

THE RIVER TYWI CATCHMENT MANAGEMENT PLAN ACTION PLAN: 1995



NRA

*National Rivers Authority
Welsh Region*

KEY DETAILS

GENERAL

<i>Area</i>	1376 km ²
<i>Population (1991 Census)</i>	41,900
<i>Population Density</i>	30.4 km ²

TOPOGRAPHY

<i>Ground Levels</i>	Max height	548 m AOD
<i>Sea Levels (Ferryside)</i>	Mean High Water Springs	4.2 m AOD
	Mean Low Water Springs	-2.4 m AOD

WATER QUALITY

<i>Length of Classified River in 1992</i>	Class A	302.8 km	Class E	0.0 km
<i>General Quality Assessment (GQA)</i>	Class B	36.7 km	Class F	0.0 km
	Class C	1.1 km		
	Class D	0.0 km	Insufficient Data	2.2 km
<i>Tywi Estuary (1990 Survey):</i>	Class A	12.6 km	Class B	9.4 km

WATER RESOURCES

<i>Annual Average Rainfall</i>	1550 mm
<i>Primary Gauging Station</i>	Tywi at Nantgaredig
<i>Principal Reservoir</i>	Llyn Brianne - capacity 61,000 Ml

FLOOD DEFENCE

<i>Length of Designated Main River</i>	287.9 km
<i>Length of River on which Flood Alleviation/Drainage Schemes implemented</i>	3.9 km
<i>Length of River covered by a Flood Warning Scheme</i>	105 km

FISHERIES

<i>Average Annual Declared Catches</i>		
<i>Nets (10 Year Average 1983-1992)</i>	Salmon	Sea trout
<i>Coracle</i>	52	831
<i>Seine</i>	132	818
<i>Rods (10 Year Average 1982-1991)</i>	768	5214

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THE AREA MANAGER'S VISION FOR THE TYWI CATCHMENT

The Tywi is a largely rural catchment, the major land use in the middle and lower reaches being dairy/livestock farming. In this area, the Tywi has a wide floodplain and flood defences have been provided at several locations. In the uplands, sheep farming and coniferous forestry predominate. Completion of the Llyn Brianne reservoir scheme has resulted in 75 km of the Tywi being regulated under low flows to support a major source for public water supply. The Tywi supports important salmon and sea trout fisheries, harvested both by anglers and net fishermen. The catchment also has a high conservation value, with special protection being afforded to a large number of sites. Parts of the catchment lie within the Brecon Beacons National Park and Cambrian Mountains Environmentally Sensitive Area.

During the life of this Plan, we wish to see significant progress in:

- **balancing the needs of water supply and the environment** - the river regulation scheme is one area that needs particular attention during the coming years, in order to achieve the best possible balance between the needs of water supply and the environment. Results of experiments and investigations within the river system must be used to refine operational strategies so as to protect fisheries and other wildlife dependent on it such as the little ringed plover. Any take-up of spare resources within Llyn Brianne for water supply or hydropower should be in such a way as to ensure that the environment is not unduly impaired.
- **improving water quality** - the acidification of surface waters around Llyn Brianne, which is being addressed by the experimental liming

project, is an issue which NRA is keen to resolve. The NRA would wish to see sulphur emissions controlled at source in order to achieve long term improvements to the acidification problem. However, it is important that funding is secured to continue the liming of Llyn Brianne and maintain the improvements achieved in the upper main river. Water quality problems in the estuary must also be addressed, particularly the low dissolved oxygen levels which occur under certain conditions.

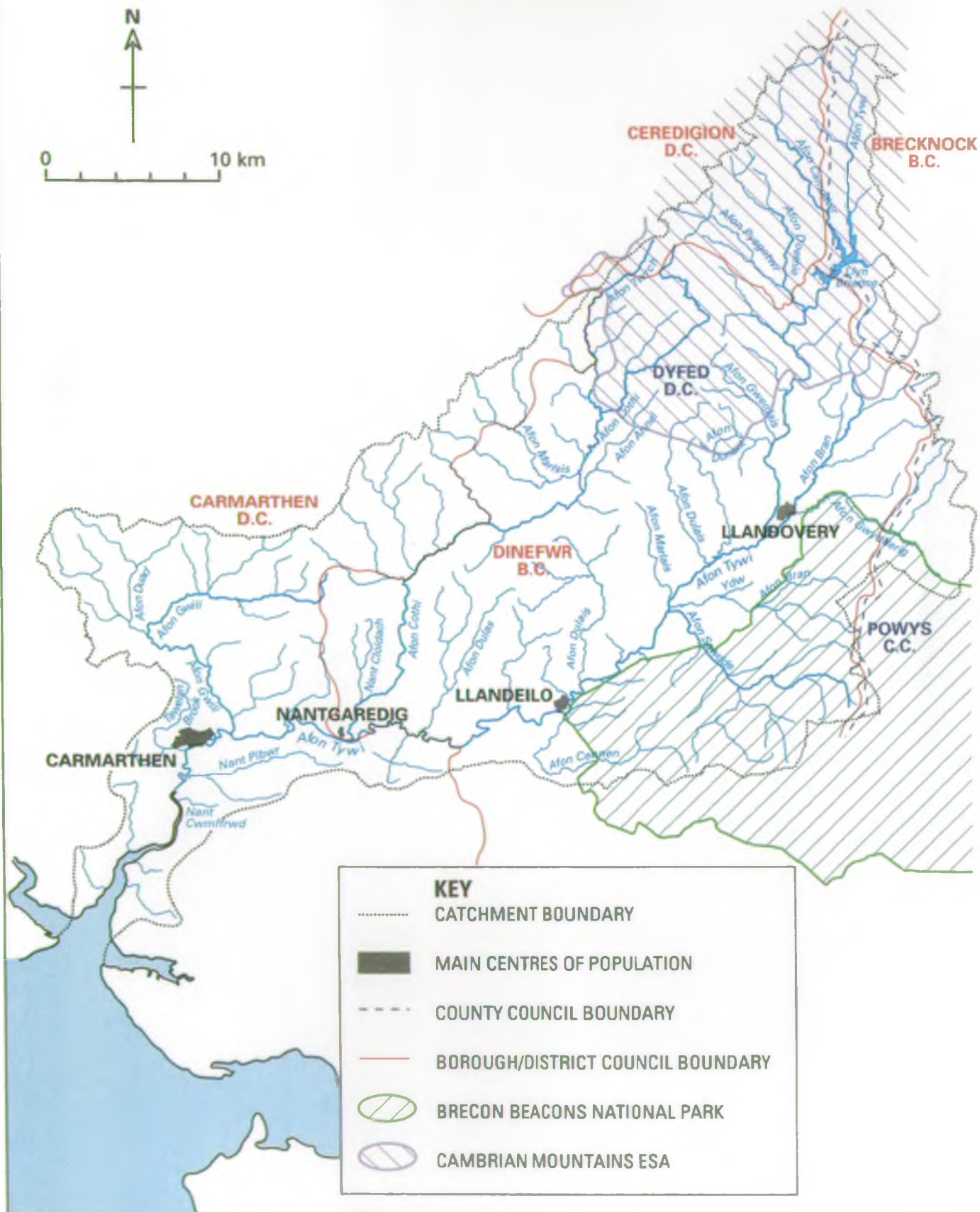
- **protecting river corridors and flood plains** - in Carmarthen, flood protection standards must be improved and the NRA will seek to ensure that all new development, including road schemes, does not compromise protection standards within the catchment. In the middle reaches of the river, gravel extraction activities have contributed significantly to channel instability and environmental damage, and the NRA will be seeking tighter control through planning and regulatory procedures.

The realisation of the NRA's vision will be achieved through a balanced management approach to all activities. We will encourage imaginative proposals to allow sustainable economic and community development to proceed whilst ensuring protection and improvement of the water environment. We will collaborate actively with all users of the catchment and all those statutory bodies that can contribute to the achievement of this vision.



DAVID WALKER
AREA MANAGER - SOUTH WEST WALES

THE TYWI CATCHMENT



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INTRODUCTION

THE CONCEPT OF CATCHMENT MANAGEMENT PLANNING

The rivers, lakes, estuaries and coastal waters of England and Wales have never before been subject to such large and rapidly increasing demands from the users of water. Many different uses interact, or compete for water or water space, and will inevitably come into conflict with one another. The National Rivers Authority (NRA) aims to protect and improve the water environment in England and Wales and to harmonise conflicts between competing water users. Our Mission Statement expresses the following principles:

"We will protect and improve the water environment by the effective management of water resources and by substantial reductions in pollution. We will aim to provide effective defence for people and property against flooding from rivers and the sea. In discharging our duties we will operate openly and balance the interests of all who benefit from and use rivers, groundwaters, estuaries and coastal waters. We will be businesslike, efficient and caring towards our employees".

We have chosen to use Catchment Management Plans (CMPs) to translate these principles into action. The plans describe our vision for each catchment, identify

problems and issues and propose actions that may be taken to resolve them. The plans also provide the means of promoting two key aspects of environmental management - land use planning and water quality objectives.

THE RELATIONSHIP BETWEEN LAND USE PLANNING AND CATCHMENT MANAGEMENT PLANNING

The broad objectives of catchment management planning are to conserve and enhance the total river environment through effective land and resource management. However, while the NRA is well placed to influence some of the factors affecting the water environment, particularly in relation to the river corridor itself, it has very little control over the mechanisms which determine land use change on a catchment-wide basis. This is largely the responsibility of local planning authorities through the implementation of the Town and Country Planning Acts. However, the NRA is a statutory consultee under this legislation.

The policies in statutory development plans set out the framework for land use change, and provide the key reference in determining development applications; the NRA encourages the inclusion of policies which reflect its concerns and responsibilities.

As guidance for local authorities, the NRA has prepared a set of statements relating to the broad

INTRODUCTION



Tywi at Llandeilo

headings of water quality and water resources, flood defence, fisheries, conservation, recreation and mineral workings and waste disposal. These statements are summarised in the NRA's "Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment through Development Plans".

This CMP Action Plan sets out Issues and Actions specific to the Tywi catchment which have been agreed within the framework of these Guidance Notes. This plan also outlines how the concerns of the water environment should influence the location and nature of development and land use change within the catchment.

The first phase of the second Dŵr Cymru Asset Management Plan (AMP2) for the period 1995 to 2000 is currently being finalised following approval by OFWAT. The phased programme of improvements to sewerage infrastructure and sewage treatment works

identified within AMP2 will determine the pace of future remedial measures in line with legislative requirements. This will have an important effect on both improvements in water quality and development/planning control as indicated within the Actions identified within this plan.

WATER QUALITY OBJECTIVES

The Statutory Water Quality Objectives (SWQO) scheme, introduced under the Water Resources Act 1991, is a new system for water quality planning which places water quality targets on a statutory footing. The scheme is based upon the recognised uses to which a river stretch may be put and is consistent with the principles of CMPs. These uses will include River Ecosystem (formerly identified as Fisheries Ecosystem in the Tywi CMP Consultation Report), Special Ecosystem, Abstraction for Potable Supply, Agricultural/Industrial Abstraction and Watersports.

At present, only the standards for the River Ecosystem Use have been developed on a formal basis and, as a result, this is the first SWQO Use to be introduced by the Government through The Surface Waters (River Ecosystem)(Classification) Regulations 1994. For each classified stretch within the Tywi catchment a River Ecosystem (formerly Fisheries Ecosystem) Use class target has been proposed and this CMP Action Plan identifies, where appropriate, the actions required to achieve these targets. At present, these targets will only be applied informally although it is hoped that, in the near future, they may be established as Statutory WQOs by the Secretaries of State for the Environment and Welsh Office.

REVIEW OF THE CONSULTATION PROCESS

The NRA published the Tywi Catchment Management Plan (CMP) Consultation Report in June 1994, following more than a year of preparation. The plan was launched as a consultative document seeking comments from all those interested in the water environment. Around 60 individuals representing various key organisations attended the public launch in Carmarthen on June 21st 1994. A display was subsequently placed in Carmarthen and Llandeilo public libraries, explaining the CMP process and the key details and issues in the Tywi catchment. The

report was placed in all libraries and local council offices within the catchment for members of the public to read and a press release was sent to local papers to raise awareness of the CMP and the consultation period.

The official consultation period ran from the public launch through to August 5th, although a number of organisations and individuals provided written comments after this period. Around 400 copies of the Consultation Report have been circulated to external interests. A total of 42 written responses were received from the following organisations and individuals:

REVIEW OF THE CONSULTATION PROCESS

Welsh Canoeing Association	The Forestry Authority Wales
St. Ishmael's Community Council	ESN - Golden Grove Estate
Welsh Tourist Board	Dyffryn Cennen Community Council
Abergwili Community Council	University of Wales College of Cardiff
Forest Enterprise Wales	Countryside Council for Wales
Dŵr Cymru Welsh Water	Her Majesty's Inspectorate of Pollution
The Forestry Authority for Wales	Dyfed Archaeological Trust Ltd
Friends of the Earth	Cadw Welsh Historic Monuments
Llanstephan Community Council	Bronwydd Community Council
Carmarthen Bay Forum	Royal Commission on the Ancient and Historical Monuments of Wales
Brecknock Borough Council	Brecon Beacons National Park
Carmarthenshire Fishermen's Federation	Welsh Office
Dinefwr Borough Council	Trinity College Carmarthen
Carmarthen Town Council	Carmarthen District Council
The Ramblers Association	Llangadog Angling Association
Amexpark Ltd	Dyfed Wildlife Trust
The Royal Society for the Protection of Birds	Mr Ivor Williams
Country Landowners Association	Mr S. Hays
Dyfed County Council	Prof. A.I. Phillips
Council for the Protection of Rural Wales	

All of the comments received concerning the Consultation Report were taken into account when formulating the Action Plan for the Tywi catchment.

This Action Plan includes and reflects many of the comments received from those organisations and individuals.

AN OVERVIEW OF THE TYWI CATCHMENT

GENERAL

The Tywi rises at an altitude of 425m AOD, falling steeply for the first 17 km before reaching the dam at Llyn Brienne. Just above Llandovery the river gradient lessens as the river begins to meander across the flood plain. Many tributaries join the Tywi on its course to the sea, the largest of which are the Bran, Sawdde, Cothi and Gwili. From source to sea the Tywi runs for some 111 km draining a large catchment area of 1376km².

The catchment is sparsely populated with a large proportion centred around the market towns of Carmarthen, Llandeilo and Llandovery in the middle to lower reaches of the catchment. The A40 runs along the river valley from Llandovery to Carmarthen and, west of Carmarthen, forms part of the Euroroute which connects Fishguard with London. Many 'B' class

roads criss-cross the middle and lower parts of the catchment. Road scheme proposals exist to bypass Llandeilo (East) and Carmarthen (East). The highly afforested part of the upper catchment around Llyn Brienne is largely devoid of any infrastructure. Carmarthen forms part of the important Intercity rail link between London and the port of Fishguard. Llandeilo and Llandovery are served by part of the mid-Wales rail link connecting with Llanelli.

Intensive dairy farming is concentrated in the lowlands, with mixed dairy/livestock rearing being the major feature of the middle reaches. Sheep farming and large tracts of commercial coniferous plantations predominate in the upper reaches and high ground. Numerous abandoned metal mine workings exist, particularly in the upper catchment, including the Nant-y-Mwyn lead and zinc mines at Rhandirmwyn.

AN OVERVIEW OF THE TYWI CATCHMENT

FLOOD DEFENCE

Flood defence interest in the catchment relates primarily to the provision and maintenance of flood alleviation schemes. These schemes provide protection to centres of population located on the flood plain of the Tywi and its main tributaries.

In times of high river flow the extensive Tywi flood plain provides natural storage for flood waters, without which the peak flow in the downstream channel would be significantly greater.

Property at several locations including Carmarthen, Abergwili, Llandeilo and Llandovery has experienced flooding in the past. Consequently, flood defences have been constructed at many locations and these are regularly inspected and maintained.

In addition, the presence of Llyn Brianne reduces the magnitude of peak flood flows, particularly in the autumn refill period. This reduction can be significant in the upper reaches of the Tywi but is less so in the lower reaches, particularly once the reservoir is full.

Two recent road scheme proposals to cross the Tywi flood plain at Carmarthen and at Llandeilo provide examples of development which can have an adverse effect on existing flood protection standards.

The NRA operates a flood warning system on the Tywi between Llandovery and Carmarthen, on the Cothi, and on the Bran at Llandovery and Llangadog. This involves continuously monitoring weather and potential flooding conditions and issuing warnings via the police as appropriate.

WATER RESOURCES

Rainfall in the Tywi catchment varies from 2400mm/year on the Black Mountains to less than

1200mm around the estuary, with a catchment average of about 1550mm/year. Flows in the Tywi have been regulated by Llyn Brianne since it first filled in March 1972. This allows a greater rate of abstraction from the river than natural flows could support. Most of the water abstracted from surface water sources in the catchment is for potable supply purposes.

The majority of the water abstracted at Nantgaredig is transferred to Lower Lliw Reservoir and Felindre WTW to supply Swansea and the surrounding area as far east as Cowbridge. The quantity of water released from Llyn Brianne is increased to match the quantity abstracted at Nantgaredig, when the natural flow in the Tywi at Nantgaredig falls below 682 Ml/d. During very dry summers this quantity is further increased so as to maintain a minimum flow in the Tywi downstream of Nantgaredig. In addition there is a reserve of water in Llyn Brianne for use, at the discretion of the NRA, to supplement river flows as necessary.

The majority of agricultural abstractions are small and, as such, do not require a licence. As agricultural land is used mainly for dairying and livestock production, and rainfall is normally plentiful, there are only two spray irrigation licences in force.

Other abstractors of water include a fish farm at Llanllawddog and a small amount of light industry, the needs of which are met from sources within the catchment.

The NRA has received and commented upon a recent planning application for a proposed hydro electric power station at Llyn Brianne. Discussions with the developer regarding operation of the scheme are ongoing.

WATER QUALITY

Water quality in the freshwater Tywi catchment is generally very good. In 1992, 99% by length of the catchment was of good quality (Class A or B) under the General Quality Assessment (GQA) classification scheme. A 9.4km reach of the estuary has been classified in Class B due to problems of seasonal low dissolved oxygen. The remaining reaches, totalling 12.6km, are in Class A (1990 survey).

The general lack of mains sewerage in the catchment necessitates effluent disposal to septic tanks and small private sewage treatment works (STWs) for many communities. The majority of STWs serve small communities and discharge into receiving waters with



Llyn Brianne Reservoir Spillway

AN OVERVIEW OF THE TYWI CATCHMENT

high dilution. The largest works, Parc-y-Splotts, serves a population of over 20,000 and currently provides only primary settlement of sewage before discharging into the Tywi estuary at Johnstown. This works is due to be improved to provide secondary treatment by 1997.

The improved treatment at Parc-y-Splotts should help alleviate the problem of low dissolved oxygen, and will also be beneficial in reducing levels of bacteria in the estuary. The estuary has been nominated as a candidate Sensitive Area under the EC Urban Wastewater Treatment Directive and, should monitoring between 1995 and 1997 demonstrate the need for designation, nutrient stripping at Parc-y-Splotts would be required under the provisions of the Directive.

Amexpark Ltd, at Johnstown, treat domestic sewage from the Llangunnor and Pensarn areas of Carmarthen Town, together with leachates from Nant-y-Caws, Wernddu and Withyhedge domestic waste disposal sites (all located outside of the Tywi catchment) and cooling water from Alcoa, Swansea. The treatment plant provides secondary (biological) treatment of these wastes.

The upland part of the catchment around and including Llyn Brianne suffers from low pH and associated elevated aluminium concentrations due to surface water acidification which is exacerbated by coniferous afforestation. To alleviate the problem of low pH in the main Tywi downstream of Llyn Brianne, a direct liming operation of the reservoir has been



Parc-y-Splotts Sewage Treatment Works

undertaken bi-annually since 1991. Contaminated drainage from abandoned mines also contributes to elevated zinc levels in the upper catchment.

FISHERIES

The Tywi catchment supports an internationally renowned sea trout (sewin) fishery which has provided higher declared annual rod catches than any river in England and Wales in recent years. The numbers of reported rod caught salmon are also high and place the Tywi amongst the top Welsh fisheries for this species. The estuary supports licensed seine and coracle net fisheries for salmon and sea trout, the latter fishery having a particular heritage value.

Brown trout are found throughout the catchment. A few pike are taken from the river system each year and these are believed to originate from Talley Lakes in the Cothi catchment which, together with the Bishop's Pond near Carmarthen, are notable for their coarse fish populations.

Following the introduction of the MAFF Bass Conservation Area Regulations and South Wales Sea Fisheries Committee Byelaws virtually no commercial fishing for sea fish is now carried out in the estuary with the exception of a small number of stake nets on the foreshore which catch predominantly flatfish and mullet. Shellfish, mainly cockles and mussels, are harvested commercially in the lower estuary.

CONSERVATION

The environmental value of the catchment is very high in terms of both its conservation and landscape features, containing 56 Sites of Special Scientific Interest (SSSIs), a single National Nature Reserve and two RSPB reserves. Parts of the upper catchment lie within the Cambrian Mountains Environmentally



Vince Bevan

Coracle Fisherman on the Tywi

AN OVERVIEW OF THE TYWI CATCHMENT

Sensitive Area and the Brecon Beacons National Park. Amongst many rare or notable species to be found in the catchment are otters, which appear to be increasing their range, red kites and little ringed plovers. The last species breeds in greater numbers on the Tywi gravel shoals than anywhere else in Wales.

The landscape is rich and particularly varied, from the rugged mountain scenery around Llyn Brianne through to the wide flood plain dotted with archaeological sites, and from the intimate wooded valleys of the larger tributaries to the sandy expanse of the estuary overlooked by Llanstephan Castle. Other notable sites of historic and archaeological interest include castles at Dryslwyn, Dynevor (Llandeilo) and Llandovery. The Old Quay at Carmarthen is a more recent reminder of the importance of the river as a trading route in the 18th and 19th centuries.

RECREATION

Walking, sightseeing, pony-trekking and birdwatching are widely practised throughout the catchment particularly in the area around Llyn Brianne. The catchment is well served by footpaths and bridleways but river bank access is generally poor and there are few formal facilities for picnicking adjacent to the river. The beauty of the mouth of the estuary, as it broadens into Carmarthen Bay, attracts many visitors.



Angling on the Tywi

Angling is popular in the catchment with the Tywi being widely recognised as one of the premier sea trout fisheries in the United Kingdom. A number of privately owned stillwater trout and coarse fisheries have been established throughout the catchment which offer day ticket fishing for visitors. The lower estuary provides good beach fishing for sea fish, particularly for bass and flatfish.

Windsurfing, water-skiing and jet-skiing are practised in the lower estuary. Boating is confined to the estuary, as the limit of public navigation ends at the tidal limit just upstream of Carmarthen. Sailing and power boating are widely practised throughout the estuary.

THE INTERACTION BETWEEN LAND USE AND THE WATER ENVIRONMENT

INTRODUCTION

Man's use of land, whether for residential, farming, industry, amenity or infrastructure developments, is likely to impact on the water environment, either directly or indirectly. This Catchment Management Plan (CMP) aims to address existing problems, seek general environmental improvement and protect the catchment from future damage.

The Tywi drains a rural catchment, the predominant land use being agriculture. The main population is centred around the market towns of Carmarthen, Llandeilo and Llandovery where there are also localised areas of industrial development. The catchment has a very high conservation value and is popular with tourists. Issues of particular concern to the NRA include:

- the risks associated with developing in floodplains
- the impact of surface water acidification in the

upper reaches of the catchment

- low dissolved oxygen in the estuary and public concern about bacteria levels
- the protection of a catchment with a high conservation and landscape value
- the impact of gravel extraction on the river corridor and water environment

The NRA's stance on all new development is that it is the responsibility of developers to assess the impact of their proposals on the water environment, and provide suitable mitigation works where necessary. In order to ensure that the right issues are addressed, and the relevant consents applied for, the developer must consult with the NRA at the earliest opportunity.

INFRASTRUCTURE

Sewerage and Sewage Disposal: It is clearly important that, wherever new development or redevelopment is proposed, the local authorities and

Dŵr Cymru ensure that adequate and suitable drainage and treatment systems are available. In particular, problems have been identified with Parc-y-Splotts and several combined sewer overflows (CSOs). These are presently being discussed with Dŵr Cymru, although no CSOs in the catchment have been identified in the higher priority group for investment between 1995 and 2000. Many of the smaller settlements are not served by a public sewerage system and therefore private facilities have been utilised. Such installations will be required to comply with BS 6297, current Building Regulations and NRA policy.

Roads: The Tywi catchment is crossed by the A40/A48 Euroroute linking London with the car ferry terminal for the Irish Republic at Fishguard. Many 'B' class roads criss-cross the middle and lower parts of the catchment connecting the larger towns with outlying villages. The A40, which runs alongside the Tywi from Carmarthen to Llandovery, is continually being uprated by the Welsh Office and schemes are programmed over several years. It is important that all road improvements are undertaken in an environmentally sympathetic manner so as to protect water quality, the landscape and the flora and fauna within the river corridor, and to ensure flooding problems are not created or exacerbated.

DEVELOPMENT AND FLOOD RISK

Development situated within a floodplain is generally at risk, and the NRA is obliged to advise the local planning authorities, in accordance with Welsh Office circular 68/92, where a proposed development may flood. Commencing in 1995, the NRA will be undertaking major surveys of all river catchments, on a phased basis and with the agreement of the local authorities. This will identify more accurately the extent of the floodplain and the impact of development on flood risk throughout the catchment. This work will take several years to complete and will concentrate initially on those areas where flooding is seen as a major issue.

Development may affect rivers and flood defences directly, or affect the risk of flooding. It is Government policy that new development on the floodplain should make provision for flood defence. Where alleviation works are possible, the onus is on the developer to investigate the flood risk, and design and submit amendments to his planning application.

This must show how any unacceptable flood risk arising from the development proposed will be mitigated or alleviated, in a manner which is environmentally

acceptable. In view of the complex and lengthy discussions that may ensue, developers should consult with the NRA prior to making an application.

The Tywi catchment possesses an extensive flood plain which provides natural storage for flood waters in times of flood. Nevertheless, there are significant flooding problems in the catchment, notably at Carmarthen, Abergwili, Llandeilo and Llandovery. Several other small settlements are also subject to flooding: Bronwydd, Llanpumsaint, White Mill, Pont-ar-gothi, Llangadog, Llanwrda, Cynghordy, Llanstephan and Ferryside. Although flood alleviation schemes have been implemented for parts of Carmarthen, Llandeilo and Llandovery, further investigations are necessary to establish whether the provision of protection to other properties at risk in the catchment would be cost effective.

CONTAMINATED LAND

When promoting redevelopment plans, developers need to be mindful of the past use of sites. Whilst the incidence of contaminated land within the catchment is minimal (e.g. the abandoned mines near Rhandirmwyn, Nant-y-Mwyn and Dolaucothi), it is always the developer's responsibility to assess the problem and implement appropriate remedial works in close consultation with the NRA.

GROUNDWATER

The preservation of groundwater quality and quantity is a major objective of the NRA, and the Authority has produced a document "Policy and Practice for the Protection of Groundwater", which provides advice on the management and protection of groundwater on a sustainable basis. This policy deals with the concept of vulnerability and risk to groundwater from a range of



Flooding at Abergwili in 1987

human activities. Aquifers within the Tywi catchment are not regarded as a major source of supply, although numerous properties do rely on groundwater sources for private domestic and agricultural purposes. In particular, developers need to be aware of protected zones in the north of the catchment, at Halfway, Dolauhirion, Penrhiwgoleu and Gors. The NRA will look to the planning authorities to have regard to the protection of groundwater where it exists, as a material consideration in the determination of planning applications.

RIVER CORRIDORS

Buffer Zones. River corridors provide important interconnections between habitats and are used extensively by wildlife. The NRA would wish to see buffer zones created along all watercourses, in both rural and urban areas, to help protect the water environment from the impact of potentially damaging activities on adjacent land. These zones would have to be fenced where livestock are present, to avoid damage to river banks which could lead to channel instability, increased flood risk and a reduction in fisheries and conservation value.

Gravel Removal. There are several locations in the catchment where gravel is extracted for private use, but currently Llwyn Jack, just below Llandovery, is the only site where gravel is extracted for commercial purposes. In the middle reaches of the Tywi, gravel extraction activities have contributed significantly to channel instability and environmental damage. The ecological importance of gravel shoals in the Tywi is increasingly being recognised, not only for breeding by little ringed plovers, but also for their invertebrate communities. The removal of gravel from a river bed, or within the corridor, can cause considerable disturbance and damage if not undertaken in an environmentally sensitive manner.

Whilst some limited removal by land owners, with consent, may be acceptable at certain times of the year, large scale commercial operations within flood plains must be constrained, and new developments kept away from river corridors. The NRA will use its consenting powers to exercise control within the river channel and/or within 7m of banks of designated Main Rivers. For those sites outside of NRA control, we would look to the planning authorities to exercise control over such developments in order to minimise the impact on flood defence and environmental interests. Commercial operations within or adjacent to the river are controlled by planning legislation and NRA consenting powers.

Within the Tywi catchment, the NRA will continue to monitor the effects of gravel extraction on the ecological regime. Pending the results of such surveys the NRA may seek to prohibit further gravel extractions in the future.

River Bank Erosion. Bank erosion is a natural feature of the Tywi and can result in significant changes to the course of the river channel, particularly during major flood events. Protection of land and property against erosion is primarily the responsibility of the riparian owner, although other third parties may also have an interest. Work to protect river bank from erosion requires the consent of the NRA. Consent would only be issued if the proposals complied, where possible, with environmentally acceptable practices. Examples of such practices are provided in the RSPB "Rivers and Wildlife Handbook".

Culverts, River Diversions and Wetlands. The use of culverts to direct and convey watercourses must have consent from the NRA. Whilst the installation of culverts, of suitable dimensions, for small river crossings is generally an acceptable practice, the NRA does not support the widespread use of culverts to enable a change in land use - this would be contrary to its conservation duties. In particular, the practice of culverting streams in order to use their valleys as landfill sites, and the infilling of wetlands, is generally



Little Ringed Plover

© Malcolm Hunt

THE INTERACTION BETWEEN LAND USE AND THE WATER ENVIRONMENT

unacceptable. Similarly, the NRA generally opposes the diversion of established watercourses in order to permit development, and would wish the original natural course to be retained as a feature, wherever possible.

AGRICULTURE

A significant proportion of the catchment is farmland with intensive dairy farming concentrated in the lowlands. Mixed dairy/livestock farming is a major feature of the middle reaches, with sheep farming and coniferous plantations predominating in the upper reaches and high ground. The lack of adequate investment in effluent management facilities occasionally causes problems. The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 have set minimum standards of construction for new or substantially altered systems. The NRA is using these Regulations, and its well established contacts with farming organisations, to secure more effective, long term solutions.

A large part of the catchment contains soils that are prone to surface water acidification. Research has demonstrated that coniferous forestry, which extends

across 15% of the catchment, exacerbates the acidification problems. The NRA has undertaken a liming programme in Llyn Brianne to ameliorate the impact, but a cost effective long term solution has yet to be found. Where future proposals for afforestation are likely to pose a risk to water quality, they will be considered by the NRA in detail, on a case by case basis. The Forests and Water Guidelines lay down standards for best practice designed to minimise the impact of forest management on the water environment.

BARRRAGES, MARINAS AND TIDAL WEIRS

This type of development, which is usually proposed to improve amenity and recreational value, can cause a variety of problems. These may include flooding, a deterioration in water quality - sometimes leading to odours and toxic algal blooms - and obstruction to movement of migrating fish. Since future problems are often difficult to predict for such developments, the NRA will look to the planning authorities to adopt a robust precautionary approach when considering any new proposals.

ISSUES AND ACTIONS

The following section outlines the actions that have been agreed in order to tackle the problems identified within the Tywi Catchment Management Plan (CMP) Consultation Report. The organisation(s) responsible for implementing the actions, the costs involved, and the agreed timescales within which the actions are to be undertaken are shown. Actions are only included where they have been agreed by the body responsible for undertaking the work/investment. Where an action is subject to constraint or is awaiting approval, this is made clear within the action table.

The Action Plans look largely to the five year period from publication of the Consultation Report ie. to the end of 1998. Where Issues are unlikely to be resolved within this timescale, this is indicated clearly within the tables. CMPs should be seen to be continually evolving, and therefore if priorities change or new opportunities for improvements present themselves, they will be reflected in future reviews of the plan.

In 1994, subsequent to the production of the Tywi CMP Consultation Report, the Government introduced

regulations for the implementation of a new Water Quality Objective Scheme called River Ecosystem (RE), which replaced the Fisheries Ecosystem (FE) Scheme used in the earlier report. The new scheme contains water quality standards which are statistically more robust than those in the earlier proposal. Consequently, the data used for the CMP Consultation Report have been re-examined to reflect the new scheme and some of the actions proposed may have changed as a result. The benefit of this more rigorous examination is that the NRA can be even more confident that the money it spends or asks others to spend to resolve issues will lead to a significant improvement in water quality.

In the Consultation Report, 38 issues were identified where targets were not being achieved and therefore requiring some action in order to resolve them. These issues were presented, together with various management options, for discussion as part of the consultation process. All of the responses received from external interests have been

ISSUES AND ACTIONS

considered, and where necessary further discussions have been held to resolve issues and to agree appropriate, realistic and affordable actions.

All of the 38 issues identified within the Consultation Report have been retained within this Action Plan although some have been amended in the light of comments made during the consultation period and the re-examination of the water quality data. The numbering system for Issues from the Consultation Report has been retained in this Action Plan for ease of reference but it has proved sensible to combine Issues 14 and 28 in addressing the necessary actions. Four new Issues have been added subsequent to the publication of the Consultation Report (Issues 39 to 42).

Within the costs column of the Action tables care has been taken to identify to whom the predicted costs apply. Where there is a lone responsibility, the costs will be borne by that organisation/interest. Where responsibility is shared (lead or other), but the costs are only available for the NRA input to that Action, this is clarified by "NRA costs". Where responsibility is shared but the costs will only be incurred by one organisation/interest, this is shown by e.g. "NRA costs only".

ABBREVIATIONS





The following abbreviations have been used in the main text and tables:

AMP	Asset Management Plan	MAFF	Ministry of Agriculture, Fisheries and Food
BBC	Brecknock Borough Council	NFU	National Farmers' Union
BOD	Biochemical Oxygen Demand	OFWAT	Office of Water Services
CC	Community Council	PCC	Powys County Council
CCW	Countryside Council for Wales	R&D	Research and Development
CaDC	Carmarthen District Council	RA	The Ramblers Association
CeDC	Ceredigion District Council	RE	River Ecosystem
CFF	Carmarthenshire Fishermen's Federation	RCS	River Corridor Survey
CLA	Country Landowners Association	RJSMP	Regional Juvenile Salmonid Monitoring Programme
CSO	Combined Sewer Overflow	RSPB	The Royal Society for the Protection of Birds
DBC	Dinefwr Borough Council	SCW	Sports Council for Wales
DCC	Dyfed County Council	SSSI	Site of Special Scientific Interest
DCWW	Dŵr Cymru Welsh Water	SWSFC	South Wales Sea Fisheries Committee
DO	Dissolved Oxygen	TCNA	Towy Coracle Netsmen's Association
DWT	Dyfed Wildlife Trust	WCA	Welsh Canoeing Association
FAW	Forestry Authority for Wales		
FUW	Farmers' Union of Wales		
LPA	Local Planning Authority		

TYWI CMP ACTIONS



ISSUE 1

Surface water acidification in parts of the catchment, causing the Tywi and Camddwr above Llyn Brianne and the Doethie, Pysgotwr and Upper Cothi to Cwrt-y-cadno to fail pH standards.

ACTIONS	RESPONSIBILITY		COST (£)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Continue liming of Llyn Brianne to regulate pH and water hardness by either direct dosing of the reservoir or continuous dosing of input streams. This will ensure the Tywi below Brianne continues to comply with pH standards.	NRA		51k p.a.						Ongoing subject to funding
b) Complete feasibility study of continuous dosing of input streams. Alternative means of funding the liming programme will be pursued in collaboration with external organisations.	NRA	To be identified	10k (NRA costs)						
c) Control new planting and re-planting in sensitive areas.	FAW	NRA, Forest Owners	Unknown						Ongoing
d) Seek to influence controls on sulphur emissions nationally and from local sources eg Pembroke Power Station.	NRA		2k p.a.						Ongoing

ISSUE 2

Elevated concentrations of zinc in the Tywi downstream of the disused Nant-y-Mwyn metal mine, to the confluence with the Gwydderig near Llandovery.

a) The only solution currently available is a major site reclamation scheme over all or part of the site, involving redirection and possible treatment of drainage waters. The priority and timescale for a remedial scheme cannot be assessed at present until a Regional review of problems from abandoned metal mines is complete. Grant aid would probably need to be provided to the Local Authority and progress with a scheme is unlikely during the period of this Action Plan.	District Councils	WDA, NRA							
b) Assess priority for a remedial scheme.	NRA								
c) Subject to the above, negotiate a timescale and funding for remedial schemes.	NRA	LPAs, WDA	Unknown						Ongoing; depends on priorities



TYWI CMP ACTIONS

ISSUE 3			Poorer than expected biologically quality in the Annell, Dunant and Gwili.						
ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Undertake further investigations, involving biological and chemical sampling and report by September 1995.	NRA		2.5k						
b) If an unacceptable impact is then confirmed, seek to improve water quality, by means of a farm visit programme and completion of remedial works.	NRA	Site owners	5k (NRA costs)						
ISSUE 4									
Poorer than expected water quality of the Ydw. Reassessment, using contemporary data, has shown that the Ydw now achieves target ammoniacal nitrogen standards but marginally fails RE Class 1 standards in respect of BOD, falling into RE Class 2.									
Owing to only a marginal failure of RE Class 1 standards, water quality of the Ydw will be carefully monitored to detect possible deterioration.	NRA		0.5k						
Should water quality deteriorate, a programme of farm visits will be organised to ensure remedial actions are completed to address sources of pollution (timescales and costs unknown).									
ISSUE 5									
Poorer than expected water quality of the Cloidach. Reassessment, using contemporary data, has shown that the Cloidach now achieves the target for suspended solids but marginally fails RE Class 1 standards in respect of BOD, falling into RE Class 2									
Owing to only a marginal failure of RE Class 1 standards, water quality of the Cloidach will be carefully monitored to detect possible deterioration.	NRA		0.5k						
Should water quality deteriorate, a programme of farm visits will be organised to ensure remedial action are completed to address sources of pollution (timescales and costs unknown).									

TYWI CMP ACTIONS

ISSUE 6

- a) The lower reach of the Tawelan Brook is in RE Class 2 due to elevated BOD and fails the target for suspended solids, but now achieves RE Class 1 standards for ammonia.
- b) The Cillefwr Industrial Estate surface water discharge has already been confirmed as having a localised impact on the Tawelan Brook.

ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Undertake approximately 20 farm visits and identify pollutant sources. Require implementation of remedial measures where appropriate. Timescales of actions dependant on problems identified.	NRA	Site owners	3k Unknown						
b) DC.WW, as owners of the Cillefwr Industrial Estate's surface water drainage system and outfall, are currently liaising with site operators to reduce chronic pollution and minimise pollution risks.	DC.WW	Site owners	*						Ongoing



ISSUE 7

The Pibwr is in RE Class 2 due to elevated BOD. Whilst this is acceptable, given the uses of the river, it does indicate that chronic pollution problems exist and some action is necessary to ensure there is no deterioration in the situation.

Undertake approximately 50 farm visit and identify pollutant sources. Undertake remedial measures where appropriate. Timescales of actions dependant on problems identified.	NRA	Site owners	5k (NRA costs)						
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ISSUE 8

Under conditions of low freshwater flow and spring tides, occurring during spring and summer periods, low dissolved oxygen concentrations are experienced in the estuary.

a) Undertake monitoring to quantify nutrient loads into and within the Tywi and Taf estuaries and Carmarthen Bay as a potential contributory factor (see also Taf Action Plan, Issue 8).	NRA		15k						
b) Further monitoring will be undertaken following the completion of improvement works at Parc-y-Splotts STW (currently scheduled for 1996/7) to assess the improvements this may bring about.	NRA		3k						

* Not known but thought to be small, less than 5k for DCWW and each site owner.

TYWI CMP ACTIONS

ISSUE 9 High bacteria levels in the estuary, where the main impact is thought to result from sewage discharges, principally Parc-y-Splotts STW, and agricultural activity in the catchment.									
ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Undertake monitoring following the uprating of Parc-y-Splotts STW, which is expected to lead to a substantial reduction in bacteria numbers in the estuary.	NRA		2k						
b) Promote "best practice" by farmers, (in particular in respect of farm slurry management), by means of regular public relations features, talks to farming groups and provision of pollution prevention advice. See issue 31 a).	NRA	Farmers	4k (NRA costs only)						
ISSUE 10 Maintained flow below Nantgaredig is less than 95 percentile flow.									
a) Assess the catchment using the regional abstraction licence policy (when available).	NRA		2k						
b) If flow found to be less than that necessary to protect the river environment and migratory fish stocks, initiate a feasibility study of possible cost-effective solutions.	NRA		15k						By 2000
ISSUE 11 Prescribed flow below Llyn-y-Fan Fach is less than 95 percentile flow.									
As this source is currently unused the river flow is natural and the prescribed flow a very low priority issue. Assess the catchment using the regional abstraction licence policy (when available).	NRA		2k						By 2000
ISSUE 12 Current yield of Llyn Brianne to be quantified.									
a) Using agreed consistent National methodology (when available) assess the reliable yield of Llyn Brianne.	NRA	DCWW	9k (NRA costs only)						
b) If yield is insufficient to meet projected demand on the resource consider impact of resource development strategies such as raising of spillway level.	DCWW	NRA	Unknown (DCWW Costs only)						To be determined

TYWI CMP ACTIONS

ISSUE 13

Flood protection standards are known to be below the indicative standard for urban areas at Carmarthen.

ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Complete appraisal to determine optimum solution to problem in Carmarthen.	NRA		10k	■					
b) Finalise scheme details and construct improvements.	NRA		400k		■				

ISSUE 14 & 28

Proposed roadworks threaten flood defence and environmental interests at Abergwili (Carmarthen Eastern Bypass) and Llandeilo (Eastern Bypass). Flood protection standards are already below the indicative standard for urban areas at these locations (see Issue 15).

Implement mitigation measures, as agreed with the NRA, as part of Bypass proposals at:- i) Abergwili (see also Issue 15 b) i)) ii) Llandeilo (Subject to implementation of roads programme).	WO	To be determined	Unknown				■		Post 1998
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ISSUE 15

Flood protection standards are considered to be below indicative standards for urban areas at certain sites.

a) Investigate the extent of the flooding problem and appraise all solutions at following sites:- i) Abergwili ii) Llandeilo iii) Bronwydd iv) Llanpumsaint v) Annel vi) Pontargoethi vii) Llangadog viii) Llanwrda ix) Llandovery x) Cyngordy xi) Llanstephan xii) Other sites	NRA		5k Other costs to be determined		■			■	By March 1999
b) Implement improvement works, subject to cost benefit analysis and funding availability at the following sites:- i) Abergwili ii) All other sites	NRA				■	■	■	■	To be determined

TYWI CMP ACTIONS

ISSUE 16									
Preparation of S105 Surveys are required to identify the extent of land liable to flood, and to assist Local Planning Authorities (LPAs) with preparation of development plans in respect of flood risk.									
ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Liaise with all LPAs in Wales to determine order for carrying out S105 Surveys.	NRA	DCC, PCC, CaDC, DBC, CeDC BBC	50k (NRA costs only)						
b) Prepare flood plain maps for Tywi catchment.	NRA		75k						Ongoing

ISSUE 17									
Effective fish exclusion screens are not in use at the potable water intakes at Manorafon and Nantgaredig.									
*a) Status of existing provision to be assessed.	DCWW	NRA	1k						
*b) Recommendation of external consultants to be sought regarding type and design of effective system.	DCWW	NRA	Unknown						
*c) Implementation of recommendations (purchase/installation).	DCWW	NRA	Determined during b)						
*d) Programme of monitoring to determine efficacy of new provisions to be implemented.	DCWW	NRA	Determined during b)						Ongoing





ISSUE 18									
Some obstructions to the passage of fish exist within the catchment.									
a) Identify sites where fish access is prevented or impeded, determine environmental impact, feasibility and methodology for improvement and determine programme of improvement works.	NRA		5k						
b) Implement programme of improvement works, subject to availability of funds.	NRA	CFF, Angling Clubs, fishery owners	10k (NRA costs)						
c) Monitor effectiveness of improvements and take appropriate action if further improvements necessary.	NRA		5k						Ongoing

*The above actions are currently under discussion with DCWW.

TYWI CMP ACTIONS


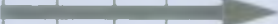

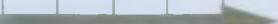
ISSUE 19

The stocking programme, instigated following the failure of the fisheries protection scheme to offset the impact of Llyn Brianne, has not been fully implemented.

ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Determine reasons for failure to meet scheme targets, and identify options.	NRA	DCWW	0.5k (NRA costs)						
b) Review options and determine actions required.	NRA	DCWW, CFF	0.5k (NRA costs)						
c) Implement actions and monitor future results.	NRA	DCWW, CFF	2k+ 2k p.a. (NRA costs)						
d) Construct smolt release pond.	NRA	DCWW, CFF	2k (DC WW costs only)						

ISSUE 20

Fisheries enforcement patrols and rod licence compliance checks are reduced due to reductions in full time enforcement staff numbers, thus leading to a risk of increasing illegal activity.

a) Target available resources on high risk areas and maximise effectiveness through planning and flexible deployment of staff throughout the catchment.	NRA		0.25k p.a.						Ongoing
b) Improve the use and effectiveness of the auxiliary Bailiff force through training and targeting activities.	NRA	CFF, Angling Clubs, fishery owners	3k p.a. (NRA costs)						Ongoing
c) Maximise the use by the public of the free 24 hr emergency telephone line for reporting poaching and improve links with angling club bailiffs.	NRA	CFF, Angling Clubs, fishery owners	0.25k p.a. (NRA costs)						Ongoing
d) Optimise the effectiveness of the NRA's Intelligence System.	NRA	CFF, Angling Clubs, fishery owners	0.25k p.a. (NRA costs)						Ongoing

TYWI CMP ACTIONS

ISSUE 21

Increased costs and decreased returns are perceived by the coracle fishermen to be a threat to the future of this heritage fishery.

ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Review opportunities for obtaining financial support for coracle netmen.	TCNA	NRA	0.25k p.a. (NRA costs)						Ongoing
b) Encourage and support funding applications by the coracle fishermen to grant-aiding bodies.	TCNA	NRA, National Heritage, DCC, PCC, CaDC, DBC, CeDC, BBC, WTB, others as determined during a)	Determined during a)						Ongoing

ISSUE 22



Salmon stocks are below optimum levels.

a) Progress the recommendations of the Net Limitation Order (NLO)/Byelaw Review through consultation with the netmen, anglers and the Welsh Office, and finalise appropriate amendments to the NLO and Rod and Net Byelaws.	NRA	Netsmen, CFF, Angling Clubs, Welsh Office	50k (NRA costs)						
b) Publicise and implement the amendments.	NRA		5k						
c) Monitor the impact of the new regulations for an appropriate period, and review if necessary.	NRA		5k p.a.						Ongoing
d) Review other contributory factors likely to have affected the decline.	NRA		5k						
e) Develop and implement appropriate Action Plan.	NRA		To be determined						

TYWI CMP ACTIONS



ISSUE 23

The current status of the rare pearl mussel and rare fish species such as shad and lamprey is unknown, and early run salmon and relict brown trout populations require protection. The Welsh Otter Strategy also needs to be implemented.








ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Establish status of threatened species and genetic strains and identify threats.	NRA	CCW, DWT, CFF, Angling Clubs	2k (NRA costs)						
b) In consultation with relevant organisations, formulate a strategy, incorporating the Welsh Otter Strategy, for protecting these species and, where appropriate, improve their status.	NRA	CCW, DWT, CFF, Angling Clubs	1k (NRA costs)						
c) Implement strategy.	NRA		Determined during b)						Ongoing
d) Monitor effects of strategy implementation and review.	NRA	CCW	2k p.a. (NRA costs)						1999 onwards-ongoing

ISSUE 24

Invasive plants, such as Japanese Knotweed, are present in the catchment and their spread should be prevented.

a) Prepare, with relevant organisations, an appropriate programme of control measures for invasive plants in the Tywi catchment, with responsibilities of individual organisations clearly identified.	NRA	DCC, PCC, BBC, CaDC, CeDC, DBC, CCW, CLA, FUW, NFU, land owners	2k (NRA costs)						
b) Implement agreed programme.	Determined during a)	Determined during a)	Determined during a)						Ongoing
c) Monitor effectiveness of programme and review as necessary.	Determined during a)	Determined during a)	Determined during a)						Ongoing





TYWI CMP ACTIONS

ISSUE 25									
Limited public access to freshwater reaches of the Tywi catchment for recreational purposes.									
ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Review adequacy of current access for different user groups, examine scope for increasing access and consider resulting conflicts and benefits.	NRA	DCC, PCC, BBC, CaDC, CeDC, DBC, CFF, Angling Clubs, Land & fishery owners, RA, FUW, CLA, WCA	2k (NRA costs)						
b) Produce a summary of the above findings and agree an Action Plan.	Determined during a)	Determined during a)	Determined during a)						
c) Implement Action Plan.	Determined during a)	Determined during a)	Determined during a)						Ongoing
ISSUE 26									
'Standards of Service' for SSSIs have not been formally agreed with CCW.									
a) Identify SSSIs which include NRA interests and agree 'Standards of Service' with CCW.	NRA	CCW	2k (NRA costs)						
b) Monitor adherence to agreed 'Standards of Service'.	CCW	NRA	1k p.a. (NRA costs)						Ongoing
ISSUE 27									
Certain developments, such as those within the flood plain or adjacent to the river corridor, may impact on the NRAs environmental and flood defence interests									
a) Ensure suitable policies are included in Local District Plans.	NRA	LPAs	2k (NRA costs)						
b) Set up meeting/seminar to enhance liaison with LPAs.	CCW	LPAs	1k (NRA costs)						

TYWI CMP ACTIONS

ISSUE 29




Changes in land use and in-channel river works are perceived to have caused habitat degradation, loss of ecological niches and to have impacted on the recreational fishery.

ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Review the 1994 RCS information and other available survey data, to identify the extent, nature and cause of habitat loss/degradation and identify any gaps in information.	NRA		1k						
b) Carry out further habitat surveys if required.	NRA		Determined during a)						
c) Following a) and b) above, formulate a programme of habitat restoration works and a habitat protection strategy for the catchment, in consultation with relevant organisations.	NRA	DCC, PCC, BBC, CaDC, CeDC, CFF, Angling Clubs, Fishery Land owners, FUW, NFU, CCW, RSPB, DWT	1k (NRA costs)						
d) Implement the programme and strategy.	NRA		Determined during c)						Ongoing
e) Monitor implementation and review periodically.	NRA		1k						Ongoing

TYWI CMP ACTIONS




ISSUE 30

Private gravel removal and channel stabilisation works, within mobile sections of the channel, are believed to have an undesirable impact on the environment.

ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Through a literature review and on site surveys, define areas at risk, the significance of any impact and determine acceptable approaches and practices.	NRA	CCW, RSPB, DWT, FUW, NFU, Land owners, LPAs	2k (NRA costs)						
b) Through regulation (land drainage consents and planning constraints) and education, ensure that acceptable practices are adopted and unacceptable practices are prevented in those areas of risk.	NRA	CCW, LPAs	0.5k (NRA costs)						Ongoing
c) Undertake monitoring to ensure compliance, and review the effectiveness of the approved practices in preventing environmental damage.	NRA	CCW, RSPB, DWT, LPAs	2k (NRA costs)						Ongoing

ISSUE 31



Current agricultural and forestry practices can result in releases of pollutants to the detriment of fisheries and conservation.

a) Promote "best practice" by farmers in respect of slurry management, as indicated in Issue 9 b).	NRA	Farmers	4k (NRA costs)						
b) Promote "best practice" by farmers in respect of sheep dip disposal by means of public relations features, talks to farming groups and targeted site inspections.	NRA	Farmers	7k (NRA costs)						
c) Promote use of the Forests and Water Guidelines by forest owners and operators.	NRA	Forest owners, operators	2k (NRA costs)						

TYWI CMP ACTIONS





ISSUE 32

Predation by seals, cormorants and saw billed ducks in estuarial and fresh waters, is believed by fishermen to be a significant threat to fish stocks and to warrant the granting of licences to cull.

ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Monitor the status of predators within the catchment, and in the light of national R&D investigations and NRA policy, advise Welsh Office, CCW and angling/netting interests as required.	NRA	RSPB, CCW, WOAD, CFF, angling and netting interests	1k (NRA costs)						Ongoing
b) Periodically review available technology to determine whether seal deterrence equipment is an effective solution to seal predation from nets and incursion into freshwater, and review national NRA policy if appropriate.	NRA		0.25k						Ongoing

ISSUE 33

Lack of access agreements between canoeing bodies and riparian/fisheries owners.

a) The NRA and Welsh Canoeing Association to prepare a draft Plan for canoeing in the catchment taking into account all potential conflicts.	NRA	WCA, DWT, CCW, CLA, SCW	0.5k (NRA costs)						
b) WCA to consult with fishery and landowners to agree a final Plan for access and use by canoeists with support from NRA.	WCA	NRA, land-owner, fishery owners, CFF, Angling Clubs	Determined during a)						
c) WCA to implement and publicise Plan.	WCA	NRA	Determined during b)						
d) Periodic review and modification of the Plan where required.	WCA	All above	Determined during b)						Periodic Review

TYWI CMP ACTIONS

ISSUE 34

An increase in motorised water sports in the estuary may impact on other users and wintering wildfowl.

ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Identify existing regulations and roles of responsible organisations.	NRA	CCs, Local Boat Clubs, Trinity House, CCW, RSPB, SCW	0.5k (NRA costs)						
b) Monitor impact of activity on other users and wildfowl and to review regulations if required.	Determined during a)	Determined during a)	Determined during a)						Ongoing
c) Formulate and implement a recreation plan for the Tywi estuary if appropriate.	Determined during a)	Determined during a)	Determined during a)						Ongoing
d) Continue to monitor the situation to identify need for review.	Determined during a)	Determined during a)	Determined during a)						Ongoing

ISSUE 35

Possible impact upon fish production and angling, caused by low temperature water leaving Llyn Brianne.

These actions, as well as establishing if remedial action is needed, will assist in assessing the impact of any future proposals for use of Llyn Brianne such as hydro electric power (HEP) and/or additional water supply.									
a) Study existing data and available literature to determine if further investigation needed.	NRA	DCWW	10k (NRA costs)						
b) Carry out investigative work identified in a) if required.	NRA	DCWW	Determined during a)						
c) From the results of a) and b) determine the significance of any impact of depressed temperatures on the ecology and fisheries of the Tywi below Llyn Brianne.	NRA		2k						
d) If significant impact identified investigate possible cost-effective solutions, such as multi-level draw-off, taking into account requirements of HEP.	NRA	DCWW	20k (NRA costs)						By 2001
e) If suitable solution found, carry out agreed remedial action to reduce impact.	NRA	DCWW	To be determined						To be determined

TYWI CMP ACTIONS

ISSUE 36 Possible impact upon Little Ringed Plover breeding success from freshets released from Llyn Brianne.										
ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE	
	LEAD	OTHER								
a) Establish data-base of known nest sites of shoal-nesting birds along the River Tywi.	NRA	RSPB, CCW, DWT	0.25k p.a. (NRA costs)						Ongoing	
b) Determine typical river channel profiles and water height/flow relationship at shoal sites and review periodically.	NRA		0.5k p.a.						Ongoing	
c) From a) and b) refine policy for timing and volume of releases from Llyn Brianne to minimise impact on shoal-nesting birds.	NRA		0.5k							
ISSUE 37 Incomplete time of travel information, for the provision of advice to abstractors and to assist in the management of major pollution incidents.										
Complete travel time and dispersion studies under a full range of flow conditions for the Tywi and major tributaries downstream of Llandoverly.	NRA		10k							
ISSUE 38 Potential or actual environmental impact caused by development in some sewered areas; <ul style="list-style-type: none"> Salem - the receiving watercourse provides very little dilution for this works which has recently been uprated. Llandoverly - suspected impact on the Bran caused by the final effluent and a nearby combined sewer overflow (CSO). 										
NRA to monitor the impact of these systems. If unacceptable impact is confirmed and remedial measures are not adequately programmed, the NRA will oppose future developments which may cause an unacceptable deterioration in environmental quality.	NRA		3.5k							

TYWI CMP ACTIONS

ISSUE 39 The adequacy of the hydrometric network to meet needs of users needs to be assessed.									
ACTIONS	RESPONSIBILITY		COST (£s)	1994	1995	1996	1997	1998	FUTURE
	LEAD	OTHER							
a) Apply national classification to existing gauging stations to assess status.	NRA		0.5k		■				
b) Identify user requirements for hydrometric data.	NRA		0.5k			■			
c) Review catchment and produce strategy to meet requirements for hydrometric data, including groundwater monitoring.	NRA		9k				■		
d) Implement strategy.	NRA		Unknown						To be determined
ISSUE 40 Water quality of the Gwili. Data re-assessment has shown that the Gwili at Llanpumsaint marginally fails its RE Class 1 target for BOD, falling into RE Class 2									
BOD levels will be closely monitored over a three year period.	NRA		0.5k		■	■	■		
ISSUE 41 Water quality of the Twrch. The Twrch at Pumsaint marginally fails its RE Class 1 target for BOD, falling into RE Class 2.									
Owing to the marginal nature of this issue, BOD levels will be closely monitored and should the situation deteriorate, site visit programmes will be instigated.	NRA		0.5k		■	■	■		
ISSUE 42 Water quality of the Myddfai. The Myddfai at Cilsaen marginally fails its RE Class 1 target for BOD, falling into RE Class 2.									
Unacceptable discharges have been identified at one farm which are thought to be largely responsible.	Site owner		Unknown		■				
Remedial measures are being undertaken by the farmer and the situation will be closely monitored.	NRA		0.5k			■			

FUTURE REVIEW AND MONITORING

The NRA will be jointly responsible, with other identified organisations and individuals, for implementing this Action Plan. Progress will be monitored and normally reported annually. These reviews will examine the need to update the CMP in the light of changes in the catchment. The period

between major revisions will normally be five years.

The annual review, which will be made widely available, will take the form of a short progress report, to include work achieved compared with that planned, and to highlight any changes to the plan.

CONTACTING THE NRA

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