
550 Streetsbrook Road
Solihull B91 1QT
Tel: 0121 711 2324
Fax: 0121 711 5824

SOUTHERN
Guildbourne House
Chatsworth Road
Worthing
West Sussex BN11 1LD
Tel: 01903 832 000
Fax: 01903 821 832

SOUTH WEST
Manley House
Kestrel Way
Exeter EX2 7LQ
Tel: 01392 444 000
Fax: 01392 444 238

THAMES
Kings Meadow House
Kings Meadow Road
Reading RG1 8DQ
Tel: 0118 953 5000
Fax: 0118 950 0388

WELSH
Rivers House/Plas-yr-Afon
St Mellons Business Park
St Mellons
Cardiff CF3 0LT
Tel: 01222 770 088
Fax: 01222 798 555

For general enquiries please call your local Environment Agency office. If you are unsure who to contact, or which is your local office, please call our general enquiry line.

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All enquiries to:
Devon Area
Exminster House
Miller Way
Exminster
Exeter
EX6 8AS
Tel: (01392) 444000