



# local environment agency plan

## RIVER TEIGN

### ACTION PLAN

JANUARY 1998



ENVIRONMENT  
AGENCY

## Foreword

The integrated management of the environment is a fundamental philosophy for the Environment Agency with Local Environment Agency Plans (LEAPs) taking a key role in this approach.

The River Teign Catchment covers a popular area of Devon including part of Dartmoor National Park and the South Devon Heritage Coast. The towns of Newton Abbot, Teignmouth and Torquay are important economic and tourist centres and it is important that the assets of the catchment are maintained and protected both now and for future generations to enjoy. It is vital that the needs of all uses of the area, including flora and fauna, are balanced to ensure continued protection of these precious assets. This Action Plan epitomises the Agency's commitment to protect and where necessary enhance the environment through the Agency's own actions or in association with other organisations.

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

*G. R. Bateman*

**GEOFF BATEMAN**  
Area Manager, Devon

Environment Agency  
Information Centre  
Head Office



127202

**Further copies of this Action Plan can be obtained from:**

**Richard Parker - Devon Area  
Environment Agency South West Region  
Manley House  
Kestrel Way  
Exeter EX2 7LQ**

**(01392) 444000**

**Environment Agency Copyright Waiver**

This report is intended to be used widely and may be quoted, copied or reproduced in any way, provided that the extracts are not quoted out of context and that due acknowledgement is given to the Environment Agency.

*Note: This is not a legally or scientifically binding document*

Map 1 - River Teign Catchment





# map 1

# Contents

## Foreword

<b>1. Introduction .....</b>	<b>1</b>
1.1 The Environment Agency .....	1
1.2 Local Environment Agency Plans.....	3
<b>2. Review of the Consultation Process .....</b>	<b>5</b>
<b>3. Catchment Area .....</b>	<b>5</b>
<b>4. Activity Tables .....</b>	<b>6</b>
Issue 1: Impact of Effluent Discharges .....	6
Issue 2: The Impact of Mineral Extraction .....	9
Issue 3: Impact of Abandoned Mines .....	11
Issue 4: Problems Associated with Development .....	12
Issue 5: Impact of Farming and Forestry on Rivers and Wetlands .....	14
Issue 6: Barriers to Fish Migration .....	16
Issue 7: Need to Control Exploitation of the Salmonid Fishery .....	17
Issue 8: Reported Problems with Fish Stocks .....	18
Issue 9: Acidification of Dartmoor .....	19
Issue 10: Forecast Deficit in Public Water Supply.....	21
Issue 11: The Effect of River Regulation by Fernworthy Reservoir .....	21
Issue 12: Concern over Low Flows .....	22
Issue 13: Concerns over Algal Blooms .....	23
Issue 14: Biodiversity and Earth Science .....	23
Issue 15: Spread of Invasive Plants .....	29
Issue 16: Lack of Information on Archaeological/Historic Value of Catchment .....	30
Issue 17: Recreation and the Environment .....	31
Issue 18: Concerns over the use of Antifouling Paints on Boats.....	32
Issue 19: Need to Protect Landscape Quality .....	34
<b>5. Appendices</b>	
Appendix 1 Priority Habitats in the River Teign Catchment .....	35
Appendix 2 Guide to Consultation Report and Action Plan Issues .....	35
Glossary .....	37
Abbreviations and Units .....	38
References .....	40





# 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 Department of the Environment (DoE) dealing with the technical aspects of waste and contaminated land.

#### Our Principal Aim

Our aim, as set out in the Environment Act 1995<sup>1</sup>, 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".

#### 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.

#### The Role of the Environment Agency

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

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



The Pollution Control function includes:

- Integrated Pollution Control (IPC) regulating the most polluting, or technologically complex, industrial and other processes in air, on land or in water.
- Water quality and pollution control which prevents and controls pollution and monitors the quality of rivers, estuaries and coastal waters.
- Radioactive Substances regulating the disposal of radioactive material, including that from licensed nuclear sites, and regulating the accumulation, keeping and use of radioactive materials, except from licensed nuclear sites.
- Waste Regulation setting consistent standards for waste management practice to regulate the treatment, storage, movement and disposal of controlled waste. The Agency also has a requirement to register and monitor those who produce waste imposing obligations to reuse, recover or recycle products and materials.
- Reporting on the extent of contaminated land and contributing to its management (primarily undertaken by local authorities).
- Abandoned mine operators are also required to work with the Agency so that steps can be taken to prevent minewater 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 committee for some estuaries. We have statutory duties with respect to commercial fishing for sea fish and shellfish in these waters.

The Agency has statutory duties under the Environment Act 1995<sup>1</sup> to promote the conservation of wildlife and landscape of inland and coastal waters and associated land, and to further the conservation of wildlife, landscape and heritage features when carrying out its operational or regulatory actions. We also have duties to promote the use of such water and land for recreation, and to consider the need to maintain public access to such sites.

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

The Environment Agency will not be dealing with:

- Waste collection and litter - responsibility remains with local authorities;
- Noise pollution - responsibility remains with local authorities' environmental health departments;
- Drinking water quality - responsibility remains with private water companies and local authorities;
- Public health;

- Those aspects of the control of air pollution which remain with local authorities;
- Planning permission is the responsibility of the local authority who will contact us when necessary. The local authorities also deal with contaminated land issues in liaison with us.

## 1.2

### Local Environment Agency Plans

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

#### Action Plan and Annual Reviews

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.

#### LEAPs and 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. Teignbridge District Council have produced a Local Agenda 21 Statement of Commitment and an Action Programme through their Agenda 21 Steering Group, which consists of Council Officers representing a broad range of functions. South Hams District Council have supported an independently produced Agenda 21 Plan, a series of recommendations for action that will act as a 'signpost' for organisations and individuals to follow. Mid Devon District Council have also produced a Local Agenda 21 plan which compiles the key issues and areas for action identified during community consultation. Torbay Borough Council are intending to produce a plan within the next two years; they are progressing several initiatives that arose from consultation with the community. 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. We will include details of Agenda 21 initiatives in which the Agency is involved in future plans.



### 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. 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.

### Local Environment Agency Plans and Non-statutory Plans

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

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

- The Nature of Devon: A Biodiversity Action Plan (draft)<sup>2</sup>
- The Nature of Dartmoor: A Biodiversity Profile<sup>3</sup>
- Devon's Local Agenda 21 Network Issues Report<sup>4</sup>
- Lyme Bay and South Devon Shoreline Management Plan (in preparation)
- Teign Estuary Management Plan (in preparation)

### Local Environment Agency Plans and the Catchment Steering Group

This group represents a range of commercial, local authority, recreational 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:

<i>Name</i>	<i>Representing</i>
Mr R Barter	Local Farmers
Mr G Bond	Teignmouth Harbour Commission
Mr J Briggs	Local Industry
Mr J Collins	Torbay Borough Council
Mr H Ellard	Waste Disposal
Mr B Foster	Coarse Fishing
Mr M Williams	South West Water Services Ltd
Mr J T Getliff	Upper Teign Fishing Association
Ms S Goodfellow	Dartmoor National Park Authority
Mr W Highgate	Teign Fishermen and Waterman's Association



Mr P M Knibbs  
 Mr T Page  
 Mr D Smallshire  
 Mr C W Stanyon  
 Mr W J C Watts  
 Mr P Watson  
 Mr M Weaver

Lower Teign Fishing Association  
 Teignbridge District Council  
 Farming and Rural Conservation Agency  
 Teignbridge Association of Local Councils  
 Teign Riparian Owners  
 The National Trust  
 River Teign Riparian Owners

## 2. Review of the Consultation Process

The issues listed in this Action Plan were either identified in the Consultation Report<sup>1</sup> or resulted from the Consultation Process. The Consultation Report<sup>1</sup> was launched in March 1997 and the consultation period concluded on 31 May 1997. Responses were received from 70 organisations and individuals; these were collated and summarised in our Summary of Responses to Public Consultation (available on request).

In general consultees were very supportive of the plan and welcomed the opportunity to comment on environmental issues. The most commented upon issues were: Problems associated with development; Impact of sewage discharges; Impact of farming and forestry on rivers and wetlands; and Concern over low flows. Many of the organisations who responded identified specific areas where they could work in partnership with the Agency to help resolve some of the issues.

## 3. Catchment Area

This plan covers the River Teign and Torbay Streams Catchment, an area of approximately 570 km<sup>2</sup>, and includes a 40 km stretch of the South Devon coast (see Map 1).

The River Teign rises on Dartmoor (SX 614 840) at a height of 520 metres Above Ordnance Datum (AOD). The length of 'main river' for the River Teign is 42 km. The catchment comprises several subcatchments of varied topography and geology which in turn dictate a variety of land uses. The principal subcatchments are the Aller Brook and Rivers Lemon and Bovey. Of these, the Aller Brook subcatchment is the most heavily urbanised.

Torbay is the principal settlement, with a population of 119,660 (1991 census). Torbay comprises the towns of Torquay, Paignton and Brixham, as well as a number of smaller villages. Other major settlements are Newton Abbot, Teignmouth, Bovey Tracey, Kingsteignton and Kingskerswell. The total population of the catchment is estimated at around 208,500 (1991 census).

The principal industries are tourism, agriculture and ball clay extraction. The coastal resorts of Torbay and Teignmouth cater for many visitors during the summer months, when the population can rise by as much as 50%. Agriculture is varied in the catchment with land use mainly grassland on higher and steeper slopes, arable on gentler slopes, and some horticulture (especially on the urban fringes). The ball clay deposit, centred in the lower Teign Valley, is internationally important and hence very significant to the economy of the area. Wholesale and retail distribution and manufacturing industries are also present in the catchment.

There are four major public water supply reservoirs: Femworthy and the reservoir complex comprising Kennick, Tottiford and Trenchford (KTT).

## 4. Activity Tables

The following tables outline the actions needed to address the issues we identified in the Consultation Report; they also include some additional issues raised during the consultation process.

Several changes to the issues raised in the Consultation Report have been made as a result of the comments received; issues have been renumbered and existing issues modified (see Appendix 2).

The tables show the following information:

- Organisations which will implement the proposed activities, either in a lead role or as a key supporter, are listed under the heading 'Action by Lead Other'.
- A timetable for the activity.
- An estimate of cost to us over the next five years, where available. The initial 'n/a' means that we do not contribute to the funding of the action, 'unknown' means that no cost estimate is available at present.
- The financial years covered by this plan are represented by a single year, for example, '97' is the financial year April 1997 to April 1998.
- Please refer to the abbreviations section at the end of the report for the definition of acronyms and abbreviations.

The following points should also be noted:

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

### Issue 1: Impact of Effluent Discharges

#### Background

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

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

There are a number of sites in the catchment where water quality is impacted by unsatisfactory sewage discharges and sewerage systems.



Improvements to South West Water Services Ltd's (SWWSL) discharges are subject to funding approved by OFWAT, the water industry's economic regulator. A Strategic Business Plan, 'Asset Management Plan 2' (AMP2)<sup>6</sup>, for improvements during the period 1995 - 2005 has been developed. This will now be reviewed in the 1999 periodic review of water charges and incorporated in the next funding programme, AMP3 which will run from 2000 - 2010.

### Effects

**River Bovey** - The River Bovey from Little Bovey to the Teign confluence marginally failed its RQO of RE1 in 1996 (based on three years of data) because of high Biochemical Oxygen Demand (BOD) results. These all occurred following periods of heavy rainfall. Storm discharges from Heathfield Sewage Treatment Works (STW) may be a cause of, or contribute to, this pollution.

**Scotley Brook** - The Scotley Brook marginally failed the proposed RQO of RE1 in 1996 because of low dissolved oxygen (DO) concentrations, which occurred during the summer of 1995. Low river flows are the cause of this failure (see Issue 12), but discharges from Crockernwell STW contribute to the problem due to insufficient dilution of the effluent. We have recommended that development is restricted at this site until Crockernwell STW is improved under AMP2.

**Doddiscombsleigh Stream** - The Doddiscombsleigh Stream is impacted by the discharge from Doddiscombsleigh STW; we have recommended that development is restricted at this site. Doddiscombsleigh STW will be improved under AMP2.

**River Lemon** - Water quality in the River Lemon is impacted by the discharge from South Knighton STW. This is another site where we have recommended that development is restricted. South Knighton STW will also be improved under AMP2.

**River Teign** - The River Teign from Spira Bridge to above Heathfield landfill site marginally failed its RQO of RE1 in 1996 as a result of a single high BOD result in 1995. We will continue to monitor this stretch to see if this problem recurs.

The River Teign (from Gidleigh Park Hotel to below Chagford STW) fails to comply with its long term RQO, in some years, because of high BOD and total ammonia levels; these are thought to be due to discharges of storm sewage from the works. Investigation work found that while final effluent quality at Chagford can be very poor (the final effluent outfall is combined with the storm sewer overflow) the downstream monitoring point was too close to the discharge point to be representative of water quality in this stretch. This monitoring point has now been moved further downstream to Rushford Bridge. We will continue to monitor this stretch to see if the long term RQO failure occurs at the new monitoring point and we will take action if it does.

Teignbridge District Council are concerned about pumping station overflows at Teign Haven and we will be discussing this problem with them and SWWSL. Any actions resulting from these discussions will be included in future annual reviews.

The SWWSL Clean Sweep programme has removed many discharges from the Teign estuary, however, there are still a number of small crude discharges. We will continue monitoring bacterial loadings to the estuary to assess the relative importance of different bacterial sources in order that further improvements can be prioritised.

**Identified Bathing Waters non-compliance** - The bathing waters at Teignmouth (Holcombe) did not comply with the EC Bathing Waters Directive<sup>7</sup> in 1989, 1994 and 1997. The main cause of non-compliance has been attributed to contamination of the stream which flows onto Holcombe beach; overflows from a SWWSL pumping station at Smugglers Lane and a combined sewer overflow (CSO) which discharges onto the beach. The continuous discharge from



Holcombe at SX 9608 7535 can impact on the bathing water quality at Teignmouth (Holcombe) and also that at Dawlish (Coryton Cove). We have recommended that development is restricted at this site.

Bathing water non-compliance at Torre Abbey (1992), Hollicombe (1986), Paignton (Paignton Sands) (1988, 1994), Paignton (Preston Sands) (1988) and Goodrington (1987, 1997) is probably caused by unsatisfactory discharges of storm sewage.

Hope's Nose and Sharkham Point discharges also pose a risk of failure to bathing water quality in this catchment although they have not been directly responsible for failures to meet the 'Imperative' standards of the Bathing Waters Directive'. These discharges will be improved as part of the SWWSL's Torbay Scheme. The first part of this scheme, which aims to secure compliance with the Bathing Waters Directive', will improve the unsatisfactory storm sewage discharges; improvements to sewerage at Torre Abbey are already complete, with the exception of screening on the CSO. In addition, a new 900 m outfall will be constructed at Sharkham Point. The second phase of the scheme, to meet the requirements of the EC Urban Waste Water Treatment Directive<sup>9</sup> will combine flows from the Hope's Nose and Sharkham Point discharges and provide improved treatment.

**Non-identified bathing water non-compliance** - The bathing waters at Scabbacombe and Man Sands, which are not designated under the EC Bathing Water Directive', exceeded the coliform standards of the Directive in 1995. The reason for this exceedence is thought to be sewage discharges at Sharkham Point, near Torbay; (see Identified Bathing Waters non-compliance).

Table 1 Impact of Effluent Discharges

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
1a Investigate impact of Heathfield STW on the River Bovey.	Agency	2 k		●			
1b Review results from River Teign Spira Bridge to above Heathfield landfill to see if RQO failure recurs.	Agency SWWSL	<1k	●				
1c Maintain objections to development in the catchment areas of Crockernwell, Doddiscombeleigh and South Knighton until STWs are improved under AMP2 (by 2005).	Agency, SWWSL, MDDC, TDC	n/a	●	●	●	●	●
1d Review results for River Teign from Gidleigh Park Hotel to below Chagford STW to see if apparent water quality problem persists.	Agency	<1k	●				
1e Holcombe discharge to receive screening as an interim measure prior to the flows being transferred to a new STW at Dawlish by the end of 2000.	SWWSL Agency	n/a	●	●		●	
1f Ensure operation of pumping station at Smugglers Lane is improved.	Agency, SWWSL	<1k	●				
1g Improve sewerage infrastructure in Torbay by the end of 1997.	SWWSL	n/a	●				
1h Complete Phase 1 and 2 of the Torbay Scheme.	SWWSL	n/a					●
1i Conduct investigations into bacterial loadings of estuary.	Agency	5 k			●		

## Issue 2: The Impact of Mineral Extraction

### Background

The Teign Catchment has been an important centre for mineral extraction in Devon for centuries. The most significant mineral deposit is ball clay, found within the Bovey Basin between Newton Abbot and Bovey Tracey. The ball clay industry in Devon employs significant numbers of people, both directly and indirectly through associated work such as manufacturing. Quarrying can have a considerable impact on the environment, especially on water quality, generating high loads of suspended solids in nearby watercourses. It can also alter groundwater, and hence surface water, flow.

### Effects

**Impact on salmonid fisheries** - Discharges and land runoff from mineral workings in the catchment creates problems with sedimentation and discoloration on a number of watercourses, in particular the lower reaches of the Adbrook and Ugbrook Streams. Salmonid spawning in these areas is limited as gravels have become infilled with sediments originating from quarry sites upstream. The streams affected tend to be of importance to local brown trout stocks only, as they are seldom used by migratory salmonids. The most important spawning areas remain unaffected by quarrying activity.

**Impact on water quality** - On occasions suspended solids from discharges from mineral workings in the catchment cause discoloration to watercourses. This has been reported in the Lower Teign and Whitelake channel. We are not aware of any particular problems associated with these discharges, however, we will encourage the reporting of such incidents and investigate any reports.

The washing of sand and gravel at Royal Aller Vale and Zig Zag Quarries produces an effluent with a high suspended solids content. During normal operations and weather conditions the current silt pond system is capable of handling this effluent. However, sporadic discharge of this process water has occurred in the past, causing pollution of the Aller Brook. These discharges have largely been due to heavy rainfall and the problems associated with controlling a large volume of surface runoff which bypasses the current silt settlement system. We have been working with the quarry owners to resolve this problem. The owners proposed that additional silt lagoon capacity could be developed at Royal Aller Vale to provide treatment for effluent from Zig Zag Quarry. This proposal was subject to planning permission which has now been granted and treatment for effluent from Zig Zag Quarry is now being carried out at Royal Aller Vale.

Discharges from Royal Aller Vale and Zig Zag Quarries also affect the biological quality of the middle reaches of the Aller Brook. Discharges from Ringslade Quarry may be affecting the biological quality of Blatchford Stream.

**Impact on groundwater** - The planning permission in place for Stoneycombe Quarry does not impose a depth restriction on limestone extraction. The presence of sinkholes and fissuring within the limestone means that deep working is likely to alter groundwater flow. This may lead to Compton Pool and Dainton Stream, both minor watercourses, becoming dry. We will be working with the Quarry owners to prevent this situation occurring.

**Impact of river diversion** - Watts, Blake, Bearne and Co. PLC. are proposing to extend Southacre Quarry in order to continue working the deposit of ball clay. This extension will require the diversion of both the Rivers Teign and Bovey up to 400 m westwards of their present courses. In addition, 17 ha of agricultural land will be taken out of production and used for the tipping of clay waste. These proposals will have long-term impacts upon the wildlife and landscape features



within, and adjacent to, the river corridors. The continued development of the ball clay industry may threaten the remaining high quality areas of river and floodplain. This proposal is now subject to a public enquiry. We will be giving evidence at this enquiry to support our concerns about the proposal.

**Loss or deterioration of Bovey Basin ponds** - The Bovey Basin has a large number of ponds which support important dragonfly communities. These ponds originate from old ball clay quarry workings, many of which remain an integral part of current operations, because of this they could be lost from infilling or reworking. There may be opportunities to create new ponds to replace those that are lost. In addition the water quality of the ponds can be a problem, with high suspended solid loads reducing their wildlife value; this may arise from use as settling ponds. We expect most actions relating to the protection of these habitats to come from the Bovey Basin Strategy (see Table 2).

### Actions

The actions below (some of which are already underway) will tackle some of the more immediate problems associated with mineral extraction in the catchment. In the long term however, it is important that a strategic approach is taken to mineral extraction in the Bovey Basin, and that the whole area is managed to balance environmental needs with those of the mineral industry. This will be facilitated by the production of a Bovey Basin Strategy, which is being led by Devon County Council in association with Teignbridge District Council and the mineral industry. We will support the production of this strategy. We expect this strategy to guide many of the Agency's actions in this area, particularly relating to the protection of the natural and historic environment.

**Table 2 The Impact of Mineral Extraction**

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
2a Improve the treatment of surface water runoff during heavy rainfall at Royal Aller Vale quarries.	ARC, Agency	unknown		●	●		
2b Review discharge consent for Royal Aller Vale.	Agency	<1k		●	●		
2c Seek long term solution of a discharge via a consented outfall via Premix RMC outfall.	Agency, ARC, Harleyford Aggregates	<1k		●	●		
2d Issue revised ball clay discharge consents with tighter quality criteria.	Agency	2 k		●			
2e Maintain flows in watercourses near Stoneycombe Quarry as the quarry is worked.	Bardon Aggregates, Agency	<1k p.a.	●	●	●	●	●
2f Continue to consider fully the implications of proposed Teign/Bovey diversion and maintain objection unless all conservation concerns are properly addressed.	Agency	2 k		●			
2g Produce Bovey Basin Strategy to deal with all issues relating to area.	DCC, TDC, Mineral Industry, TPC, Agency, Others	2 k p.a.		●	●		



## Issue 3: Impact of Abandoned Mines

## Background

Devon has a metal mining heritage as diverse and ancient as that of Cornwall, but on a much smaller scale. This has resulted in some long term impacts upon the environment, in particular on water quality. There are two major problems associated with abandoned mines: acidic water draining from the mine into surface and groundwater and increased leaching of metals from the surrounding ores.

Contamination of land may have occurred from the former operation of metalliferous mine workings in the area; elevated concentrations 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 site.

The impact of abandoned mines was described in the Consultation Report<sup>5</sup>. Watercourses known to be affected are the Beadon Brook (from Great Rock Mine and Frankmills Mine), Rookery Brook (Bridford Mine), Sig Stream, Langworthy Brook, Hyner Brook at Hennock and the Owlacombe Brook at Sigford.

In catchment terms the length of watercourses affected by abandoned mines is small and localised. Although remediation would be desirable, the high cost associated with such an operation precludes any action in the near future. Any proposals for remediation would also have to consider the historic value of these mines. We do however need to ensure that any disturbance to contaminated sites or any alteration to surface or groundwater flows in these areas does not exacerbate the problem.

Abandoned mines are normally exempt from pollution control legislation, however the River Pollution (Rookery Brook) Order 1961 removes this protection from the disused barytes mine at Bridford.

When the contaminated land regulations (see Issue 4) are implemented, abandoned mine sites may need to be assessed to see which ones will be classified as contaminated land sites. The local authorities will be conducting this work, but we will assist them where necessary, and we will take responsibility for certain 'special' sites.

Table 3 Impact of Abandoned Mines

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
3a Ensure no increase in impact from abandoned mines as a result of site disturbance and/or alterations to groundwater or surface water flows.	WDBC, TDC, TBC, MDDC, SHDC, DNPA, Agency,	<1k p.a.	●	●	●	●	●
3b Assess abandoned mine sites for classification as 'contaminated land' under contaminated land regulations and take appropriate action as guided by the regulations.	WDBC, TDC, TBC, MDDC, SHDC, DNPA, Agency	unknown	●	●			

## Issue 4: Problems Associated with Development

### Background

The Teign Catchment is predominantly rural, however it includes the major urban areas of Torbay and Newton Abbot/Kingsteignton/Kingskerswell. Development in the catchment will be concentrated in the Newton Abbot Sub-Regional Centre and Torquay/Paignton with 125 ha proposed for major employment development during the period 1991 - 2011, together with significant residential development<sup>9</sup>.

Development in inappropriate areas and with insufficient safeguards can cause environmental damage and developments within floodplains can significantly increase flood risk. However, careful developments can bring benefits, for example, through the clean up of contaminated land and re-use of old buildings. Where environmental damage will occur mitigation can be sought through the planning process.

We have identified a number of environmental impacts from development which are related to our statutory duties, and are causing actual or potential environmental problems; these are listed below.

### Examples

**Impact of industry on water quality** - Discharges from Coventry Farm Industrial Estate have affected biological water quality in the upper and middle reaches of the Aller Brook; these stretches are classified as class d (fair) biological quality. A number of remedial measures have now taken place which should result in a biological improvement. We will conduct a biological survey of the whole of this area in 1998 to see if the expected improvements have been achieved.

There are other industrial estates in the catchment which are a potential threat to water quality. We will be conducting risk assessments of these sites over the next 2 years to identify actual and potential pollution problems and we will ensure remedial measures are taken where necessary. Of particular priority is the Heathfield Industrial Estate from which runoff can enter Stover Lake Site of Special Scientific Interest (SSSI).

Historic pollution of groundwater by chlorinated solvents has been detected at a manufacturing plant near Paignton on the Waddeton (Brixham Road) Industrial Estate. Subsequent investigation boreholes drilled at the site confirmed the groundwater contamination, however, no evidence of impact on other groundwater users or of continuing release of contaminants to ground has been found. We will continue to monitor groundwater in this area and we will ensure that potential future groundwater users in the area are made aware of this contamination.

**Impact on air quality** - Our statutory duties regarding air quality are limited to the regulation of major industrial processes (Part A processes). There are no such processes in the catchment and few in the South West as a whole. However, we will be helping the Government to implement the National Air Quality Strategy<sup>16</sup> (currently undergoing revision). As part of this strategy local authorities will be reviewing air quality in their areas. This will contribute to the knowledge of air quality in the catchment. We will report the results of these reviews in future annual reviews of this Action Plan. Concerns about the effect of acid rain (more correctly termed acid deposition) on Dartmoor are covered in issue 9.

**Increased risk of flooding** - There are a number of areas in the catchment where we have concerns that proposed developments will increase flood risk; these areas were described in the Consultation Report. We need to ensure that development does not reduce the standard of flood defence and that opportunities for environmental enhancement are taken. We will continue to oppose developments



that will exacerbate known flood risks. We are currently gathering floodplain mapping information and we will provide the local authorities with this information. We will continue to liaise with other bodies to identify areas or services at risk. We also provide a flood warning service and will continue to improve this service through co-ordination with other bodies.

**Contaminated land** - The precise nature of contaminated land in the catchment is not fully known. New statutory guidance<sup>10</sup> which will be enacted via the forthcoming 'Contaminated Land Regulations' will require local authorities to identify contaminated land within their area. Once these sites have been identified, it will be necessary to decide if remedial work is required. Once the regulations are issued we will see if they affect issues raised in this plan; namely the contamination of groundwater at the Waddeton Industrial Estate (see above) and the abandoned mines in the catchment. Any additional contaminated land issues will be reported in future Annual Reviews.

**Pollution of stream from Broadmeadow closed landfill** - This site was operating prior to 1974 when formal records began, and tipping ceased in 1993. During its life household, commercial and industrial wastes were tipped there. Landfill gas is still being generated by the site and pollution of the Broadmeadow Stream by leachate has been reported on various occasions since 1979; the stream drains directly to the Teign Estuary, just upstream of Shaldon Bridge. Analysis of water samples shows increases of ammoniacal nitrogen, nitrite, chloride and of several metals, attributable to the landfill. Responsibility for the site currently rests with Devon County Council, the Waste Disposal Authority; they are in discussion with us over the remediation work that is required.

**Heathfield landfill site** - Waste disposal activities started at Heathfield landfill site in 1980. The site, which is operated by Haul Waste Ltd, plays a key role in the disposal of waste from the Teignbridge and Torbay areas, with approximately 35,000 tonnes of waste being deposited per month. The site is licensed to accept inert, general, household, industrial and commercial waste, together with a small amount of difficult and special waste. The landfill is engineered on a full containment principle with a three level liner consisting of local clays, bentonite matting, and a synthetic plastic liner, to minimise the risk of pollution. Any leachate produced in the site is removed and stored in lagoons prior to being pumped to a nearby sewage works for treatment. Methane gas, which is produced from the breakdown of waste, is extracted from part of the restored area of the landfill and used to fuel two on-site electricity generators. Regular environmental monitoring at the site is performed by Haul Waste Ltd and the Agency.

**Loss of sites of nature conservation/historic value due to development** - Sites of both nature conservation and historic value have undoubtedly been lost in the past due to development. We will ensure through our routine work that the planning authorities are aware of sites of importance (those which are relevant to our statutory duties). We will also encourage the positive incorporation of natural features into new developments (see issue 16).

**Shoreline Management Plan (SMP)** - The Shoreline Management Plan 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. The Agency in partnership with local authorities, County Councils and English Nature, are preparing the Lyme Bay and South Devon SMP which includes the length of coast incorporated in the Teign Catchment, and covers the coastal cell from Portland Bill to Rame Head.

**Teign Estuary Plan** - This document is being prepared by Teignbridge District Council and a steering group will be set up comprising a range of interests in the estuary. The plan is due for publication in 1999.



Table 4 Problems Associated with Development

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
4a Carry out survey to assess improvement to poor biological quality in Aller Brook.	Agency	12 k		●			
4b Conduct risk assessments and carry out remediation of pollution from Heathfield, Broadmeadow, Bradley Lane, Decoy, and Bovey Industrial Estates.	Agency	10 k	●	●	●	●	●
4c Continue monitoring pollution of groundwater from Waddeton Industrial Estate.	Agency	<1 k p.a.	●	●	●	●	●
4d Review air quality in the area to gain a better understanding of its effect in the catchment.	WDBC, TDC, SHDC, TBC	n/a		●	●		
4e Identify contaminated land sites in the catchment in accordance with contaminated land regulations.	WDBC, TDC, SHDC, TBC, MDDC, Agency	n/a		●	●		
4f Implement remediation work to stop pollution of stream by Broadmeadow closed landfill site.	DCC, Agency	n/a	●	●	●	●	●
4g Provide planning authorities with floodplain mapping information and discourage inappropriate development, particularly in floodplain, which may affect standards of flood defence and damage environmental interest.	Agency, WDBC, TDC, SHDC, TBC, MDDC	20 k	●	●			
4h Continue to improve liaison with other bodies to identify areas or services at risk from flooding and co-ordinate assistance if required and draw up plans for major incidents.	Agency, TDC, DCC, Others	0.5 k	●	●	●	●	●
4i Produce Shoreline Management Plan for South Devon Coastline.	Agency, DCC, LAs, EN	36 k	●	●			

## Issue 5: Impact of Farming and Forestry on Rivers and Wetlands

### Background

Significant areas of the catchment are farmed and forested and the potential for damage to the environment through these activities is considerable. Agriculture and forestry have, in some areas, caused environmental problems, such as acidification (see Issue 9) soil erosion, water pollution, reduced water yield, increased flood risk and damage to wildlife habitats, as well as posing a threat to aquatic life. However, a sustainable farming system which conserves the soil, uses water wisely, minimises and recycles wastes and protects important wildlife habitats, together with well managed forestry in the right places, will reduce damage and can bring benefits.

Over the last ten years there have been significant improvements by farmers in farm waste storage facilities and disposal methods. This has resulted in a marked reduction in the number of point source pollution incidents attributed to livestock farms and contributed to an overall improvement in water quality. However, work still needs to be done to solve the problem of diffuse pollution, for example, from runoff from waste spread to land. Guidance to farmers is provided by MAFF through the 'Code of Good Agricultural Practice for the Protection of Water'<sup>11</sup>.

## Effects

**Impact on water quality** - The River Bovey from Little Bovey to the Teign confluence significantly failed the proposed RQO of RE1 because of three high BOD results recorded in 1994 and 1995. These all occurred following periods of heavy rainfall. Diffuse runoff from farms in this area is a likely cause of this pollution. The use of agricultural fertilizers in the catchment may be contributing to algal blooms (see Issue 13).

**Loss of key habitats and species** - There are a number of important habitats and species in the catchment which have been lost and/or are currently under threat from agricultural practices (see Issue 14).



**Bank erosion and sedimentation** - On the higher parts of Dartmoor, cattle, ponies and sheep rearing predominate; these livestock cause some localised problems with erosion of river banks and wetlands adjacent to the watercourses at drinking and crossing points. The soil in these areas is particularly unstable and prone to this type of erosion and the resulting siltation can lead to increased growth in aquatic vegetation. This growth, in turn, leads to further siltation and can reduce flow velocity. Bank erosion also results in widening of the river channel and hence reduces the sediment carrying capacity leading to increased deposition.

The minor streams on the moorland contain some of the most important salmonid spawning areas in the catchment and there is growing concern over the effect of sedimentation on salmonid fisheries. A three year study has been carried out on the River Torridge Catchment to investigate the circumstantial evidence linking changes in agricultural land use to deterioration in both river water quality and salmonid populations. The study compared agricultural and non-agricultural subcatchments and found that in the agricultural subcatchment fine sediment concentrations present in gravels were damaging to salmonid embryo survival. The processes by which sediment is supplied to watercourses are complex and a research project is currently being carried out by Exeter University.

Forestry operations in the catchment do not generally cause problems, however, where large deforested areas have been cut up by the wheels of heavy machinery, rainfall can wash this sediment into watercourses.

**Water yield** - Forestry plantations can lead to reduced water yield by reducing the amount of surface runoff which reaches watercourses. This is not usually significant, however, in catchments where there is a large impoundment for water supply as there is in the Teign, it may become important. We recommend consultation should be carried out on any planting proposals in this catchment in accordance with Forest and Water guidelines<sup>12</sup>.

**Table 5 Impact of Farming and Forestry on Rivers and Wetlands**

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
5a Conduct farm inspections in the area to identify source of RQO non-compliance of River Bovey (Little Bovey to Teign confluence).	Agency	<1k					
5b Review water quality data to see if water quality in catchment has improved.	Agency	<1k					



Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
5c Encourage uptake of ESA agreements which allow less intensive agriculture.	MAFF, Agency, DNPA	<1k p.a.	●	●	●	●	●
5d Work with MAFF to ensure agri-environment schemes have appropriate prescriptions and that payments are set at correct level.	Agency, DNPA, EN	<1k p.a.	●	●	●	●	●
5e Establish buffer zones alongside rivers to reduce damage to banks by stock.	Agency DNPA, NT	unknown	●	●	●	●	●
5f Seek to control erosion by encouraging the use of bankside fencing, where appropriate.	Agency	unknown	●	●	●	●	●
5g Consider gravel rehabilitation work to remove the build-up of silt to re-establish the gravels for salmonid spawning.	Agency, Teign Riparian Owners, Netsmen, Lower and Upper Teign Fishing Association	2-3 k p.a.	●	●	●	●	●

## Issue 6: Barriers to Fish Migration

There are 26 weirs and other obstacles in the catchment some of which are complete barriers to the migration of salmon and sea trout. Many of the major weirs in the system have efficient fish passes and allow migratory fish free passage. The obstructions due to the construction of Fernworthy and the KTT reservoir complex are considered unimportant as there is no spawning habitat available further upstream. There are, however, weirs which do not have passes and seriously inhibit the movement of fish as they only permit migration in a limited range of flows. In many cases these weirs prevent free access to major spawning areas. Two weirs on the River Lemon where this was a problem, Malland Bridge Weir and Chipley Weir, have recently had fish passes installed. The next priority for improvements will be Parke Weir on the Bovey.

There are three natural obstructions to fish passage in the catchment: Becky Falls, Manga Falls and one on the Kate Brook; we will not promote alterations to these natural features.

Weirs associated with hydro-generation may have a serious effect on fish movement in periods of low flows. There are proposals to reinstate a hydroelectric power scheme at Drogo Weir. It is essential that the Agency provides protection for the fishery by improving conditions such as prescribed flow/fish pass modifications where possible.

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 will make it a requirement for all abstractors to have screens installed to the satisfaction of the Agency by 1 January 1999, where a need is identified. Fish farms and abstractors also have to have continuous by-wash flowing at all times to allow downstream migration of smolts.

Steps Bridge Weir is a problem for fish migration at low flows, and although there is a fish pass installed, it is very inefficient. The weir is gradually falling into a state of disrepair, and fish are able to negotiate the structure where it is partially collapsed. It will be important to ensure that a route for migration is maintained if the state of the weir worsens.

Many of the works required on weirs in the catchment require considerable expenditure. We have limited resources to carry out these improvements and are now very reliant on external contributions and collaborative schemes to ensure that they are achieved.

**Table 6 Barriers to Fish Migration**

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
6a Continue to remove temporary obstructions on moorland streams.	Agency, DNPA	<1k	●	●	●	●	●
6b Negotiate with abstractors to improve conditions for fish migration and ensure installation of effective screens.	Agency, Abstractors	3 k p.a.	●	●	●		
6c Improve conditions for fish migration at man-made barriers in the catchment.	Agency, fishing associations, riparian owners, other funding sources.	unknown, (highly dependant on external funding).	●	●	●	●	●

#### Issue 7: Need to Control Exploitation of the Salmonid Fishery

Analysis of current and historical catch returns from rivers across the country has shown a marked decline in the numbers of 'spring' fish i.e. those fish entering rivers between 1 January and 31 May. Returns from the River Teign indicate a similar decline where the percentage of these spring fish captured by both rods and nets has reduced to around 25% of the historic average.

The reasons for this decline are uncertain, but some similar reductions in spring fish are being observed on rivers across the North Atlantic, it is not a problem specific to the Teign.

Distant water fisheries are now known to have a major influence on the numbers of returning salmon. The Agency influences the management of the Greenland and Faroes fisheries through provision of information and advise to NASCO which will be used in negotiation of catch quotas, and through supporting the NASF buy out of these fisheries.

The Irish Drift Net fishery which has been estimated to take 10-20% of stock returning to South West rivers is outside the remit of NASCO, being within the EU. The Agency has been in communication with the Irish Department of the Marine and MAFF to raise awareness of the need for increased controls of this fishery.

It has also been demonstrated that the mortality of salmon during the marine phase has increased significantly. It is thought that this is related to changes in sea temperature which may be related to global warming. We have set out our role in addressing climate change in 'An Environmental Strategy for the Millennium and Beyond'<sup>13</sup>.



These external factors have greatly reduced the numbers of returning salmon, and it is vital that where possible action is taken to address them. Of the salmon that do return, it is essential that sufficient numbers to sustain the stock are permitted to reach spawning areas, and that conditions in the river are favourable for successful spawning and survival.

The River Teign Limitation of Salmon and Trout Netting Licences Order, 1991 (which sets the maximum number of nets which may be licensed for the capture of migratory fish at ten) expires in December 1997. Initial analysis of a variety of fisheries data has shown that the status of the salmonid fishery shows some cause for concern. We have applied to MAFF for an interim Net Limitation Order (NLO) which will run for two years at the current level of 10 licences. During this period, the Agency will be able to carry out a full examination of all fisheries data, and formulate some long term proposals for the regulation of the fishery. When reviewing the number of nets which will be allowed to operate after this time, we will closely examine the current state of the fishery, considering egg deposition and associated spawning targets. If these targets are not being achieved we may decide that it will be necessary to reduce levels of exploitation. This may mean allowing less nets to operate, or introducing byelaws to restrict capture in both the net and rod fishery. We would also have to consider if a restriction was necessary on the rod fishery.

**Table 7 Need to Control Exploitation of the Salmonid Fishery**

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
7a Assess performance of the fishery in relation to spawning targets and thorough analysis of other fisheries data before expiry of the new Net Limitation Order in 1999.	Agency	5 k	●	●			
7b Consider introduction of catch restrictions including reduced nets operating after 12/97, if need identified. Net Limitation Order dependant upon findings of above.	Agency	n/a			●		
7c Promote conservation measures for spring fish, e.g. bag limits for anglers, and agreed restriction on netting.	Agency, fishery interests	<1k	●	●	●	●	●
7d Implement salmon management strategy through Salmon Action Plan.	Agency	5 k				●	

#### Issue 8: Reported Problems with Fish Stocks

Anglers in the catchment have raised concerns about both the number of fish-eating birds in the catchment and a decline in brown trout catches over recent years. Both these issues require further investigation to assess whether these problems are real or perceived.

**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 Teign Catchment. There is also some evidence to show that goosander are beginning to colonise the area. Both these species are fully protected under the Wildlife and Countryside Act<sup>14</sup>. Concerns are expressed regularly by various fishing interests that this increase in levels of predation is adversely affecting the fishery. The most significant impact is thought to occur during the smolt run in March when large numbers of salmonids descend the river into the estuary at a size that makes them vulnerable. We shall not support licensed killing of fish-eating birds unless proof of

serious damage has been established and that killing is proven to be the most effective means for preventing significant loss of fish stocks. However, we are committed to working positively with owners and anglers to establish the full facts in each situation.

**Brown trout stocks** - Concerns have been expressed by fishery interests that brown trout catches in the main River Teign have declined over recent years. Juvenile surveys show that there has been no noticeable decline in trout fry, but do not provide sufficient information to allow any assessment of larger fish. A specific investigation targeting 'catchable' brown trout will be necessary to assess whether numbers present are less than would be expected.

Concerns have also been raised that the observed hatch of mayfly, an important food source for salmonid fish has also declined. Our invertebrate sampling of the catchment (see Consultation Report<sup>3</sup>) has not identified any problem with this species although the techniques used may not be appropriate to identify a change of this nature.

Table 8 Reported Problems with Fish Stocks

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
8a Investigate whether a problem exists with brown trout stocks in this area in light of perceived decline in catches on River Teign.	Agency	2 k p.a.		●	●		
8b Co-operate with the licensing authority to progress further research into the impact of fish-eating birds on salmonid and coarse fish stocks.	Agency MAFF, landowners, anglers	unknown	●	●	●	●	●
8c Continue to work positively with owners and anglers to establish the full facts in each situation.	Agency MAFF, landowners, anglers	unknown	●	●	●	●	●

#### Issue 9: Acidification of Dartmoor

Moorland streams are typically acid due to the underlying geology and soils. Many of the headwaters of the River Teign system have a pH as low as 5. The natural acidity of Dartmoor is, however, exacerbated by atmospheric acid deposition. The main components of acid deposition are sulphur dioxide and oxides of nitrogen. These compounds come mainly from the burning of fossil fuels, the principle sources being power stations, other industrial processes and traffic.

Acid deposition across much of Dartmoor is estimated to be at a level at which harmful effects may occur (see Consultation Report<sup>3</sup>). The moorland ecosystem is particularly sensitive to acid deposition as the soils have little capacity to neutralise acidity. Numerous effects on both terrestrial and aquatic ecosystems have been recorded in areas seriously impacted by acidification. In the Wye Catchment in Wales for example, many streams are completely devoid of fish life. In contrast, juvenile fish densities in the upper Teign Catchment appear generally to be satisfactory, and comparable with other similar river systems. There are concerns that valley mire and blanket bog habitats could be affected. There is no evidence to suggest that acidification is having an impact on Dartmoor, however, little monitoring has been done specifically for this purpose.



Levels of acid deposition have been predicted for 2005, based upon the expected emissions of sulphur dioxide and oxides of nitrogen from the major sources. The predicted level of deposition in 2005 is greatly reduced, due to 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 the protocol the UK is committed to reducing sulphur dioxide emissions by 80%, compared to a 1995 baseline, by 2010. The UK's Sulphur Strategy<sup>15</sup> published in December 1996 indicates that the UK will meet interim targets for 2000 and 2005. Compliance is also expected with the 80% reduction target for 2010.

These targets have been met in part by the collapse of the British coal industry, however, further reductions are being achieved through regulation by the Agency and the local authorities. The Government's Air Quality Strategy<sup>16</sup>, which is currently being amended, will provide further guidance on emission reductions.

As Plymouth lies directly to the South West of Dartmoor (the direction of the prevailing wind), it is likely that air pollution generated in the city will be transported to Dartmoor<sup>17</sup>. Levels of sulphur dioxide and nitrogen dioxide in the city are generally low and within Plymouth City Council's air quality standards, which are more stringent than DETR standards<sup>18</sup>. Plymouth City Council have developed a number of initiatives to reduce peak hour private car travel. There is a need to establish what contribution Plymouth makes to acid deposition on Dartmoor.

The amount of forest cover can affect the level of acid deposition in an area. The canopy of both deciduous and coniferous forests "scavenge" pollutants from the atmosphere; the problem can be exacerbated in coniferous forests as pine needles release acidic compounds as they decompose. Any proposals for significant areas of planting (>10 ha) within the acid sensitive areas of Dartmoor should be subject to an environmental assessment to ensure that acidification is not increased (Forest and Water Guidelines<sup>19</sup>). The Forestry Authority have recently launched a plan to increase the forested areas of Dartmoor. We will work with the Forestry Authority to ensure that these proposals do not contribute to increased acidification on Dartmoor.

Table 9 Acidification of Dartmoor

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
9a Reduce emissions of sulphur dioxide and nitrogen oxides from power stations, industry and traffic. Action to be co-ordinated through Air Quality Strategy.	LAs, Agency, Electricity Generators	<1k p.a. (in SW region)	●	●	●	●	●
9b Examine performance of salmonid fishery as part of Salmon Action Plan, from Salmon Management Strategy.	Agency	5 k		●	●		
9c Support research and monitoring to improve understanding of acidification and its effects on Dartmoor.	Agency, Research institutions, DNPA.	unknown	●	●	●	●	●
9d Assess impact of any proposals (>10 ha) for afforestation of acid sensitive areas of Dartmoor.	Agency, FA	<1k p.a.	●	●	●	●	●

## Issue 10: Forecast Deficit in Public Water Supply

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.

### Background

Forecasts have been made of public and private demand for water up to the year 2021<sup>18</sup>. However, these demand forecasts are only available at a Strategic Supply Area (SSA) level and do not directly relate to individual catchments. The catchment falls within SWWSL's Roadford SSA.

The extent to which demand for potable supply will increase over the next 25 years will depend upon 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. However, under the "low" scenario of low growth in domestic, industrial and commercial consumption coupled with a reduction in water company leakage to 200 litres per property per day, 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.

### Action

Under the low scenario, which reflects our policy of encouraging water company demand management and leakage control, there should be no need for any major new sources in the Roadford SSA until after 2021. Even if future growth in demand takes place according to the high scenario, it is unlikely that there would be any major implications for the catchment as any new resource developments would occur in other catchments, for example a pumped storage scheme for Roadford Reservoir. Further details of the options for meeting future demand in the Roadford SSA are provided in the Tamar Estuary and Tributaries LEAP<sup>19</sup>.

In addition to promoting water company demand management we will also promote water conservation ourselves, through our public relations work. We have recently produced a leaflet 'Water Alert', copies of which are available on request. This work is an ongoing part of our routine duties.

## Issue 11: The Effect of River Regulation by Fernworthy Reservoir

The regulation of rivers by reservoirs is known to cause changes to the river ecology. River regulation causes flow to become more even and the river less 'flashy'; this in turn affects the plants and animals which live there. More information is required in order to assess whether the ecology of the South Teign River is affected by this regulation.

Fernworthy Reservoir has a compensation release of 0.066 m<sup>3</sup>/s which was set when the reservoir was commissioned in 1913. The natural flow downstream of the reservoir has been estimated to have a Q95 (the flow which is exceeded 95% of the time) of 0.092 m<sup>3</sup>/s; assuming that the reservoir had not been built. The compensation release from Fernworthy is generally smaller than that from other reservoirs in the South West when compared to the estimated 'natural' Q95.



The South Teign River's ecology may be affected by the regulation of Fernworthy Reservoir. There are concerns that fish productivity downstream of Fernworthy is limited as a result of low flows.

There is evidence on other river systems that juvenile salmonid production is adversely effected by prolonged abnormally low river flows. On the West Okement, densities of juvenile salmon and trout were seen to greatly improve when the compensation flow from the Meldon Dam Reservoir was increased. The good spawning areas found in the South Teign below the reservoir would almost certainly benefit in the same way if the Fernworthy compensation flow were increased.

**Table 11 The Effect of River Regulation by Fernworthy Reservoir**

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
11a Conduct a study to compare the ecology of South and North Teign Rivers following regulation of river flow.	Agency, Universities	5-6 k			●		
11b Seek enhanced compensation flow from Fernworthy Reservoir through AMP3 to increase salmonid production.	Agency, SWWSL	n/a		●	●		

## Issue 12: Concern over Low Flows

Flows in the catchment are known to decrease markedly in dry summers. Many small feeder streams and tributaries dry out completely or leave isolated pools. The catchment is particularly vulnerable during dry periods as most of the flow is derived from surface water. Intermittent low flows in the middle reaches of the Teign are a source of local concern from Dunsford down to Chudleigh.

Moorland watercourses naturally rise and fall quickly in response to rainfall. However, there is some concern that they have become even more 'flashy' in recent years, giving rise to lower flows during dry periods and higher flows during wet periods. The vegetation cover on Dartmoor is thought to have changed in recent decades, with a loss of heather and degradation of blanket bog being recorded in certain parts. It is possible that a change in vegetative cover could affect the hydrology of the moorland watercourses, although there is currently no data available to support this supposition. Furthermore, the practice of swaling (controlled burning) could affect the hydrology of the moorland by altering the soil structure. Alterations to both soil structure and vegetative cover could also affect the way nutrients are leached from the soil.

Due to the exceptional dry summer in 1995 and resulting low river flows, the Scotley Brook (source to the Teign confluence) significantly failed its proposed RQO of RE1 because of low dissolved oxygen concentrations, and levels of dissolved oxygen in the River Lemon did not comply with the minimum standards of the EC Freshwater Fish Directive<sup>20</sup>.

Fish mortalities are likely during low flows as fish become trapped in water of deteriorating quality and increasing temperature. At times, the problem can become so widespread that fish rescues become unrealistic, and there is little that can be done to alleviate the problem.

Table 12 Concern over Low Flows

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
12a Support research into the effects of 'swaling' and changes to moorland vegetation on both catchment hydrology and nutrient leaching.	Agency, Universities	2 k p.a.		●	●	●	
12b Develop appropriate actions following completion of research.	Agency, DNPA	unknown				●	●

### Issue 13: Concerns over Algal Blooms

Algal blooms have been recorded in the lower and middle reaches of the River Teign. These blooms are associated with low summer flows (see Issue 12) and high water temperatures. They can be a serious threat to fish and other aquatic life as dissolved oxygen levels drop at night when algal respiration removes oxygen from the water. Algal blooms occur naturally during spring and summer, however they can be exacerbated by an excess of nutrients, principally phosphates, which are usually in limited supply in freshwater ecosystems. The principal sources of phosphates in freshwater ecosystems are runoff from agricultural land and sewage effluent.

Table 13 Concerns over Algal Blooms

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
13a Investigate whether main River Teign is subject to algal blooms by studying microscopic benthic algae (diatoms).	Agency	5 k		●			
13b Conduct a desk study to determine nutrient levels in main river throughout the year.	Agency	<1k		●			
13c Develop and implement actions for nutrient control if required.	Agency	unknown			●	●	●

### Issue 14: Biodiversity and Earth Science

Biodiversity, or the variety of life, is being lost. In the UK alone over 100 species have been lost this century. The global decline in biodiversity was recognised at the Rio Summit in 1992, where the Biodiversity Convention was signed by over 150 world leaders. The convention requires each country to 'develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity'. The UK responded with a process of Biodiversity Action Planning, which aims to reverse this decline by prioritising habitats and species for action, ensuring that conservation efforts are directed where they are most needed. In Devon, Biodiversity Action Planning also includes the conservation of important earth science features and processes.



Biodiversity: The UK Action Plan<sup>21</sup> was published in 1994 and since then a number of regional plans have been produced including Action for Biodiversity in the South West (1997)<sup>22</sup>. In Devon a steering group involving a large number of organisations involved in conservation have produced The Nature of Devon; A Biodiversity Action Plan for Devon<sup>2</sup>. Work is commencing on the production of Action Plans for both Dartmoor and South Devon; these should be very helpful in guiding actual work on the ground.

As part of this overall process we are identifying, with others, key features, habitats and species on which we will concentrate our conservation efforts. The Agency is also the UK contact point for 15 species in the UK Biodiversity Action Plan<sup>21</sup>; those present in this catchment are otter and southern damselfly. As a lead partner we will stimulate action to achieve targets in the UK BAP, set monitoring standards, act as a contact point and field enquiries, and agree work programmes with the identified lead partner (for these species; the Wildlife Trusts).

Appendix 1 lists all the key habitats and features which are present in the catchment. Table A lists the key habitats, species and geological features in the catchment which are relevant to the Agency's activities. Many of the actions required from the Agency to protect these will be carried out as part of our routine work e.g. ensuring that abstractions do not damage wetland sites. Other actions will be carried out to resolve some of the other issues raised in this report and those issues are cross referenced in Table A below. Only actions which are specific to certain features, key habitats and species are presented below.

**Table A Key habitats, species and geological features in the Teign Catchment**

Key Habitats/Associated Species/Geological feature	Reason for Inclusion	Threats in this Catchment	Associated Issue
Wet woodland  Few known rarities but rich in lichens and invertebrates	Nationally uncommon, lack of knowledge	Lack of information/appreciation, invasive plants, grazing	5, 15
Blanket Bog <u>Extensive peat deposits</u> Dunlin Golden Plover	Internationally important  Threatened in Europe Localised breeder	Overgrazing, burning, drainage	5, 9
Valley Mire Curlew Keeled skimmer Bog orchid	Nationally important Threatened in Europe Regionally Important Large % of world population	Localised overgrazing, burning, drainage	5, 9
Rhōs Pasture Marsh fritillary  Southern damselfly	Nationally important Threatened in Europe >50% decline in UK Globally threatened Localised	Agricultural improvement, neglect/undergrazing, pond creation	5
Upland Heath Red Grouse Skylark	Internationally important Local decline National decline	Overgrazing, burning	5
Lowland heath  Three-lobed water crowfoot  Narrow headed ant	Threatened in Europe  Threatened in Europe, localised Nationally important	Inappropriate management, recreation, development	4, 5, 17

Key Habitats/Associated Species/Geological feature	Reason for Inclusion	Threats in this Catchment	Associated Issue
Fast-flowing acidic rivers <i>Bovey Basin/Sticklepath fault</i>	Significant proportion of the county resource, threatened	Invasive plants, pollution, mineral extraction	1, 2, 3, 4, 9, 6, 7, 8, 10, 11, 15
Otter	Threatened in Europe		
Salmon	Nationally threatened		
Freshwater pearl mussel	Globally threatened, very localised		
Wild daffodil	High public appeal		
Standing open water	Significant area of county resource in the catchment, threatened.	Mineral extraction, reworking of ponds, siltation, pollution	2, 4
Dragonfly species including:	Nationally scarce		
Downy Emerald	Nationally scarce		
Scare Blue Tailed			
Estuaries and estuarine habitats	Threatened	Development, recreation	4, 17
Rocky sea bed	Threatened	Pollution, lack of awareness	1, 18
<i>Coastal features</i>			
Yellow skirt sea slug			

### Actions

Most of the key features and habitats in the catchment which are relevant to the Agency have been identified, although the process is not complete and there is a need to review these lists and in particular to produce a comprehensive species list. We will produce an updated version as soon as possible, as part of a process of looking at all catchments across Devon. It will be included in the annual review.

We will also set catchment specific targets for some of the key habitats and species, which will enable us to measure our progress in conserving and enhancing biodiversity.

The following species and habitats all have Action Plans within the Biodiversity Action Plan for Devon<sup>2</sup>; wet woodland, Rhôs pasture, curlew, marsh fritillary, Southern damselfly, estuaries, rivers, streams, floodplains and fluvial processes, otter and freshwater pearl mussel. When this plan is published in March 1998 it will include agreed actions from the Agency for these species and habitats. Actions from these species and habitat action plans are only repeated here if they are not part of our routine work and are specific to the River Teign Catchment. Actions are also included here for species and habitats which do not yet appear in the Biodiversity Action Plan for Devon<sup>2</sup>.

- Wet woodland** - Wet woodland, usually dominated by alder or willow, is known to have an interesting ground flora and to be particularly valuable for lichen communities. Its value for invertebrates is less well known. There are good examples of wet woodland in the Teign Catchment and we need to find out more about their value so that they can be properly managed.
- Blanket bog (linked species - dunlin, golden plover)** - Dartmoor is internationally important for this wetland habitat, which is at one of its most southerly locations in Europe. Two key species, dunlin and golden plover, breed in very small numbers. Poor moorland management has allowed much blanket bog to become degraded; drainage, burning and grazing at inappropriate intensity has resulted in lost value. Military use has also caused cratering and erosion in this area.



● **Valley mire (linked species - curlew, keeled skimmer, bog orchid)**

- Mires occur in valley bottoms where peat has accumulated. They are nationally important and support an uncommon and diverse plant community. They are also a breeding location for a few remaining pairs of curlew and a stronghold for the keeled skimmer dragonfly, a nationally scarce species. The hydrology and water quality of mires must be protected if they are to be sustained, but we do not fully understand the requirements of this habitat at present. Heavy stocking of land adjacent to the mires and burning over mires have contributed to habitat deterioration.

● **Rhös pasture (linked species - marsh fritillary, southern damselfly)**

- These species rich grasslands, also known as 'Culm grasslands' in North Devon, have a very restricted distribution. About 90% of the resource which remained at the turn of the century has now been lost. It is a habitat for breeding curlew, and is particularly important for the marsh fritillary butterfly; almost 25% of the English population of this butterfly is found on Dartmoor. In addition, the southern damselfly has recently been discovered in this catchment. Both insect species are protected under the EC Habitats Directive<sup>23</sup>. Agricultural improvement is probably the single largest threat to this habitat and its associated species, but neglect or inappropriate management is also a problem for this and other wetland habitats such as blanket bog and valley mire. Through our routine work we will discourage pond creation where it will lead to a loss of these habitats.

● **Upland heath (linked species red grouse, skylark)** - Large areas of Dartmoor are covered by heather moorland, much of which is in poor condition as a result of overgrazing and/or burning. Red grouse is at the edge of its range here and is declining. Skylark numbers have dropped dramatically nationally and it is essential that upland heath is retained to provide suitable habitat. Uptake of the ESA scheme may help, particularly if agreements can be achieved on commons.

● **Lowland heath (linked species, narrow headed ant, three lobed water crowfoot)** - Although very valuable for a variety of species, lowland heath has been lost very rapidly. Pressures include development and inappropriate recreation (for example, motorbike scrambling). The narrow headed ant which occurs in very small numbers here is at risk from both threats. The three-lobed water crowfoot is a nationally scarce plant which occurs in shallow pools on heathland which dry out in summer. It used to occur near Newton Abbot but has not been recorded for many years. The UK Biodiversity Action Plan (BAP) includes targets to restore it to former sites, so we need to know if this can be achieved in this catchment.

● **Fast flowing acidic rivers (linked species otter, salmon, freshwater pearl mussel and wild daffodil)** - The rivers and river valley habitat in the catchment support a diverse flora and fauna. The main threats to this habitat and its associated species are covered elsewhere in this plan. The freshwater pearl mussel is probably now extinct in the catchment. It used to occur in the catchment below Steps Bridge but has not been seen since the 1980s. As part of the Devon BAP for this species we will promote conditions suitable for the re-introduction of this species, where suitable information exists. In the middle of the catchment the rivers flow through semi-natural woodlands, where in the spring wild daffodils carpet areas close to the river. At this time these areas are much visited by the public. We need to ensure that woodland management in these areas does not lead to a loss of this flora.

- **Sand martin and kingfisher populations** - Whilst not identified species for in Biodiversity Action Plans both these species have high public appeal. They are typical birds of lower reaches of rivers, where erosion creates high, vertical banks in which they can excavate nesting tunnels. Erosion control and other river management practices may not only directly destroy nest sites but can stabilise eroding faces, leading to subsequent abandonment. We need to have a better understanding of the numbers and distribution of these birds, which are also vulnerable to population fluctuations as a result of hard winters (kingfisher) or drought in wintering areas (sand martin). Quarries are also a potential nest site for sand martins.
- **Bovey basin ponds** - These areas of standing open water support important dragonfly communities. The ponds originate from old ball clay workings and the main threats are covered in the impact of mineral extraction (see Issue 2). However, many of these ponds are also stocked with fish from angling clubs, this can reduce both the number and diversity of invertebrates. We will facilitate discussions with both landowners and angling clubs to ensure that the management of these ponds protects these important species.
- **Estuaries (linked species eelgrass beds, waders including curlew)** - Devon estuaries are important wildlife resources, especially in winter. They are extremely productive, providing food for wildfowl and waders. Eelgrass beds are favoured by brent geese. Estuaries are under pressure from shoreline development and expansion of recreational activities.
- **Rocky seabed (linked species yellow skirt sea slug)** - While much of the rocky seabed is of interest, attention here is focused on the tidally swept channels between headlands and islets such as the Ore Stone. This is a habitat for the rare yellow skirt sea slug, and is a good example of the need to raise awareness of the marine environment. It is poorly understood but supports many rare habitats and species.
- **Earth science sites and features** - There are concerns over the impact of quarrying on landscape and earth science features. Regionally important geological sites (RIGS) are being identified to aid their protection. We will support this initiative and encourage conservation of recognised features.

Table 14 Biodiversity and Earth Science

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
14a Complete process of identifying key features, habitats and species in Devon catchments, and set catchment specific targets where appropriate.	Agency, RSPB, DWT, EN, DNPA	2 k	●				
14b Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Wet woodland.	Agency	unknown	●	●	●	●	●
14c Identify key sites of wet woodland within the catchment to achieve better understanding of extent and value.	Agency, DNPA, FA, EN, NT, DWT, Others	2 k			●		



Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
14d Support survey to determine invertebrate interest of wet woodland.	Agency, NT	5 k			●		
14e Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Blanket bog - includes prevention of uncontrolled burning, protect hydrology; Golden plover and dunlin - need to set targets for increasing breeding populations.	DNPA, Agency DNPA, RSPB, DBWPS, EN	2 k n/a	●	●	●	●	●
14f Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Valley mire - includes possible research into hydrology and water quality;  Curlew - includes control of disturbance (see also estuaries).	Agency, Universities  DNPA, Agency, RSPB, DBWPS	unknown 2 k	●	●	●		
14g Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Rhôs pasture - includes promoting management agreements, scrub clearance; Marsh fritillary - includes habitat restoration, correct grazing regime; Southern damselfly - includes protection of hydrology, possible re-introduction.	DNPA, Agency, EN DNPA, BC, Agency DNPA, Agency	3 k 2 k 2 k	●	●	●	●	●
14h Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Upland heath - includes prevention of uncontrolled burning, and overgrazing.	DNPA, EN	n/a	●	●	●	●	●
14i Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Lowland heath - includes control of recreation.	LAs, Agency	<1k p.a.	●	●	●	●	●
14j Resurvey former sites for three-lobed water crowfoot to determine suitability for re-establishment.	Plantlife, Agency, NT	3 k			●		
14k If appropriate, implement programme for three-lobed water crowfoot from the UK BAP.	Plantlife, Agency, NT	unknown		●	●	●	
14l Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Rivers, streams, floodplains and fluvial processes - includes pollution control, production of water level management plans, increase floodplain woodlands where possible; Otter - includes continued post-mortem examinations, habitat reinstatement;  Salmon - (see Issue 7); Freshwater pearl mussel - includes promotion of conditions required to allow re-establishment, survey of former sites.	Agency, EN, LA's, Riparian Owners  Agency, DWT, Riparian Owners  Agency, DNPA, DWT	5 k 3 k 2 k	●	●	●	●	●
14m Support county-wide survey of sand martin and kingfisher nest sites.	DBWPS, RSPB, Agency, NT	unknown	●				

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
14n Retain all known sand martin and kingfisher sites and seek to create suitable conditions for colonisation elsewhere.	Agency, NT	<1k p.a.	●	●	●	●	●
14o Ensure management of riverside woodland protects wild daffodil populations.	DWT, DNPA, landowners/managers, NT	n/a	●	●	●	●	●
14p Promote measures to prevent loss of earth science sites and features in rivers and floodplains.	Agency, NT, DNPA	unknown	●	●	●	●	●
14q Identify areas where flood control standards could be relaxed to improve/enhance wetland habitats.	Agency	<1k p.a.	●	●	●		
14r Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Standing open water - includes control of alien plant species (see Issue 15).	Agency, Angling Clubs	<1k p.a.	●	●	●	●	●
14s Facilitate discussions to ensure protection of important invertebrate species in Bovey Basin Ponds which are managed for fishing.	Agency, angling associations, landowners	<1k		●			
14t Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Estuaries and estuarine habitats - includes protection from development, mapping eelgrass beds.	Agency, LA's	2k	●	●	●	●	●
14u Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Rocky sea bed - includes raising awareness of importance.	DWT, Agency, LA's	<1k p.a.	●	●	●	●	●
14v Identify and document County Geological Sites.	Devon RIGS Group Agency, LAs, EN, DNPA	<1k p.a.	●	●	●	●	●
14w Encourage greater appreciation and understanding of County Geological Sites.	Agency, DCC	<1k p.a.	●	●	●	●	●

### Issue 15: Spread of Invasive Plants

There are several alien species of plant present in the catchment which are excellent colonisers and which are spreading at the expense of more natural vegetation. Himalayan balsam and Japanese knotweed are widely established, and giant hogweed has been found at Wray Brook below Moretonhampstead. Under the Wildlife and Countryside Act 1981 (Section 14 (2))<sup>14</sup> it is an offence if any person plants or otherwise causes to grow in the wild plants such as Japanese knotweed or giant hogweed.

There are also some invasive aquatic plants, which appear to be spreading mainly through garden ponds and lakes to which they have been introduced. The most problematic species parrot's feather, and Australian swamp stonecrop (also known as New Zealand pigmyweed). However, there are a number of other species, including water fern, which could become problematic. These are extremely invasive species which can completely take over ponds at the expense of native



plants and which are becoming established in the wild. We will encourage garden centres to stop selling these plants and suggest that they are removed from ponds where possible. We would wish to know more about the distribution of these plants in the catchment.

We are introducing a control programme for these plants where they occur on sites which we own or manage, but others, especially local authorities and landowners, will be most influential in controlling their spread in the wider countryside. Action now may prevent the widespread infestation seen in other regions.

Table 15 Spread of Invasive Plants

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
15a Encourage recording of parrot's feather, Australian swamp stonecrop and water fern by field staff and others.	Agency	<1k	●	●	●	●	●
15b Raise awareness of problem of parrot's feather, Australian swamp stonecrop and water fern through garden centre trade associations.	Agency, Garden Centre Trade Assoc.	2 k		●	●		
15c Encourage removal from ponds of parrot's feather, Australian swamp stonecrop and water fern where already established.	Agency	n/a					
15d Continue surveys for invasive bankside species.	Agency	2 k	●	●	●	●	●
15e Carry out control on any Agency owned or managed sites.	Agency	unknown	●	●	●	●	●
15f Encourage control by riparian owners and other interested parties, once priority sites for control have been defined.	Agency, DNPA	n/a	●	●	●	●	●
15g Co-operate with owners and other bodies to achieve eradication of giant hogweed on Wray Brook.	Agency, LA, DCC, HA, Riparian Owners	2 k p.a.		●	●	●	
15h Make booklets "Aquatic Weed Control Operation" and "Guidance for the control of Invasive Plants near Watercourses" widely available.	Agency, DNPA	<1k	●	●	●	●	●

#### Issue 16: Lack of Information on Archaeological/Historic Value of Catchment

The River Teign Catchment contains numerous sites of archaeological and historic value, many of which are located on Dartmoor. These features require continued protection if they are to survive and features as yet unidentified are at risk from new development or changes in land use. During Agency activities we shall ensure that historic sites are protected and when we regulate the work of others we will encourage them to do so.

A need has been identified for an assessment of the overall value of the catchment to provide a framework for considering actions in relation to the historic environment, including any historic "watery" features. Such an assessment would enable many bodies to share the same information. Lack of information can lead to neglect and loss of historic features, as can be seen at the lock gates on the Stover Canal.

Table 16 Lack of Information on Archaeological/Historic Value of Catchment

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
16a Support production of document(s) covering entire area to provide a better understanding of archaeological/historic value of catchment, particularly "watery" historic and archaeological features, and investigate potential for collaboration.	TDC, TBC, EH, DAS, Agency, RCHME, University of Exeter, NT, DNPA	7 k			●		
16b Need to ensure effective liaison procedures between organisations on archaeological/historic matters.	As above	unknown	●	●	●	●	●

### Issue 17: Recreation and the Environment

Tidal waters in the catchment are the main focus for water-based recreation as there is limited access to inland waters. The Teign Estuary is used for water-skiing, windsurfing and sailing. Torbay, with its expanse of relatively sheltered open water, is a major recreational site.

There are several footpaths and rights of way in the catchment. The Templer Way and the Two Moors Way both provide access to rivers, while the South West Coast Path provides access to the coast. Many of these routes are suffering from lack of up-keep and erosion making them difficult to use, especially for the less able.

**Impact of sewage from boats** - Concern has been raised over the impact of sewage from boats on water quality. This could potentially affect use of the estuary for water sports and shellfishing. Boat users should be encouraged to install holding tanks and dispose of effluent on shore through the provision of shore based facilities.

**Poor coarse fishing facilities in the Lower Teign** - The lower Teign holds good numbers of dace and roach, with the occasional pike and carp. However this potential recreational resource is largely unused. Coarse angling is a popular sport and there are few coarse fisheries in the area. We will encourage riparian owners in the lower Teign to allow coarse fishing, whilst ensuring that there is no conflict with game fishery interests.

**Access agreements for canoeists** - There is no existing access agreement for canoeing on any non-tidal sections of the catchment, although some informal arrangements have been made on occasion. The river is not particularly suitable for canoeing, except at very high flows.

We have a general duty to promote the recreational use of water and will support sensitive and sustainable access initiatives that respect the interests of local people and the environment. It is very important that recreational use of the catchment does not degrade the environment.



Table 17 Recreation and the Environment

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
17a Need for improved visitor management to reduce footpath erosion, particularly at Steps Bridge. NB: Further actions to be added when identified.	DWT, NT DNPA, LAs	n/a	●	●	●		
17b Encourage provisions and use of shore based facilities for disposal of sewage from boats to reduce impact on amenity and wildlife.	Forthcoming Estuary Mgmt Group	unknown	●	●	●	●	●
17c Monitor effects of recreational activities on natural environment.	Agency, Other	unknown	●	●	●	●	●
17d Take part, as neutral party, in any discussions over canoe access.	Agency, DNPA, BCU, Riparian Owners	<1k	●	●	●	●	●
17e Discuss possibilities of improved public access to, and interpretation of, the water environment, especially for the less able.	Agency, TDC, DNPA, DCC	unknown		●			
17f Investigate proposals for footpaths/cycleways in the Teign Estuary, Rivers Teign, Bovey and Lemon areas.	TDC	n/a		●	●		
17g Develop vehicular access and public transport links for the less able.	DNPA	n/a	●	●	●	●	●
17h Determine likely causes of erosion (such as wave action) to the Templer Way and consider suitable solutions to problem.	Agency, TDC, DCC	unknown			●		
17i Increase awareness of potential of coarse fishery in lower reaches of the River Teign.	Agency, Local Clubs	<1k		●	●	●	●
17j Encourage riparian interests to lease/operate riverine coarse fisheries.	Riparian Owners, Agency, Local Clubs	<1k		●	●	●	●

#### Issue 18: Concerns over the use of Antifouling Paints on Boats

Paints to prevent fouling of boats with various marine organisms, such as barnacles and algae, have been in existence since the 1960s. Until relatively recently, most paints have been based on the antifouling compound tributyltin (TBT). Field and laboratory studies have shown that TBT has had an environmental impact in a number of locations around England and Wales<sup>24</sup>. One of the major effects of TBT is shell thickening and reduced meat yield in the Pacific oyster. In 1987 the UK Government introduced a number of controls on the sale of TBT based paints and banned their use on boats less than 25 m in length, which covers most of the recreational market.

MAFF monitored a number of sites throughout the UK for TBT levels in water, oysters and mussels, including two sites in the Teign Estuary: Teignmouth Harbour and the oyster beds at Arch Brook. These were monitored between 1986 and 1992.

TBT (cation) concentrations in Teignmouth Harbour between 1986 and 1991 were 19-24 ng/l; in 1992 the mean was 40 ng/l, due to one high result. The Environmental Quality Standard (EQS) for TBT (cation) is 2 ng/l, which is designed to protect aquatic life.

At Arch Brook levels of TBT (cation) in water, oysters and mussels have decreased since the 1987 ban; mean concentrations in water were 12 ng/l in 1986 and decreased to 3 ng/l in 1992. Since 1987 shell growth has been normal for oysters from Arch Brook.

Alternatives to TBT based paints are mainly based on copper and zinc oxides, some of which have the herbicide Irgarol added to them. There is some concern that Irgarol may have an adverse environmental effect.

### Action

We will conduct monitoring to establish whether levels of TBT in Teignmouth Harbour are currently above EQS, and whether they have decreased from 1992 and pre 1992 levels. It is also important to establish the sediment levels of TBT, to inform decisions on dredging and other activities which might cause sediment disturbance. At the 4th North Sea Conference, Ministers from the nine North Sea Countries agreed to take action within the International Maritime Organisation, with the aim of a world-wide phase out of TBT. If significant progress had not been made by the end of 1997, they agreed to consider phasing out the use of TBT on ships flying the North Sea States' flags. Ministers have also agreed to promote research on environmentally safe antifouling technologies. The UK Government agreed with this approach but has stated that the implications for fuel consumption must be considered.

We are supporting national research into the effects of alternatives to TBT with the intention of developing appropriate standards. We will establish current levels of Irgarol in the estuary to compare with the EQS when it becomes available.

Through the forthcoming estuary management group (see Issue 4) we will ensure that the information gained on antifouling paints is used to develop appropriate protective measures for the estuary.

Table 18 Concerns over the use of Antifouling Paints on Boats

Actions	Action By Lead Other	Cost to Agency (£)	Financial Year				
			97	98	99	00	01
18a Monitor TBT and Irgarol in the water column in Teignmouth Harbour.	Agency	3 k	●				
18b Establish sediment levels of TBT.	Forthcoming Estuary Mgmt Group, Agency, MAFF	unknown			●		
18c Progress national research into environmental effects of alternatives to TBT.	Agency, PML, MAFF	unknown	●	●	●		
18d Promote good practice for scraping down boats.	Forthcoming Estuary Mgmt Group	<1k p.a.		●	●	●	●



## Issue 19:

## Need to Protect Landscape Quality

We promote the conservation of the landscape through our work, an important part of which is to influence land use planners and land managers to look after the landscape sensitively. We have duties to conserve and enhance landscape, wildlife and natural features.

We have included here the issue of litter which, although not related to our statutory duties, was one of public concern raised during our public consultation.

**Impact of litter in the catchment** - Litter in and alongside rivers and estuaries is not only unsightly but can also encourage pests, increase flood risk, cause pollution, create a danger to wildlife and cause a public health hazard. District and local authorities are designated Principal Litter Authorities under the Environmental Protection Act 1990<sup>10</sup> and they can serve an abatement notice on the owner or occupier of the land requiring the litter to be cleaned up ('land' is interpreted as also including land covered with water), providing the rubbish is regarded as being prejudicial to health or a nuisance. We also remove litter from our own land on a routine basis and remove litter during routine flood defence operations.

It is an offence to litter any public open space, including amenity beaches, and there are a number of areas in the catchment where litter is regarded as a problem, in particular the Aller Brook, River Lemon and Teign Estuary. Litter in the estuary is regarded as a problem alongside the Templar way and other footpaths at the upper end of the estuary and in the tidal section of the River Teign. Legal responsibility for rubbish of this nature is difficult to identify. We hope to work with others, including Teignbridge District Council to facilitate a clean up operation. We would be keen to involve the public in this initiative and to encourage the adoption of measures to reduce the build up of rubbish in this area.

Table 19 Need to Protect Landscape Quality

Actions	Action By		Cost to Agency (£)	Financial Year				
	Lead	Other		97	98	99	00	01
<b>19a</b> Develop partnership actions to promote litter clean up in upper estuary. Consider involving the Community Service Workforce or forthcoming Environmental Task Force. NB: County and District Councils are designated as 'principal litter authorities' under the Environmental Protection Act 1990 <sup>10</sup> .	Forthcoming	Estuary Mgmt Group	unknown		●	●		
<b>19b</b> Implement preventative measures to reduce build up of litter in the estuary.	Forthcoming	Estuary Mgmt Group, Agency, TDC	unknown			●	●	●
<b>19c</b> Consider approach to litter in Aller Brook and River Lemon in light of experience from above action.	Agency, TDC		unknown			●	●	●

## 5. Appendices

### Appendix 1 Priority Habitats in the River Teign Catchment

Wet woodland  
Blanket bog  
Valley mire  
Rhôs Pasture  
Upland heathland  
Lowland heath  
Standing open water  
Estuaries  
Rocky seabed  
Arable farmland  
Unimproved neutral grassland  
Caves

### Appendix 2 Guide to Consultation Report and Action Plan Issues

Former Consultation Report Issue		Issue Number in this Action Plan
4.1a	Poor biology in Aller Brook	Issue 4
4.1b	Risk of pollution from industrial estates in the catchment	Issue 4
4.1c	Pollution of ground and surface waters from Waddeton Industrial Estate	Issue 4
4.1d	Impact of road runoff (on spawning gravels and pond ecology)	Issue 4, Issue 14
4.1e	Need for a better understanding of air quality and its effect in the catchment	Issue 4
4.1f	Need for a better understanding of contaminated land in the catchment	Issue 4
4.1g	Pollution of stream by Broadmeadow closed landfill	Issue 4
4.1h	Impact of litter in the catchment (particularly on the River Lemon, Aller Brook, Teign Estuary and Coastal stretch)	Issue 19
4.1i	Inappropriate development, particularly in floodplain, may affect standards of flood defence and damage environmental interest	Issue 4
4.1j	Loss/damage of sites of conservation value due to development	Issue 4
4.2a	Impact of abandoned mines	Issue 3
4.3a	Impact of salmonid fisheries	Issue 2
4.3b	Impact on water quality	Issue 2
4.3c	Impact on groundwater	Issue 2
4.3d	Impact of river diversion	Issue 2
4.3e	Loss or deterioration of Bovey Basin ponds	Issue 2
4.4a	Forecast deficit in public water supply	Issue 10



4.5a	Changes in moorland vegetation	Issue 12
4.5b	Algal blooms	Issue 13
4.6a	Effects of river regulation	Issue 11
4.7a & 4.9a	RQO non-compliance, River Bovey (Little Bovey to Teign confluence)	Issue 1 and Issue 5
4.7b	RQO non-compliance, River Teign Spira Bridge to above Heathfield Landfill	Issue 1
4.7c	RQO non-compliance, Scotley Brook	Issue 1
4.7d	Long term RQO non-compliance, River Teign (Gidleigh Park Hotel to below Chagford STW)	Issue 1
4.7e	Identified and non-identified bathing waters non-compliance	Issue 1
4.8a	Antifouling paints	Issue 18
4.9b	Deterioration/loss of key habitats and species	Issue 5
4.9c & 4.12a	Changes to ecology of fast-flowing acidic rivers	Issue 5
4.10a	Acidification of moorland headwaters	Issue 9
4.11a	Lack of information on the value of wet woodland	Issue 14
4.11b	Decline in sand martin and kingfisher populations	Issue 14
4.11c	Deterioration of valley mire	Issue 14
4.11d	Lack of current information on the three-lobed water crowfoot	Issue 14
4.11e	Lack of comprehensive information on earth science sites and features	Issue 14
4.13a	Spread of invasive bankside plants	Issue 15
4.14a	Absence of general assessment of archaeological/historic value of catchment	Issue 16
4.15a	Barriers to fish migration	Issue 6
4.15b	Expiry of River Teign Limitation of Salmon and Trout Netting Licences Order 1991	Issue 7
4.15c	Impact of fish-eating birds on salmonid and coarse fish stocks	Issue 8
4.15d	Decline in runs of spring fish	Issue 7
4.15e	Declining brown trout catches in mid-lower reaches	Issue 8
4.16a	Footpath erosion	Issue 17
4.16b	Impact of sewage from boats on water quality and wildlife	Issue 17
4.17a	Lack of access for canoeists	Issue 17
4.17b	Lack of public access to rivers, especially for the less able	Issue 17
4.17c	Poor coarse fishing facilities in the Lower Teign	Issue 17

## Glossary

**Abstraction** - removal of water from surface or groundwater.

**Algae** - a diverse group of simple aquatic plants, some microscopic, which can grow in rivers and the sea in great profusion (blooms).

**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.

**Asset Management Plan 2 (AMP2)** - the second Asset Management Plan produced by the Water Companies for the Office of Water Services (OFWAT). It sets out the water industry investment programme for the period 1995 to 2005.

**Benthic** - relating to organisms living on the bed of rivers or the sea.

**Biochemical Oxygen Demand (BOD)** - a standard test which measures over 5 days the amount of oxygen taken up by aerobic bacterial to oxidise organic (and some inorganic) matter.

**Biodiversity** - the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and ecosystems. (Article II of the Biodiversity Convention).

**Blanket Bog** - *Sphagnum* (moss) rich vegetation which occurs on thick layers of peat (>0.5 m), where the water table is at or just below the surface and fed by direct precipitation.

**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 collects surface runoff.

**Coarse fish** - this is a lay-man's term for 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.

**Combined Sewer Overflow (CSO)** - an overflow structure which permits a discharge from the sewerage system during wet weather.

**Compensation Flow** - water released from a reservoir to compensate for the impact of the impoundment.

**Consent (Discharge)** - a statutory document issued by the Environment Agency under Schedule 10 of the Water Resources Act 1991 as amended by the Environment Act 1995 to indicate any limits and conditions on the discharge of an effluent to a controlled water.

**Diffuse pollution** - pollution without a single point source e.g. acid rain, pesticides, urban runoff etc.

**Dissolved oxygen (DO)** - the amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is an important, but highly variable, indicator of 'health' of a water. It is used to classify waters.

**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.

**Environmentally Sensitive Area (ESA)** - an area designated by MAFF where grant aid is available to support traditional farming methods.

**Groundwater** - all the water contained in the void spaces in pervious rocks and that held within the soil, mainly derived from surface sources.



**Landfill** - a process whereby areas such as disused quarries are used to dispose of solid wastes in a controlled manner prior to being capped and revegetated.

**Leachate** - solution formed when water percolates through a permeable medium. Can be mineral-rich, toxic or carry bacteria.

**Leaching** - the washing out of a soluble constituent.

**Metres Above Ordnance Datum (MAOD)** - 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.

**Outfall** - the point where a river or pipe discharges.

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

**Riparian Owner** - owner of riverbank and/or land adjacent to a river. Normally owns river bed and rights to mid-line of channel.

**Runoff** - rainwater which does not soak into the ground but which runs over the surface in a downhill direction.

**Salmonid Fish** - game fish of the salmon family e.g. salmon, trout and sea trout.

**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.

**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.

**Spring fish** - adult salmon which return to freshwater, mostly in late winter/early spring, after two or more winters

**Surface water** - general term used to describe all the water features such as rivers, streams, springs, ponds and lakes.

**Valley Mire** - habitat which occurs along the lower slopes and floors of small valleys, usually around a central watercourse which is fed from springs and seepages on the valley sides. Valley mire is typically dominated by wetland plants, often moss-rich and usually occurs over a thick layer of peat (> 0.5 m).

## Abbreviations and Units

### Abbreviations

Agency	Environment Agency
AMP2	Asset Management Plan 2
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
BC	Butterfly Conservation
BCU	British Canoe Union
BOD	Biochemical Oxygen Demand
CSO	Combined Sewer Overflow
DAS	Devon Archaeological Society
DBWPS	Devon Bird Watching and Preservation Society
DCC	Devon County Council

DNPA	Dartmoor National Park Authority
DO	Dissolved Oxygen
DETR	Department of the Environment, Transport and Regions
DWT	Devon Wildlife Trust
EC	European Council
EH	English Heritage
EN	English Nature
EQS	Environment Quality Standard
ESA	Environmentally Sensitive Area
EU	European Union
FA	Forestry Authority
HMIP	Her Majesty's Inspectorate of Pollution
IPC	Integrated Pollution Control
KTT	Kennick, Tottiford and Trenchford
LA	Local Authority
LEAP	Local Environment Agency Plan
MAFF	Ministry of Agriculture, Fisheries & Food
MDDC	Mid Devon District Council
NASCO	North Atlantic Salmon Conservation Organisation
NASF	North Atlantic Salmon Fund
NLO	Net Limitation Order
NRA	National Rivers Authority
NT	National Trust
PCC	Plymouth City Council
RCHME	Royal Commission on the Historic Monuments of England
RIGS	Regionally Important Geological Site
RQO	River Quality Objective
RSPB	Royal Society for the Protection of Birds
SHDC	South Hams District Council
SSA	Strategic Supply Area
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWWSL	South West Water Services Limited
TBC	Torbay Borough Council
TPC	Teigngrace Parish Council
TBT	Tributyltin
TDC	Teignbridge District Council
UK	United Kingdom
WBB	Watts, Blake, Bearne & Co. PLC.
WDBC	West Devon Borough Council



## Units

°C	degrees centigrade
g	grams
ha	hectare
km	kilometres
km <sup>2</sup>	square kilometres
l	litres
m <sup>3</sup> /s	cumecs; cubic metres per second
mg	milligrams
MI	megalitre
MI/d	megalitres per day
mm	millimetre
ng/l	nanogram per litre
<	less than
>	greater than
≥	greater than or equal to
%	percentage

## References

- <sup>1</sup> Environment Act 1995.
- <sup>2</sup> The Nature of Devon: A Biodiversity Action Plan (draft).
- <sup>3</sup> The Nature of Dartmoor: A Biodiversity Profile, DNPA/EN, January 1997.
- <sup>4</sup> Devon's Local Agenda 21 Network Issues Report, Devon Local Agenda 21, 1997.
- <sup>5</sup> River Teign Local Environment Agency Plan, Consultation Report. Environment Agency, SW-3/97-1k-E-AXPA, March 1997.
- <sup>6</sup> A Strategic Business Plan, (Asset Management Plan 2). Discharge Consents Manual No. 024A, SWWSL, December 1994.
- <sup>7</sup> European Council Directive of 8 December 1975 concerning the Quality of Bathing Water (76/160/EEC). Official Journal of the European Communities No. L 31/1.
- <sup>8</sup> European Council Directive of 21 May 1991 concerning Urban Waste Water Treatment (91/271/EEC). Official Journal of the European Communities No. L135.
- <sup>9</sup> Draft Devon County Structure Plan 2011, Devon County Council, 1995.
- <sup>10</sup> The Environmental Protection Act 1990, HMSO.
- <sup>11</sup> Code of Good Agricultural Practice for the Protection of Water, MAFF, 1991, PB0578.
- <sup>12</sup> Forestry Authority, Forest and Water Guidelines, Third Edition 1993, HMSO. ISBN 0-11-710321-7.
- <sup>13</sup> An Environmental Strategy for the Millennium and Beyond, Environment Agency, 1997, HO-9/97-100k-D-BABF.

- <sup>14</sup>Wildlife and Countryside Act, 1981, HMSO, ISBN 0-10-546981-5.
- <sup>15</sup>Reducing Emissions of Sulphur Dioxide, A Strategy for the United Kingdom, 1996.
- <sup>16</sup>The UK National Air Quality Strategy, DoE Scottish Office, HMSO, 1997.
- <sup>17</sup>Plymouth's Environment, Plymouth City Council, 1996.
- <sup>18</sup>Tomorrow's Water: Water Resources Development Strategy, NRA, April 1995.
- <sup>19</sup>The Tamar Estuary and Tributaries LEAP Consultation Report, Environment Agency, July 1996, SW-7/96-1k-E-AVDO.
- <sup>20</sup>European Council Directive on the Quality of Freshwaters Needing Protection or Improvement in order to Support Fish Life (78/659/EEC). Official Journal of the European Communities No. L22/1.
- <sup>21</sup>Biodiversity: The UK Steering Group Report, Volume 2: Action Plans. HMSO 1995.
- <sup>22</sup>Biodiversity of the South West: An Audit of the South West Biological Resource, RSPB/County Wildlife Trusts/South West Regional Planning Conference. February 1996.
- <sup>23</sup>European Council Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC). Official Journal of the European Communities No. L206/7.
- <sup>24</sup>Waite M E, Waldock M J, Thain J E, Smith D J and Milton S M (1991). Reductions in TBT concentrations in UK estuaries following legislation in 1996 and 1987. Marine Environmental Research Vol 32, pp 89-111.





# map 2



## MANAGEMENT AND CONTACTS:

The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

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

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

### ENVIRONMENT AGENCY REGIONAL OFFICES

#### ANGLIAN

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

#### SOUTHERN

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

#### NORTH EAST

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

#### SOUTH WEST

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

#### NORTH WEST

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

#### THAMES

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

#### MIDLANDS

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

#### WELSH

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



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

#### ENVIRONMENT AGENCY GENERAL ENQUIRY LINE

**0645 333 111**

The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water.

#### ENVIRONMENT AGENCY EMERGENCY HOTLINE

**0800 80 70 60**



**ENVIRONMENT  
AGENCY**



**Devon Area  
Manley House  
Kestrel Way  
Exeter  
EX2 7LQ  
Tel 01392 444000**