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~~ALAN BURROWS~~

RIVER DART ACTION PLAN JULY 1998



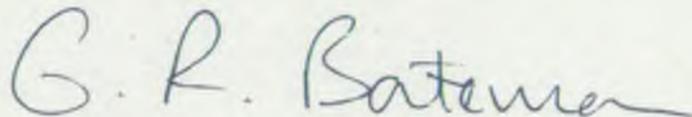
ENVIRONMENT
AGENCY

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 Dart Local Environment Agency Plan aims to promote integrated environmental management of this important area of Devon. It seeks to develop partnerships with a wide range of organisations and individuals who have a role to play in the management of the River Dart. 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.



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ENVIRONMENT AGENCY



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Contents

Foreword

| | |
|---|-----------|
| 1. Introduction | 1 |
| 2. Review of the Consultation Process | 6 |
| 3. Catchment Area | 7 |
| 4. Activity Tables | 8 |
| Issue 1: Impact of Effluent Discharges | 9 |
| Issue 2: Concerns over Effluent Discharges in the Vicinity of the Dart Estuary Shellfishery | 13 |
| Issue 3: Risk of Cryptosporidium Entering Public Water Supply | 14 |
| Issue 4: Problems Associated with Development | 15 |
| Issue 5: Impact of Mineral Extraction | 17 |
| Issue 6: Impact of Abandoned Mines | 18 |
| Issue 7: Impact of Farming and Forestry on Rivers and Wetlands | 19 |
| Issue 8: Potential Eutrophication of the Dart Estuary | 22 |
| Issue 9: Concern over Low Flows | 23 |
| Issue 10: Barriers to Fish Migration | 24 |
| Issue 11: Risk of over Exploitation of the Salmon Fishery | 25 |
| Issue 12: Additional Threats to Fish Stocks | 27 |
| Issue 13: Acidification of Dartmoor | 28 |
| Issue 14: Biodiversity and Earth Science | 29 |
| Issue 15: Spread of Invasive Plants | 36 |
| Issue 16: Lack of information on Archaeological/Historic Value of Catchment | 37 |
| Issue 17: Concerns with the Recreational Use of the Catchment | 38 |
| Issue 18: Dart Estuary Management Plan | 40 |
| Issue 19: Concerns over the use of Anti-fouling Paints on Boats | 41 |
| Issue 20: Need for Integrated Management of the Coastal Zone | 42 |
| Appendix | 43 |
| Glossary | 48 |
| References | 52 |

Key Statistics for the River Dart Catchment

| | |
|--------------------------|---|
| Catchment Area | 475 km² |
| Length of river* | 210 km |
| Average annual rainfall | 1760 mm approx. |
| Population (1991 census) | 31,000 approx. |
| Main urban areas | Dartmouth, Totnes, Buckfastleigh, Ashburton |
| Administrative areas | South Hams, West Devon, Teignbridge, Torbay |

* This is the total length of 'controlled water' in the catchment which is defined by the Water Resources Act 1991, Part III Section 104. Controlled waters include groundwaters and inland waters, estuaries and coastal waters to three nautical miles from the shore.

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 vision:

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

Our aims:

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

We will do this by:

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

1.1.1

Sustainable development

The Environment Agency is a new body. It has a wide range of duties and powers relating to different aspects of environmental management. It is required and guided by Government to use these duties and powers in order to help achieve the objective of sustainable development. The Brundtland Commission defined sustainable development as ".... development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

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

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

Although the Agency only has duties and powers to protect some environmental resources, it will need to contribute to other aspects of environmental management even if these are, in the first instance, the responsibility of others. The Agency can only do this effectively by working in partnership with and through others in order to achieve agreed objectives.

Much of the UK's environmental legislation originates from the European Union. To date there have been five EC Environmental Action Programmes which have collectively given rise to several hundred pieces of legislation of relevance to environmental protection, one of the most recent being the Directive on Integrated Pollution Prevention and Control. A number of other directives are currently under consideration, covering issues such as water management, air quality, and the management of waste using landfill.

The Agency also has to work in a wider international context because it is now generally accepted that environmental changes are occurring on a global scale. Individual countries contribute to these changes, and respond to them, in different ways. The Agency's long term strategy therefore has to reflect these global issues, and it has to be delivered within the framework of international and national commitments which has been developed to address them.

Perhaps the major international issue is that of climate change. The UK is a contributor to the emission of gases such as carbon dioxide into the atmosphere which are believed to contribute to long term climate changes. The UK will also be affected in a complex way as and when the climate does change. It is therefore a signatory to the Framework Convention on Climate Change, as agreed at the Rio Summit in 1992, and is taking an active part in international negotiations to obtain commitments beyond the year 2000 for credible, effective, and achievable reductions of greenhouse gas emissions.

Another outcome of the United Nations "Earth Summit" held in Rio de Janeiro in 1992 was agreement by governments that, in order to solve global environmental problems, local action is crucial: we must all therefore think globally but act locally. The Local Agenda 21 initiative set out actions needed to achieve sustainable development, including the need to make clear the links which exist between local life-styles and the use of resources. In the UK plans have now been formulated by local government and local communities to identify and address a wide range of environmental issues including natural resource use, pollution, health, local amenity and quality of life. These programmes set out long term solutions that take account of global implications, such as the use of resources that affect the global environment and thus local communities in other parts of the world.

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

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 1995¹ to promote the **Conservation** of wildlife and landscape of inland and coastal waters and associated land, and to further the conservation of wildlife, landscape and heritage features when carrying out its operational or regulatory actions. We also have duties to promote the use of such water and land for **Recreation**, and to consider the need to maintain public access to such sites.

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

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

- Waste collection and litter - responsibility remains with local authorities;
- Noise 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 (LEAPs) 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 Dart 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.

1.2.1 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.

1.2.2 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. 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. In West Devon the Agenda 21 process is led by the West Devon Environmental Network; a community based network created in 1992 which is now a charity. Extensive public consultation led to the formation of 16 principles which are the basis for Agenda 21 in West Devon. Dartmoor National Park Authority endorse the Statement on National Parks, Sustainability and Work on Local Agenda 21; this statement provides a commitment to the

pursuit of sustainability and Local Agenda 21 and forms the basis for future action. The Biodiversity Action Plans which have been produced for the South West provide the nature conservation element of the Local Agency 21 initiatives (see Issue 14).

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

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

1.2.3 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.

1.2.4 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)²
- The Nature of Dartmoor: A Biodiversity Profile³
- Devon's Local Agenda 21 Network Issues Report⁴
- Lyme Bay and South Devon Shoreline Management Plan (in preparation)
- Dart Estuary Management Plan⁵
- South Devon AONB Management Plan⁶
- Dartmoor National Park Management Plan (in preparation)
- Dart Fishing Association Action Plan⁷

1.2.5

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:

| Name | Representing |
|-------------------|--|
| Mr G Attree | Local Farmers/National Farmers Union |
| Mr J Bloomer | South Hams District Council |
| Mr M Brabin | Dartmoor Preservation Society |
| Mr K Carter | South Hams District Council |
| Mr J Darby | Farming and Rural Conservation Agency |
| Mr A Dutfield | Buckfast Spinning |
| Mr I Edmonds | British Canoe Union |
| Ms S Goodfellow | Dartmoor National Park Authority |
| Mr G Heywood | Local Conservation Interests |
| Mr R Humphreys | Dart Estuary Project Officer |
| Mr D Pakes | Dart Fisheries Association |
| Mr D Ramsden | Barn Owl Trust |
| Mr R Scoble | Netsmen |
| Mr I Scofield | Dart Angling Association |
| Mr P Simpson | Riparian Owner |
| Mr C Sturmer | Duchy of Cornwall |
| Mrs M R Tomlinson | Chairman, Devon Area Environment Group |
| Mr D Trout | Dartington Parish Council |
| Mr M Williams | South West Water Services Ltd |

2. Review of the Consultation Process

The issues listed in this Action Plan were either identified in the Consultation Report or resulted from the Consultation Process (see Appendix). The Consultation Report was launched in June 1997 and the consultation period concluded on 17 October 1997. Responses were received from 49 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 Dart Catchment, an area of approximately 475 km². The River Dart is formed from the East and West Dart Rivers that rise on South East Dartmoor. This is an upland granite mass that rises to over 600 m AOD.

Dartmoor is an area of open moorland with high rainfall and acid, peaty soil. Much of it is used for extensive grazing by cattle, sheep and ponies. Many of the headwaters also provide valuable spawning grounds for salmonid fish.

The perimeter of Dartmoor is typified by steep, undulating land with many of the valley sides comprising deciduous woodland. The area surrounding the open moorland is typified by small enclosures and is mainly used for small-scale livestock farming. Field size becomes progressively larger as one moves away from the moorland.

The River Dart eventually flows under the A38 Devon Expressway, close to Buckfastleigh. This not only marks the edge of Dartmoor National Park, but also serves as an approximate boundary between the granite mass and the relatively low lying but undulating area known as the South Hams. This area is noted for its rich red soils which support more intensive livestock and arable farming. A number of watercourses (River Hems, River Wash, Bidwell Brook and Am Brook) have their source in this area. The River Dart continues through this area to its tidal limit at Totnes. The steep valley sides result in a minimal floodplain. Two major tributaries join the River Dart in its estuary, these are the River Hems and the Harbourne River.

Venford Reservoir is the only reservoir in the Dart Catchment. It is one of the smaller SWWSL public water supply reservoirs. There is a second public water supply abstraction on the lower Dart at Littlehempston. The Littlehempston intake abstracts water both directly from the River Dart and from a suite of 'radial collectors' in the vicinity.

Industry in the catchment, apart from agriculture and tourism, is very limited. There is some light industry in the Totnes and Buckfastleigh area. Dartmouth and Dartmoor National Park are significant tourist destinations and Buckfast Abbey and the Dartington Cider Press Centre are very popular attractions, each attracting over half a million visitors every year.

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. Actions are either site specific or catchment wide.

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).

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, '98' is the financial year April 1998 to March 1999.
- Please refer to the abbreviations section at the end of the report for the definition of acronyms and abbreviations.

The following points should also be noted:

- many of the costs quoted consist of staff time, and these actions will be carried out in conjunction with our routine work. Other actions constitute special projects and as such are subject to internal bidding procedures for funding.
- 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

We regulate the disposal of effluent by issuing consents to discharge into controlled waters, including treated sewage and industrial effluent. 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 other standards derived from previous research and information where appropriate. In the Consultation Report we proposed RQOs for the Dart Catchment; following the consultation process these targets have now been confirmed.

Improvements to South West Water Services Limited's (SWWSL) discharges are subject to funding approved by OFWAT, the water industry's regulator. The following improvement schemes are in SWWSL's current business plan 'Asset Management Plan 2' (AMP2), which runs to 2005: Princetown STW, Broadhempston STW, Scorriton STW, Dartmouth STW, and Stoke Fleming (North and South). OFWAT have recently initiated a five year review which will result in AMP3, running from 2000 - 2010. We are currently identifying those STW's where improvements are required.

The water quality assessment in the LEAP consultation report was based on three years of data collected between 1993 and 1995. We have now updated this with the 1997 assessment based on three years of data collected between 1995 and 1997. The water quality status of eight stretches has changed in this 1997 assessment. These are discussed below.

The river stretches in the catchment where water quality is impacted by unsatisfactory sewage discharges and sewerage systems are listed below.

Blackbrook River - The Blackbrook River from source to Dart confluence marginally failed its RQO of RE1 in 1997 as a result of a single high BOD result. This failure was due to a single high BOD in March 1996; this result was accompanied by elevated levels of BOD in the discharge from Princetown STW. Water quality in this stretch is impacted by Princetown STW; the discharge contributes to a general deterioration in water quality in the Blackbrook and may contribute to the uncharacteristic weed growth and generally eutrophic state of the Blackbrook, which alters the rivers natural moorland ecology. We have recommended that development is restricted in this area until the sewage work is improved.

SWWSL are committed to carrying out improvements to the works to include a secondary treatment stage by 1999/2000. In addition, the impact of activities at the Prison Farm on water quality in the Blackbrook have been identified as a cause for concern (see Issue 7).

River Ashburn - The River Ashburn from source to Dart confluence marginally failed to comply with its RQO of RE1 in 1997. We have encouraged SWWSL to improve the level of maintenance of the sewerage system which has led to an improvement in water quality. Further work is required to ensure that these improvements are maintained. Poor water quality in the River Ashburn may also impact on the quality of the main River Dart (see below).

River Mardle - The River Mardle from Combe to the Dart confluence marginally failed its RQO of RE1 in 1997 as a result of elevated levels of BOD. This failure was due to elevated BOD results in 1995. There have been problems with sewerage systems in the vicinity of Buckfastleigh. Since 1995 a number of improvements

have been made and water quality has improved. Further work is required to identify whether this will be sufficient to meet the RQO. Poor water quality in the River Mardle may also impact on the quality of the main River Dart (see below). We are planning to carry out a biological investigation of the River Mardle during 1998.

The Dean Burn - The Dean Burn from source to its confluence with the Mardle met its RQO of RE1 in 1997, this is an improvement on the marginal failure of RQO in 1995. The cause of this improvement in water quality is unknown. Further work is required to ensure that this improvement is sustained.

River Dart - The River Dart from Austin's Bridge to downstream of Buckfastleigh (Kilbury) STW significantly failed its RQO of RE1 in 1997 as a result of elevated levels of BOD. The elevated BOD results which caused this failure occurred in July 1995. They are likely to be a result of a combination of poor upstream water quality and the discharge from Buckfastleigh (Kilbury) STW. Major improvements to Buckfastleigh (Kilbury) STW were completed in 1995. Results from our routine monitoring programme show that improvements in water quality have occurred since then and samples taken in 1996 and 1997 comply with the RQO of RE1; further failures of RQO are not anticipated. This improvement in water quality is likely to have occurred as a result of improvements in water quality in the River Ashburn and Dean Burn. Actions have been identified for the Rivers Ashburn, Mardle and Dean Burn to ensure that these improvements are sustained.

Insecticides - Exceedence of Environmental Quality Standards (EQS) for insecticides downstream of Buckfastleigh (Kilbury) STW

- In the past, concentrations of insecticides downstream of Buckfastleigh (Kilbury) STW have exceeded their proposed EQS. These insecticides originate from the washing of sheep fleeces and use of wool materials by textile enterprises, both goats and sheep have insecticides applied to them to rid them of insect pests. The effluents from these traders are treated on site before discharge into the public sewerage system where they are further treated in Buckfastleigh (Kilbury) STW. Significant improvements have been made to both the treatment of these effluents prior to the discharge into the sewerage system and to the treatment provided by Buckfastleigh (Kilbury) STW. As a result of this, levels of these insecticides have been substantially reduced.

Historically these releases have been organophosphate insecticides. However, due to concerns about the health risk to farmers associated with using this type of sheep dip, many farmers are switching to synthetic pyrethroid based dips.

One of the traders, Buckfast Spinning Company Limited, is authorised as a Part A process under Section 6 of the Environment Protection Act 1990. As part of one of the improvement conditions which are included in the authorisation, they have conducted an investigation into the occurrence of organophosphorus and synthetic pyrethroids in raw materials for spinning, the potential for harm to the environment when released from the process and how these substances can be rendered harmless. The results of this investigation are available to the public. The study examined how most of the insecticides are currently removed from the wool scouring process, bound up in grease laden solid wastes, which are then disposed of in landfill sites licensed to take 'special waste'. The insecticides remaining in the effluent from the company's treatment plant are then reduced by a further 80% by treatment at Buckfastleigh (Kilbury) STW, prior to discharge in to the River Dart.

Given current knowledge, disposal to an appropriately licensed landfill of the solid waste is considered the best environmental option. Through its membership of the Scourers' Environmental Network, the company intends to investigate other options for disposal of the solid waste which may be of increased benefit to the environment.

We have proposed consent conditions for the discharge from Buckfastleigh (Kilbury) STW to ensure compliance with EQS's for organophosphate pesticides and to include controls on synthetic pyrethroids based on recent research. This research involved investigating the combined effects of organophosphate's and the effect of synthetic pyrethroids on aquatic life, including the combined effect of individual substances.

SWWSL intend to install some tertiary treatment at Buckfastleigh (Kilbury) STW during 1998, based on powdered activated carbon, this will further reduce insecticide levels in the effluent.

Foaming at Buckfastleigh (Kilbury) STW - At Buckfastleigh, there have been concerns relating to the amount of foam which occurs downstream of the discharge point. There have been two significant foaming events, in April 1995 and April 1997. Extensive investigations were carried out by the Agency following both incidents, involving the analysis of foam, water and discharge samples. Using highly specialised analytical techniques we have now detected the presence of a lubricating oil which originates from the scouring process at Buckfast Spinning. The type of oil has now been changed and this will hopefully prevent any future foaming incidents occurring.

River Hems - The River Hems from source to Portbridge marginally failed its RQO of RE2 in 1997 as a result of elevated levels of BOD and ammonia. This stretch also significantly failed to meet its long term RQO of RE1. There has been an improvement in water quality in the River Hems from Portbridge to normal tidal limit; the stretch now complies with its RQO of RE1 (see Issue 7).

Broadhempston STW, which discharges to a small tributary of the River Hems, is showing poor performance with sewage fungus often visible downstream of the storm overflow. We have recommended that development is restricted in this area until improvements are made to the STW.

In addition, Landscope (Gullaford Farm) STW discharges to a tributary of the River Hems. We have recommended that development is restricted at this site because of the impact of the discharge on this watercourse. The extent to which the discharge impacts on water quality in the main river is unknown.

A biological investigation undertaken in 1996 found that Broadhempston STW could have an impact on local water quality. We have recommended that development is restricted at this site. However, this STW discharges approximately 5 km upstream of the routine sampling point on the River Hems and it is unlikely to be the main cause of poor water quality.

Harbourne River - The Harbourne River from Leigh Bridge to the normal tidal limit marginally failed its RQO of RE1 in 1997 as a result of elevated levels of BOD. This failure is due to a single high BOD result in October 1997; this result was accompanied by high rainfall and elevated BOD levels in the discharge from Harbertonford STW.

Bidwell Brook - The Bidwell Brook from source to Tigley significantly failed its RQO of RE1 and from Tigley to the Dart confluence failed to meet its long term RQO of RE1 in 1997, as a result of elevated levels of BOD. Biological sampling of the Bidwell Brook suggests some variation in quality at the lower site. This may be from the influence of organic pollution. This is likely to be a combination of farm inputs and problems with the sewerage system in the vicinity of Dartington. Further work is required to identify the precise causes.

Holy Brook - The Holy Brook from source to the Dart confluence marginally failed to meet its RQO of RE1 in 1997 as a result of elevated levels of BOD. Elevated BOD results have occurred on a number of occasions in 1995, 1996 and 1997; the cause of these elevated BOD results is unknown. A biological investigation undertaken in 1996 found that Scorrton STW could have an impact

on local water quality during the summer months. We have recommended that development is restricted at this site. However this STW discharges approximately 3 km upstream of the routine sampling point on the Holy Brook and it is unlikely to be the main cause of poor water quality.

We have recommended that development is restricted in this area until improvements are carried out to the STW.

Estuary water quality - Concerns have been raised about the impact of effluent discharges on the water quality in the Dart Estuary. The aesthetic impact of the crude discharges from Dartmouth and Kingswear was addressed by SWWSL in 1997 with the introduction of fine screening. Further improvements will be required under the Urban Waste Water Treatment Directive (UWWTD) to increase the level of treatment these discharges receive. The UWWTD specifies that secondary treatment must be provided for all discharges serving population equivalents greater than 2,000 to inland waters and estuaries, and greater than 10,000 to coastal waters. We will also be negotiating with SWWSL for improvements to Totnes STW in AMP3.

Other impacts on water quality - There are a number of sites which are having an impact on water quality, but where failures of RE classification have not been recorded. The storm overflow at Ipplepen STW, which discharges to a small tributary of the Am Brook, is impacting on water quality due to sewage fungus and sewage debris which are frequently visible downstream of the overflow. A number of works have been identified as causing, or potentially causing, poor water quality in their receiving waters and these require improvements under the UWWTD: Cornworthy (Cornworthy Stream); Ipplepen (Am Brook); Poundsgate (trib. River Webburn). There are also a number of locations where consented discharges are having a localised environmental impact, where we recommend that development is constrained until appropriate improvements are made. These include Cornworthy, Poundsgate, Dartmouth, and Kingswear.

Table 1 Impact of Effluent Discharges

| Actions | Action By Lead <i>Other</i> | Cost to Agency (£) | Financial Year | | | | |
|---|-------------------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 1a Continue to encourage SWWSL to adequately maintain the sewerage system in and around Ashburton. | Agency | <1 k | ● | ● | | | |
| 1b Carry out chemical and biological monitoring to investigate the causes of poor water quality in the River Mardle. | Agency | unknown | ● | | | | |
| 1c Investigate water quality in the Dean Burn. | Agency | unknown | ● | | | | |
| 1d Review results of routine monitoring of the River Dart downstream of Buckfastleigh (Kilbury) STW to see if RQO failure recurs. | Agency | <1 k | | ● | | | |
| 1e Install powdered activated carbon treatment process at Buckfastleigh (Kilbury) STW. | SWWSL | n/a | ● | | | | |
| 1f Monitor effluent from Buckfastleigh (Kilbury) STW for organophosphates and synthetic pyrethroids. | Agency | 4 k p.a. | ● | ● | ● | ● | ● |
| 1g Monitor discharge from Buckfastleigh (Kilbury) STW for foaming incidents and presence of process oil in effluent. (Requirement for further monitoring to be assessed after 12 months). | Agency, <i>Angling Interests</i> | 15 k | ● | | | | |

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | | |
|--|---|-----------------------|----------------|----|----|----|----|------|
| | | | 98 | 99 | 00 | 01 | 02 | |
| 1h Investigate alternative options for disposal of solid wastes from scouring process at Buckfast Spinning. | Buckfast Spinning, <i>Scourers Environmental Network</i> | n/a | ● | | | | | |
| 1i Investigate impact of Landscope (Gullaford Farm) STW on water quality in the River Hems. | Agency | <1 k | ● | | | | | |
| 1j Review results of monitoring of the River Hems to see if RQO failures recur. | Agency | <1 k | | ● | | | | |
| 1k Investigate causes of poor water quality in the Bidwell Brook. | Agency | unknown | ● | | | | | |
| 1l Investigate causes of poor water quality in the Holy Brook. | Agency | unknown | ● | | | | | |
| 1m Object to further development leading to increased sewage flows in Princetown, Landscope, Cornworthy, Dartmouth, Kingswear, Scorrison and Poundsgate; until improvements to STW's are carried out. | Agency, <i>SWWSL, TDC, SHDC, DNPA</i> | <1 k p.a. | ● | ● | ● | ● | ● | |
| 1n. Improvements to be carried out under Urban Waste Water Treatment Directive to STWs at: Princetown, Harbertonford, Broadhempston, Scorrison, Cornworthy, Ipplepen, Poundsgate, Dartmouth, Kingswear, Ashprington, Stoke Gabriel, Dittisham. | SWWSL | n/a | | | | | | 2005 |
| 1o Negotiate for improvements to be made to the discharge from Totnes STW in AMP3. | Agency | unknown | ● | | | | | |
| 1p Negotiate with private dischargers to ensure that improvements are made. | Agency, private dischargers | unknown | | | | | | 2005 |

Issue 2: Concerns over Effluent Discharges in the Vicinity of the Dart Estuary Shellfishery

Associated Plan: Dart Estuary Management Plan

Permission to commercially harvest oysters and mussels is granted by the Ministry of Agriculture, Fisheries and Food (MAFF), through Several Orders. There is currently only one Several Order in use in the estuary for a site at Waddeton. The Devon Sea Fisheries Committee have applied to MAFF for a Regulatory Order with Several powers for the Waddeton Fishery to enable them to properly manage and structure a sustainable commercial shellfishery on this section of the River Dart. The Waddeton site is currently classified as a harvesting area under the EC Shellfish Hygiene Directive⁹. South Hams District Council are responsible for monitoring under this Directive and this site was classified as class B (see Appendix) in 1994, 1995 and 1996. Where the Hygiene Directive⁹ applies we will ensure there is no deterioration in water quality from consented discharges.

Shellfish beds at Blackness were worked under a lease from the Harbour Authority until 1982, and used as a storage area for oysters until 1992. Following monitoring under the Shellfish Hygiene Directive the site was classified as class C and a commercial decision was taken by the operator not to continue to use the site. The lease is now held by the Devon Sea Fisheries Committee.

There is no provision to impose improvements to discharges under the Shellfish Hygiene Directive. The Shellfish Waters Directive, however, sets standards to protect shellfish from the harmful effects of pollution and includes a guideline standard for faecal coliforms in shellfish flesh or intravalvular fluid. This would afford the shellfishery greater protection, the Dart Estuary is currently not an identified shellfishery under this Directive.

Regulations have recently been set which require the Secretary of State to designate waters which need protection and improvement in order to support shellfish. This means that the Department of the Environment, Transport and the Regions (DETR) have ultimate responsibility for the designation of new sites. The Environment Agency have been asked by the DETR to advise them on the criteria for new designations and we are currently formulating our advice. We then anticipate that if DETR wish to proceed with a review of designated sites we will be formally instructed to do so.

Table 2 Concerns over Effluent Discharges in the Vicinity of the Dart Estuary Shellfishery

| | Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|---|---|-------------------------|-----------------------|-------------------|----|----|----|----|
| | | | | 98 | 99 | 00 | 01 | 02 |
| 2 | Review sites designated under Shellfish Waters Directive. | DETR, Agency | unknown | unknown timescale | | | | |

Issue 3: Risk of *Cryptosporidium* Entering Public Water Supply

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

Occasionally outbreaks of Cryptosporidiosis occur in human populations, and the public water supply is often implicated in these situations. The risk of *Cryptosporidium* entering the water supply is thought to be greatest where there is a direct river abstraction, particularly in an agricultural catchment. There is one direct river abstraction used for public water supply in the catchment at Littlehempston.

There have been two outbreaks of Cryptosporidiosis in Torbay in recent years. In 1992 an outbreak affected at least 160 people. In August 1995 there was a further outbreak causing 575 confirmed cases of the disease; during which SWWSL issued a notice to all those living in the area to boil water before drinking.

In recognition of the national increased awareness of the potential risk to public health posed by this organism a task group was formed in 1997 with representatives from SWWSL, MAFF, Environmental Health Departments and the Environment Agency. This group has assessed the risk of *Cryptosporidium* entering the public water supply. We are currently awaiting this report and we will report its conclusions and any resulting actions in the first annual review of this plan.

Issue 4: Problems Associated with Development

Associated Plans: South Hams AONB, Dartmoor National Park Management Plan, Devon's Local Agenda 21 Network Report

The Dart Catchment is predominantly rural, with the main urban areas being situated at Dartmouth, Totnes and Buckfastleigh. Over the years the area has become increasingly popular with tourists and people looking to retire, putting increasing pressure on development needs within the catchment.

Inappropriate development can cause environmental damage such as loss of flora and fauna, loss of features of geomorphological or geological interest, loss of features of archaeological significance and have an impact upon the landscape value. However, careful developments can bring benefits, i.e. through the clean up of contaminated land, redevelopment of brownfield sites and re-use of old buildings. Where environmental damage may 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 or have the potential to cause environmental problems.

The County Council has developed a waste strategy focusing on household waste and its management over the next 25 years. It reflects the policies and key targets in international, European and national advice and the imperative that waste management becomes more sustainable. The principles of the strategy states that reduction shall be the first priority followed by re-use, recycling, composting, energy recovery and final disposal (see below).

Water quality - In the Consultation Report we reported that a number of industrial estates in the catchment posed an unknown risk to water quality from runoff, spillage and leakage. Risk assessments have now been completed for industrial estates at Ashburton, Buckfast, Buckfastleigh, Kilbury and Staverton. A number of potential problems were identified and remedial measures have been taken/and or are underway. We will ensure through our routine work that these measures are carried out. Where the need arises further risk assessments will be carried out for other sites.

Air quality - Dartmoor has an extremely rich lichen flora; they grow both on rocks and trees, with a number of rare species present. Lichens are very sensitive to air pollution and there is concern that loss and damage to these species is occurring, particularly around the southern edge of the moor. There may also be some damage to other lower plants such as mosses, which grow well in the moist climate of the area. However more information is required to establish the status of these sensitive communities in the catchment.

The deposition of compounds that contain nitrogen, which can act as a fertiliser, can change the make-up of natural plant communities. There are concerns that nutrient enrichment from nitrogen deposition from air may be affecting heathland on Dartmoor.

Air pollution from traffic, industrial processes and power generation can damage flora, fauna and buildings and have significant effects on soils and water as well as contributing to serious health problems such as asthma and bronchitis. The National Air Quality Strategy⁹, requires local authorities to review air quality in their district and these reviews will contribute to the knowledge of air quality in the catchment.

Air pollution is also thought to be causing acidification on Dartmoor, (see Issue 13).

Increased risk of flooding - There are a number of areas in the catchment where we have concerns that proposed developments will increase the risk of flooding. We aim to ensure that development does not reduce the standard of flood defence and that opportunities for environmental and flood defence enhancement are taken. Areas at risk were highlighted in the Consultation Report and these include Staverton Mill, Shinners Bridge and Ashburton. We shall continue, under the terms of Department of the Environment Circular 30/92, to oppose all developments that would exacerbate known flooding until such time as works are implemented to mitigate the adverse effects.

There are proposals by South Hams District Council to rebuild the weir at Staverton. Any such works would require approval of the Agency to ensure it would not lead to an increase in flood risk (see Issue 10).

Waste - We are keen to promote the reduction of waste at source and a new initiative being carried out in South Devon aims to minimise waste generated by local companies. It is driven by the PAYBACK business environment association and Business Link, but is a partnership approach including South Hams District Council, Teignbridge District Council, Torbay Council, Devon County Council and ourselves.

Uncontrolled and illegal tipping of waste, known as fly-tipping, can pose hazards to wildlife, may attract vermin and can cause pollution as well as ruining the appearance of an area. Following the introduction of the Landfill Tax in 1996 it was expected that there would be an increase in this activity. In the Dart catchment there is currently no evidence of an increase in fly-tipping, but we will continue to monitor the situation and will act upon any reports that we receive. As part of our routine work we will publicise the problem of illegal tipping and encourage the public to inform the Agency of any such activity.

Contaminated land - The precise nature of contaminated land in the catchment is not fully known. New statutory guidance¹⁹ to be enacted in 1999 will require local authorities to identify contaminated land within their area. Once these have been identified, it will be necessary to decide what remedial work is required. Development on contaminated land can lead to the release of toxic material to the environment.

Loss of key habitats and species - Important habitats and species have undoubtedly been lost to developments in the past. For example at Longmarsh, Totnes, tipping has destroyed much of the tidally influenced wetland that once existed and only a small remnant remains.

Impacts on sites of importance for Earth Science - The value of geological and geomorphological sites and features is often not fully recognised; not only do they provide a record of the past history of the earth's development, they also help us understand more about present conditions and processes. There is a need to ensure proper protection. They fall into two groups; exposure sites, where features (e.g. typical rock strata) are uncovered above or below ground in a way that allows study; and integrity sites, which are limited or unique in extent (e.g. fossil deposits) and which need more careful preservation.

Quarries and mines, often disused, provide excellent exposure sites, however, they are particularly vulnerable to neglect and damage. Sites have undoubtedly been lost in the past by use as waste disposal locations.

Limestone caves are relatively scarce in the South West, but where they do occur they contain important features associated with the actions of water on rock, as well as often containing important fossil records, again casting light on the past history of the area.

Table 4 Problems Associated with Development

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|--|---|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 4a Review air quality in the area, in line with National Air Quality Strategy°. | LA's | n/a | ● | ● | | | |
| 4b Improve knowledge of status of communities sensitive to air pollution in the catchment. | DNPA, NT, Agency | unknown | ● | ● | ● | | |
| 4c Produce database on contaminated land sites in the catchment. | LA's | n/a | ● | ● | | | |
| 4d Ensure there is effective consultation with local authorities (LA's) with regards to contaminated land. | Agency, LA's | <1 k p.a. | ● | ● | ● | ● | ● |
| 4e Ensure new developments take account of sea level rises at Totnes, Littlehempston and Dartmouth. | Agency, LA's | <1 k p.a. | ● | ● | ● | ● | ● |
| 4f Oppose developments which would increase flood risk at Staverton Mill, Shinner's Bridge and Ashburton. | Agency, LA's | <1 k p.a. | ● | ● | ● | ● | ● |
| 4g Following provision of floodplain mapping, continue liaison with Planning Authorities to determine where further studies need to be carried out. | Agency | 10 k | | | | ● | |
| 4h Ensure sites of earth science value are identified and protected from development. | RIGS, EN, Agency | <1 k p.a. | ● | ● | ● | ● | ● |
| 4i Examine Section 105 survey to identify floodplains and promote and implement Devon BAP for Rivers, Streams, Floodplains and Fluvial Processes particularly in relation to restoration/recreation of fully functioning floodplains where this would reduce flood risk. | Agency | 3 k | ● | ● | ● | ● | ● |
| 4j Support PAYBACK/Business Link initiative to reduce waste at source. | PAYBACK, Business Link, Agency, DCC SHDC, TC, TDC | 5 k | ● | | | | |

Issue 5: Impact of Mineral Extraction

Associated Plans: South Hams AONB, Dartmoor National Park Management Plan

Since publication of the Consultation Report, Whitecleaves Quarry at Buckfastleigh has ceased operation. There is now only one working quarry within the catchment; Linhay Quarry at Ashburton.

Quarrying can have a considerable impact on the environment, especially to water quality; generating high loads of suspended solids in nearby watercourse. There can also be an impact on groundwater levels particularly where deep quarrying takes place. The damaging effects of mineral extraction are often long term and sometimes permanent (see Issue 6). Linhay Quarry also lies within Dartmoor National Park, and has a significant impact on the surrounding environment.

Impact on water quality - The disposal of runoff from both Linhay and Whitecleaves Quarries has historically been an issue, causing high levels of suspended solids in local watercourses. Whitecleaves quarry has now ceased operating and is no longer considered a problem. We will continue to work with the owners of Linhay Quarry to seek further improvements to the discharge.

Impact on nature conservation - Mineral extraction has caused a loss of a number of key habitats in the catchment, particularly sites of geological interest (see Issue 14). Potters Wood SSSI partially lies on land leased to the operators of Whitecleaves Quarry. This site features caves which are of national importance as roosts for the Greater Horseshoe bat and will need to continue to be protected following closure of the quarry.

Table 5 Impact of Mineral Extraction

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|---|----------------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| Sa Ensure key habitats are identified and protected from mineral extraction activities. | Agency, DWT, DCC | <1 k p.a. | ● | ● | ● | ● | ● |
| Sb Continue to liaise with Linhay Quarry to seek further improvements to the discharge and to reduce the impact of the quarry on the environment. | Agency, Quarry Owners, DNPA, DCC | <1 k p.a. | ● | ● | ● | ● | ● |
| Sc Following closure of Whitecleaves Quarry, need to ensure that the scientific interest of Potters Wood SSSI is maintained. | EN, Quarry Owners, LA's, DNPA | n/a | ● | ● | ● | ● | ● |
| Sd Promote and implement Devon BAP for Pits and Quarries and Caves and Mines. | DWT, RIGs, EN, Agency | 2 k | ● | ● | ● | ● | ● |
| Se Produce guidance notes for mineral operators on ways of enhancing restoration and after use of pits and quarries to benefit wildlife and earth science conservation. | RIGs, DCC | n/a | | | ● | | |
| Sf Give increased consideration to natural regeneration as a method of site restoration, as opposed to infilling and planting, with due consideration to public safety. | DCC, Operators, DNPA, Agency | n/a | ● | ● | ● | | |

Issue 6: Impact of Abandoned Mines

Associated Plan: Dartmoor National Park Management Plan

Devon has a mining heritage as diverse as that of Cornwall, but on a much smaller scale. This has resulted in some long term impacts upon the environment, and in particular on water quality. Much of the mining activity on areas of Dartmoor centred around tin streaming, where ore deposits were worked in close relation to moorland streams. 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. Streams which drain shale and slate areas flanking Dartmoor are particularly vulnerable as the mineralisation here includes sulphide ores.

Contamination of land may have occurred from the former operation of metalliferous mine workings in the area. Leaching of heavy metals from contaminated land can subsequently impact upon both local ground and surface water quality. When the contaminated land regulations (see Issue 4) are implemented, abandoned mine sites may 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. We do, however, need to ensure that any disturbance to contaminated sites or any alterations to surface or groundwater flows in these areas do not exacerbate any problems.

There is little evidence available to assess the impact of abandoned mines on groundwater as comprehensive monitoring programmes only exist in areas with substantial groundwater resources. Pollution events will normally be noted when they affect the uses of groundwater, such as abstractions. In the Dart Catchment abstraction of groundwater in areas where mining has occurred is extremely limited.

Routine monitoring of surface water quality in the catchment which includes monitoring for zinc and copper has not highlighted any problems which could be attributed to abandoned mines. The presence of metals such as zinc, iron and copper can effect industrial processes, such as textile dyeing, which use abstracted water.

Table 6 Impact of Abandoned Mines

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|---|-------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 6 Identify and assess effects of abandoned mine workings on unmonitored watercourses and where necessary identify remedial actions to address problems. | Agency | 8 k | ● | ● | | | |

Issue 7: Impact of Farming and Forestry on Rivers and Wetlands

Associated Plans: South Hams AONB, Dartmoor National Park Management Plan

During the past ten years farmers have made great improvements in farm waste storage facilities and disposal methods, the result being a significant reduction in the number of point source pollution incidents attributed to dairy and beef cattle farms and this has contributed to an overall improvement in water quality in the catchment.

However, work still needs to be done to solve the problems of diffuse pollution, for example; runoff from waste spread to land. Guidance to farms is provided by MAFF through the 'Code of Good Agricultural Practice for the Protection of Water'¹¹. All farms found to be causing problems have been visited and remedial work has either taken place or is underway. We will ensure remedial measures are carried out where necessary to improve water quality.

Buffer zones which are created between farmland and riverbanks can be used to achieve a range of benefits; as well as creating wildlife habitats, they act as a livestock exclusion zone which allows the growth of vegetation helping to stabilise river banks; they can reduce soil runoff from farmland during periods of heavy rain, thereby reducing siltation in rivers. Buffer strips can also be effective in reducing nitrate pollution in headwater streams. However, buffer zones can only be effective when properly designed¹².

Impacts on Water Quality - A number of watercourses in the Dart Catchment failed to achieve the desired water quality target due to organic pollution and runoff from agricultural sources.

River Hems - The River Hems from source to Portbridge marginally failed its RQO of RE2 in 1997 as a result of elevated levels of BOD and ammonia. This stretch also significantly failed to meet its long term RQO of RE1. The main reason of failure in the River Hems are three samples taken in summer 1995, the most likely cause of which was identified as farm inputs. Farm waste management plans were drawn up for a number of farms in the catchment surrounding the River Hems and their successful implementation has led to improvements in water quality in both stretches (see Issue 1).

Am Brook - The Am Brook from Collacombe Bridge to the confluence with the River Hems complied with its long term RQO of RE1 in 1997. This improvement in water quality has occurred as a result of improvements to farming practices in the Am Brook catchment; further RQO failures are not anticipated.

Bidwell Brook - The Bidwell Brook from source to Tigley significantly failed its RQO of RE1 and from Tigley to the Dart confluence failed to meet its long term RQO of RE1 in 1997, as a result of elevated levels of BOD. Biological sampling of the Bidwell Brook suggests there may be an impact from organic pollution which is likely to be a combination of farm inputs and problems with the sewerage system in the vicinity of Dartington (see Issue 1). Further work is required to identify the precise causes.

Blackbrook River - The Blackbrook River from source to Dart confluence marginally failed its RQO of RE1 in 1997 as a result of a single high BOD result. Water quality in this stretch is impacted by runoff from the prison farm at Princetown. This is a fairly intensive operation and may contribute to the eutrophic status of the river characterised by excessive weed growth which alters the natural moorland ecology of the river. The prison have produced a conservation plan for the farm, which is understood to include measures to develop a buffer zone alongside the Blackbrook, we strongly support these measures and will provide help and advice where required to ensure implementation.

As part of the Dart Biodiversity Project (see Issue 14) there will be opportunities for the restoration and recreation of habitats which have been damaged in the past by inappropriate agricultural practices, including the restoration of areas of upland heath which have been subject to improvement or have lost much of the heather cover.

Loss of blanket bog and valley mires due to agricultural drainage - These important wetland habitats are not only important in their own right but also hold water on the moor and provide support for river flows during dry periods, acting as sponges releasing water slowly. Dartmoor contains the most extensive areas of blanket bog in the South West. Small numbers of golden plover breed in this habitat, Dartmoor being its only breeding site in Southern England. This species is declining in numbers nationally (see Issue 14). The practice of "swaling" and uncontrolled fires on the moor may contribute to the degradation of this habitat (see Issue 9).

Valley mires are also important, for example: Foxtor mires are the source of the River Swincombe, from which water is abstracted for public supply; the wetland area is undoubtedly important in maintaining flows. The tin streaming activities associated with most Dartmoor rivers have contributed to the formation of mires, due to the partial damming of valleys, with subsequent filling by peat. Keeled skimmer dragonflies are particularly associated with this habitat.

Decline in heather moorland - The general decline in extent and quality of heather moorland is symptomatic of changes in management and more intensive agricultural practices. Heavy grazing tends to encourage grass moor at the expense of heath; this may lead in turn to more rapid runoff, particularly when the vegetation is kept short, with consequent effects on the aquatic environment (see Issue 9). While the Dartmoor ESA has been well received by individual landowners,

there have, as yet, been few agreements over the commons where the majority of heather moorland is present. Modifications to the scheme may result in improved uptake (see Issue 14).

Heather is also being lost in some places as a result of bracken invasion. Bracken control can sometimes be achieved by mechanical methods (cutting or rolling), but in upland areas where the topography makes this difficult chemical control may be the only answer. The appropriate herbicide is asulam, which is approved for use near, but not **in**, water subject to approval from the Environment Agency. This can be relatively easily controlled when spraying small areas using a knapsack sprayer, but when using aerial application it is less easy to ensure wetland areas and watercourses are avoided.

Deterioration of salmonid habitat - Concerns have been expressed by various interests that changes in land use and land management practices have resulted in a degradation in the environmental quality of the Dart headwaters. The results of these changes are siltation of river gravels, excessive algal/plant growth and a tendency towards increased eutrophication of many streams. These factors are seen as a major threat to the continued survival of salmon stocks.

There is obvious visual evidence of siltation in many parts of the catchment partly resulting from natural erosion and partly from poaching of banks by livestock. Bank erosion also leads to channel widening which reduces velocity and leads to further siltation. A study carried out on the River Torridge has demonstrated that siltation of spawning areas severely limits the survival of salmonid ova, and that productivity in degraded reaches is markedly reduced. The processes by which sediment is supplied to watercourses are complex and a research project is currently being carried out by Exeter University. The findings of these studies may be relevant to other river catchments, including the River Dart.

Investigations carried out to date by the Agency have shown that there has been no decline in the water quality of the Dart headwaters, and detailed statistical analysis of juvenile salmonid densities in identified areas similarly shows no significant decline. Although it is known that the problems which have resulted from changing farming practices do have the potential to severely impact salmonid fisheries, the effects on the Dart fishery to date appear limited, particularly when compared with other South West rivers where land use problems are more extreme.

Actions below are both site specific and catchment wide. The catchment wide measures to promote agri-environment schemes and buffer zones in the catchment have multiple benefits, which are targeted to address many of the areas of concern given above.

Table 7 Impact of Farming and Forestry on Rivers and Wetlands

| | Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|----|---|------------------------------|-----------------------|----------------|----|----|----|----|
| | | | | 98 | 99 | 00 | 01 | 02 |
| 7a | Work with Prison Authority to seek better farming practices and facilities to reduce the risk of diffuse pollution entering the Blackbrook. | Prison Farm, DNPA, Agency | <1 k | ● | ● | | | |
| 7b | Encourage uptake of ESA agreements. | MAFF, Agency, DNPA | <1 k p.a. | ● | ● | ● | ● | ● |
| 7c | Work with MAFF to ensure agri-environment schemes have appropriate prescriptions and that payments are set at correct level. | Agency, DNPA, EN | <1 k p.a. | ● | ● | ● | ● | ● |
| 7d | Consider establishing buffer zones alongside rivers to reduce damage to banks by stock, reduce soil erosion and reduce diffuse pollution. | Agency, DNPA, Landowners | unknown | ● | ● | ● | ● | ● |

| | Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|----|---|--|-----------------------|----------------|----|----|----|----|
| | | | | 98 | 99 | 00 | 01 | 02 |
| 7e | Facilitate the securing of funding for bankside fencing to reduce erosion, where appropriate. | Agency, Landowners | unknown | ● | ● | ● | ● | ● |
| 7f | Continue gravel rehabilitation work to remove the build-up of silt to re-establish the gravel for salmonid spawning and monitor the effectiveness of this work. | Agency, DFA, DAA, Netting Interests | 3 k p.a. | ● | ● | ● | ● | ● |
| 7g | Encourage adoption of best practice for swaling (controlled burning). | DNPA, FRCA | n/a | ● | ● | ● | ● | ● |

Issue 8: Potential Eutrophication of the Dart Estuary

Associated Plans: Dart Estuary Management Plan, South Hams AONB

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

Routine estuary chemical water quality data has been obtained for six sites in the Dart Estuary since 1990. Samples were collected from various water depths over a range of tidal, meteorological, and river flow conditions. The data indicate that overall the water quality in the Dart Estuary is good, but that on occasions elevated levels of BOD can occur which appear to be related to algal blooms, as they are generally related to increased chlorophyll levels.

In 1994 and 1995, specialist investigations of water quality in the Upper Dart Estuary were carried out. These showed that large diurnal variations in dissolved oxygen concentrations can occur during the summer. These are apparently associated with algal activity, as depressed levels occurred at night due to algal respiration and elevated levels during the day due to algal photosynthesis.

The large variations in dissolved oxygen coupled with increased chlorophyll levels in the Estuary during the summer suggest that the estuarine waters are potentially eutrophic. On the available information, the major source of nutrients to the Dart Estuary is riverine, but effluent discharges to the estuary may be significant.

There is some anecdotal evidence that eutrophication may be occurring; there have been reports of increased algal growth in the estuary in recent years. A number of salmonid fish have been found dead in the estuary during summer months; the reason for these deaths is unknown although low dissolved oxygen levels are a possible cause.

The Dart Estuary has been identified as a potential Sensitive Area (Eutrophic) under the EC Urban Waste Water Treatment Directive¹³. We will be carrying out intensive chemical and biological monitoring to determine its trophic status and the principal sources of nutrients to the estuary. If the estuary is found to be eutrophic, and there is a significant input of nutrients from sewage discharges which qualify under the Directive, we will recommend to DETR that the Dart Estuary is designated as a Sensitive Area. This will then require nutrient input from these discharges to be significantly reduced and controlled. Designation of the Estuary as a Sensitive Area may require nutrient removal to be installed at any 'qualifying discharges'.

Designation as a Polluted Water may require the Agency to seek advice from MAFF on how to control fertiliser application in the catchment. The status of the Dart Estuary as a potential Polluted Water under the EC Nitrates Directive¹⁴ will be dependant upon the outcome of the above studies on trophic status and the principal sources of nutrients to the estuary.

Table 8 Potential Eutrophication of the Dart Estuary

| | Actions | Action By Lead <i>Other</i> | Cost to Agency (£) | Financial Year | | | | |
|---|--|--------------------------------|-----------------------|----------------|----|----|----|----|
| | | | | 98 | 99 | 00 | 01 | 02 |
| 8 | Conduct chemical and biological monitoring to investigate the nomination of the estuary as a Sensitive Area or Polluted Water. | Agency, <i>DETR</i> | 25 k | ● | ● | ● | ● | |

Issue 9: Concern over Low Flows

Most of the flow in the catchment is derived from surface water. As a result flows drop markedly during prolonged dry periods. Low flows in watercourses can damage the environment in a number of ways by affecting aquatic wildlife and exacerbating water quality problems due to reduced dilution. At a catchment level, abstraction is not considered to adversely affect flows. Only an estimated 4.6% of the total available water resource is abstracted and not returned to the catchment.

In the Dart Catchment low flows are only an issue in dry summers. However, there are concerns that low flows in the river during dry summers have been exacerbated by changes in land use and drainage. The potential for water retention on the moor is thought to have declined, possibly resulting in a reduced retention time for water in the catchment as a whole.

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 (see Issue 14). It is possible that a change in vegetative cover could affect the hydrology of the moorland watercourses. In addition, the practice of swaling (controlled burning) and uncontrolled moorland fires 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 (see Issue 7).

Table 9 Concern over Low Flows

| | Actions | Action By Lead <i>Other</i> | Cost to Agency (£) | Financial Year | | | | |
|----|--|---|-----------------------|----------------|----|----|----|----|
| | | | | 98 | 99 | 00 | 01 | 02 |
| 9a | Conduct research into the effects of 'swaling' and changes to moorland vegetation on both catchment hydrology and nutrient leaching. | Plymouth University, <i>EN, Agency, DNPA</i> | 2 k p.a. | ● | ● | ● | | |
| 9b | Develop and implement appropriate actions following completion of research. | <i>EN, DNPA, Agency</i> | unknown | | | ● | ● | |
| 9c | Support research into climate change and assess acceptable water flows in watercourses. | Agency | unknown | ● | ● | ● | | |

There are 28 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. However, some weirs which do not have passes seriously inhibit the movement of fish as they only permit migration during a limited range of flows. In many cases improving conditions at these weirs is of considerable importance as they prevent free access to major spawning areas.

When a new weir is constructed or an old weir damaged or allowed to fall into a state of disrepair, the Agency can require the owner to install a fish pass if conditions for fish passage are likely to be compromised. Under these circumstances, the weir owner is liable for the costs of the works. Although we can install fish passes on any existing weir, it must be at our own cost. Many of the works required on weirs in the catchment entail 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.

Many weirs which have passes installed become obstacles under low flow conditions where they are associated with high levels of abstraction. Often a large proportion of the total river flow is abstracted leaving only a small quantity to flow over the weir or through the fish pass. For new abstractions it is possible to set conditions to protect the river, for example, winter only abstraction or a prescribed flow, but for existing abstractions where there is a licence of entitlement, we can only negotiate with the abstractor to limit the quantity taken at certain times of the year; this is largely dependent upon goodwill.

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 abstractors to have screens installed by 1 January 1999. Problem sites for screening have been listed and over the next few months we will be working with abstractors. We recognise that for many abstractors this will require considerable financial outlay, and major works will need to be undertaken, so it is intended to allow up to 5 years after 1999 for the screens to be installed. Fish farms and abstractors also have to have a bypass channel to allow downstream migration of smolts.

During the summer months we are often involved in the removal of boulder dams from moorland rivers and upland streams which have been created by visitors to the moor. The Agency will continue to work with other organisations, including DNPA and fishing associations, to remove these temporary obstructions on moorland streams. It is important that these dams are regularly removed as they are commonly impassable to fish migrating to spawning areas. Sometimes coarse woody debris accumulates to form trash dams. Unlike boulder dams, these can provide an important in-stream habitat for a range of species, particularly invertebrates. However, under extreme events, these can obstruct the passage of migratory fish and we need to remove them when they reach this stage.

Other sites which have been identified as requiring attention include weirs on the Harbourne River and Strode road bridge on the River Mardle. There are several major obstructions on the River Harbourne which require improvements. This major tributary of the Dart contains several areas of quality spawning habitat which, if fully utilised, would contribute significantly to the overall salmonid production in the catchment.

Staverton Weir - This structure has suffered from prolonged deterioration for many years. During 1995 the weir was breached and following consultation with interested parties, the Agency repaired the breach creating a new route for fish

migration at the same time. This considerably improved conditions for fish migrating over the weir as the existing fish pass had fallen into a state of disrepair. South Hams District Council is considering completely reinstating the whole weir, which may include blocking the existing route used by migrating fish. Such works would necessitate the installation of a new fish pass to ensure that the weir did not create an obstacle. As an interim measure a bid by South Hams District Council for European Union funds has been made to allow repairs to be carried out to stabilise the current position (see Issue 4, 14, & 17).

Kilbury Weir - This weir is gradually falling into a state of disrepair and has been listed as a priority site for attention. Migrating fish are currently able to negotiate the structure in moderate/good flows, but they experience problems in low flows. A fish pass installed on the weir is of limited value since when the river drops, the pass runs dry. Due to the prohibitively high cost of rebuilding the weir, it is likely that it will continue to deteriorate. It is important to ensure that a complete barrier to fish movement is not created as this deterioration occurs.

Jordan Weir - A small block stone weir has been installed at the base of the pass to improve conditions for migration, which appears to be effective.

Table 10 Barriers to Fish Migration

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|---|-------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 10a Identify sites which create problems for the downstream migration of smolts. | Agency | 1.5 k | ● | | | | |
| 10b Following National Guidance on screening criteria; advise abstractors of the Agency's screening requirements and work towards implementation. | Agency, abstractors | 4 k | ● | ● | ● | ● | ● |
| 10c Identify remaining obstructions to migration and consider fish pass installation if appropriate. | Agency | unknown | ● | ● | ● | ● | ● |

Issue 11: Risk of over Exploitation of the Salmon Fishery

Many of the factors which influence the numbers of migratory fish returning to the river to spawn fall outside our statutory responsibilities; for instance, distant water fisheries and the Irish drift net fishery. This places particular importance on measures adopted locally to maximise the number of fish returning to spawn, and to ensure that conditions in the river system are favourable for successful spawning and survival.

Analysis of current and historical catch returns from rivers across the country has shown a marked decline in the numbers of salmon entering rivers between 1 January and 31 May and returns from the River Dart reflect this decline.

The future management of salmon stocks on the Dart will be facilitated by the production of a Salmon Action Plan for the river in 1998-9, and will include consultation with fisheries interests. The Salmon Action Plan will contain more detailed actions for the salmon fishery in addition to those highlighted in the LEAP. We have produced a national strategy for the management of salmon²⁰, part of this strategy is to develop individual action plans for all major salmon rivers in England and Wales. The national strategy sets out four objectives for the future management of salmon stocks: optimise recruitment to home water fisheries; maintain and improve the diversity and fitness of stocks; optimise the total economic value of exploited fish whilst allowing for social equity considerations; meet the necessary costs of managing the resource.

Existing fisheries data will be important in identifying problems within the catchment. The data will be used for setting targets for spawning and assessing how the salmon fishery complies with these targets. It is recognised that a fish counter installed on the river to assess the extent and timing of the migratory fish run would be a valuable management tool, and would greatly increase the quality and quantity of information currently available. The Agency has recently purchased the hardware for a resistivity counter which it is hoped will be installed in the Totnes Weir fish pass when further funds become available.

Migratory fish may be legally taken from the River Dart by the net fishery in the estuary, or the rod fishery in the freshwater river. Adult fish are also being taken from the river, estuary and adjacent coastline by illegal fishing. Poaching can have a dramatic effect on fish stocks if uncontrolled. We maintain a programme of regular enforcement on the Dart to minimise the numbers of fish taken illegally. Presently the extent of poaching carried out is thought to be limited, however, the importance of maintaining an enforcement presence on the river and at sea is recognised as a necessary requirement to prevent poaching increasing.

The Net Limitation Order (NLO), which limits the number of licensed salmon nets operating on the Dart estuary to 18, has been renewed with effect from December 1997 for a period of two years.

We are only empowered to regulate exploitation in a river system, and are not able to determine the proportion of fish which may be taken by the net and the rod fisheries. This is a decision that can only be made by Government, requiring legislative change. Our current powers to regulate licensed fishing are limited to the conservation of the resource, and to improve the management of individual stocks. Initial analysis of a variety of data indicates that there is cause for concern over the state of salmon stocks, and in particular the spring component of the run.

It has become apparent following a decline in numbers of spring fish returning to the Dart that particular importance needs to be given to protecting this component of the salmon run.

Irrespective of the possibility of reduction in exploitation associated with any net limitation order, additional measures to maximise the numbers of spring fish returning to spawn should be considered either on a voluntary or mandatory basis, or in combination.

It is anticipated that a new NLO will be in place as from 2000 following the expiry of the current 2 year NLO. Development of these measures will be undertaken by the Agency in partnership with all fisheries interests on the Dart. The problem has been recognised by the Duchy of Cornwall Estates, Dart Fisheries Association and the Dart Angling Association who have introduced voluntary restrictions to protect spring fish.

Table 11 Risk of over Exploitation of the Salmon Fishery

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|--|-----------------------------|--|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 11a Carry out detailed analysis of fishery data including juvenile surveys, setting spawning targets, egg deposition rates and declared catch returns. | Agency | 5 k | ● | ● | | | |
| 11b Introduce catch controls and new NLO to manage exploitation in line with the findings of above. | Agency, Fisheries Interests | 5 k (unless public inquiry, then 50 k) | | | ● | | |

| Actions | Action By Lead <i>Other</i> | Cost to Agency (£) | Financial Year | | | | |
|---|----------------------------------|-----------------------|----------------|----|----|----|--|
| | | | 98 | 99 | 00 | 01 | 02 |
| 11c Consider introduction of rod and net fishing byelaws to reduce exploitation of spring fish. | Agency, Fisheries Interests | 2 k | ● | ● | | | |
| 11d Produce Salmon Action Plan for the River Dart. | Agency | 5 k | ● | ● | | | |
| 11e Carry out study to identify behaviour and spawning preferences for spring salmon, if funds available. | Agency, <i>Others</i> | 15 k p.a. | | ● | ● | ● | |
| 11f Promote voluntary conservation measures for spring fish until formal measures are in place. | Agency, Fisheries Interests | <1 k | ● | ● | | | |
| 11g Develop resistivity fish counter as funds become available. | Agency, WRT, Fisheries Interests | 60 k (total cost) | | | | | timescale depends on availability of funding |

Issue 12: Additional Threats to Fish Stocks

Concerns have been raised regarding the decline in brown trout catches in the catchment over recent years and in the increase in fish-eating birds. Both issues require further investigation to assess whether these problems are real or perceived.

Brown trout - Historically, fishing interests have stocked various reaches of the Dart with farmed brown trout originating from a variety of sources to improve the quality of angling. This practise may have an adverse effect on the native population by increasing competition for food and habitat, and by increasing predation of native juveniles. Furthermore, the continued introduction of farmed fish will modify the genetic integrity of remaining native stocks.

The upper reaches of the River Dart support a significant stock of wild native brown trout. In order to maintain the genetic integrity of these stocks the Wild Trout Society has proposed the commissioning of a fishery consultant to provide advice on habitat management and conservation measures on the whole of the Cherry Brook. In addition, it is also proposed that voluntary catch and release schemes be placed on the Upper East Dart (above Postbridge), Blackbrook and the West Dart. The Agency supports this project and will contribute as required.

We are proposing to commission regional research into the perceived decline of brown trout. The outcome of the bid for funding for the project will be known by June 1998, and once this is available a decision will be taken as to where the research will be carried out.

Fish-eating birds - In common with many rivers in the area, there has been an increase in the numbers of cormorants and goosanders observed in the Dart Catchment. Concerns are regularly expressed by various fishing interests that this is adversely affecting the fishery. They mostly occur during the smolt run in March where large numbers of salmonids descend the river into the estuary at a size that makes them particularly vulnerable. The lower reaches of many South West rivers contain coarse fish stocks which like salmonids are known to be susceptible. On the Dart, predation in freshwater will be almost exclusively of salmonid species. MAFF, who issue licences for the culling of cormorants, is presently carrying out research to determine the possible effects of cormorants on fisheries. These birds are protected under the Wildlife & Countryside Act¹³ and the EC Birds Directive¹⁴ and we will not support licensed killing of fish-eating birds until, and unless, proof of serious damage has been established and killing is proved to be the most

effective means for preventing significant loss of fish stocks. However, we are committed to working positively with owners and anglers to establish the full facts in each situation.

Table 12 Additional Threats to Fish Stocks

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|--|-----------------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 12a Carry out research into perceived decline in stocks of brown trout. | Agency | 20 k | ● | ● | | | |
| 12b Discourage stocking with fish other than those originating within the catchment. | Agency, Fishing Associations | <1 k | ● | ● | ● | ● | ● |
| 12c Promote habitat enhancement as a preferred method of improving stock levels. | Agency | <1 k | ● | ● | ● | ● | ● |
| 12d Co-operate with the licensing authority to progress further research into the issue of fish-eating birds. | Agency, MAFF, Landowners, Anglers | <1 k | ● | ● | ● | ● | ● |
| 12e Continue to work positively with fishery owners and anglers to establish the full facts in each situation. | Agency, MAFF, Landowners, Anglers | <1 k | ● | ● | ● | ● | ● |
| 12f Implement recommendations from R & D research into fish-eating birds. | Agency | unknown | | ● | ● | ● | ● |

Issue 13: Acidification of Dartmoor

Moorland areas are typically acid due to the underlying geology and soils. The acidity of Dartmoor maybe exacerbated by atmospheric acid deposition, the main sources of which are sulphur dioxide and oxides of nitrogen. In the northern hemisphere these compounds come mainly from burning fossil fuels, but also from natural sources such as organic decay, volcanic eruptions and lightning strikes.

Emissions of nitrogen oxides are thought to be responsible for about one third of the acidity of rainfall, and the proportion appears to be increasing. Road vehicles are responsible for about half of the emissions of nitrogen oxides in the UK. Agency regulated processes account for an estimated 22% of total UK nitrogen oxide emissions, and we aim Nationally to reduce these emissions by 33% from a level of 512,000 tonnes in 1995 to 338,000 tonnes in 1998.

Under the terms of the Second Sulphur Protocol of the United Nations Economic Commission for Europe¹⁷, the UK has agreed to reduce its SO₂ emissions by 80% by 2010. The UK's Sulphur Strategy published in December 1996¹⁸ indicates that the UK will meet interim targets for 2000 and 2005. Compliance is also expected with the 80% reduction target for 2010. Agency regulated processes account for an estimated 70% of total UK sulphur dioxide emissions, and we aim Nationally to reduce these emissions by 75% from a level of 1,656,000 tonnes in 1993 to 414,000 tonnes by 2005.

Changes in land use could have significant effects on the level of acid deposition. Forestry, in particular coniferous forests, can increase the level of acid deposition where they are present¹⁹. This is primarily due to the way the forest canopy 'scavenges' pollutants from the atmosphere. Additionally, as pine needles break down they release acidic compounds. It is important that the impact of any significant proposals for afforestation on Dartmoor is assessed.

Impact on fish stocks - There are concerns that the acid conditions of the moorland headwaters of the catchment limit the productivity of juvenile salmonids. However, studies carried out on the Narrator Brook, a tributary of the River Plym and the only acid water monitoring site on Dartmoor (these sites form a national network), show that brown trout appear to have adapted to the acid conditions and remain largely unaffected. Currently there is no evidence to suggest that pH levels experienced in the Dart are influencing juvenile salmonid stocks.

Key habitats - There are concerns that blanket bog and valley mire habitats, and their associated species may be being affected by acid deposition³. There is some concern that acid deposition may be having an adverse effect on the ecology of streams and rivers; certainly there is some evidence of acidification in SSSI's around Britain.

Clearly more information is required to ascertain whether or not acid deposition is causing any detrimental effects in this catchment.

Table 13 Acidification of Dartmoor

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|---|------------------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 13a Ensure Part A processes authorised under IPC legislation achieve planned emission reductions. | Agency, Industry | <1 k p.a. | ● | ● | ● | ● | ● |
| 13b Promote measures to reduce emission of nitrogen oxides from traffic. | DCC, LA's | n/a | ● | ● | ● | ● | ● |
| 13c Examine performance of salmonid fishery as part of Salmon Action Plan ²⁰ . | Agency | unknown | ● | ● | | | |
| 13d Conduct research to improve understanding of acidification of Dartmoor and its effects. | Universities, IFE, Agency, DNPA | unknown | ● | ● | ● | ● | ● |
| 13e Assess impact of any proposals for afforestation >10 ha within the acid sensitive area. | Agency, FA | <1 k p.a. | ● | ● | ● | ● | ● |

Issue 14: Biodiversity and Earth Science

Associated Plans: South Hams AONB, Dartmoor National Park Management Plan, The Nature of Devon, The Nature of Dartmoor, Dart Estuary Management Plan

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.

The UK Steering Group Report²¹ was published in 1995 and since then a number of regional plans have been produced including Action for Biodiversity in the South West (1997)²². 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 Devon². Work is commencing on the production of Action Plans for both Dartmoor and South Devon; and 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 Plan²³; 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 (which for these species is the Wildlife Trusts).

English Nature, the government's statutory nature conservation adviser, has divided England into a large number of Natural Areas based on their physical attributes, wildlife, land use and culture. Profiles are being produced for each of these areas which will help to identify the distinctive nature conservation character and to guide action for their benefit. The Dart Catchment lies in the Dartmoor and South Devon Natural Areas, while the coast and sea is part of the Lyme Bay Maritime Natural Area.

As part of the Natural Areas initiative English Nature intends to identify Prime Biodiversity Areas. They are seen as areas where resources may be targeted most effectively to achieve wildlife conservation. The Dart Catchment has been identified as a Prime Biodiversity area and the Dart Biodiversity Project, which is jointly funded by the Environment Agency, Dartmoor National Park Authority, The Duchy of Cornwall, English Nature and Leader II, aims to co-ordinate and deliver relevant actions and targets for the biodiversity that have been identified in existing plans. This includes the actions identified in the Dart Action Plan. It is planned to start this project in April 1998, lasting for three years.

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

| Key Habitats/Associated Species/Geological feature | Reason for Inclusion | Threats in this Catchment | Associated Issue |
|--|---|--|------------------|
| Wet woodland Few known rarities but rich in: <i>lichens</i> <i>invertebrates</i> | Nationally uncommon, lack of knowledge Declining | Lack of information/appreciation, invasive plants, grazing Air quality | 7, 15 |
| Reedbed <i>Otter</i> <i>Reed bunting</i> <i>Warblers</i> <i>Moths</i> | Threatened across Europe National decline | Disturbance, pesticides Habitat loss | 1, 4, 7, 17 |
| Lowland farmland <i>Brown hare</i> <i>Cirl bunting</i> <i>Skylark</i> | National decline High % of nat. population National decline | Agricultural improvement, loss of mixed farming Changing practices | 7 |

| | | | |
|---|--|--|----------|
| Unimproved neutral grassland <i>Brown hare</i> <i>Lapwing</i> | Rapidly declining National decline Declining | Loss of mixed farmland Drainage, intensification | 7 |
| Caves, Mines, Quarries <i>Greater horseshoe bat</i> <i>Cave shrimp</i> | Rapid national decline High % of population High % of population, very local | Landfill usage, mineral extraction, recreation, waste disposal Disturbance, improvement of feeding areas Water quality | 4, 5, 17 |
| Blanket Bog <i>Extensive peat deposits</i> <i>Dunlin</i> <i>Golden Plover</i> | Internationally important Major % of county resource Threatened in Europe Localised breeder | Overgrazing, burning, drainage Disturbance, habitat loss | 7, 9, 17 |
| Valley Mire <i>Curlew</i> <i>Keeled skimmer</i> <i>Bog orchid</i> | Nationally important Threatened in Europe Regionally Important Internationally important population | Localised overgrazing, burning, drainage Disturbance, changes in management Eutrophication | 7, 9, 17 |
| Rhös Pasture <i>Marsh fritillary</i> <i>Southern damselfly</i> | Nationally important Threatened in Europe >50% decline in UK Globally threatened Localised | Agricultural improvement/intensification, neglect/undergrazing, pond creation, Intensification Hydrological changes | 7, 9 |
| Upland Heath <i>Red Grouse</i> <i>Skylark</i> | Internationally important Local decline National decline | Overgrazing, burning Changes in management | 7 |
| Fast-flowing acidic rivers <i>Otter</i> <i>Salmon</i> | Significant proportion of the county resource, threatened Threatened in Europe Nationally threatened | Invasive plants, pollution, mineral extraction Disturbance, pesticides Exploitation | 1, 5, 15 |
| Estuaries, estuarine habitats and saltmarsh | Threatened | Development, recreation | 4, 17 |
| Sea cliff & slope | Threatened | Recreation, coastal defences | 20 |
| Oakwood | High % of county resource | Lack of management, invasion by non-native plant species | 7 |
| Hedgebanks, stone walls, etc. | High % of county resource | Neglect, inappropriate maintenance | 7 |

The Dart Catchment contains three candidate Special Areas of Conservation (SAC), listed according to the terms of the EC Habitats Directive²¹. They include all or part of seven existing Sites of Special Scientific Interest (SSSI) and are considered internationally important for the following habitats and species; blanket bog (Dartmoor cSAC); oak woodland (South Dartmoor Woods cSAC); and caves which support important bat populations (South Hams cSAC).

The Environment Agency has additional responsibilities, in addition to its normal conservation duties, placed on it by the Habitats Directive and the legislation which implements it in this country. As a competent authority we must exercise our powers to further the conservation objectives of such sites and we will need to review consents and other authorisations which may adversely affect them (see Issue 1 & 4).

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 Devon²²; wet woodland, Rhos pasture, curlew, marsh fritillary, Southern damselfly, estuaries, rivers, streams, floodplains and fluvial processes, and otter. When this plan is published in July 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 Dart Catchment. Actions are also included here for species and habitats which do not yet appear in the Biodiversity Action Plan for Devon²³.

- **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 Dart Catchment and we need to find out more about their value so that they can be properly managed.
- **Reedbed (linked species - otter, reed bunting, warblers, moths)** - The major reedbeds in the catchment are in the upper reaches of the Dart Estuary, where significant stands have developed behind the banks which have breached. Reed is an important habitat for a number of bird species as well as many invertebrates.
- **Lowland Farmland (linked species - brown hare, cirl bunting, weasel's snout)** - Much of the South Hams is a typical lowland farming landscape, with a mixture of improved pasture and arable land. Field boundaries are important features, as are the small areas of semi-natural habitat. Changing agricultural practices, for example, the move from spring-sown to winter-sown cereals and from hay to silage, have resulted in changes to the flora and fauna of farmland. Birds that were once common are now much rarer; South Devon now supports most of the few remaining cirl buntings. Arable weeds and flowers of hedgebottoms are also much rarer. The Dart Catchment is a key area for declining lowland farmland species (see Issue 7).
- **Unimproved Neutral Grassland (linked species - brown hare, lapwing)** - Once widespread, this species-rich grassland has almost disappeared everywhere, largely as a result of agricultural intensification over the last fifty years. In South Devon, the steep sides to many of the valleys have prevented easy access for improvement and there is, therefore, a significant amount of unimproved grassland remaining. The main threats are from overgrazing or neglect.

- **Caves/Mines/Quarries (linked species - greater horseshoe bat, cave shrimp)** - The largest remaining population of greater horseshoe bats in Britain uses cave sites in this catchment; they are vulnerable to disturbance, as well as changes to their feeding areas. A cave shrimp is also found in the catchment which occurs at only one other site in the UK. The underground features are geologically significant too. A number of quarries provide good examples of geological exposures or processes; they are often at risk as disposal sites.
- **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.
- **Rhôs 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 Directive²³. 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.
- **Fast flowing acidic rivers (linked species otter, salmon)** - 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.
- **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.

- **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 (see Issue 4 & 17). The Dart estuary includes small but valuable areas of saltmarsh with a range of species present.
- **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 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. Only actions which are specific to certain features, key habitats and species are presented in the following table.

Table 14 Biodiversity and Earth Science

| Actions | Action By Lead <i>Other</i> | Cost to Agency (£) | Financial Year | | | | |
|--|--|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 14a Support the Dart Valley Prime Biodiversity Project. | Agency, DNPA, Duchy of Cornwall, EN, Leader II | 5 k p.a. | ● | ● | ● | | |
| 14b 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 | ● | | | | |
| 14c Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Wet woodland. | Agency | unknown | ● | ● | ● | ● | ● |
| 14d Identify key sites of wet woodland within the catchment to achieve better understanding of extent and value. | Agency, DNPA, FA, EN, NT, DWT, <i>Others</i> | 2 k | | | ● | | |
| 14e Support survey to determine invertebrate interest of wet woodland. | Agency, NT | 5 k | | | ● | | |
| 14f Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Reedbeds - including encouragement of creation of new reedbeds and conservation management of existing areas. | Agency, EN | 2 k | ● | ● | ● | ● | ● |
| 14g 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 | 2 k | ● | ● | ● | ● | ● |
| | DNPA, RSPB, DBWPS, EN | n/a | | ● | | | |
| 14h 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; | Agency, Universities | unknown | | ● | ● | ● | |

| | Actions | Action By Lead <i>Other</i> | Cost to Agency (£) | Financial Year | | | | |
|-----|--|---|-----------------------|----------------|----|----|----|----|
| | | | | 98 | 99 | 00 | 01 | 02 |
| | Curlew - includes control of disturbance (see also estuaries). | DNPA, Agency, RSPB, DBWPS | 2 k | ● | ● | ● | ● | ● |
| 14i | Implement Actions from Biodiversity Action Plans for Devon and/or Dartmoor and/or South Devon for: Rhos 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 | 3 k | ● | ● | ● | ● | ● |
| | | DNPA, BC, Agency | 2 k | ● | ● | ● | ● | ● |
| | | DNPA, Agency | 2 k | ● | ● | ● | ● | ● |
| 14j | 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 | ● | ● | ● | ● | ● |
| 14k | 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; Wolverine - include identifying existing populations, carry out and support habitat restoration; Salmon - (see Issue 10 & 11); | Agency, EN, LA's, Riparian Owners | 5 k | ● | ● | ● | ● | ● |
| | | Agency, DWT, Riparian Owners | 3 k | ● | ● | ● | ● | ● |
| | | DWT, Agency, EN, DCC | 2 k | ● | ● | ● | ● | ● |
| 14l | Support county-wide survey of sand martin and kingfisher nest sites. | DBWPS, RSPB, Agency, NT | unknown | ● | | | | |
| 14m | Retain all known sand martin and kingfisher sites and seek to create suitable conditions for colonisation elsewhere. | Agency, NT | <1 k p.a. | ● | ● | ● | ● | ● |
| 14n | Promote measures to prevent loss of earth science sites and features in rivers and floodplains. | Agency, NT, DNPA | unknown | ● | ● | ● | ● | ● |
| 14o | Identify areas where flood control standards could be relaxed to improve/enhance wetland habitats. | Agency | <1 k p.a. | ● | ● | ● | | |
| 14p | 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 | 2 k | ● | ● | ● | ● | ● |
| 14q | Identify and document County Geological Sites. | Devon RIGS Group Agency, LAs, EN, DNPA | <1 k p.a. | ● | ● | ● | ● | ● |
| 14r | Encourage greater appreciation and understanding of County Geological Sites. | Agency, DCC | <1 k p.a. | ● | ● | ● | ● | ● |
| 14s | Include suitable survey techniques for lamprey in routine fisheries survey work, with identification to species level. | Agency | <1 k p.a. | ● | ● | ● | ● | ● |

Issue 15: Spread of Invasive Plants

Associated Plans: South Hams AONB, Dartmoor National Park Management Plan

There are several alien species of plant present in the catchment which are rapid colonisers and are spreading at the expense of more natural vegetation. Under the Wildlife and Countryside Act 1981 (Section 14 (2)) it is an offence if any person plants or otherwise causes to grow in the wild, plants such as Japanese knotweed or giant hogweed.

Himalayan balsam is well known and has been present for many years; it spreads easily along rivers and streams forming dense strands that exclude other plants.

Japanese knotweed is less closely linked to the water environment, but is still extremely invasive, regenerating from small fragments of root or stem. It can grow through tarmac or concrete and spreads rapidly once established. Control is difficult and disposal must be carried out with care. Soil containing parts of the plant should be treated as contaminated. We will control the plant on any sites that we own or manage and will work with others to try to reduce the problem. Dartmoor National Park Authority have a control programme with which we will co-operate.

Giant hogweed which grows up to fifteen feet in height, not only seeds very heavily, but establishes dense growth within a few years. It also presents a significant risk to health. Contact with either the sap of the plant or the coarse hairs which cover it causes severe blistering to the skin, together with possible long-term sensitivity to sunlight. It is currently rare in the Dart Catchment, but we are keen to know of any sites where it is present, particularly if close to water.

We have produced a booklet dealing with these three species and their control and this is available from our offices on request.

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 two most problematic species are *Myriophyllum aquaticum*, sometimes sold as parrot's feather, and *Crassula helmsii*, known as Australian swamp stonecrop or New Zealand pigmyweed. 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 like 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.

Concerns have also been raised about the spread of Hemlock Water Dropwort. This is a native plant and the Agency has no plans to control it.

Table 15 Spread of Invasive Plants

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|--|--|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 15a Encourage recording of invasive plants by field staff and others. | Agency | <1 k | ● | ● | ● | ● | ● |
| 15b Raise awareness of problem of Australian swamp stonecrop and Parrots feather through garden centre trade associations. | Agency, Garden Centre Trade Associations | 2 k | ● | ● | | | |
| 15c Encourage removal from ponds of Australian swamp stonecrop and Parrots Feather where already established. | Agency | n/a | ● | ● | ● | ● | ● |
| 15d Continue surveys for invasive bankside species. | Agency | 2 k | ● | ● | ● | ● | ● |
| 15e Carry out control on any Agency managed sites. | Agency | unknown | ● | ● | ● | ● | ● |
| 15f Encourage control by riparian owners and other interested parties. | Agency | n/a | ● | ● | ● | ● | ● |
| 15g Co-operate with owners and other bodies to achieve eradication of giant hogweed on Wray Brook. | Agency, LA's, DCC, HA | 2 k p.a. | ● | ● | ● | | |
| 15h Make invasive plants booklet widely available. | Agency | <1 k | ● | ● | ● | ● | ● |

Issue 16: Lack of information on Archaeological/Historic value of Catchment

Associated Plans: South Hams AONB, Dartmoor National Park Management Plan

There are numerous sites of national historical and archaeological importance within the River Dart Catchment, many of which are situated on Dartmoor.

Whilst the area of Dartmoor has been fairly widely studied and documented, there are other areas of the catchment where the archaeological and historic value may be unknown. Unidentified sites are at risk from new development or changes in land use and there is a need for a general assessment of sites of potential importance. 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.

There is a need for an assessment of the overall historic and archaeological value of the catchment to provide a framework for consideration in relation to actions. It is intended to carry out a pilot study in the east of the county to assess the archaeological and historic importance of the area. Once this has been completed it is hoped to carry out a similar study for the Dart Catchment.

Table 16 Absence of General Assessment of Archaeological/Historic Value of Catchment

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|---|--|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 16 In the absence of general assessment support the production of document(s) covering entire area to provide a better understanding of archaeological/historic value of catchment. | DCC, LAs, EH, DAS, Agency, RCHME, Uni. of Exeter, NT | 3 k | | ● | | | |

Issue 17: Concerns with the Recreational Use of the Catchment

Associated Plans: South Hams AONB, Dartmoor National Park Management Plan, Dart Estuary Management Plan, Lyme Bay and South Devon Shoreline Management Plan

Many people spend their spare time enjoying our rivers and coasts. We have a general duty to promote the recreational use of water in England and Wales and we will support sensitive and sustainable access initiatives that respect the interests of local people.

There are some sites in the Dart Catchment where there are opportunities to improve facilities for recreational use and we try to do this where we can, particularly if land is in our control. There are also areas where recreation is having an adverse effect on the environment. The Agency recognises that recreation can conflict with other interests such as conservation, and we work with other organisations to resolve these problems. In promoting new recreational facilities we endeavour to ensure that the environment is safeguarded.

Recreation within the Dart Estuary is also covered within the Dart Estuary Management Plan produced by South Hams District Council. One of the aims of this document is to manage and enhance the recreational activities of the estuary and ensure they are consistent with the goals of sustainability and the protection of the natural beauty of the Dart.

Restricted public access to rivers - Access to rivers in the catchment is restricted to existing footpaths and other rights of way (see Access agreements for canoeists below). Many of these routes are difficult to use especially for the less able. We do not encourage new access routes or promote the use of particular rights of way without the support of landowners and countryside interests. The Totnes Riverside Path is managed by South Hams District Council who have a programme of work to improve the path and promote its use by the disabled and cyclists. The Dart Valley Trail has been developed by Devon County Council to provide a circular footpath route around the Lower Dart. They will be looking for opportunities to extend the footpath in the future.

A project is being developed at Totnes to improve angling facilities for the disabled, including wheelchair access. A limited number of day tickets will be available to the public.

Visitor pressure - Large numbers of visitors can cause disturbance or even damage to the environment. Footpaths and other rights of way are subject to erosion from walkers, horse riders, cyclists and motorcyclists. Management of access, particularly in more natural areas, is increasingly important in the countryside.

Riverbanks are particularly vulnerable to damage from heavy recreational use. At some honeypot sites, such as Newbridge, Dartmeet and Bellever, the Dartmoor National Park Authority has carried out erosion control works by sensitive use of natural boulders. Elsewhere, such as at Lower Cherrybrook bridge, a combination of stock access and recreational use has resulted in channel widening with consequent slower flows and sediment deposition, affecting salmonid habitat (see Issue 12). A collaborative project is underway to improve the situation at this site.

Disturbance to wildlife - Sensitive species also suffer as a result of disturbance from large numbers of visitors. In particular concern has been expressed about the following:

- erosion and disturbance of high moorland and species, partly as a result of letterboxing; breeding birds, in particular are vulnerable;
- disturbance of bats due to caving activities;

- disturbance of bankside habitat, with associated species such as otters and birds; this is particularly a problem in the wooded middle reaches, where footpaths run close to the riverbank.

Access agreements for canoeists - As one of the premier canoeing rivers in England, the Dart is heavily used by participants of the sport, especially in the section known as 'The Loop' between Newbridge and Holne Bridge, with canoeists prepared to travel long distances. Although existing access agreements tend to protect the interests of anglers during the fishing season, and spawning areas in the winter, conflicts arise where canoeists use the river in the closed period. Access agreements between riparian owners and the British Canoe Union (BCU) are in force which allow canoeists to use part of the river during the winter. Outside these agreements there is no public right of navigation on non-tidal watercourses. It has been suggested that a byelaw is created by the Dartmoor National Park Authority to prohibit canoeing during the closed period, thus making the activity an offence. This would allow a greater level of control, and prevent irresponsible canoeists from causing damage to spawning areas.

There is also widespread concern about parking in the area and the risk of obstruction of the narrow roads, as well as the fact that canoeists often have to change into or out of wetsuits at the roadside.

Dartmoor National Park has been working with the BCU, riparian owners and others to address these problems. We are also involved as an independent and unbiased arbitrator and will continue to seek consensus on the best way to manage canoeing.

Implications of River Dart charity raft race - Although this annual event is generally very well run and a major fund raiser for charities, there are concerns that need to be addressed. These concerns include the state of Kilbury and Staverton Weirs which are deteriorating and may present some risks to participants. In particular, steel bars have become exposed at Kilbury and there are deep holes amongst the blockstone at Staverton.

Damage and disturbance from management for angling - In 1995 serious damage to the river corridor habitat occurred along a small section of the River Dart as a result of management for angling. Whilst the majority of management for angling is carried out in a responsible manner, there are concerns that such an incident could be repeated.

Impact of sewage from boats - Concern has been raised over the impact of sewage from boats on water quality and water sports in the coastal waters and estuary of the catchment. Boat users should be encouraged to install holding tanks and dispose of effluent on shore through the provision of shore based facilities. We will seek to achieve this through the Dart Estuary Management Plan.

Table 17 Recreational Use of the Catchment

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|---|-------------------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 17a Need to continue with careful visitor management to lessen impact of pressure from visitors to catchment. NB: Further actions to be added when identified. | DNPA, LAs | n/a | ● | ● | ● | ● | ● |
| 17b Encourage disposal of sewage waste at shore based facilities to reduce impact of sewage from boats on water quality, wildlife and amenity. | Dart Harbour & Navigation Authority | n/a | ● | ● | ● | ● | ● |

| Actions | Action By Lead Other | Cost to Agency (£) | Financial Year | | | | |
|---|------------------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 17c Monitor impact of recreational activities on conservation interests and water quality in the Estuary and support Estuary Management Plan Initiatives. | Agency | <1 k p.a. | ● | ● | ● | ● | ● |
| 17d Take part, as neutral party, in any discussions over access agreements for canoeists. | Agency, DNPA, BCU, Riparian Owners | <1 k p.a. | ● | ● | ● | ● | ● |
| 17e Review safety implications of the River Dart charity raft race and encourage adoption of appropriate safe practices. | Agency, Race Organisers | n/a | ● | ● | ● | ● | ● |
| 17f Investigate opportunities for improved public access to rivers, especially for the less able. | DNPA, Agency, LA's | <1 k p.a. | ● | ● | ● | ● | ● |
| 17g Investigate opportunities for improved interpretation of water environment for visitors. | DNPA, Agency, LA's | <1 k p.a. | ● | ● | ● | ● | ● |
| 17h Investigate proposals for footpaths/cycleways in the catchment. | LA's | n/a | ● | ● | ● | ● | ● |
| 17i Develop vehicular access and public transport links for the less able. | DCC, DNPA | n/a | ● | ● | ● | ● | ● |
| 17j Create angling facilities for less able at Totnes. | Agency, DAA, SWWSL | unknown | ● | ● | | | |
| 17k Raise awareness amongst public of disturbance to wildlife. | DNPA, RSPB | n/a | ● | ● | ● | ● | ● |
| 17l Increase public awareness of the dangers of fires on Dartmoor. | DNPA | n/a | ● | ● | ● | ● | ● |
| 17m Raise awareness amongst anglers of need for careful management of riverside habitat. | Agency, DNPA | <1 k p.a. | ● | ● | ● | ● | ● |

Issue 18: Dart Estuary Management Plan

Associated Plans: Lyme Bay and South Devon Shoreline Management Plan, South Devon AONB

The draft Dart Estuary Management Plan was launched in October 1997 for public consultation and has now been developed into the final plan which was launched in May 1998. The purpose of this plan is to provide a framework against which strategies and actions can be put in place to manage in a sustainable way the environment of the Dart Estuary.

The plan seeks to promote the sustainable use of the Dart Estuary, balancing the demands of tourism, local industry and the natural environment. The proposals put forward include:

- To develop strategic policies to encourage the sustainability of the estuary.
- To raise public awareness of water quality issues.
- To integrate recreational activities harmoniously with other estuary users.
- To promote awareness of issues in coastal and estuarine zone management.

- To improve the range and detail of information available on wildlife and its habitat in the Dart Estuary.

We will continue to work with other agencies and organisations to develop and implement the Dart Estuary Management Plan.

Table 18 **Dart Estuary Management Plan**

| Actions | Action By Lead <i>Other</i> | Cost to Agency (£) | Financial Year | | | | |
|---|--------------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 18 Support actions in the Dart Estuary Management Plan. | Agency | <1 k p.a. | ● | ● | ● | ● | ● |

Issue 19: Concerns over the use of Anti-fouling Paints on Boats

Associated Plan: **Dart Estuary Management Plan**

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, many paints have been based on the anti-fouling compound tributyltin (TBT). Field and laboratory studies have shown that TBT has had an environmental impact in a number of locations around England and Wales²⁴. 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 25m in length, which covers most of the recreational market. This ban has led to a decrease in TBT concentrations in many estuaries frequented by small boats. The remaining sources of TBT are likely to be from resuspension of sediments, boats over 25m in length and possibly the illegal use of TBT on smaller boats.

MAFF monitored a number of sites throughout the UK between 1986 and 1992 for TBT levels in water, sediments, oysters and mussels. Sampling of oysters at Blackness Point over the period 1986-1992 showed that there was no abnormal shell-thickening after 1988 and that meat yield increased considerably after 1986.

Agitation dredging, where water is churned in order to resuspend sediment and keep navigation channels clear, has taken place on the Dart Estuary in the past. The Agency and CEFAS are concerned that resuspension of sediments containing high levels of TBT may have an adverse impact on water quality. Research into the effects of agitation dredging in areas where there are contaminated sediments would help to make management decisions regarding this practice.

At the 4th North Sea Conference at Esbjerg in 1995, Ministers from the nine North Sea Countries agreed that if the International Maritime Organisation (IMO) had not made significant progress on the issue of an international ban on the use of TBT by the end of 1997, they would consider phasing out the use of TBT on ships flying the North Sea States' flags. However, in March 1998 members of the Environment Protection Committee of the IMO concluded that there is sufficient evidence to warrant a ban on the use of triorganotin in paints. The committee has suggested, but not agreed to, a ban by 2006. A working group will consider what type of legally binding instrument will be necessary for a global ban. Ministers will assess the progress made by the IMO committee, when it reconvenes in November 1998, before considering whether to take further regional action. Ministers have also agreed to promote research on environmentally safe anti-fouling technologies. The UK Government agreed with this approach but has stated that the implications for fuel consumption must be considered.

Alternatives to TBT based paints are mainly based on copper and zinc oxides, some of which have organic biocides, such as the herbicide Irgarol, added to them. There is some concern that Irgarol may have an adverse environmental effect. Currently there is little monitoring for Irgarol and its toxicity to aquatic organisms is poorly understood.

We are supporting national research into the effects of alternatives to TBT with the intention of developing appropriate standards and we will be investigating levels of both TBT and Irgarol in the Dart Estuary.

Table 19 Concerns over the use of Anti-fouling Paints on Boats

| Actions | Action By Lead <i>Other</i> | Cost to Agency (£) | Financial Year | | | | |
|---|-------------------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 19a Work with the Dart Harbour Authority to ensure that agitation dredging does not result in exceedance of the EQS for TBT in the estuary. | Dart Harbour Authority, Agency | <1 k p.a. | ● | ● | ● | ● | ● |
| 19b Consider support for research into the effects of agitation dredging in areas of contaminated sediments. | Agency, MAFF, Research Institutions | unknown | ● | | | | |
| 19c Progress national research into environmental effects of alternatives to TBT. | Agency, PML, MAFF | unknown | ● | ● | | | |
| 19d Establish levels of TBT and Irgarol in the Dart Estuary. | Agency | 2.5 k | ● | | | | |

Issue 20: Need for Integrated Management of the Coastal Zone

Associated Plans: Dart Estuary Management Plan, Lyme Bay and South Devon Shoreline Management Plan, South Devon AONB

Devon and Cornwall have one of Europe's finest natural and historic coastlines. There are numerous bodies in this area which have formed partnerships and developed coastal initiatives over a number of years, including estuary management plans (see Issue 18), heritage coasts, shoreline management plans, marine action plans, etc. components of LEAPs also relate to the coastal zone. The Atlantic Living Coastlines Project seeks to draw these threads together and produce a strategy for Integrated Coastal Zone Management.

This project is funded from the EU TERRA fund with funding matched by existing expenditure on coastal zone management in the area (including the Agency's LEAPs for Devon and Cornwall). It is intended that the outputs of the project will be extended to other coastal regions across Europe. The Agency is represented on the projects sponsors group and a special focus group which has been set up to examine the use of data and technology in coastal zone management. Throughout this project we will be examining our role in coastal management.

Table 20 Need for Integrated Management of the Coastal Zone

| Actions | Action By Lead <i>Other</i> | Cost to Agency (£) | Financial Year | | | | |
|---|--------------------------------|-----------------------|----------------|----|----|----|----|
| | | | 98 | 99 | 00 | 01 | 02 |
| 20 Continue to support Atlantic Living Coastline Project. | DCC, CCC | <1 k p.a. | ● | ● | ● | ● | ● |

Appendix

| Former Consultation Report Action | Number in this Action Plan |
|--|--|
| 4.1 a Conduct pollution risk assessment of industrial sites in the catchment. | Routine activity |
| 4.1 b Review air quality in the area, in line with National Air Quality Strategy. | Action 4a |
| 4.1 c Improve knowledge of status of communities sensitive to air pollution in the catchment. | Action 4b |
| 4.1 d Produce database on contaminated land sites in the catchment. | Action 4c |
| 4.1 e Ensure there is effective consultation with Local Authorities (LA's). | Action 4d |
| 4.1 f Provide floodplain mapping information to the planning authorities. | Routine activity |
| 4.1 g Ensure new developments take account of sea level rise at Totnes, Littlehempston and Dartmouth. | Action 4e |
| 4.1 h Appraise scheme at Harbertonford. | Excessive costs make scheme unfeasible |
| 4.1 i Oppose developments which would increase flood risk at Staverton Mill, Shinnars Bridge and Ashburton. | Action 4f |
| 4.1 j Ensure sites of earth science value are identified and protected from development. | Action 4h |
| 4.2 a Assess effects of abandoned mine workings on unmonitored watercourses. | Action 6 |
| 4.3 a Ensure key habitats are identified and protected from mineral extraction activities. | Action 5a |
| 4.3 b Continue to liaise with Linhay Quarry to seek further improvements to the discharge and to reduce the impact of the quarry on the environment. | Action 5b |
| 4.3 c Need to ensure that the scientific interest of Potters Wood SSSI is maintained. | Action 5c |
| 4.4 a Gather and assess data on moorland vegetation changes, and river hydrology. | Action 9a |
| 4.4 b Support research into climate change and flows in watercourses. | Action 9c |
| 4.5 a Liaise with Prison to reduce nutrient inputs to the Blackbrook. | Action 7a |
| 4.5 b Press for improvements to Princetown STW as early as possible within the AMP 2 programme under the UWWTD (Appropriate Treatment). | Action 1n |
| 4.5 c Object to development which would increase sewage flows to the works until improvements are carried out. | Action 1m |
| 4.5 d Investigate consented discharges from storm overflows and unconsented discharges during high rainfall events. | Replaced by Action 1b |
| 4.5 e Investigate potential problems with sewage system in the vicinity of Buckfast and Buckfastleigh. | Replaced by Action 1a |
| 4.5 f Investigate storm sewage discharges. | Replaced by Action 1a |
| 4.5 g Investigate degree to which water quality in the River Mardle, Dean Burn and Ashburn is causing downgrading in main River Dart. | Action 1a, 1b & 1c |
| 4.5 h Issue consent conditions to achieve compliance with appropriate environmental quality standards for organophosphorous insecticides in effluent from Buckfastleigh STW. | Discharge consent is in process of being determined. |
| 4.5 i Consider the inclusion of conditions for synthetic pyrethroids. | To be included in consent conditions. |
| 4.5 j Investigate synergistic effects of synthetic pyrethroids and review consent if necessary. | Forms part of National R&D project with WRC. |

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| 4.5 k | Conduct an investigation into the occurrence of organophosphorous and synthetic pyrethroids in raw materials for spinning, the potential for harm to the environment when released from the process and report on how these substances can be rendered harmless (condition in IPC Authorisation). | Routine activity. |
| 4.5 l | Continue to monitor for foaming incidents at Buckfastleigh STW, and pursue causative agent(s). | Action 1g |
| 4.5 m | Assess impact of Landscope (Gulliford Farm) STW. | Action 1i |
| 4.5 n | Investigate sewerage problems in the vicinity of the River Hems (Source to Portbridge). | Replaced by Action 1j |
| 4.5 o | Make improvements to Broadhempston STW as identified in AMP2 under the UWWTD (Appropriate Treatment). | Action 1n |
| 4.5 p | Object to further development, leading to increased sewage flows in STW catchment until improvements to STW are carried out. | Action 1m |
| 4.5 q | Assess impact of Harbertonford STW. | Action 1n |
| 4.5 r | Make recommendations from above investigations for appropriate actions to improve water quality. | Replaced by Action 1n |
| 4.5 s | Object to further development, leading to increased sewage flows in Scorrion and Poundsgate STW until improvements to STW's are carried out, under AMP2. | Action 1m |
| 4.6 a | Review sites designated under Shellfish Waters Directive | Action 2 |
| 4.6 b | Ensure there is no deterioration to water quality through discharge consenting procedures. | Routine activity |
| 4.7 | Investigate the potential nomination of the estuary as a Sensitive Area or Polluted Water. | Action 8 |
| 4.8 | Assess risk in catchment and examine feasibility of introducing catchment controls. | Will propose action at 1st Annual Review |
| 4.9 a | Ensure all farms identified during catchment inspections carry out remedial measures work to improve water quality in Bidwell Brook, Am Brook and River Hems. | Routine activity |
| 4.9 b | Examine options to prevent/reduce risk of fish kills in Devonport leat. | One off incident, no action thought appropriate |
| 4.9 c | Encourage uptake of ESA agreements. | Action 7b |
| 4.9 d | Work with MAFF to ensure agri-environment schemes have appropriate prescriptions and that payments are set at correct level. | Action 7c |
| 4.9 e | Implement actions from River and Wetlands BAP for Heather Moorland. | Action 14 j |
| 4.9 f | Set targets for increasing breeding populations of golden plover in the catchment. | Action 14g |
| 4.9 g | Implement salmon management strategy. | Action 11d |
| 4.9 h | Consider whether establishment of buffer zones alongside rivers is a possibility to reduce damage to banks by stock. | Action 7d |
| 4.9 i | Facilitate the securing of funding for bankside fencing to reduce erosion, where appropriate. | Action 7e |
| 4.9 j | Continue gravel rehabilitation work to remove the build up of silt to re-establish the gravels for salmonid spawning. These works may also increase the diversity of the macroinvertebrate community. | Action 7f |
| 4.9 k | Continue to remove trash dams where problems are identified. | Routine activity |
| 4.10 a | Ensure Part A processes authorised under IPC legislation achieve planned emission reductions. | Action 13a |
| 4.10 b | Promote measures to reduce emission of nitrogen oxides from traffic. | Action 13b |
| 4.10 c | Examine performance of salmonid fishery as part of Salmon Action Plan. | Action 13c |

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| 4.10 d | Conduct research and monitoring to improve understanding of acidification of Dartmoor and its effects. | Action 13d |
| 4.10 e | Assess impact of any proposals for afforestation within the acid sensitive area. | Action 13e |
| 4.11 a | Lack of information on true value of wet woodland. | Action 14c, d & e |
| 4.11 b | Decline in sand martin and kingfisher populations. | Action 14l & m |
| 4.11 c | Deterioration of valley mire (linked species - curlew, keeled skimmer). | Action 14h |
| 4.11 d | Lack of current information on the three-lobed water crowfoot. | Not an issue for Dart Catchment |
| 4.11 e | Lack of comprehensive information on earth science sites and features. | Action 14n, q, & r |
| 4.12 a | Increase public awareness of the dangers of fires on Dartmoor. | Action 17l |
| 4.12 b | Encourage adoption of best practice for swaling (controlled burning). | Action 7h |
| 4.12 c | Consider approach to loss of reedbed in Sharpham area. | Action 14f |
| 4.12 d | Implement actions from Rivers and Wetlands Biodiversity Action Plan for otters and water voles. | Action 14k |
| 4.13 a | Encourage recording of invasive plants by field staff and others. | Action 15a |
| 4.13 b | Raise awareness of problem of Crassula and Myriophyllum through garden centre trade associations. | Action 15b |
| 4.13 c | Encourage removal from ponds of Crassula and Myriophyllum where already established. | Action 15c |
| 4.13 d | Continue surveys for invasive bankside species. | Action 15d |
| 4.13 e | Carry out control on any Agency owned or managed sites. | Action 15e |
| 4.13 f | Encourage control by riparian owners and other interested parties. | Action 15f |
| 4.13 g | Co-operate with owners and other bodies to achieve eradication of giant hogweed on Wray Brook. | Action 15g |
| 4.13 h | Make invasive plants booklet widely available. | Action 15h |
| 4.14 a | Absence of general assessment of archaeological/historic value of catchment. | Action 16 |
| 4.15 a | Identify sites which create problems for the downstream migration of smolts. | Action 10a |
| 4.15 b | Follow National Guidance on screening criteria; advise abstractors of Agency screening requirements and work towards implementation. | Action 10b |
| 4.15 c | Continue to remove temporary obstruction on moorland streams and seek to modify man-made barriers in the system to permit fish passage. | Routine activity |
| 4.16 a | Promote conservation measures for spring fish and agreed restrictions on netting. | Action 11f |
| 4.16 b | Consider introduction of rod and net fishing byelaws to reduce exploitation of spring fish. | Action 11c |
| 4.16 c | Introduce interim 2 year NLO for 18 nets. | Completed |
| 4.16 d | Carry out detailed analysis of fishery data including juvenile surveys, egg deposition rates and catch returns. | Action 11a |
| 4.16 e | Introduce catch controls and new NLO to restrict exploitation in line with findings of above. | Action 11b |
| 4.17 a | Discourage stocking with fish other than those originating within the catchment. | Action 12b |
| 4.17 b | Promote habitat enhancement as a preferred method of improving stock levels. | Action 12c |
| 4.17 c | Co-operate with the licensing authority to progress further research into issue of fish-eating birds. | Action 12d |
| 4.17 d | Continue to work positively with owners and anglers to establish the full facts in each situation. | Action 12e |
| 4.18 a | Need to continue with careful visitor management. | Action 17a |
| 4.18 b | Encourage disposal of sewage waste at shore based facilities. | Action 17b |

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| 4.18 c | Support Estuary Management Plan initiatives. | Action 17c |
| 4.18 d | Monitor impact of recreational activities on conservation interests and water quality in the Estuary. | Action 17c |
| 4.18 e | Take part, as neutral party, in any discussions over canoe access. | Action 17d |
| 4.18 f | Review safety of River Dart Raft Race and encourage adoption of appropriate safe practices. | Action 17e |
| 4.18 g | Encourage removal of debris from river. | Routine activity |
| 4.18 h | Discuss possibilities of improved access to, and interpretation of, the water environment. | Action 17f |
| 4.18 i | Investigate proposals for footpaths/cycleways. | Action 17h |
| 4.18 j | Develop vehicular access and public transport links for the less able. | Action 17i |
| 4.18 k | Create angling facilities for less able at Totnes. | Action 17j |
| 4.18 l | Raise awareness of public regarding disturbance to wildlife. | Action 17k |
| 4.19 a | Assess current status of TBT in estuary. | Replaced by Action 19a |
| 4.19 b | Consider the need to conduct monitoring of Irgarol. | Replaced by Action 19c |
| 4.19 c | Support research into Irgarol and its environmental effects. | Replaced by Action 19d |

New Actions

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| Action 1d | Review results of monitoring of the River Dart downstream of Buckfastleigh (Kilbury) STW to see if RQO failure recurs. |
| Action 1e | Install powder activated carbon treatment process at Buckfastleigh (Kilbury) STW. |
| Action 1f | Monitor effluent from Buckfastleigh (Kilbury) STW for organophosphates and synthetic pyrethroids. |
| Action 1h | Investigate alternative options for disposal of solid wastes from scouring process at Buckfast Spinning. |
| Action 1k | Investigate causes of poor water quality in the Bidwell Brook. |
| Action 1l | Investigate causes of poor water quality in the Holy Brook. |
| Action 1o | Negotiate for improvements to be made to the discharge from Totnes STW in AMP3. |
| Action 1p | Negotiate with private dischargers to ensure that improvements are made. |
| Action 4g | Following provision of floodplain mapping, continue liaison with planning authorities to determine where further studies need to be carried out. |
| Action 4i | Examine Section 105 survey to identify floodplains and promote and implement Devon BAP for Rivers, Streams, Floodplain and Fluvial Processes particularly in relation to restoration/recreation of fully functioning floodplains where this would reduce flood risk. |
| Action 4j | Support PAYBACK/Business Link initiative to reduce waste at source. |
| Action 5d | Promote and implement Devon BAP for Pits and Quarries and Caves and Mines. |
| Action 5e | Produce guidance notes for mineral operators on ways of enhancing restoration and after use of pits and quarries to benefit wildlife and earth science conservation. |
| Action 5f | Give increased consideration to natural regeneration as a method of site restoration, as opposed to infilling and planting, with due consideration to public safety. |
| Action 7g | Encourage adoption of best practice for swaling (controlled burning). |
| Action 9b | Develop and implement appropriate actions following completion of research. |
| Action 10c | Identify remaining obstructions to migration and consider fish pass installation if appropriate. |
| Action 11e | Carry out study to identify behaviour and spawning preferences for spring salmon. |
| Action 11g | Develop resistivity fish counter as funds become available. |

- Action 12a Carry out research into perceived decline in stocks of brown trout subject to successful bid for funds.
- Action 12f Implement recommendations from R & D research into fish-eating birds.
- Action 14a Support the Dart Valley Prime Biodiversity Project.
- Action 14b Complete process of identifying key features, habitats and species in Devon catchments, and set catchment specific targets where appropriate.
- Action 14i Implement actions from biodiversity action plans for Rhos Pasture, Marsh fritillary & Southern damselfly.
- Action 14o Identify areas where flood control standards could be relaxed to improve/enhance wetland habitats.
- Action 14p Implement actions from biodiversity action plans for estuaries and estuarine habitats.
- Action 14s Include suitable survey techniques for lamprey in routine fisheries survey work, with identification to species level.
- Action 17g Investigate opportunities for improved interpretation of water environment for visitors.
- Action 17m Raise awareness amongst anglers of need for careful management of riverside habitat.
- Action 18 Support actions in the Dart Estuary Management Plan.
- Action 19a Work with the Dart Harbour authority to ensure that agitation dredging does not result in exceedance of the EQS for TBT in the estuary.
- Action 19b Consider support for research into the effects of agitation dredging in areas of contaminated sediments.
- Action 19c Progress national research into environmental effects of alternatives to TBT.
- Action 19d Establish levels of TBT and Irgarol in the Dart Estuary.
- Action 20 Continue to support Atlantic Living Coastline Project.

Glossary

Abstraction - removal of water from surface or groundwater.

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

Acidification - the detrimental effect of acid rain on soils and freshwater.

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.

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.

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.

Descriptive Consent - a consent which qualitatively describes the type of treatment or polluting effect rather than setting numerical limits, normally used for small sewage works.

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.

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

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

Hydrology - the study of water and its dynamics.

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.

Leaching - the washing out of a soluble constituent.

Letterboxing - Recreation activity carried out on Dartmoor.

pH - a measure of the concentration of hydrogen ions which cause acidity. Acid solutions have a pH of less than 7, alkalis of more than 7 and neutral solutions a pH of 7 (e.g. pure water).

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.

Section 105 Surveys - Section 105 of the Water Resources Act 1991 allows for Standards of Service Assets and Flood Risk Surveys.

Sensitive Area - Areas whose waters receive discharges from population equivalents of greater than 10,000, and are or may become eutrophic in future.

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.

Siltation - the deposit of material carried in suspension.

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

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).

RQO (RE) class Class description

| | |
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| RE1 | Water of very good quality suitable for all fish species |
| RE2 | Water of good quality suitable for all fish species |
| RE3 | Water of fair quality suitable for high class coarse fish populations |
| RE4 | Water of fair quality suitable for coarse fish populations |
| RES | Water of poor quality which is likely to limit coarse fish populations |

Classification of Shellfish Harvesting Areas

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

Abbreviations and Units

Abbreviations

| | |
|-------|--|
| AMP | Asset Management Plan |
| AOD | Above Ordnance Datum |
| AONB | Area of Outstanding Natural Beauty |
| BAP | Biodiversity Action Plan |
| BCU | British Canoe Union |
| BOD | Biological Oxygen Demand |
| CEFAS | Centre for Ecology, Fisheries and Science |
| DAA | Dart Angling Association |
| DAS | Devon Archaeological Society |
| DBWPS | Devon Bird Watching and Preservation Society |
| DCC | Devon County Council |
| DETR | Department of Environment, Regions and Transport |
| DFA | Dart Fishing Association |
| DNPA | Dartmoor National Park Authority |
| DoE | Department of the Environment |
| DWT | Devon Wildlife Trust |
| EH | English Heritage |
| EN | English Nature |
| ESA | Environmentally Sensitive Area |
| EQS | Environmental Quality Standard |
| FA | Forestry Authority |
| HA | Highways Agency |
| HMIP | Her Majesty's Inspectorate of Pollution |
| IFE | Institute of Freshwater Ecology |
| IMO | International Maritime Organisation |
| IoH | Institute of Hydrology |
| IPC | Integrated Pollution Control |

| | |
|-------|---|
| LA | Local Authority |
| LEAP | Local Environment Agency Plan |
| MAFF | Ministry of Agriculture, Fisheries and Food |
| NFU | National Farmers Union |
| NLO | Net Limitation Order |
| NT | National Trust |
| NRA | National Rivers Authority |
| OFWAT | Office of Water Services |
| PML | Plymouth Marine Laboratory |
| RCHME | Royal Commission on Historic Monuments of England |
| RE | River Ecosystem |
| RIGS | Regionally Important Geological Site |
| RSPB | Royal Society for the Protection of Birds |
| RQO | River Quality Objective |
| cSAC | Candidate Special Area of Conservation |
| SHDC | South Hams District Council |
| SSSI | Site of Special Scientific Interest |
| STW | Sewage Treatment Works |
| SWWSL | South West Water Services Ltd |
| TBT | Tributyltin |
| TC | Torbay Council |
| TDC | Teignbridge District Council |
| UWWTD | Urban Waste Water Treatment Directive |
| WRA | Waste Regulation Authority |
| WRT | Westcountry Rivers Trust |

Units

| | |
|-------------------|----------------------------------|
| °C | degrees centigrade |
| g | grams |
| ha | hectare |
| km | kilometres |
| km ² | square kilometres |
| l | litres |
| m ³ /s | cumeecs; 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 |

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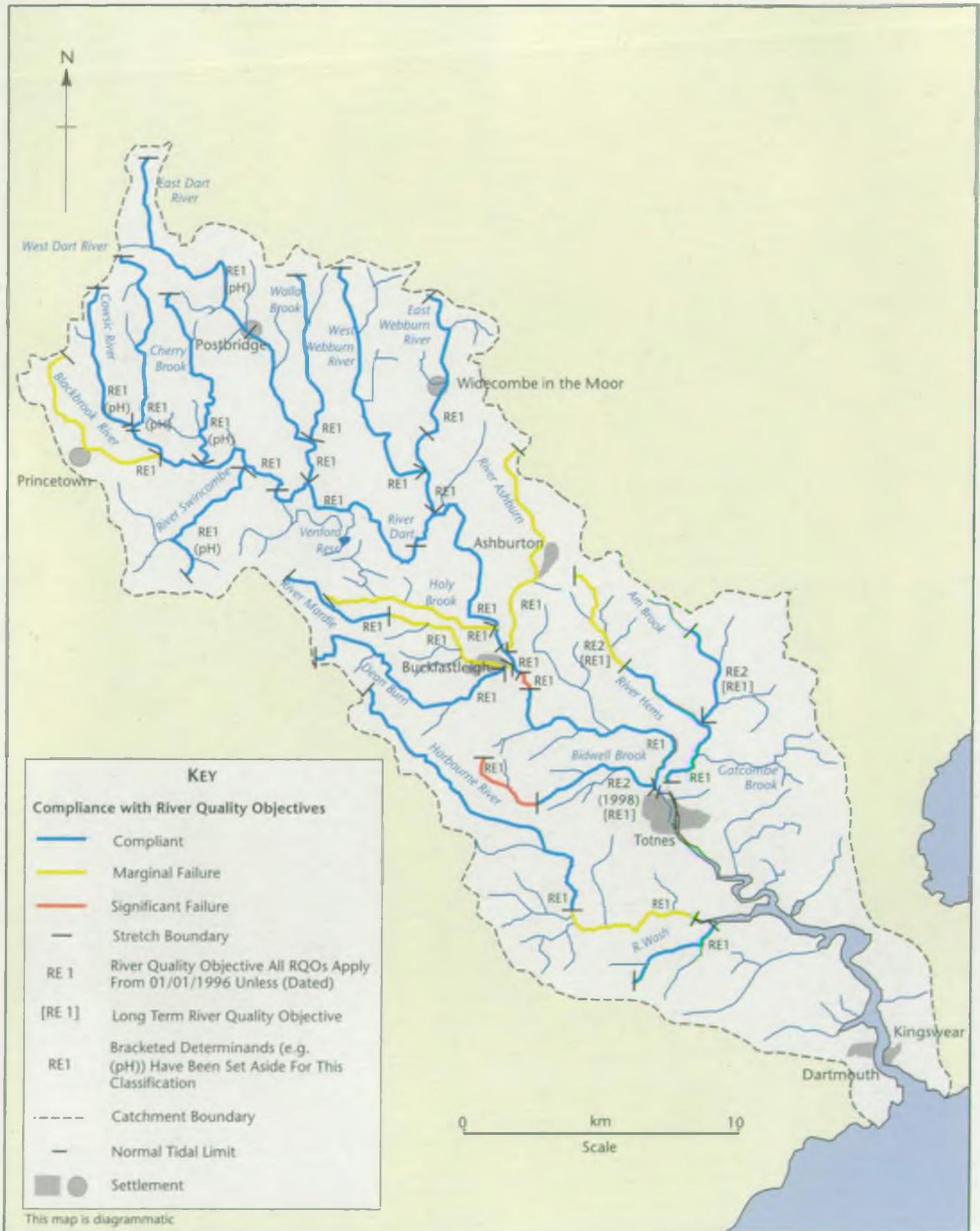
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map 1

Map 1 - Key Sites in the River Dart Catchment



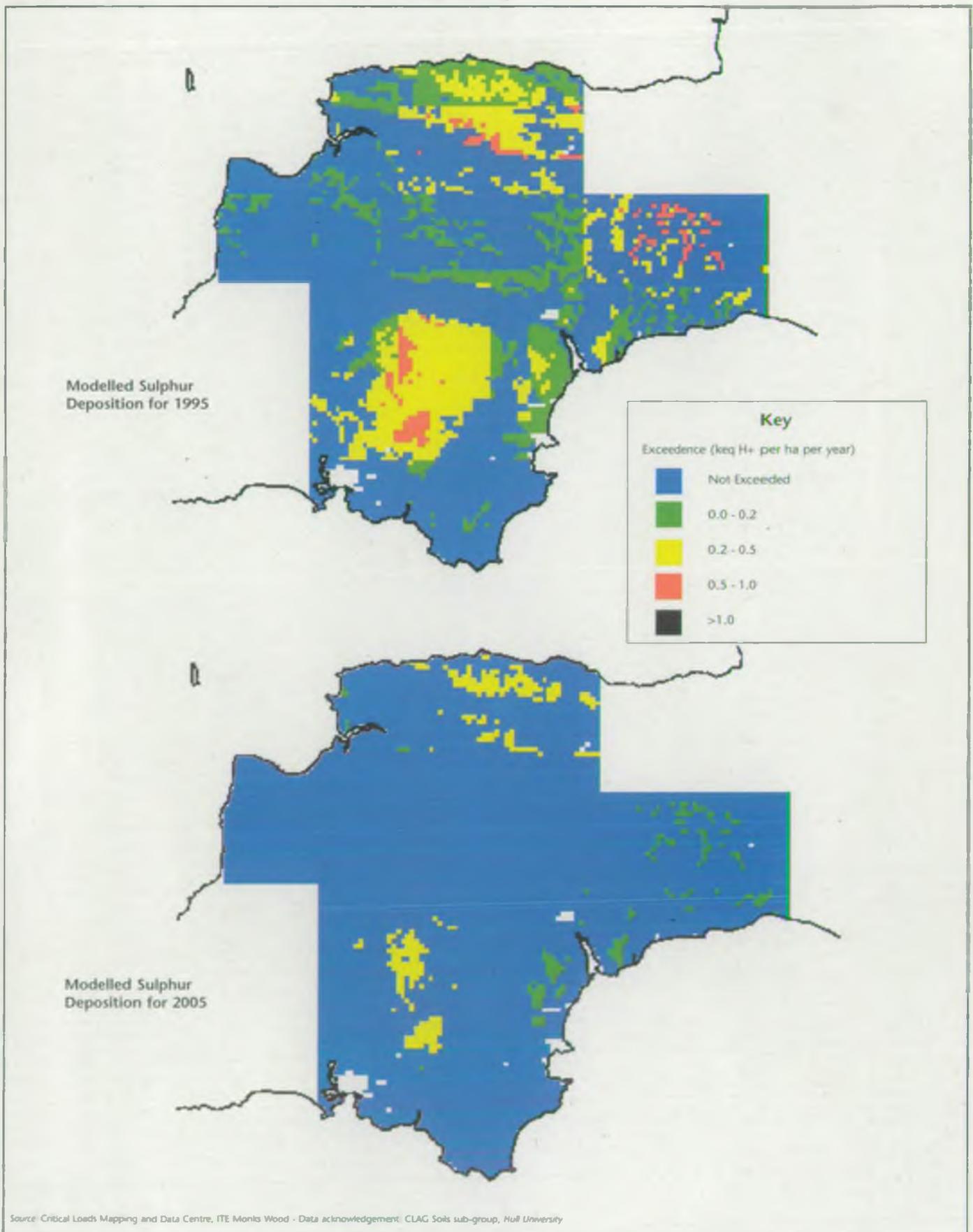
Map 2 - 1997 Compliance with River Quality Objectives (River Ecosystem Classification)



map 2

Fold out for Map 2
1997 Compliance with River Quality Objectives

Map 3 - Exceedences of Critical Loads of Acidity for Soils



map 3

Fold out for Map 3
Exceedences of Critical Loads of Acidity for Soils

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.

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