

local environment agency plan

RIVERS AVON AND ERME

CONSULTATION REPORT

JANUARY 1998



ENVIRONMENT
AGENCY

Foreword

The Rivers 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 Rivers Avon and Erme.

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

An important stage in the production of the plans is a period of public consultation. This Consultation Report is being widely circulated both within and outside the catchment and we are keen to draw on the expertise and interests of the local communities involved.

Please comment - your views are important, even if it is to say that you think particular issues are necessary or that you support the plan.

Following on from the Consultation Report an Action Plan will be produced with an agreed programme for the future protection and enhancement of this much loved area. We will use these plans to ensure that improvements in the local environment are achieved.

G R Bateman

GEOFF BATEMAN

Area Manager, Devon

Environment Agency
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ENVIRONMENT AGENCY



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Your Views

We hope that this report will be read by everyone who has an interest in the environment of the Rivers Avon and Erme Catchment. Your views will help us finalise the Action Plan.

Have we identified all the problems in the catchment?
If not, we would like to know.

Are there any issues that you would like to highlight?

We are keen to receive your views and comments on this report. Please send your response by
Friday 10 April 1998 to:

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Kestrel Way
EXETER
Devon EX2 7LQ

Alternatively you may contact us via E-mail. Our address is YT46 @ dial.pipex.com

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1. Introduction

1.1 The Environment Agency

The Environment Agency has been formed by bringing together the National Rivers Authority (NRA), Her Majesty's Inspectorate of Pollution (HMIP), the Waste Regulation Authorities (WRAs) and some units of the former Department of the Environment (DoE) dealing with the technical aspects of waste and contaminated land.

1.1.1 Our Principal Aim

Our aim, as set out in the Environment Act 1995¹, is to protect or enhance the environment, taken as a whole, in order to play our part in attaining the objective of sustainable development.

Sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

1.1.2 Our Objectives

The Environment Agency works towards sustainable development through seven objectives, set by Ministers:

- An integrated approach to environmental protection and enhancement, considering the impact of all activities and natural resources;
- Delivery of environmental goals without imposing excessive costs on industry or society as a whole;
- Clear and effective procedures for serving its customers, including the development of single points of contact with the Agency;
- High professional standards, using the best possible information and analytical methods;
- Organisation of its own activities to reflect good environmental and management practice, and provision of value for money for those who pay its charges, and for taxpayers as a whole;
- Provision of clear and readily available advice and information on its work;
- Development of a close and responsive relationship with the public, including local authorities, other representatives of local communities and regulated organisations.

1.1.3 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 Resources** 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 through regulation of the treatment, storage, movement and disposal of controlled waste. The Agency also has a requirement to monitor those who produce waste, to encourage its reduction and to register and regulate those who have obligations to recover or recycle 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, fish stocks and providing advice to fishery owners. The Agency is also the sea fisheries authority for some tidal waters. We control commercial fishing for sea fish and shellfish in these waters.

The Agency has statutory duties under the Environment Act 1995¹ 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 and odour pollution - responsibility remains with local authority's environmental health departments;
- Drinking water quality - responsibility remains with private water companies and local authorities;
- Public health;
- Most aspects of air pollution - responsibilities for local air quality management plans, local traffic and development planning and control and the regulation of some industrial processes remains with the local authorities.
- Planning permission - responsibility remains with local authorities who are legally obliged to seek our opinion on any developments which affect our interests.

1.2 Local Environment Agency Plans

Local Environment Agency Plans (LEAPs) assist the Agency to achieve its objectives (see section 1.1.2). The plans consider all elements of the environment which the Environment Agency has a role in regulating or can influence through its statutory powers or duties. LEAPs assist in planning the Agency's future activities, and the activities of those bodies, groups or individuals the Agency must work with in order to achieve its objectives. The plans are part of an ongoing dialogue between ourselves and the various organisations involved in the protection and management of the environment; we will encourage this dialogue to continue. Following the consultation period, we will consider the responses received and we will use them to help us develop an Action Plan, which we will then publish. This is the key document in the Agency's local planning process as it will contain details of the main actions that we and other organisations will be carrying out over the next five years to address environmental issues in the catchment.

1.2.1 The Consultation Report

This report contains the following sections:

Part 1 - The Management Plan

- **The Catchment Area** - provides a brief introduction to the area.
- **Issues and Proposed Actions** - highlights the environmental issues in the catchment and proposes actions to help to resolve them.

Part 2 - Supporting Information

- This section provides supporting information for the issues raised in Part 1.

We will **not** republish this Consultation Report.

1.2.2 Summary of Consultation, Action Plan and Annual Reviews

We will collate responses to this Report and distribute a Summary of Consultation in May 1998 to all those who responded. The Action Plan will then be published in August 1998. Each year we will review the progress that has been made with the actions identified in the Action Plan and publish an Annual Review. We will also report on any major new issues that may affect the way we manage the environment in this area. Within five years of publishing the Action Plan we will undertake a major review of the progress we have made.

1.2.3 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 Plan², a series of recommendations for action that will act as a 'signpost' for organisations and individuals to follow. In West Devon the Agenda 21 process is led by the West Devon Environmental Network; a community based network created in 1992 which is now a charity. Extensive public consultation led to the formation of 16 principles which are the basis for Agenda 21 in West Devon. 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.

The Agency is committed to encouraging more sustainable lifestyles for all, through our work and in partnership with others. This is captured in our vision which is "a better environment in England and Wales for present and future generations."

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 progress sustainable development in the county. We are already involved in a number of groups and projects across Devon.

1.2.4 Local Environment Agency Plans and 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 (see Section 5.1.4 for more information). 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.

1.2.5 Local Environment Agency Plans and Non Statutory Plans

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 various bodies which also seek to develop partnerships and collaborative work to manage and improve the environment. These include:

- Devon Biodiversity and Earth Science Action Plan³
- The Nature of Dartmoor: A Biodiversity Profile⁴
- Salcombe Kingsbridge Estuary Environmental Management Plan⁵
- Devon's Local Agenda 21 Network Issues Report⁶
- Lyme Bay and South Devon Shoreline Management Plan (in preparation)

1.2.6 Local Environment Agency Plans and Catchment Management Plans

This LEAP slots into a sequence of plans which were being prepared by the former NRA to cover all river catchments in England and Wales by the end of 1998. LEAPs will be used by us to cover the same topics as Catchment Management Plans but they will also deal with new topics to cover the full range of our responsibilities.

1.2.7 Local Environment Agency Plans and the Catchment Steering Group

This group represents a range of commercial, local authority and environmental interests. The group comment upon the Consultation Report 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, our committees (including the Area Environment Group) and the local community, and will help to promote and develop initiatives of benefit to the environment within the catchment. The steering group members are:

Mr J Bloomer	South Hams District Council/Heritage Coast
Mr P Bowen	Devon Avon Riparian and Fishery Owners Association
Mr K Carter	South Hams District Council
Mr K Chell	Field Studies Council, Slapton Ley
Mr J Coombes	River Avon Fishing Association
Mr G Cummings	Local Industry
Mrs D Flood	Parish Councils
Ms S Goodfellow	Conservation, Dartmoor National Park Authority
Mr P Hodges	Salcombe Harbour Authority
Mr G Johnson	Erme and Yealm Riparian Owners Association
Mr J Longworth-Kraff	The National Trust
Mr A Mildmay-White	Erme and Yealm Riparian Owners Association
Mr N Mortimer	Salcombe Kingsbridge Estuary Manager
Mr D Peters	Local Farmers/National Farmers Union
Mr C Pultenay	Conservation, English Nature
Mr C Trant	Local Fish Farmers
Mr M Williams	South West Water Services Ltd

1.2.8 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 in 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 the data presented in this Consultation Report, please contact our Exeter office.

Map 1 - Rivers Avon and Erme Catchment



Part 1

The Management Plan

2. The Catchment Area

This Local Environment Agency Plan comprises the adjoining catchments of the Rivers Avon and Erme (Map 1) and is subsequently referred to as the Avon and Erme Catchment. These two catchments have been grouped together for the purposes of this plan. The Avon Catchment includes those watercourses draining to Start Bay and to the Salcombe Kingsbridge Estuary.

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

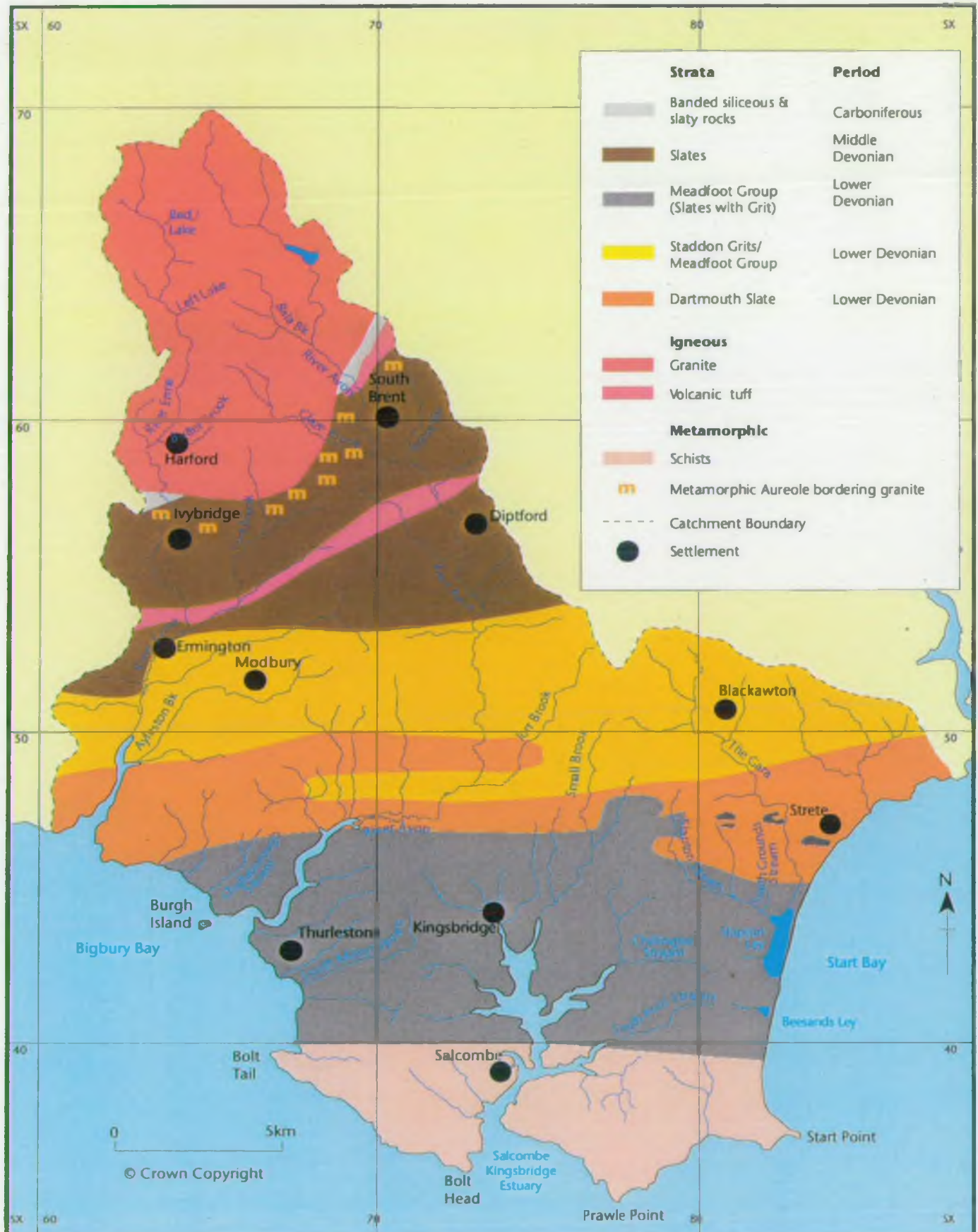
The upper reaches of the River Avon are intercepted by the Avon Reservoir, which provides water for public supply for the South Devon area. There are additional public water supply abstractions on the Bala Brook and the River Erme.

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

2.1 Geology

Map 2 shows the geology of the catchment. The Dartmouth Slate is the oldest formation recognised in South Devon. Interbedded with the slates are medium to fine grained sandstones and conglomerate bands. The Dartmouth Slate is succeeded by the slates and grits of the Meadfoot

Map 2 - Simplified geology



Group. Younger still are the Staddon Grits which comprise purplish grey grits and sandstones with interbedded thin purple and grey slates. The youngest Devonian rocks are the Middle Devonian slates which skirt the southern border of the Dartmoor granite in the north of the catchment. A broad band of metamorphosed rocks borders the Dartmoor granite and is referred to as the 'metamorphic aureole'. The Carboniferous Period is represented by very small areas of the banded siliceous and slaty Culm Measures.

A major mountain building event which ended in the late Carboniferous folded and faulted the pre-existing sedimentary and volcanic rocks. This resulted in the metamorphic schists of the Start Point area.

2.2 Hydrogeology

Although the rocks within the catchment are capable of yielding sufficient groundwater to support numerous small private abstractions, none are considered a major aquifer and all have been classified by the Agency as minor aquifers. Within these rocks the water is found within fractures and fissures. In general, the lowest yielding rocks are the metamorphic schists of the Start Point area.

The limited nature of the groundwater resources in this catchment means that we do not monitor groundwater levels at any sites.

2.3 Rainfall

Dartmoor has a marked effect on the local climate. Table 1 shows that there is a large variation in average rainfall over the catchment, with the largest difference occurring over the Avon. values range from 2004mm on Dartmoor to 989mm at the coast.

Table 1 Long term average annual rainfall (1961-1990) at specific sites in the catchment

Position In Catchment	Long Term Average Annual Rainfall (mm)
Avon Head, Upper Avon	2226
South Brent, Mid Avon	1599
Hope Cove, Coastal	891
Erme Intake, Upper Erme	2004
Harford, Mid Erme	1493
Kingston (Scobbiscombe), Coastal	989

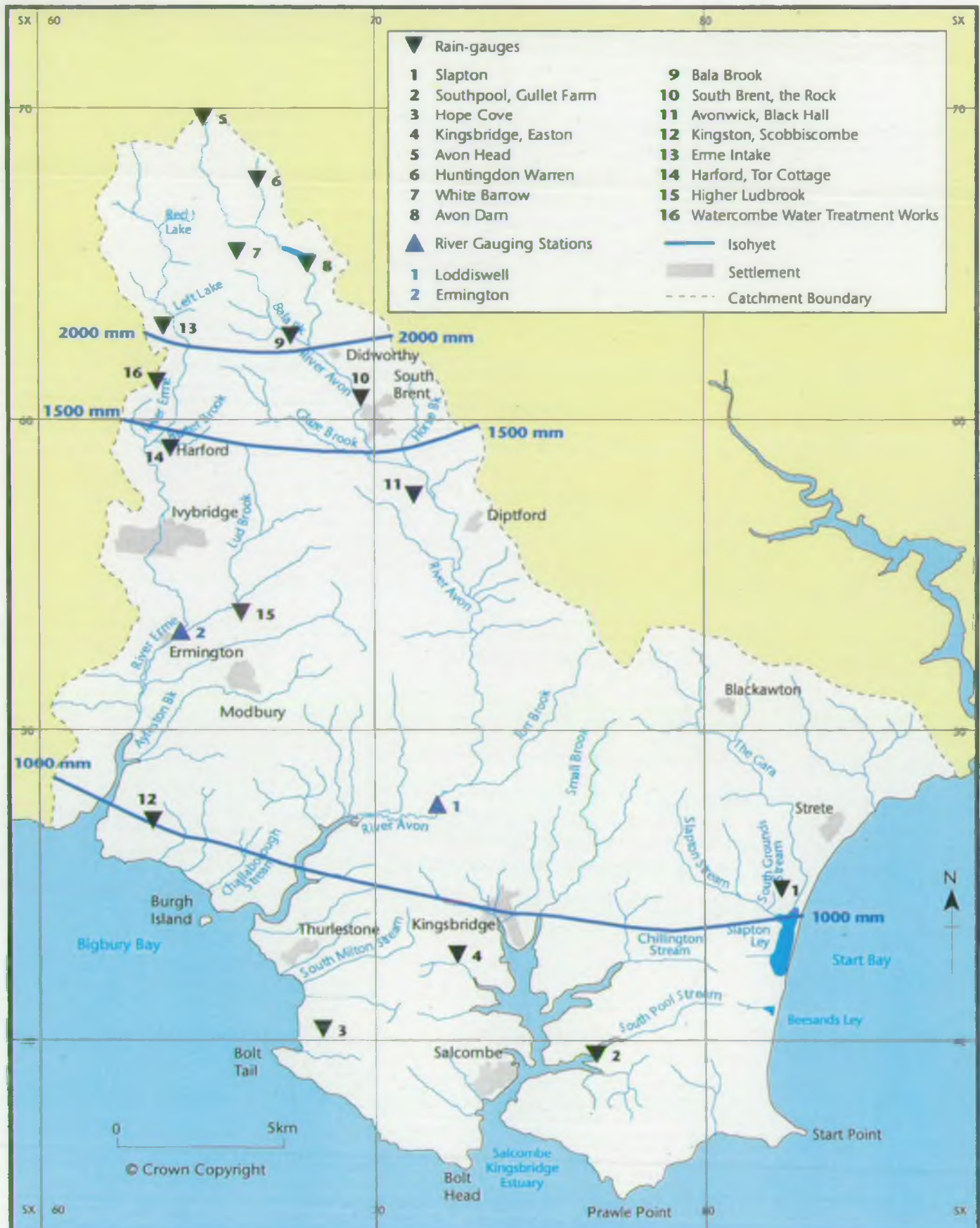
2.4 River Flow

River Avon

Flows in the River Avon are measured at the gauging station at Loddiswell (see Map 3). Recording began in March 1971 but the station was closed between October 1981 and May 1990. An analysis of the data records for the site indicate a daily mean flow of 3.54 m³/s. The Q95 flow for the period 1991 to 1996 is 0.41 m³/s. The Q95 flow represents the flow that is exceeded on average for 95% of the time, which is equivalent to 347 days a year, and is used as an indication of low river flows.

The Q95 flow can also be compared with the daily mean flow to indicate how significant the groundwater contribution is to the river flow. For example, at Loddiswell the Q95 represents only 12% of the daily mean flow, indicating that groundwater contributes very little to the River Avon.

Map 3 - Hydrometric network



The maximum daily mean flow recorded at Loddiswell is 62.44 m³/s which occurred on 27 December 1979. The maximum instantaneous flow during this flood was 88.95 m³/s. The minimum daily mean flow recorded at the site is 0.16 m³/s, which occurred on 9 September 1976.

River Erme

Flows in the River Erme are measured at Ermington gauging station (see Map 3). The station has been open since 6 December 1973. The daily mean flow for the station for the period 1974 to 1996 is 1.86 m³/s and the calculated Q95 flow for the site for the same period is 0.24 m³/s.

At Ermington the Q95 represents only 13% of the daily mean flow, indicating that groundwater contributes very little to the River Erme.

The maximum recorded daily mean flow occurred on 27 December 1979 and was measured as 29.96 m³/s. The maximum instantaneous flow was recorded on 23 June 1991, when a flow of 93.45 m³/s was measured. The minimum daily mean flow recorded at the site occurred on 24 August 1976 and was measured as 0.08 m³/s.

2.5 Landscape

The Avon and Erme Catchment, in common with much of the rest of Devon, is a landscape of very high quality. Indeed, it is for this reason that many visitors are attracted to the area, and large parts of the catchment are designated for their landscape importance (see Map 4).

Dartmoor National Park and the South Devon Area of Outstanding Natural Beauty (AONB) are designated to protect landscapes recognised as nationally important. Some two-thirds of the catchment area falls within those designated areas, while the whole of the coastline is part of the South Devon Heritage Coast, recognising its outstanding scenic value. Even the remaining sections of the catchment are very attractive, often with views north to Dartmoor. There are major contrasts between the northern, moorland part of the catchment and the landscape of the South Hams.

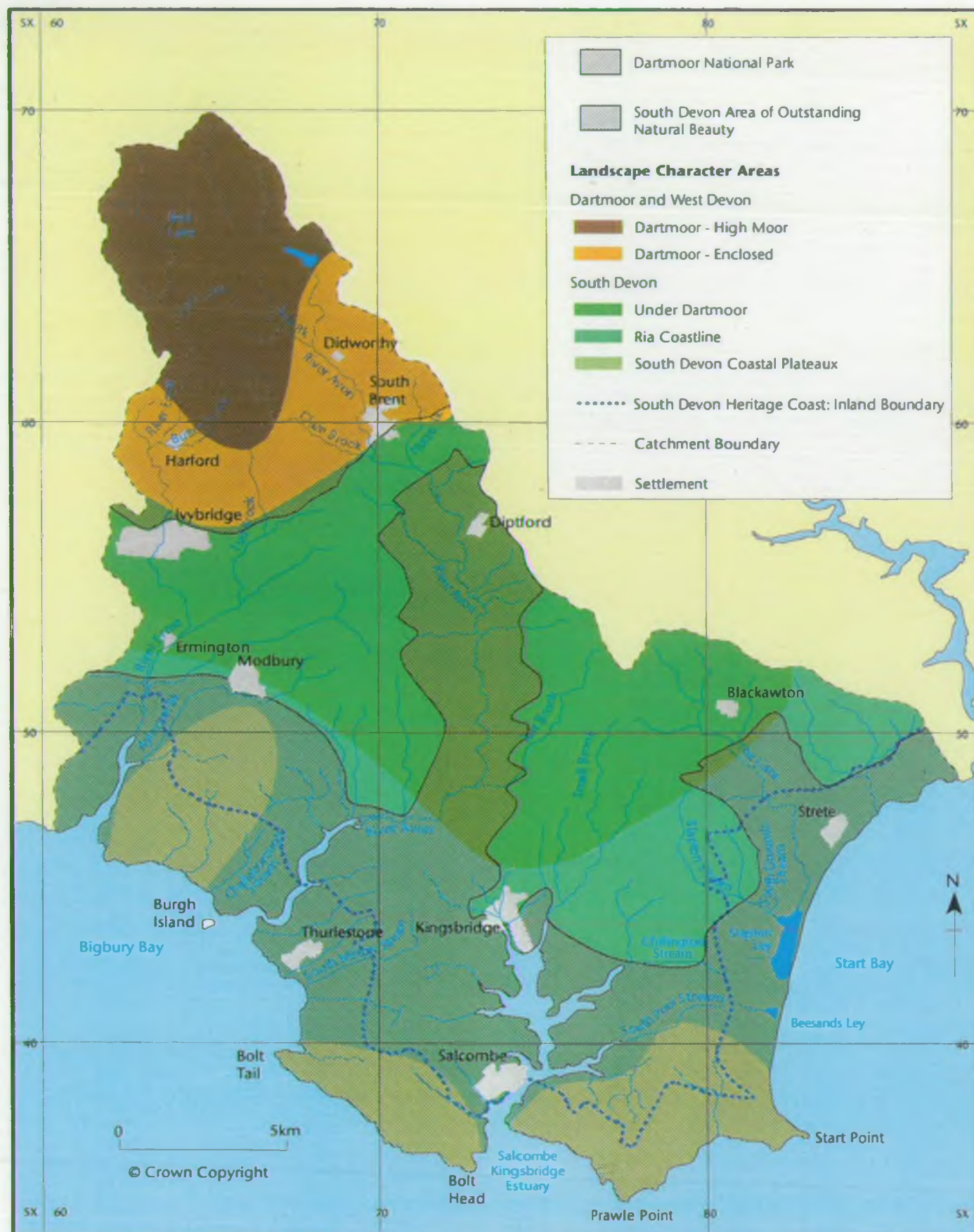
Policies are included in strategic documents such as the County Structure Plan⁷ and local plans which seek to control activities in these designated areas. New development, for example, is severely constrained. A landscape assessment has been produced for the South Devon AONB and several documents deal with the Dartmoor landscape. In addition, Devon County Council have produced a draft Landscape Strategy which identifies different landscape areas across the county (see Map 4). The Strategy recognises the need to conserve the landscapes in Devon, and aims to establish agreed priorities and programmes with all those involved in landscape management. This strategy is currently being revised and finalised.

The sources of both the Erme and Avon lie in the heart of South Dartmoor around Cater's Beam. Other rivers like the Mardle and Swincombe, tributaries of the Dart, and the Plym also originate from this expanse of blanket bog. The rivers soon develop steep valleys which break up the unenclosed spaces of the open moor. The moorland is full of the remains of past cultures, with burial mounds, stone rows and old mineral workings dotting the area, but it has a remote, untouched feel. Trees are few and far between, with just a few remnants of a once extensive forest remaining, often close to the rivers as at Piles Copse on the Erme and small patches along the banks of the Avon.

Around the edges of the moorland, and extending up into the river valleys, the landscape changes to one of small walled fields, often on steep slopes. There is more woodland, especially in the Erme Valley above Ivybridge, and more evidence of development, particularly around the corridor of the A38 Devon Expressway and the London-Penzance railway line.

There are few major settlements in the catchment. Kingsbridge and Salcombe soon filled the available flat land and now tumble down the steep slopes to the estuary. Space for new development is limited and the towns have a fairly comfortable relationship with the natural landscape. The town of

Map 4 - Landscape



Ivybridge, situated right on the edge of Dartmoor National Park, is one of the Europe's fastest growing urban areas and care will be needed if it is not to have a major impact on the surrounding area. The landscape of the South Hams has, to a large extent, been created by the rivers and streams which run through it. The plateau has been divided into a complex arrangement of steep valleys with rounded hills between. It is an intimate landscape where distant views are the exception; even on the higher ground, hedgebanks usually prevent more than fleeting glimpses of the land beyond. It is also a managed landscape; climate and geology combine to favour farming, resulting in a patchwork of improved pasture and arable fields.

Field boundaries are significant elements in the landscape of the catchment, with typical variations in different areas. Massive hedgebanks covered in vegetation are a key feature of much of the catchment. In the Erme Valley, river boulders have been used to make stone walls and on the margins of Dartmoor granite walls are common.

The middle reaches of the river valleys, especially the Avon, are well wooded. Overhanging trees are covered in lichens, while the river banks are rich in mosses and ferns. Pockets of flat land alongside the river are used for grazing stock. Lower downstream, the valleys have wider floodplains in which the rivers are able to meander across pastures before reaching the sea.

The Salcombe Kingsbridge, Avon and Erme estuaries are a major part of the landscape of this catchment. These are rias (drowned river valleys), which have a very different feel to the bar-built estuaries of East and North Devon. They are more sinuous in form, with secluded creeks and side arms. Woodland fringes come down virtually to the high tide line and the areas of saltmarsh or grazing marsh are quite restricted. The Salcombe Kingsbridge Estuary is more open than either the Avon or Erme estuaries and is an important harbour and centre for maritime activities.

Along the coast to the west of Start Point are several small areas of fairly flat land with steep cliffs down to the sea. These coastal plateaux have a different character from the rolling inland landscape. Stone walls and buildings are important features, especially in the area around Prawle.

In contrast with the cliffs of this section, there are also sections where the geology has resulted in a more gentle transition. Around Thurlestone, and along the sweep of Start Bay, streams run down shallow gradients and freshwater wetland habitats have developed. Behind the shingle ridge which runs from Torcross to Strete, Slapton Ley has developed as the largest natural freshwater lake in the South West.

The catchment contains a wide range of high quality landscapes varying from those which are little modified by man to formally designed estates. Throughout, they reflect the underlying geology and the modifying forces of weathering and erosion, overlain by the influence of human activity over the last few thousand years. It is also a highly valued landscape and one which the Agency will seek to protect through its operational and regulatory activities.

2.6 Archaeology

The catchment contains a number of sites of historic and archaeological importance, the majority of which are found on Dartmoor (see Map 5).

Nationally important sites are designated as Scheduled Ancient Monuments (SAMs); there are 148 of these, nearly all of which are located on Dartmoor. In addition, there are many unscheduled sites on the Sites and Monuments Register. Two Historic Parks and Gardens are recognised in the catchment; Flete 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

Map 5 - Archaeology



catchment. Map 5 shows the locations of SAMs, Historic Parks and Gardens and Built Conservation Areas.

Dartmoor is the most important prehistoric landscape in Northwest Europe and the archaeology here has been widely studied. Man's influence on this seemingly natural landscape dates back around 10,000 years. At this time the area was mostly woodland with just the highest parts open heathland, where it was easier for early man to hunt. Gradually areas were cleared and grazing or burning prevented regrowth. This allowed the development of bogs instead, which slowly replaced the high forest. By the Bronze Age there were many settlements on Dartmoor and the land division system of reaves (low stony banks) was being used, remains of which can be found along the upper reaches of the River Erme. 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. There appears to have been a decline in population of Dartmoor at some time around 500 BC, possibly due to changes in climate.

Much of the catchment remained rural for many centuries, but by the 18th century industries such as wool and paper had started to become established partly due to the ready supply of water. The majority of these mills have since ceased operation, but one, Stowford Mill which was originally built in the late 18th 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 19th century mining and quarrying had become established in parts of the upper and lower reaches of the catchment and this continued until the early part of this century. Tin working and milling was carried out in few places and the remains of buildings are still visible in places. There was a silver-lead 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 forms part of the Two Moors Way. During the mid-19th century Brunel's Great Western Railway was built crossing the River Erme by way of a viaduct at Ivybridge, near to Stowford Mill.

Many of the settlements in the catchment have changed little over the years. However, Hallsands which was once a fishing village and is situated along the coast from Slapton was abandoned in 1917 after a number of houses slipped into the sea during heavy storms.

Map 6 - Proposed River Quality Objectives (River Ecosystem Classification)



3. Our Proposed Targets for River Water Quality

We manage water quality by setting targets called River Quality Objectives (RQOs). They are intended to protect current water quality and future use, and we use them as a basis for setting consents for new discharges and planning future water quality improvements.

We also manage water quality by applying standards set in EC Directives and other international commitments. Failures to comply with these standards are raised in Issues 1, 2 and 3; more detail is available in section 5.10.

We have proposed RQOs using a classification scheme known as the River Ecosystem (RE) Classification which was introduced by the NRA, following public consultation, in 1994. It replaces a former scheme introduced by the Water Authorities in the late 1970s and used by the NRA until 1994. The RE Classification comprises five hierarchical classes as summarised below.

Table 2 The River Ecosystem classification scheme

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

The RQOs we set must be achievable and sustainable; we must be able to identify what needs to be done to meet the RQO and to ensure as far as practicable that water quality can be maintained at this level in the future.

Where we are unable to identify solutions or resources to resolve current water quality problems, we may also set a Long Term RQO. We will measure compliance against RQOs but use Long Term RQOs as a basis for setting consents for new discharges. This will ensure that future developments will not prevent us from achieving our long term objectives.

The rivers of the Avon and Erme Catchment have been divided into 19 classified reaches and the RQOs that we intend to set are outlined in Table 3 and shown on Map 6.

Table 3 Proposed River Quality Objectives for the catchment

River	Stretch name	RQO	Long Term RQO
The Cara	Source - Higher North Mill	1	
	Higher North Mill - Slapton Bridge	1	
Slapton Stream	Source - Slapton Ley inflow	1	
South Grounds Stream	Source - Slapton Ley inflow	1	
Small Brook	Source - normal tidal limit	1	
Avon	Avon Reservoir - Shipley Bridge	1	
	Shipley Bridge - A38 Bridge South Brent	1	
	A38 Bridge South Brent - Horsebrook	1	
	Horsebrook - Loddiswell	1	
	Loddiswell - normal tidal limit	1	
Glaze Brook	Source - Avon confluence	1	
Bala Brook	Source - Avon confluence	1	
Erme	Source - Stowford Weir	1	
	Stowford Weir - A38 Bridge Ivybridge	1	
	A38 Bridge Ivybridge - below Ivybridge STW	1	
	Below Ivybridge STW - Lower Keaton	1	
	Lower Keaton - Fawn's Bridge	1	
	Fawn's Bridge - normal tidal limit	2	1
Lud Brook	Source - Erme confluence	1	

We have proposed RQOs of RE1 for 18 of the 19 monitored river stretches in the Avon and Erme Catchment.

An RQO of RE2 has been proposed for a stretch of the River Erme from Fawn's Bridge to the normal tidal limit with a long term RQO of RE1. Further information is given in section 5.10.1.

We welcome your comments on the River Quality Objectives that we propose, even if it is to say that you agree with them.

Compliance with these proposed RQOs is discussed in section 5.10.1.

4. Issues and Proposed Actions

Table 4 summarises the Issues we have identified for the Avon and Erme Catchment in relation to the subject of interest they fall within. Please use this table as a guide to this section.

INTEREST	ISSUE (page)														
	1: Impact of effluent discharges (21)	2: Impact of farming on rivers and wetlands (23)	3: Potential eutrophication of the Salcombe Kingsbridge Estuary (25)	4: Barriers to fish migration (27)	5: Additional threats to the salmonid fishery (28)	6: Problems associated with urban development (29)	7: Impact of waste management activities (31)	8: Demand for water resources (32)	9: Concern over low flows (33)	10: Risk of Cryptosporidium entering water supply (34)	11: Impact of air pollution (34)	12: Loss and deterioration of key habitats and species (37)	13: Spread of Invasive plants (42)	14: Concerns with the recreational use of the catchment (43)	15: Lack of information on the archaeological/historic value of the catchment (45)
Water quality / pollution / sewage disposal	•	•	•		•	•				•				•	
Public health	•									•	•		•		
Waste management							•							•	
South West Water Services Ltd	•							•	•	•					
Water resources / low flows / abstractions								•	•			•			
Flood prevention / coastal defence						•									
Amenities / recreation	•			•	•				•					•	
Fisheries		•		•	•				•			•			
Dartmoor		•							•		•	•	•		
Conservation / wildlife / earth science		•		•	•				•		•	•	•	•	•
Agriculture		•	•									•			•
Nutrient enrichment / algae	•	•													
Building / infrastructure	•					•					•				•
Slapton Ley	•	•										•	•		
Estuary management	•		•									•		•	



Issue 1: Impact of effluent discharges

Background

We regulate the disposal of effluent, including treated sewage and industrial effluent, by issuing consents to discharge into controlled waters. 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.

Map 7 shows all consented discharges of effluent to controlled waters in the catchment with a daily flow of >5m³/day, and the level of treatment the discharge receives (where appropriate).

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) to protect recognised uses, standards laid down in EC Directives and other standards derived from previous research and information where appropriate (see section 5.10 for further information).

Improvements to South West Water Services Ltd (SWWSL) discharges are subject to funding approved by OFWAT, the water industry's regulator. The following improvement schemes are in SWWSL's current business plan AMP2: East Portlemouth, Torcross and Holbeton. Details of these schemes can be found in section 5.5.1.

Effects

Failures of EC Bathing Water Directive - The bathing waters at Salcombe North and South Sands (see Map 17) failed to comply with the Directive for a number of years in the period 1986 to 1996. Crude sewage discharges from Salcombe were identified as the major contributor to elevated levels of bacteria. These discharges were the subject of the SWWSL Clean Sweep scheme for Salcombe and Malborough. Following upgrading of Malborough Sewage Treatment Works (STW), sewage now receives secondary treatment with ultraviolet disinfection before being discharged into the estuary. Major improvements in water quality have occurred as a result of this scheme, which was completed in time for the 1997 bathing season.

The bathing water at Mothecombe (see Map 17) failed to comply with the Directive in 1986 and 1994. An investigation carried out in 1993 found that the discharge from Holbeton STW appeared to be capable of causing non-compliance at Mothecombe. Improvements to Holbeton will be carried out by 2005 (see section 5.5.1).

Deterioration in EC Shellfish Hygiene Directive Classification - The east bank of the Avon Estuary was classified as C for mussels in 1997 under the EC Shellfish Hygiene Directive (see section 5.10.8); the previous classification for this site was B (1994). Where the Hygiene Directive applies the Agency will not grant consents which would result in a deterioration in class reported by the centre for Environment, Fisheries and Aquaculture Science (CEFAS) at the time of determination. There are concerns that the shellfishery is affected by sewage discharges in the estuary, but there is no provision to impose improvements to discharges under the Shellfish Hygiene Directive. The Shellfish Waters Directive sets standards to protect shellfish from the harmful effects of pollution and includes a guideline standard for faecal coliforms in shellfish flesh or intravalvular fluid. Regulations have recently been set which require the Secretary of State to designate waters which need protection and improvement in order to support shellfish. This means that the Department of the Environment, Transport and the Regions (DETR) have ultimate responsibility for the designation of new sites. The Environment Agency have been asked by the DETR to advise them on criteria for new designations and we are currently formulating our advice. We then anticipate that if DETR wish to proceed with a review of designated sites we will be formally instructed by DETR to do so.

Impact on biological water quality - Biological water quality in the Bala Brook is classified as c (fairly good) (see section 5.10.10). There have been problems in the past with a discharge from Avon Water Treatment Works which contained high levels of suspended solids; this may be affecting the biological quality of the watercourse. We will carry out an investigation to determine the cause(s) of poor biological water quality in the Bala Brook and take remedial action if appropriate.

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 1995¹ introduced new duties on water service companies to provide public sewers for certain domestic properties where environmental or amenity problems exist or are likely to arise. Any parish or district council may apply to SWWSL for such a scheme. The Agency can provide information to relevant bodies, and can act 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 environmental impact, where we recommend that development is constrained; Beeson, Brownston, Frogmore, Kingston, East Charleton, West Charleton and Woolston. For more information see section 5.5.1.

The development which will take place in Ivybridge over the next few years (see section 5.1.4) will lead to an increasing volume of effluent being sent to Ivybridge STW. There are concerns that water quality will deteriorate as the storm sewer overflow will operate more frequently. This stretch of river has an RQO of RE1 and is designated as a salmonid fishery under the EC Freshwater Fish Directive. We are working with SWWSL to prevent any deterioration in water quality. Recently, the volume of sewage which receives full treatment has been increased, however, further investment is likely to be required in AMP3 (see 5.5.1).

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 changes (see Issue 12i). The main nutrients are nitrates and phosphates, principally from agricultural activities (see Issue 2) but also from Slapton STW. The STW effluent is currently being monitored weekly for nitrates and phosphates as part of an ongoing research programme by Cambridge University, which is assisted by Slapton Ley Field Studies Centre. We will work with these organisations to assess the level of nutrient loading from the STW.

There are also concerns that effluent discharges may be contributing to eutrophication in the upper Salcombe Kingsbridge Estuary (see Issue 3) and in South Milton Ley. We are devising a strategy to deal with the perceived problems caused by effluent discharges at these sites and others in Devon. Given the nature of land management in the catchment, it is likely that agricultural activities may add to eutrophication at these sites (see Issue 2).

Table 5 Proposed actions for impact of effluent discharges

Proposed action	Action by Lead Other
• Conduct monitoring to ensure that desired improvements have been achieved at Salcombe North and Salcombe South Sands.	Agency
• Make improvements to Holbeton STW by 2005.	SWWSL, Agency
• Liaise with CEFAS to obtain more detailed information on the bacterial quality of shellfish.	Agency
• Ensure there is no deterioration to water quality through discharge consenting procedures.	Agency
• Review sites designated under Shellfish Waters Directive.	DETR
• Carry out investigation of the Bala Brook and take remedial action if required.	Agency, SWWSL
• Carry out investigation to determine the effect of unsatisfactory septic tank discharges on the Buckland Stream.	Agency
• Seek improvements to sewerage system at Buckland.	Owners/Occupiers, Parish/ District Councils, SWWSL, Agency
• Seek improvements to discharges in areas where development is constrained.	Agency
• Investigate nutrient loading from Slapton STW and seek any required improvements.	Agency, Cambridge University, Slapton Ley FSC, SWWSL
• Develop strategy for Devon rivers and estuaries that are eutrophic or may become eutrophic in the future.	Agency

Issue 2: Impact of farming on rivers and wetlands

Background

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. Guidance to farmers is provided by MAFF through the 'Code of Good Agricultural Practice for the protection of water'⁸.

Effects

Failure of water quality standard - The River Avon from the A38 Bridge South Brent to Horsebrook marginally failed to meet its proposed RQO of RE1; the most likely cause is organic pollution. Problems have been found at a farm bordering the river, and pollution prevention advice has been given.

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 Kingsbridge Estuary (see Issue 3). 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 12) as a result of nutrient inputs from the watercourses which drain to it. Research in this area has identified the principle 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 and 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 Ley⁹.

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.

Sedimentation - Sedimentation from the Gara catchment 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 principle source of sediment is sloping arable land. Research has shown that significant quantities of topsoil are being lost from arable land in the Gara sub-catchment especially from steeply sloping ploughed fields many of which are adjacent to watercourses. This sedimentation has also led to severe siltation of spawning gravels in the Gara subcatchment, which undoubtedly affects the brown trout fishery there.

At a number of locations in the Avon and Erme Catchment, poaching of the river banks by livestock has resulted in the siltation of spawning gravels which is detrimental to the production of juvenile fish. Currently the extent of this damage is limited, and many of the main spawning areas are unaffected. The effects of increased siltation on a salmonid fishery can be considerable, and it is important that there is no further increase in degraded reaches.

To address this problem, the Avon Fishing Association has carried out bankside fencing schemes at two sites which to date have proved successful. In addition, the Agency has carried out experimental bank protection using willow spiling over a 100m length of watercourse.

In many cases bank erosion has led to river widening and large gravel shoals being deposited, often exacerbating the situation. The river gravels in these areas are generally unstable and of little value to spawning salmonids.

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 (see Issue 12).

Table 6 Proposed actions for impact of farming and forestry on rivers and wetlands

Proposed action	Action by Lead Other
• Ensure all problem farms identified during catchment inspections carry out remedial measures to improve water quality.	Agency
• Encourage farmers to use appropriate Best Management Practices for control of soil erosion.	Agency, MAFF, FRCA, NFU, CLA
• Facilitate the securing of funding for bankside fencing to reduce erosion, where appropriate.	Agency, Landowners
• Coppice bankside trees to reduce risk of collapse into river.	Landowners, Agency
• Consider modifications to Habitat Scheme (Water Fringe option) to encourage greater uptake in the Gara and Start catchments.	MAFF, FRCA, Agency, EN, FSC
• Explore opportunities for the application of other beneficial agri-environment schemes at relevant locations.	MAFF, FRCA, Agency
• Consider establishment of buffer zones alongside rivers to reduce damage to banks by stock.	Landowners, Agency
• Continue gravel rehabilitation work to remove the build-up of silt and re-establish the gravels for salmonid spawning.	Agency, Fishing associations
• Consider the transport of surplus gravel shoal material from lower reaches of River Avon to middle reaches to improve salmonid spawning habitat.	Agency

Issue 3: Potential eutrophication of the Salcombe Kingsbridge Estuary

Background

Estuaries tend to be naturally quite high in nutrients; however, an excess of nutrients (principally nitrates and phosphates) can result in the increased production of algae and higher plants. If algal production becomes excessive then this can affect the chemical, biological and aesthetic quality of the estuary.

Chemical water quality has been monitored at 5 sites in the Salcombe Kingsbridge Estuary since 1990. Samples were collected from various water depths over a range of tidal, meteorological, and river flow conditions. The data indicate that overall water quality in the 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 the elevated nutrient and chlorophyll values and the likely restricted circulation it seems that the upper Salcombe Kingsbridge Estuary is potentially eutrophic. Monitoring carried out during the period 1994-1996 showed there was a clear tendency for nitrogen levels to be highest during peak winter freshwater runoff. On the available information, the major source of nutrients to the estuary is riverine, presumably from agricultural sources.

There has been a reduction in nutrient loading in the lower estuary as a result of SWWSLs Clean Sweep scheme for Salcombe.

Proposed Actions

EC Nitrates Directive - There are provisions within the EC Nitrates Directive¹¹ to apply restrictions on certain agricultural activities in areas where surface or groundwaters are or could be affected by pollution from nitrates (see section 5.10.4). Further studies should be considered to investigate the potential nomination of the estuary as a Polluted Water under the EC Nitrates Directive. Designation of the estuary may require controls on the application of fertilisers in the catchment.

EC Urban Waste Water Treatment Directive - Concerns have been raised by English Nature and some local organisations that discharges of sewage effluent are affecting nutrient levels in the estuary. There are two significant sources of sewage effluent to the estuary, from Gerston STW which serves Kingsbridge and from Malborough STW which serves Salcombe. Of these, Gerston STW which discharges to the upper estuary is the most likely to be of importance.

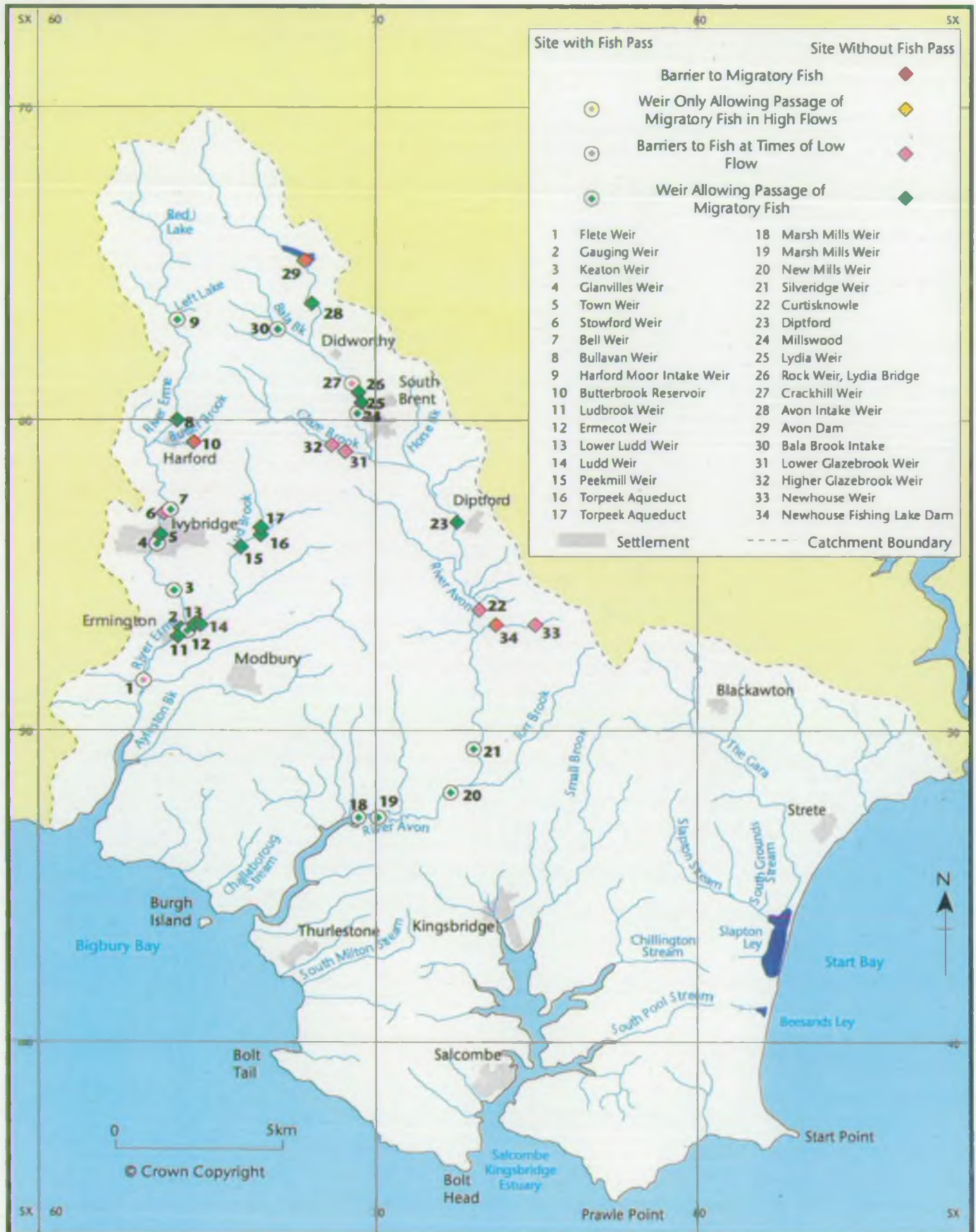
There are provisions within the EC Urban Waste Water Treatment Directive¹² (see section 5.10.7) requiring higher standards of treatment for discharges to sensitive areas. Sensitive areas are those waters that receive discharges from population equivalents of greater than 10,000 and are eutrophic or may become eutrophic in the future.

Gerston STW has a population equivalent of less than 10,000 and therefore the discharge does not require higher standards of treatment as specified under the EC Urban Waste Water Treatment Directive. We are devising a strategy to deal with the perceived problems caused by Gerston STW and other similar sites in Devon.

Table 7 Proposed actions for the potential eutrophication of the Salcombe Kingsbridge Estuary

Proposed action	Action by Lead Other
• Consider carrying out further monitoring to determine whether the Salcombe Kingsbridge Estuary is a Polluted Water under the EC Nitrates Directive.	Agency
• Continue routine monitoring of the Salcombe Kingsbridge, Avon and Erme estuaries.	Agency
• Develop strategy for Devon rivers and estuaries that are eutrophic or may become eutrophic in the future.	Agency

Map 8 - Barriers to migratory fish



Issue 4: Barriers to fish migration

Background

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 (see Map 8). 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 historical interest, although they do not tend to be designated or have protected status. These considerations should be taken into account in any proposals for improvements 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 abstractors to have screens installed to our satisfaction by 1 January 1999.

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, which should 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 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 SWWSL - 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 is severely inhibited.

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 8 Proposed actions for barriers to fish migration

Proposed action	Action by Lead Other
• Identify sites which create problems for the downstream migration of smolts.	Agency
• Following National Guidance on screening criteria, advise abstractors of Agency screening requirements and work towards implementation.	Agency Abstractors
• Seek to modify man-made barriers in the system to permit fish passage.	Agency, fishing associations, riparian owners, others (for possible sources of funding)

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.

Background

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 instance, 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 have produced a National Strategy for the Management of Salmon¹², 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.

Examples

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 (see section 5.10.3) ensures that water quality in designated stretches of water is suitable for supporting salmonid fish. We would like to increase the number of river stretches designated under this Directive.

Exploitation of the fishery - Migratory fish are legally taken by the rod fishery operating in freshwater river 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.

As angling pressure on both rivers is relatively light, this is not at present seen as being 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 South Western migratory fish rivers.

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.

MAFF is presently carrying out a three year research programme to determine what the effects of cormorants frequenting a river system are on the fishery. This study will end in December 1998, the findings should assist in determining the most appropriate means of dealing with the issue. We shall not support licensed killing of fish-eating birds until and unless proof of serious damage has been established and killing is proved to be the most effective means for preventing significant loss of fish stocks. We are however committed to working positively with owners and anglers to establish the full facts in each situation.

Lack of spawning areas - There are few areas in the catchment in which salmon spawn. In many reaches, this may be attributed entirely to the lack of suitable spawning substrate. The lack of suitable gravel areas severely limits the potential for salmon production in the catchment. In comparison with other migratory fish rivers in the South West, the proportion of spawning territory in relation to the total length of river is small.

Table 9 Proposed actions for additional threats to the salmonid fishery

Proposed action	Action by Lead Other
• Develop Salmon Action Plan.	Agency
• Seek to designate additional stretches of river under the EC Freshwater Fish Directive.	Agency
• Co-operate with the licensing authority to progress further research into fish-eating birds and implement appropriate recommendations once research is complete.	Agency, MAFF, landowners, anglers
• Consider the installation of artificial beds or bed check weirs to increase spawning area, taking into account effect on habitat.	Agency, Riparian Owners

Issue 6: Problems associated with urban development

Background

Development in the catchment is largely restricted to the towns of Kingsbridge, Salcombe and in particular, Ivybridge. A full description of development and land use planning is given in section 5.1. 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 7 and 8.

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 that appropriate mitigation measures are taken.

Examples

Need for policies preventing environmental pollution to be included in Local Plans -

Town and Country Planning policies contained in the South Hams Local Plan includes positive steps to balance development proposals with the maintenance and improvement of environmental

qualities. However, the plan does not include policies to prevent the pollution of water; we recommend that initiatives are taken to develop 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 poses an unknown risk to water quality in the catchment from runoff and leakage. Risk assessments and associated risk reduction measures are required for these areas.

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 discoloration downstream.

There are a number of ways such pollution can be limited by incorporating 'source control' methods in the design of new developments. These are outlined in a video which we have part sponsored, called 'Nature's Way', further details are available from our Exeter office.

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 will provide local authorities with floodplain mapping information to assist them to ensure that wherever possible development does not occur in the floodplain. There are however, many locations in the catchment where flooding occurs (see section 5.9.2). We shall continue to oppose all developments that would exacerbate flooding in these areas until works are implemented to mitigate the adverse effect.

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. Gravel extraction for the construction of the Plymouth Dockyards depleted the shingle bank protecting Hallsands with loss of the bar and much of the village. More recent works at Beesands have altered the natural dynamics of the bar there. There is also 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 12j).

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 (see section 5.9.4). 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.

Table 10 Proposed actions for problems associated with development

Proposed action	Action by Lead Other
• Work with Local Planning Authorities to ensure that policies to protect the environment from pollution are included in Local Plans.	Agency, SHDC, DNPA
• Conduct pollution risk assessments and risk reduction at industrial sites in the catchment.	Agency, Local industry
• Work with others to reduce impact on water quality in the River Erme from drainage from construction.	Agency, Developers, SHDC
• Encourage local authorities to incorporate conditions in planning permissions which reduce the risk to the environment from construction.	Agency, SHDC, DNPA
• Produce database on contaminated land sites in the catchment and ensure there is effective consultation with local authorities regarding contaminated land sites.	SHDC, WDBC, Agency
• Provide floodplain mapping information to the planning authorities.	Agency, SHDC, DNPA
• Produce Shoreline Management Plan for South Devon Coastline taking full account of the importance of the shingle bank.	Agency, LBSDCC
• Take account of physical processes when considering modification or maintenance of existing flood or coastal defence structures.	Agency, SHDC

Issue 7: Impact of waste management activities

Background

The National Waste Strategy¹³ 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 had fewer pollution control measures built into their original design.

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. Following the introduction of the landfill tax on 1st October 1996 much media attention has been focused on fly-tipping and the identification of problem sites.

Section 5.4 provides more information on waste management in the catchment.

Examples

We are keen to promote the reduction of waste at source; a new initiative being planned for South Devon aims to minimise waste generated by local companies. The scheme will be driven by the PAYBACK business environment association and Business Link but will be a partnership approach including South Hams and Teignbridge District councils, Torbay Borough Council and Devon County Council and ourselves. The initiative hopes to attract around 10 local 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 came into force on 6 March 1997. They require certain companies who handle packaging to ensure that a percentage of that packaging is recovered and recycled. About 120 companies in Devon will be initially affected by these regulations, 2 are located within the Avon and Erme catchment. In the future, producer responsibility is likely to be applied to other waste streams.

The first composting site to be licenced 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; details of the site are available on request.

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) which is the licence holder, to decide the best way to control the gas migration and to ensure that the site is comprehensively monitored and thoroughly restored.

We have recently discovered a badly fly-tipped 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. We are currently unable to fund a clean up, which would be very expensive and problematical due to the nature of the site.

Recently fly-tipping has been occurring outside the gates to the Civic Amenity sites at Ivybridge and Kingsbridge. This is because the Waste Disposal Authority (WDA) has been forced to limit the opening hours of these sites due to cuts in the Local Authority budget. We are negotiating with the WDA over this problem and advising householders not to tip waste outside of the sites when they are closed.

Table 11 Proposed actions for impact of waste management activities

Proposed action	Action by Lead Other
• Support PAYBACK/Business Link initiative to reduce waste at source.	PAYBACK, Business Link, Agency, DCC, SHDC, TDC, TBC
• Provide advice to those companies affected by the Producer Responsibility Obligations.	Agency
• 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.	Agency, WDA
• Investigate any new information relating to fly-tipped site at Chillington and seek to prosecute offenders if possible.	Agency
• Investigate options for cleaning up the site.	Agency
• 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.	Agency

Issue 8: Demand for water resources

Background

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 abstractors. Section 5.8 gives a detailed discussion of water resources in the catchment.

Forecasts have been made of public and private demand for water up to the year 2021¹⁴. 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 SWSLs 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 improvements to current leakage levels), demand in the Roadford SSA is forecast to increase to 347 MI/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 MI/d.

Effect

Compared with the current reliable yield for the Roadford Zone (326 MI/d) under the high scenario there will be a deficit of 21 MI/d whereas under the low scenario there will be a surplus of 35 MI/d in 2021.

Table 12 Proposed actions for demand for water resources

Proposed action	Action by Lead Other
• Encourage water company demand management and leakage control.	Agency, SWWSL
• Encourage consumers to undertake water saving actions.	Agency, SWWSL, others

Issue 9: Concern over Low Flows

Background

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

Overall the catchment is not stressed by abstraction (see section 0) however there are some areas where abstraction for public water supply is considered to have a local impact. There are also concerns that the moorland parts of the catchment which slowly release water during dry periods may be being affected by management practices on the moor (see Issue 12b).

Most of the flow in the catchment is derived from surface water (see section 0), 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.

Examples

On the Erme the most vulnerable reach is below the Harford Moor Intake weir, where SWWSL abstract water for public supply (see section 0). Under the conditions of the licence, following abstraction the river flow must be at least 0.049 m³/s. For several weeks during summer river flow consists solely of this prescribed flow, which is now considered to be too small to adequately protect the river.

Similarly, below the Avon Dam the river can be entirely dependant on the compensation water release of 0.068 m³/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 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 13 Proposed actions for concern over low flows

Proposed action	Action by Lead Other
• Negotiate with SWWSL for increase in prescribed flow at Harford Moor intake.	Agency, SWWSL
• Negotiate with SWWSL for increase in compensation flow from Avon Reservoir.	Agency, SWWSL

Issue 10: Risk of *Cryptosporidium* entering water supply

Background

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 stage 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. *C. 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.

Proposed Action

In recognition of the national increased awareness of the potential risk to public health posed by this organism we are working with SWWSL, MAFF and 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.

Table 14 Proposed action for risk of *Cryptosporidium* entering public water supply

Proposed action	Action by Lead Other
• Assess risk in catchment and examine feasibility of introducing catchment controls.	<i>Cryptosporidium</i> task group

Issue 11: Impact of air pollution

Background

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 is somewhat limited.

The National Air Quality Strategy¹³ requires local authorities to review air quality in their district. These reviews will contribute to the knowledge of air quality in the catchment.

Examples

Ozone - ozone in the upper atmosphere shields the earth from harmful ultraviolet radiation. However, at ground level, ozone can be a harmful pollutant damaging crops and building materials and causing respiratory difficulties amongst sensitive people. Ground level ozone is formed by a chemical reaction between the mixed emissions of nitrogen oxides and hydrocarbons, derived mainly from vehicle exhausts, in the presence of sunlight. These chemical reactions do not take place instantaneously, but over several hours or even days, and once ozone is produced it may persist for several days. In consequence, ozone produced at one site may be carried for considerable distances in the air, and maximum concentrations usually occur downwind, away from the source of the primary

pollutants. In fact ozone levels in the UK are influenced by both national emissions and emissions from north-west Europe and elsewhere. Unilateral effort to reduce ozone concentrations by the UK alone are therefore unlikely to be effective. Although peak levels may be reduced, average levels would be likely to remain high. A coherent European approach to reducing the primary pollutants would therefore be of most benefit.

Ground level ozone - The highest concentrations of ozone generally occur during hot, sunny and relatively windless days in summer. In urban areas with high concentrations of traffic, a proportion of nitric oxide from vehicle emissions reacts with ozone, forming nitrogen dioxide and reducing ozone concentrations. However, primary pollutants carried away from urban areas continue to generate ozone, often resulting in high levels of ozone in downwind rural areas. In common with other parts of Southern England, ozone levels in the catchment were found to be above the Expert Panel on Air Quality Standards (EPAQS) recommended air quality standard of 50 ppb (expressed as an eight hour running mean) for more than 140 hours in each of the periods, April to September, during ozone monitoring between 1987 and 1990 and at a level at which damage to vegetation may occur¹⁵.

Direct effects of air pollution on sensitive species - Dartmoor has an extremely rich lichen flora; they grow on both rocks and trees, with a number of rare species present. Lichens are particularly sensitive to atmospheric sulphur. Estimated annual mean sulphur dioxide concentrations for the catchment are $<5\mu\text{g}/\text{m}^3$ ¹⁵; this is lower than the standard of $10\mu\text{g}/\text{m}^3$ proposed for the protection of sensitive lichens¹⁶. 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 soils. 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% of acid deposition in the UK.

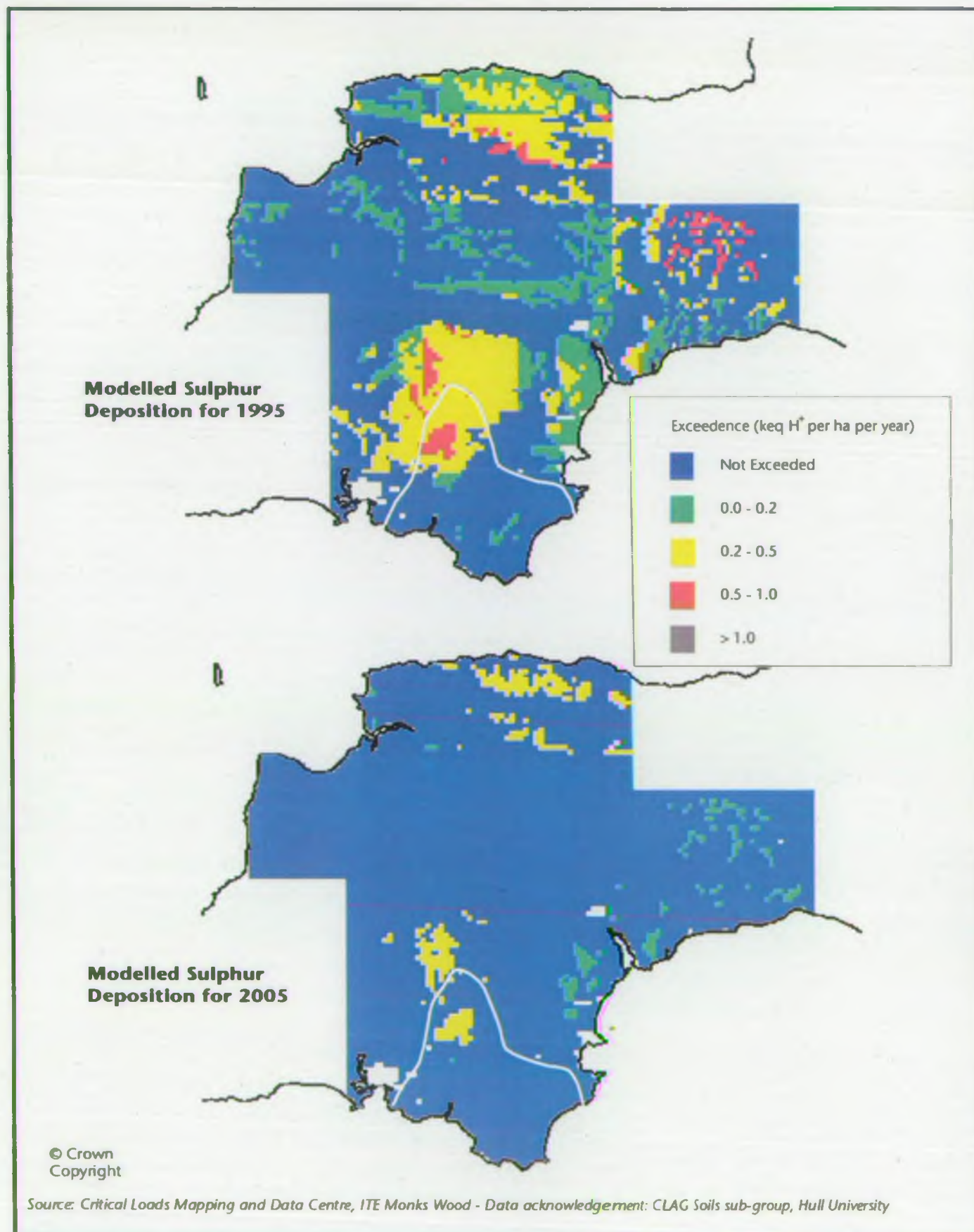
Emissions of nitrogen oxides are thought to be responsible for about one third of the acidity of rainfall, and the proportion appears to be increasing. Road vehicles are responsible for about half of the emissions of nitrogen oxides in the UK.

Research in the UK over the last 20 years has led to the development of effects based emissions control policies through 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 9 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 greatly reduced; these reductions are due to the international reductions in sulphur emissions which have been agreed under the Second Sulphur Protocol of the United Nations Economic Commission for Europe.

Under the terms of this protocol the UK has agreed to reduce its sulphur dioxide emissions by 80% by 2010 from a 1980 baseline. The UK's Sulphur Strategy published in December 1996¹⁷ indicates that the UK will meet interim targets for 2000 and 2005. Compliance is also expected with the 80% reduction target for 2010.

Map 9 - Exceedences of critical loads of acidity for soils



The critical loads model assume land use remains unchanged. However changes in land use could have significant effects on the level of acid deposition. Forestry, in particular coniferous forests, can increase the level of acid deposition where they are present, this is primarily due to the way the forest canopy 'scavenges' pollutants from the atmosphere; additionally as pine needles break down they release acidic compounds. It is important that any proposals for forestry development within the areas which are exceeding their critical loads are subject to an environmental impact assessment. This is in line with the Forest and Water Guidelines¹⁸.

In parts of the country where acidification has been studied in some depth, numerous effects on both terrestrial and aquatic ecosystems have been recorded.

There are concerns that blanket bog and valley mire habitats and their associated species may be being affected by acid deposition (see Issues 12b and 12c).

Acid deposition may also have an adverse effect on the ecology of streams and rivers; certainly there is some evidence of acidification in Sites of Special Scientific Interest (SSSIs) around Britain. Acidification of watercourses has been shown to adversely affect invertebrates, fish, amphibians and birds (particularly dippers):

Eutrophication - In upland areas, where nutrients are usually quite limited, there is growing concern that the deposition of atmospheric nitrogen can act as a fertiliser and cause changes to plant growth. The Institute of Terrestrial Ecology is carrying out a national monitoring programme for atmospheric ammonia, in order to obtain a more accurate assessment of potential aerial nitrogen deposition. We will continue to work with other agencies to gain a better understanding of the problem.

Table 15 Proposed actions for the impact of air pollution

Proposed action	Action by Lead Other
• Review air quality in the area, in line with National Air Quality Strategy.	SHDC, DNPA
• Improve knowledge of status of communities sensitive to air pollution in the catchment.	DNPA, Agency
• Co-operate in development of clean air quality standards to protect key species.	Agency, EN, JNCC, DNPA
• Conduct and support research to improve understanding of effects of airborne acidification and eutrophication on semi-natural habitats and species.	Universities, Agency, EN, DNPA, Institute of Terrestrial Ecology
• Ensure all proposals for forestry development within the areas of critical load exceedence receive an environmental impact assessment where appropriate.	Agency, Forestry Authority

Issue 12: Loss and deterioration of key habitats and species

Issue 12a: 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 livestock densities, conversion of permanent pasture to short term leys or arable and 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. The Environmentally Sensitive Area (ESA) Scheme is voluntary and was designed and funded by MAFF to encourage farmers to adopt agricultural practices, for the benefit of wildlife, archaeology and landscape. Much attention has been focused on the success of the Somerset Levels 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 habitat is 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 16 Proposed actions for loss/deterioration of key habitats and species

Proposed action	Action by Lead Other
• Continue to develop the Biodiversity Action Planning process at regional, county and more local levels to establish priorities for wildlife and earth science conservation.	EN, RSPB, DWT, Agency, DCC, local authorities, others
• Promote and implement action plans, particularly for those features, habitats and species which may be affected by our operational or regulatory activities.	Agency
• 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.	MAFF, FRCA, Agency, landowners
• Encourage uptake of agri-environment schemes, particularly where there are benefits for target features, habitats or species.	Agency, FRCA, landowners, managers, others

Issue 12b: 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 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 also Issue 9). In addition the extensive peat deposits which underlie the blanket bog are a key earth science feature; 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 11).

SWWSL hold a licence allowing them to abstract water from Red Lake and Left Lake under extreme drought conditions (see section 5.8.4). 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 Directive¹⁹ (see section 5.12). 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.

Table 17 Proposed actions for loss/deterioration of blanket bog

Proposed action	Action by Lead Other
• Increase public awareness of dangers of uncontrolled fires.	DNPA, Devon Fire Brigade, Agency
• Carry out research into effects of grazing and burning on moorland vegetation and soils.	Universities, Agency, EN, DNPA
• Promote and implement action plans for blanket bog and associated species from forthcoming Dartmoor BAP.	DNPA, EN, Agency, MAFF
• Review all existing authorisations and activities that we license within Dartmoor proposed SAC.	Agency

Issue 12c: 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 11.

Table 18 Proposed actions for loss/deterioration of valley mire

Proposed action	Action by Lead Other
• Promote and implement action plans for valley mire and associated species from forthcoming Dartmoor BAP.	DNPA, EN, Agency, MAFF
• Support survey to determine dragonfly interest.	BDS, DNPA, Agency

Issue 12d: 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 19 Proposed action for loss/deterioration of upland heathland

Proposed action	Action by Lead Other
• Promote and implement action plans for upland heathland and associated species from Biodiversity and Earth Science Action plan for Devon (DBAP).	DNPA, EN, Agency, MAFF

Issue 12e: Loss/deterioration of Rhôs pasture

Rhôs pastures are species-rich purple moor grasslands with a very restricted distribution; about 90% 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% 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 20 Proposed action for loss/deterioration of Rhôs Pasture

Proposed action	Action by Lead Other
• Promote and implement action plans for Rhôs pasture and associated species from DBAP.	DNPA, EN, Agency, MAFF

Issue 12f: 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 habitat supports 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 21 Proposed actions for key catchment habitats and species associated with the freshwater environment

Proposed action	Action by Lead Other
• Promote and implement action plan for otters from DBAP.	Agency, DWT, volunteers
• Continue programme of post-mortem and tissue analysis on otter corpses.	Agency, MAFF, Universities
• Encourage habitat creation or management as part of any suitable enhancement schemes or projects.	Agency, FRCA, DWT, DNPA

Issue 12g: Threats to key bird species

Dippers also have a western distribution; they have been shown to be affected by acidification of streams (see Issue 11), and 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; these sites are often favoured locations for waste disposal when redundant. We need to ensure our regulatory activities take account of all known sites. We are working with others to improve the understanding of distribution.

Table 22 Proposed actions for threats to key bird species

Proposed action	Action by Lead Other
• Carry out county-wide survey of sand martin and kingfisher nest sites.	DBWPS, Agency, volunteers
• Support research to determine effects of acidification on dipper populations.	Agency, BTO, Universities
• Record dipper nest sites and pass information to county highways section in relation to bridge repairs.	Agency

Issue 12h: 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 bullhead and brook, river and sea lamprey are also species of conservation concern; see section 5.13.1 for further information.

Table 23 Proposed actions for threats to key fish species

Proposed action	Action by Lead Other
• Improve knowledge of distribution and abundance of bullhead and lamprey species.	Agency
• Identify lamprey to species level when found in fisheries surveys.	Agency
• Raise awareness of conservation importance of other fish species among field staff.	Agency

Issue 12l: 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 reedswamp at Beesands Ley and South Milton, with remnants at Hallsands and South Huish. A wide variety of species are present (see also Issue 12f), 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% 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).

There may be opportunities for water level management at Slapton Ley and other sites in the catchment (see section 5.9.2).

Table 24 Proposed actions for threats to freshwater lagoon habitats

Proposed action	Action by Lead Other
• Investigate changes to flora and fauna of Slapton Ley through an agreed programme.	FSC, EN, Agency, Universities
• Promote and support establishment of voluntary action group with input from statutory agencies to tackle recognised problems in the Ley through collaborative approach.	EN, FSC, Agency, MAFF, FRCA, NFU, CLA
• Establish better control over water levels in Slapton Ley to benefit strapwort and other flora and fauna.	FSC, Agency

Issue 12j: 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 10, Issue 6.

Issue 12k: 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 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 Kingsbridge Estuary as a Local Nature Reserve

and the development of a management plan under the guidance of the Estuary 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 (see section 5.9.2).

The number of swans on the Salcombe 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 25 Proposed actions for threats to estuarine habitats

Proposed action	Action by Lead Other
• Promote and implement action plans for estuaries and associated habitats and species from DBAP.	Agency, SHDC, Estuary Conservation Officer, DWT, Landowners
• Support initiatives to enhance fringing habitats (grazing marsh, reed swamp) around Salcombe Kingsbridge Estuary.	Agency, SHDC, Estuary Conservation Officer
• Continue to contribute to estuary steering group.	Agency
• Investigate possibilities for water level management, particularly on grazing marshes alongside the Avon and Erme estuaries.	Agency, EN, Landowners
• Support investigations to determine reasons for decline in number of swans on Salcombe Kingsbridge Estuary.	Agency, Estuary Conservation Officer

Issue 12: 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 Kingsbridge estuary. We will work with others to ensure that these species remain in their present sites and expand 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 26 Proposed actions for threats to key plant species

Proposed action	Action by Lead Other
• Contribute to local action plans to protect and encourage spread of dwarf spike rush and pennyroyal.	Agency, SHDC, BSBI, Estuary Conservation Officer
• Manage site to maintain and if possible promote expansion of heath lobelia colony.	DWT, EN

Issue 13: Spread of invasive plants

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 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 with much time and effort being spent to prevent further spread. We will try to encourage owners to remove these plants from ponds and to discourage suppliers from selling them to the public.

Table 27 Proposed actions for the spread of invasive plants

Proposed action	Action by Lead Other
• Record all occurrences of invasive species on sites owned or managed by the Agency and implement control programmes.	Agency
• Collaborate with Japanese knotweed control programmes initiated by others.	Agency, DNPA, SHDC
• Encourage control of invasive plants by riparian owners and other interested bodies.	Agency
• Raise awareness of problem of introduced aquatic plants among general public and distributors.	Agency, Garden Centre Trade Associations
• Discourage suppliers from making invasive species available.	Agency
• Encourage removal of invasive aquatic plants where already established	Agency
• Check ponds for presence of alien species as part of routine operations.	Agency

Issue 14: Concerns with the recreational use of the catchment

Background

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.

Section 5.7 provides more information on recreation in the Avon and Erme Catchment.

Examples

Restricted 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 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. For example, overwintering birds on the Salcombe Kingsbridge Estuary.

Need for improved information for canoeists - Canoeing takes place on a stretch of the River Erme. This river 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. We plan to

introduce telephone information lines which will make it clear what permissions are required and whether conditions are suitable for canoeing.

Need for improved canoe access - Presently, access for canoeing in the catchment is restricted to part of the River Erme. 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.

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. This will be dealt with through the Estuary Management Plan⁵.

Impact of sewage and litter from boats - Some concerns have been expressed over the impact of large numbers of boats in the Salcombe Kingsbridge Estuary on water quality and amenity; this is being addressed through actions in the Estuary Management Plan⁵.

Impact of anti-fouling paints used on boats - Paints to prevent the fouling of boats with various marine organisms, such as barnacles and algae, are mainly based on copper and zinc metal oxides or the herbicide Irgarol. There are concerns that Irgarol 1051, which is similar to the persistent herbicides atrazine and simazine, 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 marinas²⁰. There is currently no monitoring of Irgarol 1051 in the Salcombe Kingsbridge Estuary, an area of high boating activity; the toxicity of this herbicide to aquatic organisms is poorly understood.

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 Wales²¹. In 1987 the Government introduced a number of controls on the sale of TBT based paints and banned their use on boats less than 25m in length.

Between 1986 and 1992 MAFF monitored two sites in the Salcombe Kingsbridge Estuary at Frogmore Creek and Salcombe Harbour for TBT levels in water, sediment, oysters and mussels. In 1986 the mean summer TBT concentration in water at Frogmore Creek were 15 ng/l; in 1992 it was equal to the Environmental Quality Standard (EQS) of 2ng/l which is designed to protect aquatic life²¹. At Salcombe Harbour the mean summer concentration of TBT in water in 1986 was 117 ng/l; in 1992 it was 9 ng/l.

TBT concentrations in the Salcombe Kingsbridge Estuary have clearly decreased since 1987; although concentrations in water at Salcombe Harbour were marginally above the EQS in 1992. As TBT concentrations in Salcombe Harbour were initially much higher at this site than at Frogmore Creek it will take longer for concentrations to decrease to the level of the EQS. Current levels of TBT in the estuary are unknown.

Table 28 Proposed actions for concerns with the recreational use of the catchment

Proposed action	Action by Lead Other
• Seek opportunities for improved public access to water and associated land in appropriate locations.	DNPA, Estuary Managers, Agency
• Encourage development of sustainable transport links to allow public access.	HCS, DNPA, Estuary Managers, Agency
• Raise public awareness of problems associated with disturbance to wildlife.	DNPA, HCS, Agency
• Look for sites where improved visitor management can alleviate problems.	DNPA, HCS, Agency
• Improve information available to canoeists by progressing implementation of national Rivercall project within Devon area.	Agency
• Take part, as a neutral party, in any discussions over canoe access.	Agency
• Carry out further investigation into causes of saltmarsh erosion.	SHDC
• Develop and encourage use of shore based disposal systems to reduce impact of sewage and litter from boats.	SHDC
• Support research into the anti-fouling paint Irgarol and its environmental effects.	Agency
• Consider the need to conduct monitoring of Irgarol levels in the Salcombe Kingsbridge Estuary.	Agency
• Consider the need to assess current levels of TBT in the Salcombe Kingsbridge Estuary.	Agency

Issue 15: Lack of information on the archaeological/historic value of the catchment**Background**

The catchment contains many sites of historic and archaeological value, the majority of which are found on Dartmoor (see section 2.6).

Effects

Archaeological/historic features as yet unidentified are at risk from new development or changes in land use.

Table 29 Proposed action for lack of information on archaeological/historic value of the catchment

Proposed action	Action by Lead Other
• Support production of document(s) covering entire area; investigate potential for collaboration.	DCC, LAs, EH, DAS, Agency, RCHME, Uni. of Exeter, NT

Part 2

Supporting Information

5.1 Urban Development and Land Use Planning

5.1.1 Land Use Planning and The Role of the Environment Agency

We work to protect the environment from the harmful effects of development and to minimise flood risk. There are two main ways we can influence development:

- through the planning system we can assist local planning authorities to allocate land for development by commenting on local plans, identifying constraints and highlighting how the environment can be enhanced by sympathetic development. We will continue to advise on water, waste and air quality related issues in our comments on structure and district wide local plans.
- we can advise planning authorities on the control of development by offering formal and informal comments to planning authorities on planning applications and development guides. We can also control some developments using our own powers such as Land Drainage Consents and waste (see section 5.4.1) and IPC (see section 5.2.1) licences.

We are also active at a higher level informing strategic planners of our environmental concerns, for example, rivers affected by over abstraction or water supplies threatened by major pollution hazards.

Local authorities prepare statutory development plans. In January 1994 the NRA published guidance notes for local planning authorities on ways of protecting the water environment through development plans. The notes highlight some of the topics which concern the Environment Agency and offer guidance on model policies.

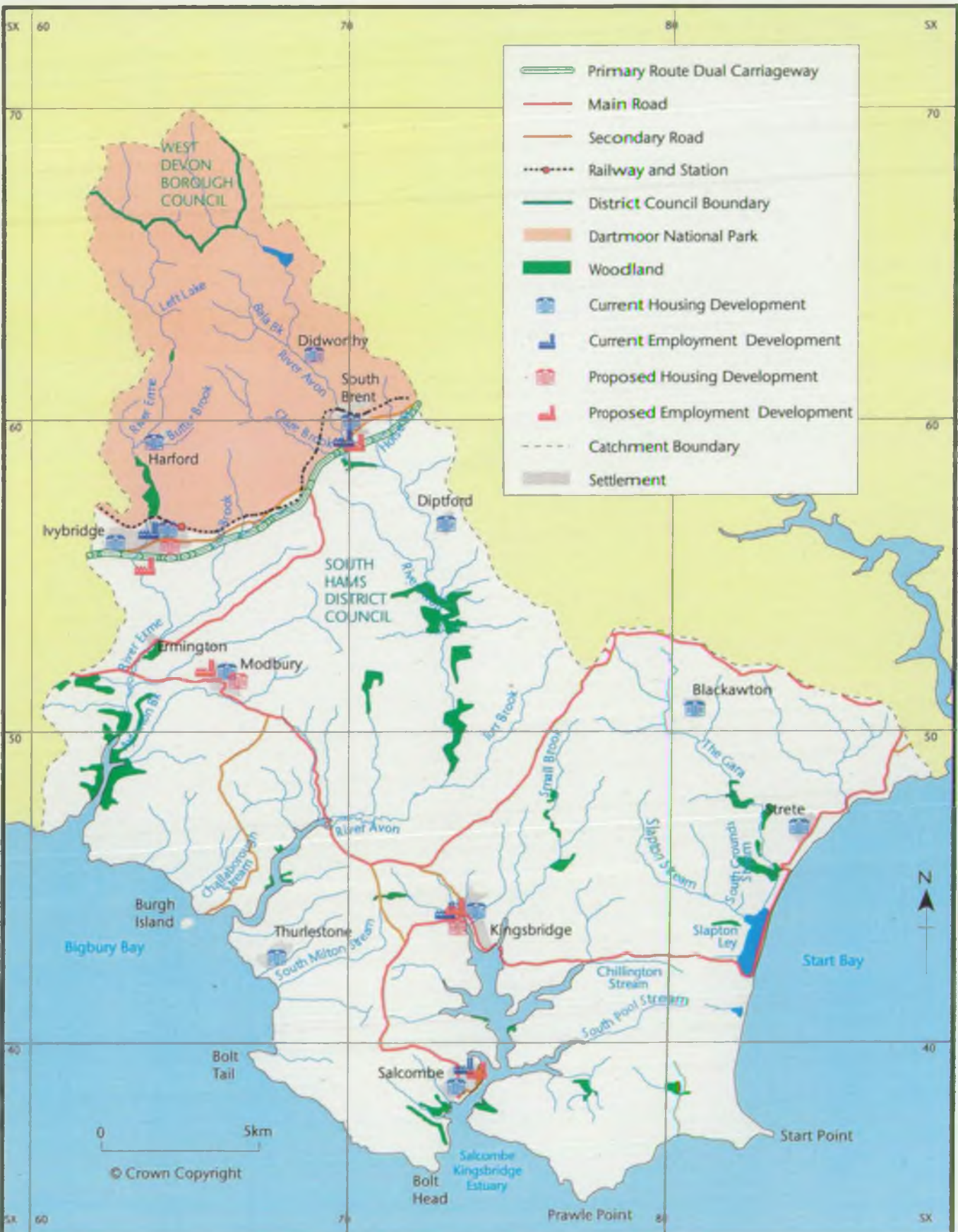
5.1.2 Planning and Flood Risk

The Government view is that development should be guided away from areas that may be affected by flooding and should be restricted where it would increase the risk of flooding. To achieve this it expects local authorities to use their planning powers and the Environment Agency to assist by providing advice on development and flood risk. The work that is underway now on preparing flood plans is an example of this advice. (for details see section 5.9.2).

5.1.3 Derelict and Contaminated Land

The Environment Act¹ contains new provisions for dealing with contaminated land; local authorities are the key regulators under the Act with the Agency acting as a consultee and advisor. The new provisions will be enacted in 1998 and will define contaminated land as any land which appears to a local authority to be in such condition - because of the substances it contains - that either water pollution or significant harm is being, or is likely to be, caused. This interpretation is subject to guidance issued by the Secretary of State. Each local authority will be required to carry out a survey to identify contaminated land in its area. When these surveys have been carried out we have a duty to prepare and publish a report on the state of contaminated land from time to time, or if specifically requested to do so by the Secretary of State. Some sites may be designated as 'special sites'; these

Map 10 - Built environment



will become our responsibility. Special sites include those which are, or are likely to, cause serious water pollution, because of the substances in or under them. It is made clear in the draft Statutory Guidance that contaminated sites should continue to be remediated wherever possible on a voluntary basis or through the normal development planning process and existing pollution legislation, whereby we can prosecute if pollution is actually occurring, or take action to effect clean-up or pollution prevention, with cost recovery from the polluter or landowner. For those sites not meeting the more rigid new definition in the Guidance, these will be the only routes for clean-up that remain available.

Derelict land is land which is considered to be so damaged by industrial or other developments that it is incapable of beneficial use without treatment. Such land may include, for example, closed and disused waste tips or abandoned military installations.

5.1.4 Development Plans

The Regional Planning Guidance for the South West²² was published in July 1994. This guidance recognises the need to achieve sustainable development and aims to influence the policies in Structure and Local Plans to secure the best development strategy for the region; it includes advice on a variety of environmental issues.

There is only one approved Structure Plan relevant to the catchment: the Devon County Structure Plan, Third Alteration²³, covering the period up to 2001. The Structure Plan provides a strategic framework for development and land use within Devon and contains policies and advice to ensure the protection and conservation of the environment.

Devon County Council has produced a draft review of the Structure Plan 'the Devon County Structure Plan First Review 1995 - 2011'²⁴, which takes the plan forward to 2011 and embodies principles of sustainable development; we have commented on this plan.

The majority of the catchment falls under South Hams District Council with an area to the north within Dartmoor National Park (see Map 10). The Dartmoor National Park Authority is a local planning authority. The existing statutory Local Plans are shown in Table 30. Local Plans are prepared in conjunction with the Devon County Structure Plan. Table 30 also shows the housing and employment land provision up to 2011. Due to its natural beauty, sites of wildlife and geological importance and outstanding coastline, much of the catchment is subject to development constraint, with only limited economic, residential, commercial and infrastructure investment appropriate in order to meet local needs. In the National Park the preservation and enhancement of the landscape will be given priority over other considerations in the determination of development proposals.

Kingsbridge and Ivybridge both function as Area Centres, which means they are important in providing facilities, shops and services for the surrounding rural area. The town of Ivybridge has an important historic core, but has experienced a high rate of development over the past 10 to 15 years, making it one of the fastest growing towns in Europe and the area in which most development has been concentrated in this catchment. Its situation, close to the A38 Devon Expressway, allows Ivybridge to partially contribute to Plymouth's development needs. However despite being included in the Main Area for Economic Activity local constraints, including landscape and environmental pressures, limit the potential for new development and once the significant existing commitments (1,200 dwellings between 1989 and 2001) have been completed, further development is considered inappropriate, at least in the period up to 2001. The Devon County Structure Plan First Review recognises there is only limited scope for additional housing provision in the period 2001 - 2011.

Kingsbridge is a bustling market town which has been one of the fastest growing of Devon's small market towns over the last 20 years. It has limited capacity to accommodate new development, and much of the development which has taken place (263 new units completed between 1989 and 1995) or been granted planning permission has been on a variety of large and small infill sites within the town's Development Boundary.

The Selected Local Centres are Modbury, Salcombe, Stokenham/Chillington, and South Brent. These towns are considered important in providing facilities, shops and services for the surrounding rural area. This implies the provision of public services and community facilities should be granted some priority. In addition Salcombe has been identified as a resort, where tourism provides the mainstay of the economy.

South Brent is situated adjacent to the A38 Devon Expressway on the southern boundary of, and within, the Dartmoor National Park. The parish experienced a very high rate of growth in the 1980s. All residential land allocated in the 1985 Dartmoor National Park Local Plan has now been developed and no further housing land allocations are made in the Dartmoor National Local Plan (Revised). The 1985 Plan indicated three sites for employment uses. Presently two of these sites (Station Yard and Brent Mill) have been partially developed and these, together with the unused Slumberland site, provide scope for future development²⁵

Table 30 Local Plans in the catchment

Local authority	Housing provision (dwellings) to 2011 ²³	Employment land provision to 2011 ²³	Local Plan Plan status
South Hams District Council	11,400 *	120 *	South Hams Local Plan <i>Finally adopted April 1996.</i>
Dartmoor National Park	800 *	Insignificant in this catchment. (see text for South Brent, above).	Dartmoor National Park Local Plan (Revised), including Minerals and Waste Policies. <i>Adopted Version February 1996.</i>

* These figures are for the whole of the administrative district and include areas outside the catchment.

In addition to the Dartmoor National Park Local Plan, the National Park Plan - Second Review²⁶ sets out objectives for the area under the headings Landscape, Enjoyment and Community. This will be replaced by the forthcoming Dartmoor National Park Management Plan which will set out strategic targets and management policies for the Park. In addition it will provide a framework for co-ordinated actions by organisations with an interest in the Park to progress conservation, development control, access etc.

5.1.5 Transport Network

We are a statutory consultee to the DETR when new trunk roads are developed. We also have input into road schemes proposed by County and District Councils.

We have powers under the Water Resources Act 1991²⁷ to control highway drainage through prohibition notices and discharge consents.

Several important routes cross the catchment (Map 10), including the A38 Devon Expressway. The road network is under increasing pressure from heavy traffic loads, particularly in the holiday season. Many of the more remote towns and villages are approached by narrow roads, resulting in severe congestion during peak holiday periods.

Dartmoor National Park have produced a Traffic Management Strategy which has resulted in a number of improvements, including the introduction of a functional route network designed to reduce congestion by encouraging transport to use appropriate routes.

In order to alleviate traffic congestion, which has become an increasing problem as the town of Ivybridge has grown, the Fore Street Relief Road was opened in June 1994. This has relieved the main shopping street of most traffic, providing improved access to some of the town's facilities, although further improvement would be beneficial.

The recently completed Aveton Gifford bypass removes all through-traffic from the village, and has provided an opportunity to effect improvements to the built environment of the main village street and other adjacent land.

A scheme to bypass Modbury is included in the Devon County Structure Plan for construction if resource allocations within the Plan period are increased. This scheme would also allow improvements to the built environment. We would comment in detail upon the proposed route should the road scheme be implemented.

Devon's rail network forms a key element of an integrated and balanced transportation system. Ivybridge Rail Station was opened in 1994 and is at present the only rail station in the catchment which is served by the national network. There is a proposal to re-open the rail station at South Brent in the period to 2011²⁴.

5.1.6 Development Sites and Sewerage

There are a number of settlements in the catchment served by STWs which the Agency judges to be unsatisfactory; these are shown in Table 31. We recommend against further development in these areas until remedial works have been carried out by SWWSL (see Issue 1).

Table 31 Settlements where development is constrained

Settlement	Comments
Beeson	Impact on Beeson Stream from Beeson STW.
Brownston	Impact on Brownston Brook from Brownston STW.
Frogmore	Impact on Chillington Stream from Chillington & Frogmore STW.
Kingston	Impact on Kingston Stream from Kingston STW.
East Charleton	Impact on West Charleton Stream from West Charleton STW.
West Charleton	
Woolston	Impact on Woolston Stream from Woolston STW.

5.2 Controlled Industrial Processes and Use of Radioactive Substances

Our responsibilities include the regulation of large and complex prescribed industrial processes and the regulation of the storage, use and disposal of radioactive substances.

5.2.1 Controlled Industrial Processes

We are the statutory authority in England and Wales for regulating the largest and most complex industrial processes. To do this we use a system known as Integrated Pollution Control (IPC). This system requires the use of best available technique not entailing excessive cost (BATNEEC) to prevent the release of particular substances into the environment or, where this is not practicable, to minimise their release and render them harmless.

Two lists of processes have been prescribed by regulations for control: Part A processes are controlled under IPC by the Agency; Part A processes are those which are potentially the most polluting industrial processes, including large combustion plant, iron and steel manufacturing, the chemical industry, solvent recovery and incineration plants; these may affect all aspects of the environment (air, water, land). Part B processes are controlled at a local level under a system of Local Authority Air Pollution Control; Part B processes are only controlled for their releases to air.

There are no Part A processes in the Avon and Erme Catchment.

5.2.2 Radioactive Substances

We are the principal regulator in England and Wales under the Radioactive Substances Act 1993. This statute is concerned with the storing, use and disposal of radioactive substances and in particular, the regulation of radioactive waste.

Radioactive substances are present in the environment as a result both of natural processes and of human technological developments. The uncontrolled and incautious use of these substances can pose both immediate and long-term hazards.

We are the Competent Authority for a number of EC Directives on the shipment of radioactive substances and sealed sources between EU Member States. We also regulate shipments of radioactive waste into, out of, or through England and Wales.

The major nuclear establishments are licensed to operate by the Nuclear Installations Inspectorate (NII), but discharges from them are authorised by the Agency. These discharges arise from the day-to-day operations at the sites. Site operators are required to ensure that discharge conditions are met and also ensure that radiation dose limits to the public are not exceeded as a result of the discharges.

There are a small number of sites in this area which are registered under the Radioactive Substances Act 1993, for keeping and using small radioactive sources.

Each of these sites have been assessed and permission granted by us on the basis that the use of radioactive materials is justified and that operators are prepared to abide by conditions to safeguard human health and protect the environment. The permissions take the form of certificates of registration for keeping and using radioactive materials and certificates of authorisation for the accumulation and disposal of radioactive waste.

5.2.3 Radon

Radon is a natural radioactive gas which forms from the decay of uranium and thorium in rocks and soils. In 1990 Devon and Cornwall were designated by the former DoE as affected areas. These were areas where more than 1 in 100 homes were likely to have radon concentrations above the level recommended by the National Radiological Protection Board.

South Hams District Council and West Devon Borough Council conduct monitoring of radon concentrations in homes in the catchment. They also provide advice and in some cases home improvement grants, in order to reduce exposure to radon.

5.3 Mineral Extraction

5.3.1 Mines

Mineralisation is scarce within the catchment and is located within small isolated lodes in the Dartmoor Granite, the Carboniferous and Devonian sedimentary rocks mainly close to the granite contact and the Start Point complex. Map 5 shows the locations of abandoned mines in the Avon & Erme Catchment; there is no mining activity currently taking place.

The northern part of the catchment is underlain by the Dartmoor Granite. Tin oxide ores within the granite were worked by two mines north of the Avon Dam Reservoir. Alluvial deposits overlying the Dartmoor Granite were also worked for tin.

South of the Dartmoor Granite the remainder of the catchment is underlain by Devonian and Carboniferous slates and some volcanic rocks, except for an area of metamorphic rocks south of a line between Bolt Tail and Hallsands (see below). Five mines are present within the slates. Two mines near Ivybridge worked iron ore, and two mines worked silver, lead and zinc ores. It is uncertain which ore was worked at the fifth mine, near Thurlestone.

The Start Point metamorphic complex outcrops in the south of the catchment. Iron oxide ores were worked from five mines within this complex.

Mining activities can result in long term impacts on the environment, and in particular on water quality. Elevated concentrations of iron originating from two mines in the upper Avon Catchment led to a failure of the EC Surface Water Abstraction Directive (see section 5.10.5). Routine monitoring of chemical and biological water quality has not shown any further problems.

Contamination of land may have occurred from the former operation of metalliferous mine workings in the area; elevated levels of heavy metals, compared with background levels, are often encountered in land that has been previously backfilled with mining waste or spoil. Leaching of heavy metals from contaminated land can subsequently impact upon both local ground and surface water quality. During work on spoil heaps or contaminated land sites, soil containing metalliferous mining waste must be disposed of in an appropriate landfill.

5.3.2 Quarries

There are no active quarries within the Avon and Erme Catchment.

Both mines and quarries can be important sites for earth science conservation and education, in addition to providing unusual habitats (see Issues 12g and 15).

5.4 Waste Management

5.4.1 Waste Management Licensing

On 1st May 1994 the waste management licensing system established by the Environmental Protection Act²⁸ was implemented. This legislation introduced a range of new duties for which the Environment Agency took over responsibility when it was formed; in particular Waste Disposal Licences became Waste Management Licences. The new system brought in improved environmental standards and licence holders now have to prove their suitability as a licence holder by demonstrating that they have the financial capability, technical competence and no history of relevant convictions. In addition a licence can only be surrendered when we are satisfied that the site no longer represents a risk to the environment and a certificate of completion has been issued by us. This can be many years after operations have ceased at the site.

5.4.2 The National Waste Strategy

The National Waste Strategy¹³ published in 1995 introduced the concept of a hierarchy of options for managing waste in the UK. The reduction of waste is the best environmental option at the top of the list moving down to re-use, recovery (recycling, composting or converting into energy) or if none of these are viable, disposal. The aim is to increase the quantity of waste being handled by the options at the top of this hierarchy. The document therefore sets a number of targets including one to recycle or compost 25% of household waste by 2000. We have recently completed the first part of a National survey of the waste being produced by industry and commerce to help to develop the waste strategy further.

Currently 70% of household, commercial and industrial waste generated in the United Kingdom is landfilled and in Devon this is closer to 90%. A target has been set to reduce this to 60% by 2005. Landfill has been an attractive option because it is inexpensive, suitable for many types of waste and may often be regarded as the only option for some inert wastes. They do, however, have the potential to cause pollution. They can release chemicals to surface and underground water and to the soil and they generate significant quantities of methane and carbon dioxide which are "greenhouse gases". During operation, noise, odour, unsightliness and vehicle movements may all have a local impact and after a site closes the land may contain some contaminants making it unsuitable for certain uses. Today new landfill sites are engineered to a high specification, their operation is governed by strict licence conditions and they are required to be monitored for signs of pollution both during and after operation.

With the introduction of the Landfill tax last year (see section 5.4.5), and new legislation affecting those that produce waste, the balance is shifting away from landfill towards other options such as energy recovery, recycling and waste reduction.

5.4.3 Waste Minimisation

We are keen to promote the reduction of waste at source. In recent years there have been a number of very successful waste minimisation projects. One of the most well known of these was Project Catalyst in the North West of England, which looked at all wastes and identified potential annual savings totalling £8.9 million for the companies which were involved. The Agency has begun its own

programme of waste minimisation known as the 3 Es project, concentrating on Emissions, Efficiency and Economics. The project involves localised groups of businesses across the whole Country and aims to demonstrate how the philosophy can be applied to save money and improve performance as well as reduce waste and emissions. We are also supporting other waste minimisation initiatives where possible including a new initiative being planned for South Devon (see Issue 7).

5.4.4 Local Perspective

Most of the household waste collected within the catchment is taken to the Chelson Meadow landfill site in Plymouth. There are two civic amenity facilities located in Ivybridge and Kingsbridge for use by residents of the area to dispose of bulky household items and for use as recycling points for paper, glass bottles etc. Several privately operated waste management sites are also located within the catchment with a concentration of these at Torr Quarry, East Allington. A composting site is also available for public use (see Issue 7).

The location of the waste management facilities within the catchment, their current state of operation and the waste types accepted at them are presented in Table 32 and Map 11.

There are currently 14 licensed sites within the catchment. These include 7 landfill sites (of which 3 are operational), 2 transfer stations, 2 civic amenity sites and a composting site. In addition there is 1 effluent treatment works licensed to accept household, commercial and industrial waste, two sites which provide a service for the cremation and burial of dead pets and 8 metal recycling sites not included in Table 32 and Map 11.

Table 32 Current waste management sites in the catchment

Site name and type	Site status	Waste type
Wood Farm - landfill	operational	inert and general
Part Torr Quarry - landfill	operational	inert and general
Torr Quarry - landfill	operational	inert and general
The Mounts - transfer station	operational	inert, general, household/biodegradable
Torr Quarry - transfer station	operational	inert, general, household/biodegradable
Ivybridge - civic amenity site	operational	inert, general, household/biodegradable, some difficult wastes
Kingsbridge - civic amenity site	operational	inert, general, household/biodegradable, difficult, special
Green Crop - composting site	operational	inert, general, biodegradable
Goutsford - landfill	non-operational	inert
Dallacombe Farm - landfill	non-operational	inert
Rake Farm - landfill	non-operational	inert, general
Molescombe - landfill	closed, awaiting restoration	inert, general

There are 10 known closed landfill sites within the catchment. Their location and the types of waste accepted at them are given in Table 33 and Map 11.

Table 33 Closed waste landfill sites in the catchment

Site name and location	Site status	Waste type
Old Quarry, Embridge Hill, Stoke Fleming	Closed 1992, restored	mainly soil, some rubble
Whympston Farm, Modbury	Closed 1990, restored	Inert
Quarry Farm, East Allington	Closed, restored	Inert
Beechy Lane, Torrdown, Modbury	Unknown	Unknown
Higher East Leigh Farm, Modbury	Closed 1991, restored	Mainly soil & stone
Sorely Farm, Churchstow, Kingsbridge	Unknown	Unknown
Thurlestone Hotel, Thurlestone	Closed, restored	Inert/ Ash
Ilten Farm, Malborough	Closed 1993, restored	Inert
Easton Court Farm, Thurlestone	Closed 1993, restored	Inert
Winslade Farm, Frogmore	Closed 1993, restored	Inert/ some scrap cars

Map 11 - Waste disposal



Certain waste management activities are exempt from the requirement for a waste management licence. This includes a range of activities which predominantly involve storage, treatment or recovery of waste. The object of exemptions is to reduce bureaucracy for small scale activities and to encourage recycling and recovery operations, by avoiding the need for a licence where the quantities of waste involved are below certain specified limits. Each exempt operation must however be registered with the Agency and it must comply with the criteria given in the Waste Management Licensing Regulations 1994 for that particular activity. There are a number of exemptions within the catchment which are registered with the Agency.

5.4.5 Landfill Tax Credit Scheme

Landfill tax is levied on all disposals by waste companies and is estimated to total about £500 million per year. The tax is collected by H.M. Customs and Excise. Landfill operators can claim a credit against their landfill tax payments if they make voluntary contributions to approved Environmental Bodies. There are a number of conditions which affect an organisation's ability to receive these voluntary contributions, organisations who wish to become Environmental Bodies must register with ENTRUST, the regulator of the Landfill Tax Credit Scheme. In addition, ENTRUST approves those projects which can receive money.

Over 300 Environmental Bodies have been enrolled with ENTRUST, carrying out projects ranging from research and development to large scale land remediation and the purchase of land for public parks, amenities and nature reserves. Landfill operators who wish to make contributions, or organisations who would like to enrol as Environmental Bodies, can contact the Agency for further information.

5.5 Effluent Disposal

We regulate the disposal of effluent direct to surface or groundwater by determining discharge consents.

Discharges which have the greatest potential to affect the quality of the water environment have numeric volume and concentration limits attached to their consents. These limits may apply to individual or groups of substances and are set at levels needed to protect the environment from harm and ensure compliance with River Quality Objectives (see sections 3 and 5.10.1), EC Directives (see section 5.10) and International Conventions.

The following EC Directives affect the control of aqueous discharges in this catchment. For more information see section 5.10:

- EC Bathing Water Directive (76/160/EEC)
- EC Dangerous Substances Directive (76/464/EEC)
- EC Freshwater Fish Directive (78/659/EEC)
- EC Urban Waste Water Treatment Directive (91/271/EEC)
- EC Surface Water Abstraction Directive (75/440/EEC)
- EC Groundwater Directive (80/68/EEC)

Discharge consents can only be used to control point source discharges. Those over 5m³/day are shown on Map 7. Point source discharges fall into the following types:

- Continuous e.g. sewage works discharges
- Intermittent e.g. sewer overflows, surface water runoff
- Discharges to ground e.g. soakaways.

Diffuse sources of pollution such as agricultural runoff and much urban/highway runoff has to be tackled using other regulatory powers.

5.5.1 Sewage Treatment Funding Plans

Improvement schemes to SWWSL STWs are subject to available funding approved by OFWAT, the water industry's regulator. A strategic business plan, known as Asset Management Plan (AMP2) was developed based on guidelines agreed between the NRA, the former DoE, the water services companies and OFWAT in 1994. This plan will run from 1995 to 2005.

In order of priority, schemes included are:

- those required to meet and maintain current EC and domestic statutory obligations
- those required to meet and maintain new EC and domestic statutory obligations and future legal obligations
- those which have been justified separately to maintain river quality relative to the 1990 NRA survey of water quality or to achieve river or marine improvements.

We have agreed improvement plans for the STWs shown in Table 34, below.

Table 34 Sewage treatment works with funding for improvement in AMP2

Site	Improvements required	Year
East Portlemouth	Secondary treatment	by 2005
Torcross	Secondary treatment	by 2005
Holbeton	Secondary treatment	by 2005

OFWAT have recently initiated a five year review which will result in AMP3 running from 2000 - 2010. We are currently identifying those STWs where improvements are required (see Issue 1).

5.5.2 Oil Pollution Prevention

The Agency is responsible in preventing, where practicable, the spread of oil inland from estuaries on incoming tides. We need to prepare action plans in consultation with local authorities, MAFF, English Nature etc, to protect wherever feasible sensitive areas of coastlines and estuaries.

In order to carry this forward we have started a process of sensitivity mapping and oil spill protection surveys.

Sensitivity mapping

Sensitivity maps contain a high level of data relating to the location/area of all the features found in an estuary, such as: EC Bathing Waters, areas of commercial shellfish harvesting (including periods of greatest environmental sensitivity), Special Areas of Conservation, SSSIs, nature reserves, heritage coastline, geological features, marine conservation importance and habitat vulnerability, ornithological sensitivity, amenity value, sailing marinas and moorings along with basic tidal range information.

Sensitivity maps for the Salcombe Kingsbridge, Avon and Erme estuaries have been prepared in partnership with local authorities and County Emergency Planners. This will enable us to provide a joint response to major pollution emergencies.

Oil spill protection surveys

This phase includes the assessment of practical booming points from the mouth of an estuary up into the higher tidal reaches. Rendezvous points and access are considered, along with the types of boom to be used and current and other tidal information. The survey and its accompanying plans are extremely useful should a major oil pollution occur.

Oil spill protection surveys have been completed for the Salcombe Kingsbridge, Avon and Erme estuaries, along with practical booming exercises. These surveys now form an Agency/Devon County Council Oil Pollution Plan.

Fixed boom anchoring points have been installed in all three estuaries in the catchment.

5.6 Rural Land Use

5.6.1 Forestry

Well-managed woodland in the right places does not harm the water environment and will often bring benefits. The Forestry Authority regulates forestry in the UK by licensing some operations such as felling and providing grant aid through the Woodland Grant Scheme.

Forests and woodlands are scattered throughout the catchment (See Map 10). A Forestry Authority census of British woodland is in progress; the South West counties will be covered over the next few years.

The South Hams Local Plan has identified woods which are significant in the landscape. A number of these 'important woodlands' are in the Rivers Avon & Erme Catchment.

The catchment lies within a critical load area. This is an area designated by the former DoE, where sulphur levels, causing acidification (low pH), are considered to be impacting on the ecosystem. This is explained in further detail in Issue 11.

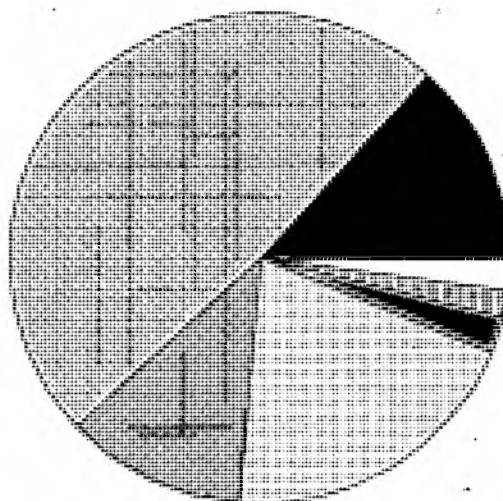
5.6.2 Farming

Over 80% of the land in England and Wales is farm land. The way this land is used affects the quality of the environment.

There are a limited number of ways we can influence how farmers use land. However, we can control and prevent pollution in the same way as we do with any other industry. Other agencies such as MAFF also encourage sensitive farming practices using financial incentives.

Land Use

Figure 1 summarises the agricultural land use in the catchment.



Grassland < 5 yrs
 Grassland > 5 years
 Rough Grazing
 Crops and Fallow
 Farm Woodland
 Other
 Set-aside

Farming Types

Livestock farming based on grassland is the dominant activity in the area. On Dartmoor cattle and sheep rearing predominate. Away from the moorland, the sheep and beef cattle production is diversified with some dairy farming, pigs, poultry and arable production. Livestock numbers in the catchment are shown in Table 35.

Table 35 Livestock numbers in the catchment

	1985	1995	% Change 1985 - 1995
Total cattle & calves	54,038	56,005	3.6
Total sheep & lambs	125,738	154,951	23.2
Total pigs	9,116	7,824	-14.2
Total fowls	45,360	146,819	223.7

Source: MAFF

Following the general trend in Devon, the number of dairy cows has fallen in the last 10 years (down 1,302 - 9%) and the number of dairy holdings has declined by 20.1% (see Table 36). There has been an increase in the average size of dairy herds from 69 to 79 cows. This shift is partly due to changes in legislation affecting, for example, milk quotas, hygiene and pollution. Some dairy farms have switched to other types of farming and total cattle and calf numbers have increased by 3.6% due to a 74.8% increase in the beef herd. In addition the total sheep flock has also increased, but by the smaller margin of 23.2%.

The number of pig and poultry holdings in the catchment is relatively small, and whilst there has been a small decline in their numbers during the decade (see Table 36), both these enterprises are subject to more rapid fluctuations than other livestock and the figures should be treated with caution.

The total area of crops and fallow in the catchment has fallen by 12.3% over the decade. The cereal area has declined considerably by 21.4%. Much of this is likely to have been put into set-aside at the expense of spring barley which is the least profitable crop in cereal rotation.

The area covered by horticultural crops has shown a very large decline of 55.5%, with the main victims being fruit (down from 50 to 30 hectares) and vegetables (down from 256 to 99 hectares) grown in the open.

For other farm crops, the potato area has shown a substantial increase of 21.4%, and crops benefiting from European subsidies such as field beans and dry peas (up by 20.6%) together with oilseed rape (up by 185%) have shown significant increases.

Farm types found in the catchment are details in Table 36.

Table 36 Farm types found in the Catchment

Farm Type	1985	1995	% of Holdings 1995	% change (1985-1995)	Notes
Dairy	209	167	16.7	-20.1	Quotas and more stringent hygiene and pollution standards tend to favour larger farms.
Cattle and sheep	146	196	19.6	34.2	Some dairy farms have switched to beef and sheep enterprises.
Pigs and poultry	13	11	1.1	-15.4	Both pig and poultry holdings have slightly declined, although the fowl flock has increased by 223.7%. Both are subject to rapid fluctuations.
Cropping	42	28	2.9	-33.3	The total area of crops and fallow has fallen by 12.3%, mainly due to set-aside at the expense of spring barley.
Horticulture	9	19	1.9	111.1	Area covered has declined by 55.5%. The main decline has been in fruit and vegetables grown in the open.
Mixed	27	19	1.9	-29.6	Although a considerable number of farms in the area grow cereals and other crops, or keep pigs and poultry, this is as a mixed and/or part-time farming system in support of livestock.
Part-time	423	557	55.9	31.7	

Source: MAFF

Farm Pollution Control

Routine farm visits and inspections are carried out on a regular basis within the catchment. Issues relating to pollution problems due to farming are discussed in Issue 2.

Future Trends

The agricultural use of the catchment is likely to remain much as it is at present, but perhaps with fewer, larger units. With the agreements through the Common Agricultural Policy (CAP) and General Agreement on Trade and Tariffs (GATT) there may be increased set-aside of land, reduced management and increased opportunities for conservation and recreation within the countryside.

The whole of Dartmoor has been designated as an Environmentally Sensitive Area (ESA) and funding is therefore available to encourage farmers to adopt less intensive farming practices (see Issue 12a).

Other MAFF schemes designed to encourage environmental improvements include the Habitat Scheme, Countryside Stewardship, Farm Woodland Premium, Moorland and Organic Aid. In addition there is the Wildlife Enhancement Scheme (English Nature) and Woodland Grant Scheme (Forestry Authority). The uptake of these schemes will be dependent partly on the level of financial inducement (see Issue 12a). There are also a large number of land management agreements managed and funded by Dartmoor National Park.

Farmers increasingly look to diversify into activities other than agriculture in order to supplement their incomes. Many farmers have added to their income (albeit in a small way) by providing accommodation, produce and services to visitors. Much farm-based work is now concerned with activities such as woodland management, running farm shops and equestrian businesses, and the provision of sporting facilities, nature trails, holiday cottages and various agricultural services.

5.7 Recreation

The catchment is widely used for a range of recreational activities (see Map 12), both by residents and the many visitors who are attracted by the tranquillity and largely unspoiled nature of the area. 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

Map 12 - Recreation and angling



access routes or promote the use of particular rights of way without considering the needs of landowners or other countryside interests. Issue 14 deals with concerns relating to the recreational use of the catchment.

5.7.1 Water-based recreation

A short section of the River Erme is used for canoeing in the winter, under an access agreement between the British Canoe Union and riparian owners. It is technically very difficult and can be dangerous, especially in high flows. The new fish pass at Stowford Gauging Weir has been constructed to allow canoe passage. There are no other rivers with access agreements in the catchment. Most tidal waters, such as the Salcombe Kingsbridge and the Avon estuaries, have a right of public navigation, but the Erme Estuary is privately owned and access is not permitted.

The Avon and Salcombe Kingsbridge estuaries are extensively used for boating activities. There are sailing clubs at Salcombe and Bantham, and a water-skiing club which uses areas off the mouth of the Avon and at Starehole Bay. Both surfing and windsurfing take place at Bantham, one of the few locations on the south coast of Devon where conditions are suitable for both activities.

A number of beaches and coves are used for bathing; we monitor water quality at a number of these sites (see section 5.10.2).

5.7.2 Land-based recreation

Access to water and associated land is perhaps most extensive within the Dartmoor National Park where large areas have open access to the public through the Dartmoor Commons Act 1985. No right of way is necessarily indicated, although within the general area there are also many public footpaths and bridleways.

The South Devon Coast Path, part of the South West Peninsula Coast Path National Trail, extends around the whole of the coastline of the catchment with only short breaks. In places it provides the only real access to the coast. It also provides access to several wetland sites of interest; South Milton Ley is crossed at the downstream end and there are other footpaths around the site; South Huish marshes are easily visible from the coastal path and there is an interpretation panel providing information about the site; the path runs alongside Slapton Ley and connects to other footpaths.

The Two Moors Way, a long distance footpath of 100 miles, starts at Ivybridge and runs north, crossing the upper Avon Catchment on its way. It ends in Lynmouth on the North Devon coast after crossing both Dartmoor and Exmoor National Parks.

5.7.3 Angling

The Avon salmon angling season is from the 15 April - 30 November, and the sea trout season between 15 April and 30 September. On the Erme, the salmon fishing season is 15 March - 31 October, and for sea trout, 15 March - 30 September. Details of the rod catches for the Avon and Erme are given in section 5.13.6.

The majority of the fishing rights on the Avon between South Brent and Aveton Gifford are exercised by the Avon Fishing Association, and here, sea trout, salmon and brown trout may be taken. Outside of this reach, the river is only lightly fished, mainly for brown trout, but also sea trout and salmon when flows have allowed them to move up the system prior to the end of the fishing season.

Generally, the whole of the Erme is only lightly fished. Fishing for migratory species is highly dependent upon river flows, and access for angling in many parts of the system is difficult.

The Duchy of Cornwall is a major landowner in the Dartmoor area including the headwaters of the Avon and Erme. It is possible to fish these areas with a permit from the Duchy, but in practise, due to their remoteness and the difficulty of gaining access to the moorland streams, they are rarely fished.



There are four stillwater game fisheries (see Map 12). The Avon Reservoir, which is owned by SWWSL, contains brown trout which may be fished for by Agency rod licence holders at no additional cost. Mill Leat trout farm and the Newhouse fishery are day ticket waters while the Butterbrook Reservoir is stocked and fished by a local club.

There are eight stillwater coarse fisheries in the area (see Map 12). Slapton and Beesands Leys are only lightly fished to minimise disturbance. The remaining waters are either day ticket fisheries or in the case of Emperor Lakes, fished by a syndicate. Valley Springs fishery offers mixed coarse and game fishing.

5.8 Water Abstraction and Supply

Here we consider the abstraction of water from surface and groundwater for public and private uses in the Avon and Erme Catchment. Our objective is to manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.

5.8.1 The Natural Resource

On average the total quantity of water available in the Avon and Erme Catchment is of the order of 341,240 Ml/yr. This water represents the amount of rainfall not evaporated or taken up by plants.

5.8.2 Current Licensed Abstractions

Water is abstracted from the Avon and Erme Catchment for public water supply and private water use. Private use includes the supply of water for domestic and agricultural purposes, fish farming, industrial uses, hydroelectric power and amenity purposes.

There are currently 34 surface water and 112 groundwater abstraction licences within the catchment (those greater than or equal to 20 m³/d are shown on Map 13). The total authorised annual quantity of water which can be abstracted from the catchment is 39,086 Ml/yr. Of this licensed volume, 99% is abstracted from surface water and 1% from groundwater sources. These totals reflect the hydrogeology of the catchment, which is characterised by rocks with limited groundwater storage (see section 2.2). As a result there is a large dependence upon abstraction from surface sources, namely rivers and reservoirs.

The total volume licensed for abstraction therefore represents 11%, on average, of the total available natural resource. However this is a distortion of actual resource consumption. In reality abstracted water is often returned to the catchment (e.g. fish farming) and is available for re-use (see below).

5.8.3 Consumptive and Non-consumptive Abstractions

Abstractions can be categorised according to the consumptive or non-consumptive nature of their water use.

Consumptive abstractions generally involve a loss to the catchment of a proportion of the water abstracted, for example public water supply or spray irrigation. Non-consumptive abstractions are those that return the majority of the abstracted water to the catchment, usually within the vicinity of the abstraction point, for example fish farms and water power schemes.

In considering the water 'lost' to the catchment through abstractions it is the 'net resource commitment', the proportion of abstraction not returned to the catchment, which is of most relevance.

Table 37 shows for each abstraction purpose the approximate net resource commitment. Net resource commitment is calculated using a set of % factors which give an indication, for each abstraction purpose, of the amount of water not returned to the catchment. The total net resource commitment in the Avon and Erme Catchment amounts to approximately 8212 Ml/yr, a fraction (2%) of the total available natural resource. This figure is likely to be even lower as many abstractors take less than their authorised quantity. Therefore at the catchment scale, the available natural resource far exceeds the net abstracted quantity.

Map 14 - Public water supply



Table 37 Net licensed resource commitment in the Avon and Erme Catchment

Abstraction purpose	Ground or surface water	Authorised quantity (Ml/yr)	Proportion of abstraction not returned	Net resource commitment (Ml/yr)
Public water supply	Ground	0	100%	0
	Surface	7683	100%	7683
Agriculture (excluding spray irrigation)	Ground	222	25%	56
	Surface	1	25%	<1
Spray irrigation	Ground	4	100%	4
	Surface	83	100%	83
Fish farming	Ground	0	0%	0
	Surface	8205	0%	0
Industry	Ground	<1	30%	<1
	Surface	1249	30%	375
Hydropower	Ground	30	0%	0
	Surface	15674	0%	0
Private water supply	Ground	45	25%	11
	Surface	<1	25%	<1
Private amenity	Ground	0	0%	0
	Surface	5890	0%	0
Total				8212

5.8.4 Public Water Supply

Abstractions for public water supply represent 20% of the total annual licensed volume in this catchment. South West Water Services Limited (SWWSL) are the water company responsible for public water supply in the Avon and Erme Catchment (see Map 14).

The catchment lies within SWWSL's Roadford Strategic Supply Area (SSA) which covers a large part of Devon as well as North East Cornwall. The zone is served by a complex water supply system, the centrepiece being Roadford Reservoir which, in conjunction with other reservoirs and river abstractions, is used to supply North Devon, Plymouth and the South Hams.

The Demand For Public Water Supply

The total demand for public water in the Roadford SSA during 1992 was 246 Ml/d; demand in the Avon and Erme Catchment does not make up a significant proportion of this. Demand in this area can increase considerably during the summer as a result of the influx of holiday-makers.

The action required to meet the demand for public water supply in the future is discussed in Issue 8.

Meeting The Public Water Supply Demand - Licensed Public Water Supply Abstractions

The sources available to SWWSL within this catchment are used to meet local demand. The Avon Reservoir supplies water to much of the catchment and one local supply area is entirely dependant on it; the reservoir is operated so as to protect the resource necessary to supply this area. The Avon Reservoir can also supply Totnes and Dartmouth, in the Dart Catchment.

There are four public water supply licences within the Avon and Erme Catchment with a total annual authorised abstraction of 7683 Ml. As Table 38 shows, they are all surface water abstractions.

Catchment sources can also be supported by imports of water from Burrator Reservoir, the River Dart and via the South Devon Spine Main (served by Roadford Reservoir, Burrator Reservoir and the River Tamar).

Table 38 Public water supply abstractions

Source	Daily licensed quantity (MI)	Annual licensed quantity (MI)	Comments
River Erme, Red Lake and Left Lake	9.092	2 500	Residual flow of 0.049 m ³ /s in River Erme.
Butterbrook Reservoir	0.681	182	Compensation release 0.009 m ³ /s.
Avon Reservoir	14.774	5 001 (in aggregate)	Compensation release 0.068 m ³ /s.
Bala Brook	1.818		Prescribed flow 0.012 m ³ /s.

Water is abstracted from the River Erme at the Harford Moor Intake and piped to Watercombe Water Treatment Works (WTW). Abstractions from Red Lake and Left Lake are only used as an emergency measure under extreme drought conditions.

Water from Avon Reservoir is treated at Avon WTW; an abstraction from the Bala Brook is used to support the main abstraction from the reservoir. Butterbrook Reservoir is not used for public water supply at present.

The volumes of water abstracted at each site are measured by SWWSL; the Agency carries out regular checks to ensure compliance with the abstraction licence conditions.

5.8.5 Reliable Yield

A factor which must be considered when establishing the current status of the catchment as a source of public water supply is the reliable yield available from individual sources of supply. Although an abstraction licence authorises the licence holder to abstract up to a maximum quantity of water, it may not be possible to abstract this all year due to physical and operational constraints. The "reliable yield" of a source is the theoretical amount of water that can be physically abstracted during critical dry periods. SWWSL's reliable yield from the licensed sources in the catchment is approximately 16 MI/d which is less than both the daily licensed maximum of 26.4 MI/d and the annual licensed total of 7683 MI (which equates to 21 MI/d) and represents 5% of the Roadford SSA reliable yield (326 MI/d). These reliable yield figures have been reduced by 2.5% to allow for planned and unplanned events which result in the source being temporarily inoperable.

5.8.6 Current Resource-Demand Balance

By comparing current reliable yield with the current demand for water, an assessment can be made of the 'resource-demand' balance. With a total reliable yield of 326 MI/d and assuming average demand of 246 MI/d (1992 levels), the Roadford SSA currently has a surplus of 80 MI/d. Clearly, there should be no difficulty in meeting current demands in an average year.

However, under prolonged drought conditions, when demands are higher than average, for instance as a result of increased garden watering and higher numbers of tourists entering the region, careful management of the public water supply system is needed to avoid problems in meeting demand. We expect water companies to plan and operate public water supply systems to cope in all but the most extreme circumstances.

SWWSL have undertaken a range of measures to improve the operational efficiency of the Roadford SSA. For example, the leakage control programme has made significant savings and compulsory metering for customers with sprinklers and/or swimming pools has been introduced.

A detailed drought management plan has been incorporated into the recently agreed Operating Agreement for the Roadford SSA. This establishes a staged programme of water conservation measures to be taken as a drought intensifies. These will include operational management of public water supply sources, such as: maximising the use of river abstractions within licensed limits to conserve reservoir storage; demand management such as enhanced leakage control and/or hosepipe bans; as well as Drought Orders/Permits, where these are deemed necessary.

The Avon Reservoir is included to ensure that the need for environmentally damaging emergency drought measures, such as reduction in reservoir compensation flows, is minimised.

5.8.7 Private Water Use

Abstractions for private use are discussed in relation to the separate river catchments.

The River Avon Catchment

The maximum authorised quantity of water which can be abstracted for private use is approximately 18,335 Ml/yr. Of this, approximately 136 Ml/yr (1%) is from groundwater sources and approximately 18,199 Ml/yr (99%) from surface water sources.

Of the total 64 private use abstraction licences in the River Avon Catchment, 46 are groundwater and 18 are surface water licences. However, surface water abstractions account for a greater volume of water than the groundwater abstractions (see above).

Hydropower is by far the largest use with over 15, 674 Ml/yr from surface water. The largest use of groundwater is 98 Ml/yr for agricultural purposes (excluding spray irrigation). Of the total authorised quantities for private use, approximately 80% is non-consumptive.

The River Erme Catchment

The maximum authorised quantity of water which can be abstracted for private use is approximately 13,068 Ml/yr. Of this, approximately 165 Ml/yr (1%) is from groundwater sources and approximately 12,903 Ml/yr (99%) from surface water sources.

Of the total 78 private use abstraction licences in the River Avon Catchment, 66 are groundwater and 12 are surface water licences. However, surface water abstractions account for a greater volume of water than the groundwater abstractions (see above).

Fish farming is the largest user with approximately 6400 Ml/yr from surface water. The largest use of groundwater is 124 Ml/yr for agricultural purposes (excluding spray irrigation). Of the total authorised quantities for private use, approximately 80% is non-consumptive.

5.9 Flood Defence

5.9.1 The Nature of Flooding

The river network carries surplus water from land to the sea as part of the natural water cycle. Rivers and watercourses can only cope with a certain maximum flow and when this is exceeded flooding occurs. Flooding can be caused by prolonged rainfall, thunderstorms or rapid snowmelt. The peak flow of a flood is measured and expressed in terms of the frequency at which that flow is statistically likely to recur, for example, on average 1 in 10 years or 10% chance in any one year.

Seemingly similar types of watercourse will respond differently to the same rainfall conditions due to variations in catchment areas and land use. For example, an urbanised catchment with a high proportion of paved surfaces and drains, will have rivers whose levels respond relatively quickly to rainfall. The more open countryside of a rural catchment will often allow more of the rain to soak into the ground and thus slow down runoff, so river levels will rise less rapidly but remain at the higher level longer.

The Avon and Erme catchments are steep with narrow floodplains and mostly natural drainage systems. Settlements are few and are generally located near to the tidal limits. There are no riverine flood alleviation schemes.

Flooding can also occur when meteorological conditions such as low atmospheric pressure, wind speed and direction combine with topography so that tide levels are produced that are greater than the defence levels. In estuaries a combination of freshwater river flows and tidal surges can also cause flooding.

Map 15 - Flood defence and land use bands



A key aim of the Environment Agency is to provide effective protection for people and property against flooding from rivers and the sea (see section 5.9.4) and to provide adequate arrangements for flood forecasting and warning (see section 5.9.5).

5.9.2 Regulation

Main River

All watercourses are classified as either 'main river' (which is defined on maps held by the Agency and MAFF) or 'ordinary watercourse' (sometimes referred to as 'non-main river'). In broad terms main river includes all watercourses which contribute significantly to a catchment's drainage, though ordinary watercourses may be more significant locally. The legislation dealing with main river is the Water Resources Act 1991²⁷ and is supplemented by local byelaws. We supervise all flood defence matters but have special powers to carry out or control work on main rivers and sea defences.

Local authorities are responsible for flood defence on ordinary watercourses. Local authorities are also responsible for protecting the coast from erosion by the sea.

Proposed revisions to main river are dealt with through a consultation and advertising process with the decision whether to main a river, or not, being made by MAFF.

There are 11.5 km of main river on the Avon and 11.25 km of main river on the Erme (see Map 15).

Flood Risk Areas.

It is preferable to avoid increased risk from flooding through control of development than to have to carry out works to alleviate problems once they occur. The relevant authority for controlling development in the floodplain is the local planning authority. The Agency believes that, wherever possible, development in the floodplain should be avoided. In addition to their importance in the natural drainage process, floodplains are valuable wildlife corridors and often contain important landscape and archaeological features.

Local planning authorities and ourselves are required by the DETR to liaise closely on flooding and surface water runoff matters. The aim is to ensure that flooding risks that might arise from a development are recognised and made an integral part of the decision making process undertaken by local planning authorities. Flooding and drainage issues are also to be taken fully into account during the preparation of land use development plans. In this respect we have responsibility to prepare surveys and to define the nature and extent of flood risks.

Flood risk surveys have been prepared by the Agency for main river in the Avon and Erme Catchment. Further information can be obtained from the Agency or the Local Authority.

Flooding can occur throughout the Avon and Erme Catchment; it is not restricted to main river. Map 15 shows sites where there are notable flood risks.

Land Drainage Consents

Access along river banks for staff and equipment needs to be preserved wherever possible especially for emergency works. To ensure this access is kept clear we will not normally grant a consent to any development within 7 m of a main river watercourse which would compromise flood defence work activities.

In deciding whether to issue a consent we will also take into account whether the proposed works comply with the requirements of our conservation duties.

Surface Water Control

Surface water runoff is likely to be increased to some degree as a result of development as more impermeable surfaces such as roofs and pavements are created. The impacts of such development, however small, add up and can lead to significant problems. Increases in both the amount and rate of water reaching rivers lead to greater risk of flooding. We will seek to ensure new development is

carefully located and designed. Where appropriate we will require measures to control surface water to be incorporated into the overall development.

Water Level Management Plans

Recent guidance has been issued by the government on the preparation of Water Level Management Plans (WLMPs) for Sites of Special Scientific Interest or other areas of high ecological or landscape importance. Where we are the operating authority, we will liaise with English Nature to prepare a plan to ensure appropriate key water levels are safeguarded.

There are several sites in the catchment where WLMPs may be appropriate, for example, South Huish, West Charleton, Slapton Ley and Erme grazing marsh (see Issue 12i).

5.9.3 Operations

Agency Owned Structures

There are Agency owned structures at Aveton Gifford, Ayleston Brook, Torcross and Beesands.

There are earth flood banks and masonry walls which protect several properties and fields from estuarine flooding at Aveton Gifford, and an earth flood bank with flapped outfall on the Ayleston Brook.

Sea defences at Beesands consist of a concrete wave return wall with blockstone revetment. There is a floodgate to allow access to the slipway. The scheme protects a row of cottages, a public house and other isolated properties as well as the access road and coastal path. At Torcross there is a concrete wave return wall with blockstone revetment. The scheme protects a section of the A379 trunk road and about 28 properties from flooding due to wave action.

Privately Owned Structures

Privately owned structures are common on watercourses, for a variety of traditional water uses such as operation of mills, creation of navigation channels and fish farming and amenity. By law these must be maintained and operated properly by their owners if they affect river levels and flows.

Flood Defence Standards of Service

As an aid to decisions on priorities for works we have determined Standards of Service for flood defence based on land usage within the floodplain. Five "land use bands", have been established, based on the presence and concentration of certain features of land use. These include housing, commercial property, agriculture and transport networks. Such features are each allocated a financial value (based on the potential losses that would ensue if the features were subject to flooding) which allows comparison of different features on the same basis.

Each land use band has a target for the maximum flood risk to which it should be exposed. The standard of flood protection at a location is the worst flood (expressed as a return period) which can be withstood without significant damage. Flood defence schemes alleviate flooding up to a design standard, a more serious flood may still occur.

Serious floods occur less often than minor floods. The term 'return period' describes how often an average flood might occur. For example, a ten year return period flood might be equalled or exceeded once every ten years, on average; a more serious flood may occur once every 100 years and therefore have a 100 year return period. This is a statistical methodology based on gauged river flows.

Details of targets and land use bands are given in Table 39 below. Map 15 shows the various land use bands for main river in this catchment.

Table 39 Indicative flood defence standards for different land use

Current land use	Land use band	Sea (return period-years)	River (return period-years)
High density urban, containing significant residential and non-residential property	A	100 - 200	50 - 100
Medium density housing	B	50 - 200	25 - 100
Low density or rural communities; highly productive agricultural land	C	10 - 100	5 - 50
Generally arable farming with isolated properties	D	2.5 - 20	1.25 - 10
Low productivity land, extensive grassland with few properties at risk	E	< 5	< 2.5
No area at risk from flooding due to both topography and hydraulic conditions, or lack of information of the flooding that occurs	X	n/a	n/a

Note: Indicative standards are only a guide: they may not always be appropriate.

A comparison of the target and actual standards of service allows improvement and maintenance works to be prioritised towards those rivers which do not meet their target standards.

Routine Maintenance Regime

The ultimate responsibility for the upkeep of a watercourse rests with the riparian owner. We have permissive powers, on main river, to undertake works and exercise our powers in this respect according to available resources and priorities. Regular maintenance is essential if the river system and sea defences are to operate properly at times of high water levels. Such maintenance works include vegetation control, repairs to earth embankments and other floodwalls, obstruction and blockage removal and dredging. Maintenance can contribute significantly to reducing the risk of flooding.

Emergency Response

At times of high water levels in addition to our flood warning role (see section 5.9.5) we patrol the defences, operate flood defence structures, remove blockages and carry out any emergency repairs needed.

District councils have permissive powers to offer assistance during floods. This may include placing sandbags, moving possessions and evacuating people. Each Council has a different policy on the type and amount of help they give.

The fire service provides help in flood emergencies if they are able to do so. The local station will be able to advise the public on what help is, or is likely to be, available and whether or not a charge will be made.

The County Council are responsible for public highways and would deal with any flooding problems associated with road drainage. All County Councils have Emergency Planning Officers who may become involved in more serious flood events.

Public surface water sewage systems are the responsibility of SWWSL, who may sometimes use District Councils as their agents.

5.9.4 Improvements

Capital Works

In addition to general maintenance work, we can build new flood defences if flooding is a serious problem in a particular area. We usually only build new defences to protect built up areas from flooding. All schemes must be technically, economically and environmentally sound. We keep a list of schemes called a Programme of Capital Works which helps us to plan for the future.

We have carried out pre-feasibility studies at Kingsbridge and Salcombe to decide whether it is possible to build defences to protect from tidal flooding at these sites.

Shoreline Management Plans

A Shoreline Management Plan (SMP) is a document which sets out a strategy for coastal defence for a specified length of coast, taking account of natural coastal processes, human and other environmental influences and needs (see Issue 6).

Recent research has suggested that the coastline of England and Wales can be divided into 11 major sediment cells. A sediment cell is defined as a length of coastline which is relatively self contained as far as the movement of sand and shingle is concerned and where interruption to such movement should not have a significant effect on adjacent sediment cells.

SMPs provide the vehicle for the long term sustainable protection of our coastlines. The objectives of SMPs are to:

- improve our understanding of coastal processes,
- work in partnership with all interests and organisations,
- prepare an agreed framework for the long term planning of coastal defences.

SMPs are part of an initiative on the future planning of our coastline, backed by MAFF, the Association of District Councils, English Nature and ourselves.

The Agency, in partnership with local authorities, County Councils and English Nature, are preparing the Lyme Bay and South Devon SMP which includes this length of coast, and covers the coastal cell from Portland Bill to Rame Head. The South Devon SMP is currently at Stage 2 of the process, which involves collecting data and setting objectives for the plan. West Dorset District Council is leading this initiative and the SMP is scheduled to be in place by 1998.

Duty of Care for Conservation

All new schemes and maintenance works are subject to an environmental impact appraisal. Under the legislation three main areas have to be considered, namely to take into account the impact of proposals on natural features, to have regard to protection features of historic interest, and to further the conservation and enhancement of flora, fauna and other natural features.

5.9.5 Flood Warning

Flood Warning Responsibilities

We recognise that irrespective of attempts to minimise the risk from flooding through the implementation of various policies and actions, flooding can occur and on occasion represents a risk to human life. With regard to public safety we operate a flood forecasting service in the catchment which uses rain-gauge and river level data from a number of sites, radar, and rainfall forecast data from meteorological agencies, and information from flood defence staff in the field.

A flood warning service is provided for the following stretches of river and coastline:

Table 40 Flood warning service

River	Stretch or location description	Types of warning issued
Avon	Didworthy to Aveton Gifford	Yellow, Amber, Red
Erme	Harford to Ermington	Yellow, Amber, Red
Tidal	South Devon Coast	Yellow, Amber, Red

As well as issuing flood warnings we have the lead role in making sure that they actually get through to the people at risk. Arrangements are agreed in consultation with local authorities and the

emergency services. Annual flood warning seminars are also held to review the effectiveness of the flood forecasting and warning process.

Dissemination arrangements are detailed in the Devon Flood Warning Dissemination Plan, a copy of which is available for inspection at our Area and Regional Offices.

Flood warnings are issued directly to the emergency services, relevant public authorities and utilities. Relevant warnings are issued directly to properties identified in the dissemination schedules incorporated within the Dissemination Plan. In addition flood warnings are passed to local radio stations, AA Roadwatch, The Meteorological Office and the ITV Teletext service.

Floodcall, a 'dial and listen' telephone information service, will be updated regularly to provide information of flood warnings in force at any time within the South West region.

The Rivers Avon and Erme both drain from Dartmoor and in general respond rapidly to rainfall. Levels can rise quickly in the upper reaches and floodwater travel rapidly down the watercourses. It is therefore important that warnings are disseminated quickly.

A leaflet describing our flood warning service is available from our Exeter office.

Flood Warning Standards of Service

In order to ensure that timely warnings are issued to the right people, we operate a system of Flood Warning Standards of Service. By defining lengths of river, or reaches, with common land use interests, those areas with a high population concentration can be treated as priority. We aim to provide a two hour warning of commencement of flooding wherever practicable. A survey to determine current Standards of Service across the region is due to be completed in 1999.

Any person or organisation who wishes to be included on the flood warning service is encouraged to contact us at our Exeter office. The service is free at the present time.

5.10 Water Quality

5.10.1 River Quality Objectives

The water quality targets that we use for managing surface water quality are known as River Quality Objectives (RQOs); these are based on the River Ecosystem (RE) classification scheme (see Appendix A). The RQOs that we are proposing to set for this catchment are detailed in section 3.

Map 16 shows where current water quality fails to meet its RQO. This assessment is based on three years of routine monitoring data from the Public Register collected between 1994 and 1996. We have shown failures to meet RQOs as significant and marginal failures. Significant failures are those where we are 95% certain that the river stretch has failed to meet its RQO. Marginal failures are those where we are less certain (between 50% and 95%) that the stretch has failed to meet its RQO.

Of the 19 monitored river stretches (93.2 km) in the Avon and Erme Catchment no stretches significantly fail to meet their RQO.

The River Avon from the A38 Bridge South Brent to Horsebrook marginally failed to meet its proposed RQO of RE1 (see Issue 2).

The River Erme from Fawn's Bridge to the Normal Tidal Limit marginally failed to meet its proposed RQO of RE2 and significantly failed to meet its proposed long term RQO of RE1 due to a 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 we will review the RQO for this stretch of watercourse in 1998; if no further pollution incidents have occurred we will set a RQO of RE1.



The monitoring site for the bottom stretch of the Gara from Higher North Mill to Slapton Bridge was relocated from Slapton Bridge to Goldswell Quarry in May 1996. Slapton Bridge is at a point between the Higher and Lower Ley; the river is silty and has very little flow and water quality here is not considered representative for the whole stretch. There is insufficient data available from the new site to assess compliance with the proposed RQO of RE1, although samples collected to date appear to show that this RQO is supportable.

"Set Aside" of Data

In certain circumstances we can "set aside" data, that is we will not take into account some or all the results for a particular determinand when we assess compliance with an RQO.

We may "set aside" data where high concentrations of metals or low pH values are predominantly caused by the natural geology of the catchment. This allows us to protect good water quality shown by other determinands in the RE classification. The headwaters of the Avon and Erme Catchment rise on Dartmoor, a moorland area with underlying granitic rocks. This gives rise to very acidic soils and watercourses have a limited buffering effect on precipitation which is naturally slightly acidic. This in turn can result in lowered pH in the watercourses. The provision for pH to be set aside in the River Avon, from Avon Reservoir to Shipley Bridge, and the entire Bala Brook has been used in the 1996 classification.

5.10.2 EC Bathing Water Directive

The EC Directive concerning the quality of bathing water (76/160/EEC)²⁹ seeks to protect public health and the amenity value of popular bathing waters by reducing pollution. The Directive contains standards for nineteen microbiological, physical and chemical parameters to assess bathing water quality. DETR assess compliance mainly by standards for bacteria (total and faecal coliforms) found in sewage.

We are responsible for monitoring the quality of identified, popular bathing waters and providing the results to DETR who decide whether the standards in the Directive have been met. Where identified bathing waters fail to meet the Directive, we are responsible for identifying sources of pollution that are causing failures, and making sure that improvements are made.

There are fourteen identified EC Bathing Waters in the catchment, these are shown on Map 17. There have been failures to comply with the standards of the Directive at seven of these sites. Details are shown in Table 41 and Issue 1.

Table 41 Details of failures of the EC Bathing Water Directive

Bathing water	Years in which failure recorded	Cause of failure
Mill Bay	1987	Probably sewage discharge from East Portlemouth, improvement work is planned (see section 5.5.1).
Salcombe North Sands	1986, 1989, 1991	Sewage discharge from Salcombe, see Issue 1.
Salcombe South Sands	1986, 1988, 1993, 1996	
Thurlestone (North)	All years 1986 - 1991	Sewage discharge from Thurlestone, ceased prior to 1992 bathing season and flows transferred to South Milton STW.
Bigbury-on-Sea (North)	1986	The main discharge from Bigbury STW contributed to these failures. We are negotiating with SWWSL to provide ultraviolet disinfection at this site.
Challaborough	1987	
Mothecombe	1986, 1994	Contaminated water from the Erme Estuary, see Issue 1.



5.10.3 EC Freshwater Fish Directive

The EC Directive on the quality of waters needing protection or improvement in order to support fish life (78/659/EEC)³⁰ ensures that water quality in designated stretches of water is suitable for supporting certain types of fish.

This Directive contains two sets of quality standards. One set of standards protects cyprinid or coarse fish populations, for example, roach and chub. The other set of more strict standards protects salmonid populations.

We are responsible for monitoring the quality of identified fisheries and reporting the results to DETR who decide whether the standards in the Directive have been met. Where the requirements of this Directive are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.

Map 17 shows the designated fishery stretches in the catchment, all of which have complied with the standards of the Directive since 1990.

We are investigating whether further stretches should be designated under this Directive (see Issue 5).

5.10.4 EC Nitrates Directive

The EC Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC)³¹ protects waters from pollution by nitrates used in agriculture. This Directive requires Member States to monitor the nitrate concentration in freshwaters (surface and ground) and review the eutrophic state of fresh surface, estuarine and coastal waters to identify those that are or could be affected by nitrate from diffuse agricultural sources. The land draining to these polluted waters must be designated as a nitrate vulnerable zone (NVZ). In England, Action Plans will be established by 1998 to reduce existing nitrate pollution and prevent further pollution. Outside NVZs, Member States must establish and promote a code of good agricultural practice. Regular reviews must be carried out of existing and potential new NVZs; the first must be completed in December 1997, and then at four year intervals. There are currently no NVZs in the catchment.

We are responsible for advising on the selection and boundaries of NVZs. The designation of NVZs and agricultural measures to be adopted is the responsibility of Government.

For details of the estuary water quality monitoring we carry out, see Issue 3 and Section 5.10.9.

5.10.5 EC Surface Water Abstraction Directive

The EC Directive concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (75/440/EEC)³² protects the quality of surface water used for public supply. This Directive ensures that water abstracted for public supply meets certain quality standards and is given adequate treatment before entering public water supplies.

The Directive sets out standards that must be achieved for water for public supply which is to be given different levels of treatment.

We are responsible for monitoring the quality of designated surface water abstractions and reporting the results to DETR who decide whether the standards in the Directive have been met. Where standards are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.

There are three identified surface water abstraction sites in the catchment; these are shown on Map 17 and in Table 42.

Table 42 Details of non-compliance at EC Surface Water Abstraction Sites

Site	Details of non-compliance
Avon Reservoir	Colour: 1994, 1995
	Total phenol: 1994
	Dissolved and emulsified hydrocarbons: 1994, 1995
	Dissolved iron: 1994, 1995, 1996
Bala Brook intake	Colour: 1994
	Total phenol: 1994, 1996
	Dissolved and emulsified hydrocarbon: 1994, 1995
River Erme Harford Moor intake	Colour: 1994
	Total phenol: 1994
	Dissolved and emulsified hydrocarbons: 1994, 1995
	Dissolved iron: 1996

All sites have failed to comply with the Directive standards for colour and total phenols in the period 1994 to 1996. This is due to natural runoff from the moorland surrounding the abstraction points, and a waiver for colour has been applied at all three sites since 1993. This means that we will not be taking action to ensure compliance with the Directive standard for colour. Under the terms of the EC Surface Water Abstraction Directive we are unable to apply a waiver for total phenols, even when failures occur as a result of natural causes. However, we are not intending to take any further action.

All sites have failed to comply with the Directive standards for dissolved and emulsified hydrocarbons in the period 1994 to 1996. We are concerned about the methods for analysis of these compounds, as specified by the Surface Water Abstraction Directive. Exceedences of the Directive standards cannot always be attributed to polluting discharges, and the Agency suspects that some exceedences may be due to natural compounds resulting from the breakdown of vegetation. We are involved in discussions with DETR, with a view to reviewing the analytical methods used.

We will continue to report exceedences of the EC Surface Water Abstraction Directive standards for dissolved and emulsified hydrocarbons. However, as there are no obvious sources of these compounds in the catchment we are not planning to take any further action until we receive direction from the DETR.

The Avon Reservoir failed to comply with the EC Surface Water Abstraction Directive standard for dissolved iron; the 1994 failure corresponded with high rainfall and was confirmed by investigation as due to runoff. Historic mining activities in the two watercourses feeding the reservoir have led to elevated iron concentrations, which are exacerbated by the naturally low pH of moorland streams. A waiver was applied in 1995; following the 1996 failure a waiver will be sought for all future years.

The abstraction site on the River Erme also failed to comply with the Directive standards for dissolved iron; elevated iron levels are associated with low pH levels in the upper catchment.

Following the abstraction of water from the above three sites, SWWSL provides treatment which ensures the water provided for public supply complies with the Drinking Water Standards for all these substances.

5.10.6 EC Dangerous Substances Directive

The EC Directive on pollution caused by certain substances discharged in the aquatic environment of the community (76/464/EEC)³² protects the water environment by controlling discharges to rivers, estuaries and coastal waters.

This Directive describes two lists of compounds. List I contains substances regarded as particularly dangerous because they are toxic, they persist in the environment and they bioaccumulate. Discharges containing List I substances must be controlled by Environmental Quality Standards

(EQSs) issued through Daughter Directives. List II contains substances which are considered to be less dangerous but which still can have a harmful effect on the water environment. Discharges of List II substances are controlled by EQSs set by the individual Member States.

We are responsible for authorising, limiting and monitoring dangerous substances in discharges. We are also responsible for monitoring the quality of waters receiving discharges which contain dangerous substances and reporting the results to DETR who decide whether the standards in the Directive have been met. Where the requirements of this Directive are not met, we are responsible for identifying sources of pollution and making sure that improvements are made. All discharges to rivers, estuaries and coastal waters consented for List I and/or II substances are monitored by the Agency.

We monitor two designated sites for List I substances in the Avon and Erme Catchment (see Map 17). Downstream of Gerston STW (serving Kingsbridge) a site is monitored for hexachlorocyclohexane (HCH) and aldrin, dieldrin, endrin and isodrin, while a site downstream of Ivybridge STW is monitored for the presence of HCH alone. Neither site has been found to exceed EQSs for these substances in the period 1990-1996.

The site downstream of Gerston STW is additionally monitored for the List II substances copper, nickel, zinc and lead. No EQS exceedences have been found for these substances in the period 1990-1996.

5.10.7 EC Urban Waste Water Treatment Directive

The EC Directive concerning urban waste water treatment (91/271/EEC) specifies minimum standards for sewage treatment and sewage collection systems.

This Directive specifies that secondary treatment must be provided for all discharges serving population equivalents greater than 2,000 to inland waters and estuaries, and greater than 10,000 to coastal waters. Discharges below these population equivalents receive appropriate treatment as defined in the AMP2 guidance note (see section 5.5.1). We are responsible for making sure that discharges receive the level of treatment specified in this Directive.

This Directive also requires higher standards of treatment for discharges to sensitive areas, and/or lower standards of treatment to less sensitive areas. Sensitive areas are those waters that receive discharges from population equivalents of greater than 10,000, and are or may become eutrophic in the future.

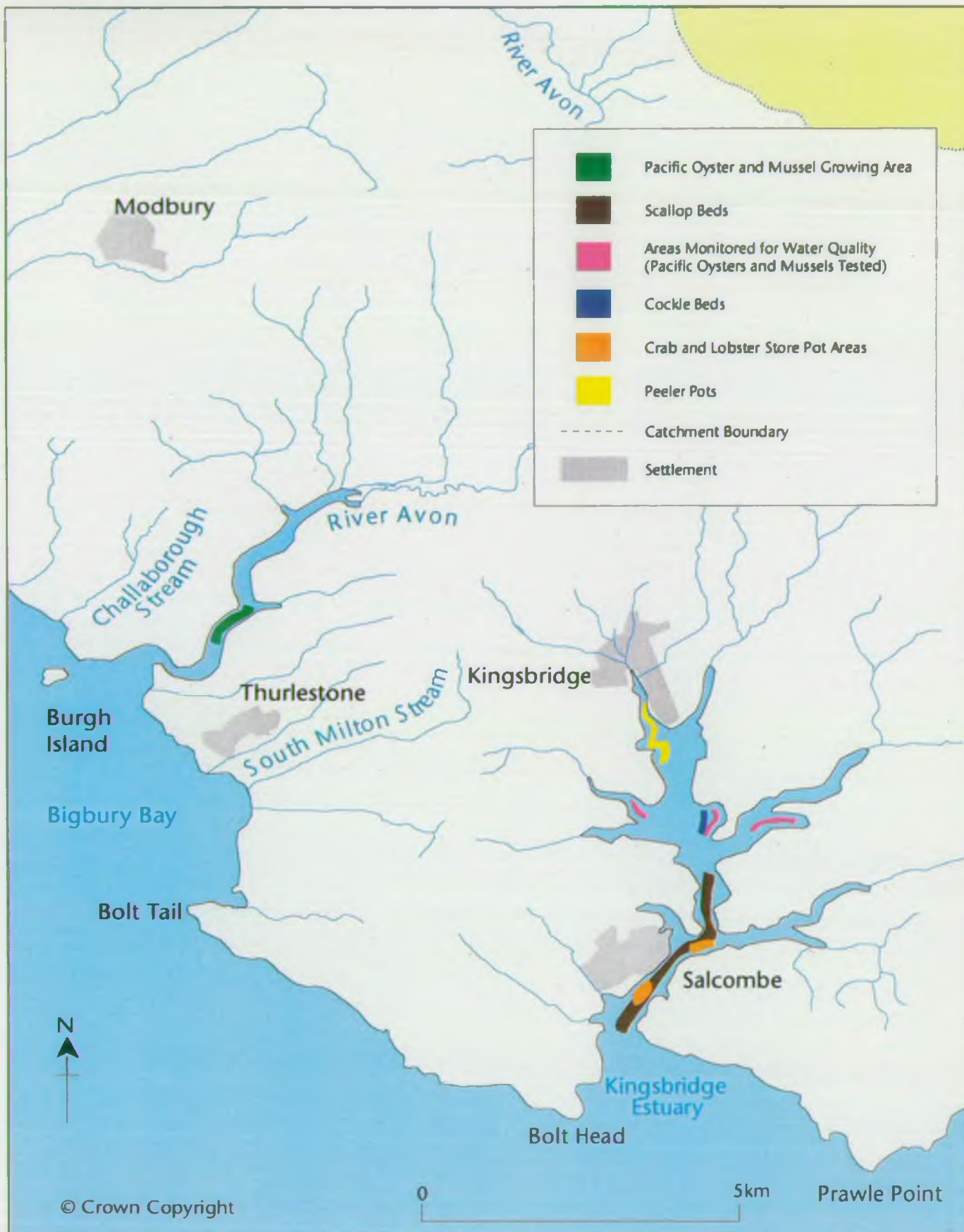
DETR decide if a watercourse is sensitive. We carry out monitoring and provide information to DETR and also ensure that discharges to sensitive areas receive a higher level of treatment.

Less Sensitive Areas or High Natural Dispersion Areas (HNDAs) are those estuarine or coastal waters which are naturally very dispersive. In these areas a lower level of sewage treatment is required. However, dischargers must demonstrate that no harm will be caused to the environment by the lower level of treatment. We are responsible for ensuring that these studies are carried out correctly. There are no HNDAs in the Avon and Erme Catchment.

Under the Urban Waste Water Treatment Directive the River Erme from Ivybridge STW to the normal tidal limit was identified as a candidate sensitive area. The qualifying discharge is Ivybridge STW. Studies to determine the status of this proposed area have been deferred for the period of this current round of designation.

In the Avon and Erme Catchment there are two Urban Waste Water Treatment Directive - Appropriate Treatment schemes at Torcross and Holbeton STWs (see section 5.5.1). The level of treatment required at both works is secondary with a statutory completion date of 2005.

Map 18 - Shellfisheries



5.10.8 EC Shellfish Hygiene Directive

The EC Shellfish Hygiene Directive laying down the health conditions for the production and the placing on the market of live bivalve molluscs (91/492/EC)³³ protects the health of consumers of live bivalve molluscs such as mussels and oysters. This Directive defines standards for shellfish quality required in the end product. It also classifies bivalve mollusc shellfish harvesting areas into four categories according to the concentrations of bacteria found in the shellfish flesh.

MAFF and the Department of Health (DoH) share responsibility for this Directive in England and Wales. We have only a minor role in implementing this Directive. The Agency provides information on the location of discharges that may affect harvesting areas; we will not grant consents that will result in a deterioration in class reported by CEFAS at the time of consent determination.

The most recent Shellfish Hygiene Classification lists for the catchment are shown in Table 43; these sites are shown on Map 18.

Table 43 Sites classified under the EC Shellfish Hygiene Directive

Site	Species	1995	1996	1997
Salcombe - North Pool Creek	non-native Pacific Oyster	B	Unclassified	B
Salcombe - All beds	non-native Pacific Oyster	Unclassified	B	B
Bigbury & Avon - West & East Bank	non-native Pacific Oyster	B	B	B
Bigbury & Avon - West Bank & Green Well	common mussel	B	B	B
Bigbury & Avon - East Bank	common mussel	Unclassified	Unclassified	C

The east bank of the Avon Estuary was unclassified in 1995 and 1996 as commercial activity here had ceased. In 1994 this area was classified as B for mussels; the 1997 classification is C (see Issue 1).

Within the Salcombe Kingsbridge Estuary only North Pool Creek was included in the 1995 listing. Commercial activity in the estuary at other sites had ceased (due to elevated levels of tributyltin) but South Hams District Council did not want the classification to lapse completely. There are now proposals by Devon Sea Fisheries Committee to set up a regulated fishery in the area. To support these proposals the council has instituted monitoring at three separate sites for both non-native pacific oysters and mussels. There is currently insufficient information on the mussels to determine a classification but the three areas have been classified as B for non-native pacific oysters.

Historically a single relaying area has been classified:

Table 44 Relaying sites classified under the EC Shellfish Hygiene Directive

Site	Species	1994	1995	1996
Bigbury and Avon West Bank Relay Area	non-native Pacific Oyster, native oyster and common mussel	B	unclassified	unclassified

5.10.9 Assessment of Estuary Water Quality

The catchment contains three coastal embayments: the Salcombe Kingsbridge, Avon and Erme estuaries. Estuary chemical water quality data has been obtained for five sites in the Salcombe Kingsbridge Estuary, and two sites in the Avon and Erme estuaries since 1990. Samples were collected from various water depths over a range of tidal, meteorological, and river flow conditions. The data indicate that water quality in all of these estuaries is generally good. However in the Salcombe Kingsbridge Estuary which is less well mixed than the Avon and Erme, the two upper estuary sites had elevated chlorophyll levels which were frequently associated with high levels of Total Oxidised Nitrogen (see Issue 3).



5.10.10 Biological Assessment of Water Quality

Biological river quality is based on the diversity of aquatic macroinvertebrate life, the small animals present in the river. They are unable to move far and respond to long term conditions within the watercourse. In addition they are affected by pollutants that are not monitored by our chemical monitoring programme (see Appendix A). Macroinvertebrates provide a good indication of the biological condition of the river. In order to present biological river quality, a biological classification has been devised (see Appendix A).

Map 19 shows the 1995 biological classification for the catchment. Very good or good biological quality was found at most of the sites monitored. Two sites, on the River Erme at Stowford Weir and on the River Avon at Shipley Bridge, were classified as having fairly good biological quality, due to a low diversity of invertebrates. This is often typical of moorland rivers with a fast flow and numerous boulders. No indications of water quality problems were found.

The Bala Brook shows fairly good biological quality (see Issue 1).

Two sites on the Slapton Stream and the South Grounds Stream are classified as fairly good quality, and a site on the River Gara upstream of Slapton Ley is classified as fair quality. The watercourses at all three sites have a slow flowing, silty nature, which unfortunately is not taken into account by the biological classification scheme we use. The invertebrate fauna is in fact typical for this type of habitat, and no indications of water quality problems have been found.

5.10.11 Groundwater Protection

The protection of groundwater is of great importance since once pollution has occurred it is extremely difficult and costly to clean up, and this may not always be possible. Pollution can put water supplies at risk, and may impact on river water quality.

We have prepared a framework document, the Policy and Practice for the Protection of Groundwater³⁴, which covers activities affecting groundwater quality, including physical disturbance to aquifers, point source and diffuse pollution and contaminated land.

We commit substantial resources to groundwater protection, applying our policies through our own authorisations and in our role as statutory consultee to the planning authorities. Many of the policies are not supported by any formal role of the Agency, but rely on us to persuade and educate landowners of the benefits of good practice.

Our policies are supported by Groundwater Vulnerability Maps. These show the location of aquifers and classify their vulnerability according to the properties of the soil and underlying strata. These maps allow planners, developers and regulatory bodies to make better informed judgements on the location of new developments, avoiding potentially polluting activities in high vulnerability areas. The Groundwater Vulnerability Map for the Avon and Erme Catchment is due for publication in May 1998.

5.10.12 EC Groundwater Directive

The EC Groundwater Directive (80/68/EEC)³⁵ controls the release of certain substances to groundwater. There are two lists of substances: List I substances, which should not be released and List II substances, which can only be released in limited amounts. Currently the principles of the Groundwater Directive are implemented through our waste management activities and by controlling the discharge of effluents to soakaways.

Other potential sources of List I and II substances are currently unregulated, such as disposal of spent sheep-dip and sewage sludge to land. The DETR is currently consulting on new regulations to bring all such discharges under control, these regulations should be implemented in early 1998.

There are no statutory standards for the quality of groundwater, and because of the difficulties in obtaining and interpreting information we have only limited data on the impacts of human activity

on groundwater quality. In drought conditions, however, most of the flow in rivers is derived from groundwater and so potential problems may be identified through our routine river monitoring programme. There are no known major areas of contaminated groundwater in this catchment.

5.11 Air Quality

5.11.1 National Air Quality Strategy

Under Part 4 of the Environment Act 1995¹ the Government was required to publish a national strategy for air quality¹⁵ including:

- a framework of standards and objectives for the pollutants of most concern;
- a timetable for achieving objectives;
- the steps the Government is taking and the measures it expects others to take to see that objectives are met.

The strategy was published for consultation in August 1996. We will be working closely with local authorities to help achieve the objectives of the National Air Quality Strategy.

5.11.2 Local Air Quality Management Areas

Local authorities took on the new responsibilities for assessing and managing air quality under the Environment Act from 1 April 1997. They will be conducting a review of air quality in their areas, and are required to produce Air Quality Management Plans in areas where air quality exceeds certain standards and guidelines.

5.11.3 Local Perspective

With the exception of ground level ozone (see Issue 11), ambient levels of pollutants such as sulphur dioxide, nitrogen oxides and lead, are generally lower in the South West of England than in many other parts of England and Wales. However, there is a need for a better understanding of air quality in the catchment (see Issue 11).

The Agency has published 'The Environment of England and Wales - A Snapshot'¹⁶ which describes the state of the environment, including air quality, in the UK.

5.11.4 Other Air Pollutants

Generally other air pollutants are at lower concentrations in the South West of England than in many other areas of the UK and, apart from isolated incidents, remain generally below the guidelines set by the Department of the Environment. Local authorities will, however, be reviewing air quality.

5.12 Wildlife and Earth Science

Various nature conservation designations apply to parts of the catchment (see Map 20). They reflect the diverse interests found in the catchment.

Part of the upper catchment is designated as a candidate Special Area of Conservation (SAC) under the terms of EC Directive 92/43/EEC, on the Conservation of Habitats and Wild Fauna and Flora. This site is internationally important for blanket bog.

Dartmoor National Park was designated for its nationally significant landscape and nature conservation interests. The Dartmoor ESA covers all of the moor which falls within the catchment.

Eleven sites (listed in Appendix B) are notified as Sites of Special Scientific Interest (SSSI). This designation indicates their national importance, measured against carefully selected criteria. Their value may be biological, geological or a combination. A wide range of species, habitats and earth science features are included.



Many sites which do not meet the criteria for selection as SSSIs are still valuable and it is important that they are also protected. Devon Wildlife Trust has carried out a survey programme in South Hams, supported by other bodies including the Agency, to identify areas which qualify as County or Local Wildlife Sites. A similar survey is planned for West Devon. No specific sites are identified within Dartmoor National Park as the whole area is considered to be at least this standard. In addition there is a programme to identify Regionally Important Geological Sites (RIGS). These are sites where an earth science feature or process is particularly well illustrated. South Hams has been surveyed and a survey of Dartmoor is in progress. The process is being co-ordinated by the Devon RIGS Group, a body including geologists and geomorphologists as well as representatives from local authorities, non-governmental organisations (NGOs) and government agencies.

Generally RIGS and County or Local Wildlife Sites do not have statutory protection, but they are often identified in Local Plans for special consideration, especially in relation to development. We have not mapped the many sites in the catchment as the scale of maps in this plan is considered inappropriate.

Most of the sites mentioned above are in private ownership, often with no public access. However, access is possible to all of the common land in Dartmoor National Park and also to a number of sites managed as nature reserves by various organisations. These are listed in Appendix B and include parts of Slapton Ley and the Salcombe Kingsbridge Estuary. To protect vulnerable wildlife, sites may not be open to the public without restriction.

The shores and coastal waters from Torbay to Start Point and Bolt Tail to Start Point have been classified as Sensitive Marine Areas. These are not statutory designations but they recognise the value of the marine life in the area and seek to protect it from inappropriate development or exploitation.

5.12.1 Biodiversity Action Plans

Wildlife and, to a lesser extent, earth science conservation is now being directed through a series of Biodiversity Action Plans (BAPs). These plans are derived from a national document³⁷ 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 45) which are also 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 45 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; 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; 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.

Table 45 Key habitats, features and species in the Avon and Erme Catchment

Habitat / Feature / Species	Threats	Relevant Issues
Blanket bog extensive peat deposits <i>Sphagnum imbricatum</i> (moss)	Burning, acidification Drying, shrinkage Uncertain	11, 12b
Valley mire scarce blue-tailed damselfly keeled skimmer	Acidification, drainage Drainage, habitat neglect Drainage	11, 12c
Upland heathland heather	Burning, grazing	12d
Rhōs pasture marsh fritillary	Agricultural improvement, neglect	12e
Rivers and streams otter dipper sand martin kingfisher salmon brook, river and sea lamprey bullhead	Eutrophication, acidification Habitat loss, disturbance Acidification, bridge works Bank protection works Bank protection, water quality	2, 11, 12f 14 12g 12g 12g 5 12h 12h
Freshwater marsh and lagoon aquatic warbler Cetti's warbler bittern strapwort	Eutrophication, water levels Uncertain Habitat loss Loss of large reedbeds, water quality Water levels, management	1, 2, 12i
Estuarine habitats; saltmarsh, mudflats, sandflats dwarf spike rush pennyroyal	Development, recreation, coastal/flood defence Uncertain, specialised Uncertain, specialised	6, 12k, 14 12l 12l
Shingle bars shingle bars and beaches	Recreation, coastal defence Interrupted material supply	6, 12j
(Lowland heath) heath lobelia	Agricultural improvement	12a 12l

5.13 Fisheries

5.13.1 Conservation of Key Fish Species

Several species of fish are of concern from a conservation perspective, although they are not important as either commercial or angling species. They include bullhead, brook lamprey, river lamprey and sea lamprey. All are included in Annex IIa of the EC Habitats Directive¹⁹ and in the UK Biodiversity Action Plan²⁰ as a result of their unfavourable status in a European context. Our populations are apparently healthy and therefore important. We have responsibilities in Articles 2 and 11 of the Directive to take measures to maintain and monitor favourable conservation status for these species (see Issue 12h).

5.13.2 Salmonid Species

The rivers Avon and Erme sustain modest runs of salmon, and good runs of sea trout. The majority of salmon enter the river in the summer months, principally August, and then make their way upstream to the spawning grounds. The sea trout follow a similar pattern although the peak of the run tends to be earlier, generally in June. Brown trout are widespread across the catchment. Maps 21 and 22 show the status of juvenile salmon and brown trout.

Map 21 - Juvenile salmon distribution and status



Map 22 - Brown trout distribution and status



Juvenile salmon productivity in the Avon Catchment has historically been limited - principally as a result of a lack of suitable spawning areas, much of the river being rocky and of a steep gradient (see Map 23). There are, however, some areas in the mid to lower reaches of the main river where salmon are able to spawn successfully and juvenile production is good. The Badworthy Brook, lower Glaze Brook, Bickham Brook and the Cocks Brook all contain areas in which salmon spawn, albeit to a limited extent only. Trout production is much better, with most of the main river and many of the tributaries supporting good numbers of juveniles.

There are very good spawning areas in the upper reaches of the Erme Catchment in the granite streams draining Dartmoor, although high flows are required to permit salmon access (see Issue 4). Salmon spawn consistently in the Erme at Ivybridge where there are some suitable areas of gravel. The Ludbrook contains important spawning areas for salmon, and they have also spawned successfully in the Ugbrook and the Brownstone. Trout spawn throughout the catchment, and levels of juvenile productivity are generally at, or slightly below average. The majority of migratory fish spawning in both rivers takes place in November and December. Brown trout, which spawn throughout both catchments, generally spawn slightly earlier.

The main spawning areas and juvenile nursery areas are surveyed every 3 years to assess juvenile numbers. The Avon and Erme will be surveyed during the summer of 1997.

5.13.3 Coarse Species and Eels

There are no significant coarse fish populations on the river other than minor species, namely minnows, stone loach and bullheads, all of which are relatively common (see Map 24). Bullheads are noticeably absent from the moorland, which is in keeping with other Dartmoor rivers. It is known that this species is not tolerant of low pH which is characteristic of many moorland streams in the area. Eels are found throughout the Avon and Erme Catchments. Both rivers sustain a small run of elvers during the spring months.

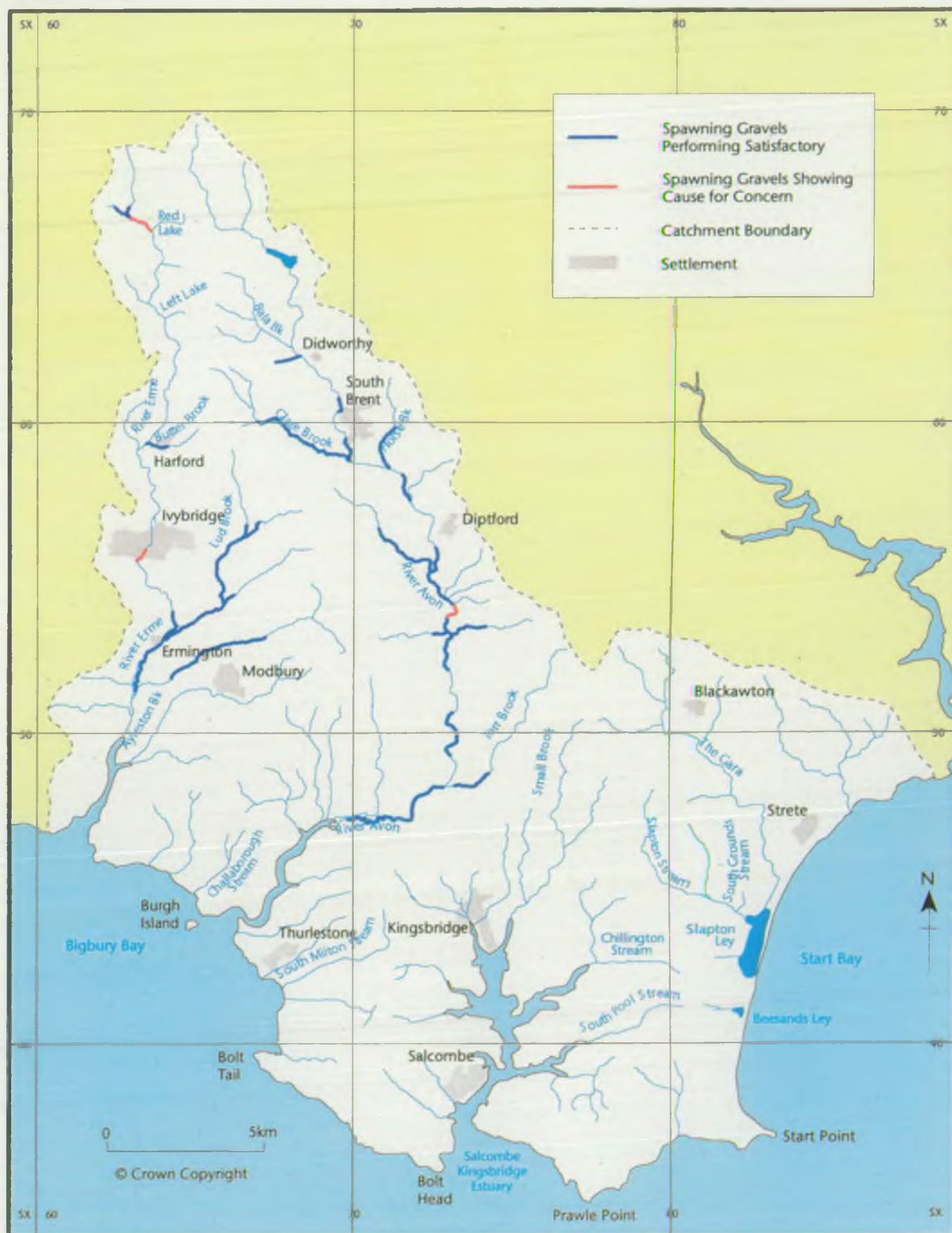
Slapton Ley and Beesands Ley support natural coarse fisheries. Both lakes are similar in character and contain roach, rudd, pike and perch. In Slapton Ley, the population has fluctuated considerably since observations were first made in 1970 - declines in one species being offset by an increase in numbers of another. A major fish mortality occurred in the winter 1984/5 when the Ley became frozen, dramatically reducing the numbers of all species present. Further influences on the stock, including outbreaks of the tapeworm *Ligula intestinalis* which suppressed roach stocks and repeated eutrophication events, often resulted in mortalities of all species.

Eels have always been very common in both Leys. In Slapton, commercial harvesting by fyke netting was carried out over a three year period, substantially reducing numbers. When conditions permit, elvers are known to try to enter the Ley although often the shingle bank prevents open access from the sea.

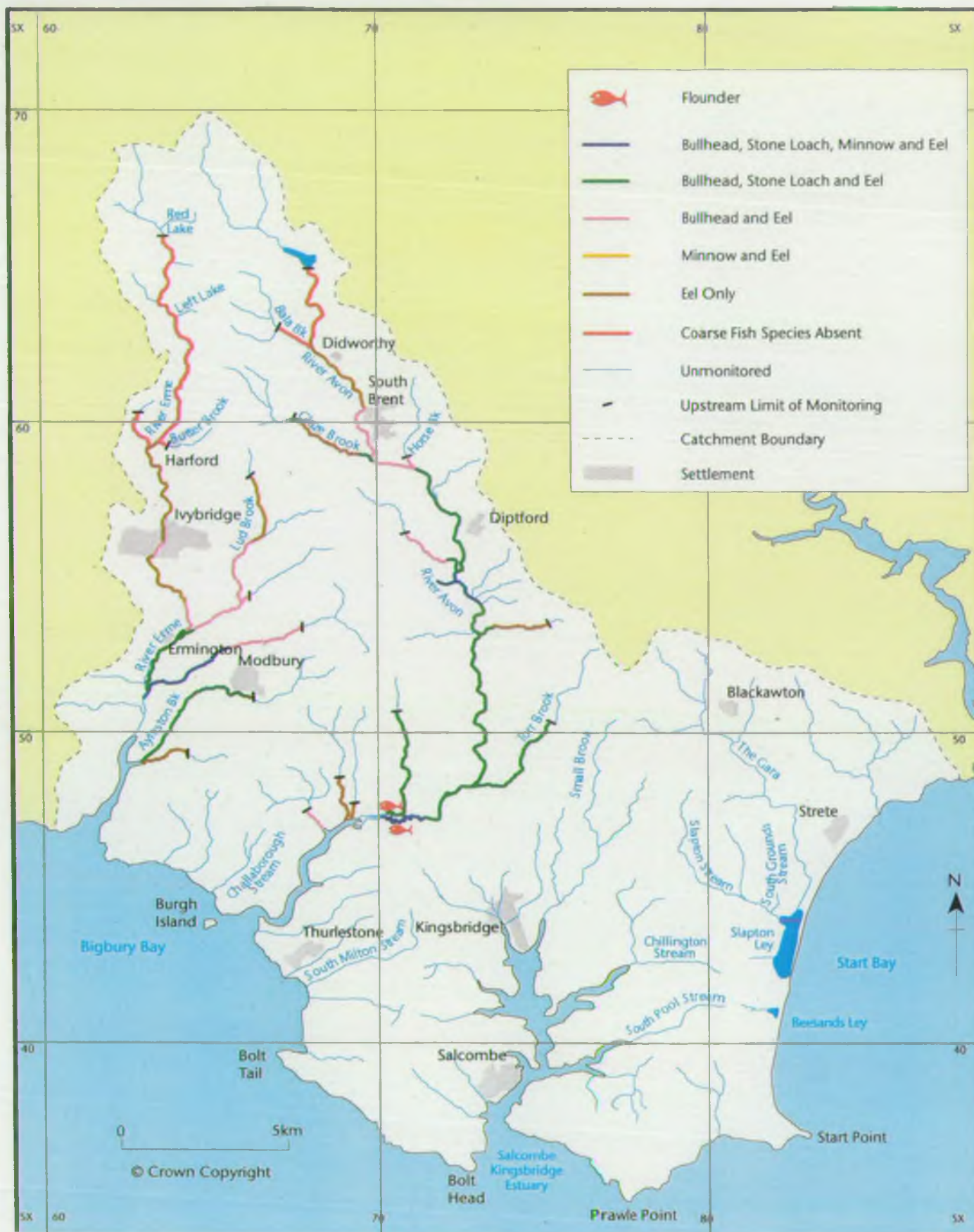
5.13.4 Estuarine Species

The Avon Estuary is a designated bass nursery area and fishing for this species from a boat is prohibited from 1 May - 31 December. This affords protection for juvenile bass which proliferate in the tidal reaches at certain times of the year. Mullet and flounders are common in both estuaries and often penetrate upstream to the tidal limit. Sand eels are found in large numbers in the Avon estuary in the summer months.

Map 23 - Spawning gravels



Map 24 - Freshwater coarse fish and eels



5.13.5 Commercial Fisheries

The fishing rights in the Erme Estuary are privately owned by the Flete estate, and the owners do not permit any form of commercial fishing.

The fishing rights in the Avon Estuary are owned by the Duchy of Cornwall. Commercial drift netting is carried out for mullet and bass outside the nursery area closed period. In the closed period, rod and line fishing for bass is permitted from the shore only. The Agency assist MAFF in the enforcement of the bass nursery area and several Agency staff have limited British Sea Fishery Officer powers for this purpose.

The use of fixed nets in the estuaries is prohibited by byelaw, and occasional problems arise with illegal fishing taking place, targeting either bass or migratory fish. Illegally set nets are removed and, where possible, offenders prosecuted.

Prior to 1980, a net owned by the Duchy of Cornwall operated in the Avon Estuary which used to take over 100 salmon and 50 sea trout. As a conservation measure, the net has not been operated since 1979, and its use is now disallowed by byelaw.

As a further measure to control exploitation, the Agency purchased the rights to operate a salmon trap located on the weir at the tidal limit. Since the trap and rights were purchased in 1984, use of the trap has all but ceased and salmon and sea trout are able to pass through unhindered.

5.13.6 Angling

Reported rod catches for the Avon and Erme in 1996 are shown in Table 46. The average reported salmon rod catch for the period 1974 to 1996 is 26 on the Avon and 2 on the Erme. The average reported sea trout rod catch for the period 1974 to 1996 is 167 on the Avon and 58 on the Erme. Prior to 1974, rod catches for the Erme were combined with those of the Avon.

Table 46 Reported rod catches for salmon and sea trout

		Reported rod catch in 1996
Salmon	Avon	35
	Erme	5
Sea trout	Avon	168
	Erme	21

Appendix A: Our Environmental Standards

There is a great deal of legislation that determines the way we operate and carry out our enforcement duties. The Environment Act 1995 provides some harmonisation of powers, but we also rely on existing legislation, including the Control of Pollution Act (1974), the Control of Pollution (amendment) Act (1989), the Environmental Protection Act (1990), the Radioactive Substances Act (1993), the Salmon and Freshwater Fisheries Act (1975), the Water Resources Act (1991), and the Land Drainage Act (1991).

We are the competent Authority for over 25 European Community environmental Directives whilst a further 70 Directives affect our policies and activities. These include the Quality of Bathing Waters, Dangerous Substances, Industrial Plant Emissions, Waste Management Framework, Quality of Water to Protect Freshwater Fisheries, and the Urban Waste Water Treatment Directives.

Operational Standards are the technical, scientific and engineering procedures which are necessary to put legislation and our policy into practice. These take many forms, including policy statements, procedural manuals, and a suite of quantitative output and performance measures that we monitor quarterly or annually. Details of our operational standards are published in technical handbooks, research & development reports, and information leaflets. Further details are available from our local offices.

A1: The RQO 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 NWC scheme. The Re classification has five classes, as shown in Table 47. 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.

Table 47 Standards for the five River Ecosystem use classes

Use class	DO % sat 10%ile	BOD (ATU) mg/l 90%ile	Total ammonia mgN/l 90%ile	Un-ionised ammonia mgN/l 95%ile	pH 5%ile & 95%ile	Hardness mg/l CaCO ₃	Dissolved copper µg/l 95%ile	Total zinc µg/l 95%ile	Class description
1	80	2.5	0.25	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500	Water of very good quality suitable for all fish species.
2	70	4.0	0.6	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500	Water of good quality suitable for all fish species.
3	60	6.0	1.3	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1,000 2,000	Water of fair quality suitable for high class coarse fish populations.
4	50	8.0	2.5		6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1,000 2,000	Water of fair quality suitable for coarse fish populations.
5	20	15.0	9.0						Water of poor quality which is likely to limit coarse fish populations.

A2: The GQA 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 National Water Council (NWC) Scheme for this purpose.

Biological GQA

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 Ecological Quality Indices (EQI):

Table 48 Ecological Quality Indices for the GQA biological classification

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

The RIVPACS III computer program 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.

Appendix B: Wildlife and Earth Science Designations

ESAs

Dartmoor Environmentally Sensitive Area

SSSIs

Andrew's Wood	Species rich grassland, wet heath and secondary woodland with plant interest.
Bolt Head to Bolt Tail	Flowering plant, lichen, invertebrate and bird interest.
Erme Estuary	Estuary, saltmarsh, freshwater & oakwood habitats with breeding and wintering bird interest.
Lady's Wood & Viaduct	Species rich meadow (Rhôs pasture), coppice with standards woodland and stream.
Piles Copse	Ancient, high level, Dartmoor oakwood with bryophyte interest.
Prawle Point to Start Point	Geological plus lichen, invertebrate & other species interest, plus intertidal habitats.
Salcombe to Kingsbridge	Intertidal and subtidal flora and invertebrate fauna. Some communities are outstanding within the northeast Atlantic.
Slapton Ley	Geomorphological plus lichen, fungi invertebrate wintering bird and higher plant interest.
South Dartmoor	Blanket bog, mixed valley mire & unimproved acidic grassland/heathland mosaic plus geological (palynological).
South Milton Ley	Freshwater reedbed with breeding & passage bird interest.
Stokenham	Lichen interest.

Proposed Special Areas of Conservation

Dartmoor : Part of this pSAC is within the catchment (part South Dartmoor SSSI). It is to be notified for its blanket bog.

National Nature Reserves

Slapton Ley : Managed by the Herbert Whitley Trust and Field Studies Council

Local Nature Reserves

Salcombe - Kingsbridge Estuary : Managed by South Hams District Council

Non-statutory Nature Reserves

Andrew's Wood, Loddiswell	Wet woodland & heathy grassland with species interest.
Lady's Wood, Ugborough	Coppice with standards woodland.
Hall Farm, near Harford	233 acre farm managed for conservation.
Bantham Copse, Bantham	Small area part wood, part butterfly area.
The Plantation, Salcombe	Small area of broadleaved trees.
Pig's Nose Valley, East Portlemouth	Osier beds with passage bird interest.
Prawle Point, Chivelstone	Mosaic of habitats with passage bird interest.
South Milton Ley, South Milton	Reedbed with breeding and passage bird interest.
Woodcot Wood, Salcombe	Woodland

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.

alluvial - referring to materials eroded, transported and deposited by the action of river flow.

ammonia - a chemical found in water often as the result of discharge of sewage effluents. High levels of ammonia affect fisheries and abstractions for potable water supply.

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.

aquifer - layer of porous rock able to hold or transmit water.

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 collect 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.

controlled waters - defined by the Water Resources Act 1991 Part III Section 104. They include groundwaters and inland waters, estuaries and coastal waters to three nautical miles from the shore.

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 freshwater's natural buffering capacity.

dangerous substances - substances defined by the European Commission as in need of special control because of their toxicity, bioaccumulation and persistence. The substances are classified as List I or II according to the Dangerous Substances Directive.

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

determinand - a general name for a characteristic aspect of water quality. Usually a feature which can be described numerically as a result of scientific measurement, e.g. Ph, BOD, DO, etc.

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.

Drought Order - orders made by the Secretary of State upon application by the Environment Agency or a water undertaker to meet deficiencies in the supply of water due to exceptional shortages of rain. Drought Orders are sub-divided into 'ordinary' and 'emergency'. An 'ordinary' Drought Order may, for example, authorise abstraction from an unlicensed source or override the conditions pertaining to an abstraction licence. An emergency drought order might prohibit, such as in car washes.

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.

fissure - a crack or open break in rocks.

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

fyke net - net designed to catch eels, consisting of a tube of netting supported by hoops with three or more internal funnels.

game fish - e.g. salmon and trout.

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.

heavy metal - metals such as copper, zinc, cadmium, nickel, lead and mercury that may have deleterious environmental impact.

hydrogeology - branch of geology concerned with water within the earth's crust.

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 BATNEEC and 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.

metamorphic aureole - the zone of rocks surrounding an intruded mass of igneous rock, e.g. granite, which has been altered and affected by the heat.

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/l laid down in the 1991 EC Nitrate Directive, and where compulsory, un-compensated agricultural measures will be introduced from 1996 as a means of reducing those levels.

outfall - the point where a river or pipe discharges.

permissive powers - powers which confer the right to do things but not the duty.

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.

phenols - a class of aromatic organic compounds derived from a benzene ring structure. Toxic by ingestion, inhalation and skin absorption.

poaching - trampling by livestock causing land to break up into wet muddy patches.

Public Surface Water Sewer - sewers which transmit surface water runoff to a watercourse. The water should be uncontaminated and is the responsibility of the sewerage undertaker to maintain and control.

Q95 - the flow that on average is equalled or exceeded for 95% of the time.

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.

return period - refers to the return period of a flood. Flood events are described in terms of the frequency at which on average a certain severity of flood is exceeded. This frequency is usually expressed as a return period in years e.g. 1 in 50 years.

revetment - facing built to support a bank.

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.

set aside - the EC set aside scheme was first introduced for the crop year 1991/1992 as part of the Common Agricultural Policy reform. Farmers are compensated for setting aside land used for the production of arable crops.

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.

sludge - the accumulation of solids from treatment processes.

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.

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

spill - material and silt removed during dredging or excavation.

strata - layers of rock, including unconsolidated materials such as sands and gravels.

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
BATNEEC	Best Available Technique Not Entailing Excessive Cost
BAP	Biodiversity Action Plan
BDS	British Dragonfly Society
BOD	Biochemical Oxygen Demand
BSBI	Botanical Society of the British Isles
BTO	British Trust for Ornithology
CAP	Common Agricultural Policy
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CLA	Country Landowners Association
DAS	Devon Archaeological Society
DBAP	Biodiversity and Earth Science Action Plan for Devon
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
DoE	Department of the Environment
DoH	Department of Health
DWT	Devon Wildlife Trust
EC	European Council
EH	English Heritage
EN	English Nature
EPAQS	Expert Panel on Air Quality Standards
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
GATT	General Agreement on Trade and Tariffs
GQA	General Quality Assessment
HCS	Heritage Coast Service
HCH	Hexachlorocyclohexane
HMIP	Her Majesty's Inspectorate of Pollution
HNDA	High Natural Dispersion Area
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
NFU	National Farmers Union
NGO	Non-governmental Organisation
NII	Nuclear Installations Inspectorate
NRA	National Rivers Authority
NT	National Trust
NVZ	Nitrate Vulnerable Zone
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
SAM	Scheduled Ancient Monument
SHDC	South Hams District Council
SMP	Shoreline Management Plan
SSA	Strategic Supply Area
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWWSL	South West Water Services Limited
TBT	Tributyltin
TBC	Torbay Borough Council
TDC	Teignbridge District Council
UK	United Kingdom
WDA	Waste Disposal Authority
WDBC	West Devon Borough Council
WLMP	Water Level Management Plan
WRA	Waste Regulation Authority
WTW	Water Treatment Works

Units

°C	degrees centigrade
g	grams
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	milligrams
MI	megalitre
MI/d	megalitres per day
MI/yr	megalitres per year
mm	millimetre
ng/l	nanogram per litre
ppb	parts per billion
ug/m ³	micrograms per cubic metre
<	less than
>	greater than
≥	greater than or equal to
%	percentage

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