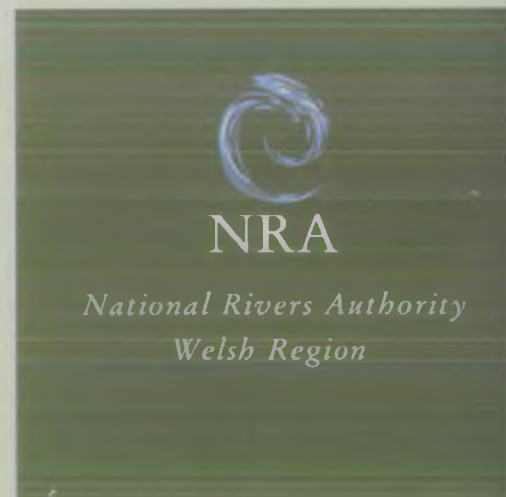


# DYFI AND LERI CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT

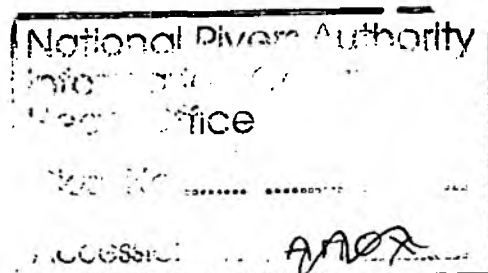


# **DYFI AND LERI CATCHMENT MANAGEMENT PLAN**

## **CONSULTATION REPORT**

**DECEMBER 1995**

**National Rivers Authority  
Welsh Region**



ENVIRONMENT AGENCY



091998

Further copies can be obtained from :

The Catchment Planning Coordinator  
National Rivers Authority  
Welsh Region,  
Rivers House,  
St Mellons Business Park,  
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The Area Catchment Planner  
National Rivers Authority  
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Awarded for excellence

## THE NRA'S VISION FOR THE DYFI AND LERI CATCHMENTS

The picturesque catchments of the Dyfi and Leri, at the southern extremity of the Snowdonia National Park are sparsely populated and have experienced less impacts due to man's activities than many other river systems. The area drained by these rivers is of exceptional conservation value, particularly around the internationally important estuary, which has a Site of Special Scientific Interest designated as one of only three Biosphere Reserves in the UK. The Dyfi is noted for its salmon and sea trout fisheries and the coastal zone is of considerable importance for tourism and recreational activities.

Our main priority must therefore be to protect the existing high value of the catchments, ensuring through our contacts with others that developments and uses of the river systems proceed in harmony with each other and without unacceptable environmental impact.

Nevertheless, there are issues that will require action by ourselves and others to realise the full potential of the catchments. These include:

- |   |   |
|---|---|
| <p>o     <b>Improvements to bathing water quality</b></p> | <p>-     the failure of the EC designated bathing waters at Aberdyfi to meet the required quality standards will soon be addressed as part of a planned scheme within the Dwr Cymru Welsh Water second Asset Management Plan (AMP2). However, the failure of the similarly designated bathing waters at Borth during 1995 was unexpected and investigations will need to be undertaken to identify the cause of this failure and remedial solutions</p> |
|---|---|
  
- |  |   |
|--|---|
| <p>o     <b>Water Level Management Plans</b></p> | <p>-     these need to be developed to safeguard wet grasslands and their habitat for wetland birds, whilst achieving an acceptable balance for the satisfactory management of land drainage and agricultural interests</p> |
|--|---|
  
- |  |  |
|--|--|
| <p>o     <b>Fisheries protection and development</b></p> | <p>-     measures to reduce commercial exploitation of migratory fish and enhancement of stocks through habitat improvements, removal of barriers and stocking need to be developed to provide for the long term viability of the fishery.</p> |
|--|--|

Within this consultation document we have set out our initial views on these, and other issues that we have identified. It is important that organisations and individuals with interests in the Dyfi and Leri catchments join with us to identify any further issues and assist us in the development and implementation of an action plan that will ensure sustainable development and protection of the natural assets of the catchments into the next millennium

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**PART I**  
**THE DYFI AND LERI CATCHMENT**  
**MANAGEMENT PLAN**



**1.0 THE PURPOSE OF  
CATCHMENT MANAGEMENT  
PLANS**



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## 1.0 THE PURPOSE OF CATCHMENT MANAGEMENT PLANS (CMPS)

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### 1.1 THE ROLE OF THE NRA

The rivers, lakes, estuaries and coastal waters of Wales are subject to large and rapidly increasing demands from the users of water. Many different uses interact, or compete for water or water space, and may 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 general duties include:-

- Maintenance and improvement of water quality by control of pollution in surface and groundwater.
- Flood defence for people and property.
- Flood warning.
- The management of water resources to achieve the right balance between the needs of the environment and those of abstractors.
- Maintenance and improvement of fisheries.
- Conservation of the natural water environment.
- Promotion of water based recreation.
- Navigation (in some rivers).

We also play a key role in the strategic management of the interaction between users of the water and land environments.

We believe that it is important that the interests of all water users are considered in the development and protection of the water environment. Consequently, we have chosen to promote our *vision* and management proposals via published Catchment Management Plans (CMPs).

## 1.2 WHAT THIS PLAN IS DESIGNED TO DO

This consultation document presents a number of issues and options for the future management of the Dyfi and Leri catchments, and is based on a detailed study that we carried out during 1994. A number of proposals are presented for comment and it is intended that, following consultation with you and other river users, an Action Plan will be presented which will seek to manage conflicts in river use and optimise the overall benefits to all river users within the catchments.

The Action Plan will steer us in developing our own management programme for the catchments and guiding us in the way we respond to any development proposals.

This consultation document is divided into 2 parts:

- Part I:** Presents the range of management issues, and options to address them, that have been identified by the NRA;
- Part II:** Provides background information on the approach we took in developing this plan, using information on identified river Uses (including those to be incorporated in the new Water Quality Objectives scheme) and the statutory and informal targets required to support them. The targets are expressed in terms of water quality, water quantity and physical features.

We hope that you find the information in this consultation document informative and thought provoking (for your convenience a glossary of terms and abbreviations has been included as an Appendix). Let us know whether you agree or disagree with our current proposals: remember this is not just our document, it is also yours: without your help we cannot produce a workable Action Plan that will be of benefit to you and all users of the Dyfi and Leri Catchments.

Please send any comments you may have on the Consultation Report to:

The Area Catchment Planner,  
National Rivers Authority,  
Plot 10,  
Parc Menai,  
Vaynol Business Park,  
Bangor,  
Gwynedd. LL57 4BP

Telephone: (01286) 672247

## **The Environment Agency.**

The new Environment Agency for England and Wales will be created in April 1996 by the merger of the NRA, Her Majesty's Inspectorate of Pollution and the Waste Regulation Authorities. It will be the largest environmental protection agency in Europe. While it will incorporate the full role of the NRA there will be wider responsibilities for integrated pollution prevention and control, of air land and water. One of the Agency's principal aims will be to contribute towards attaining the governmental objective of achieving sustainable development by protecting or enhancing the whole environment.

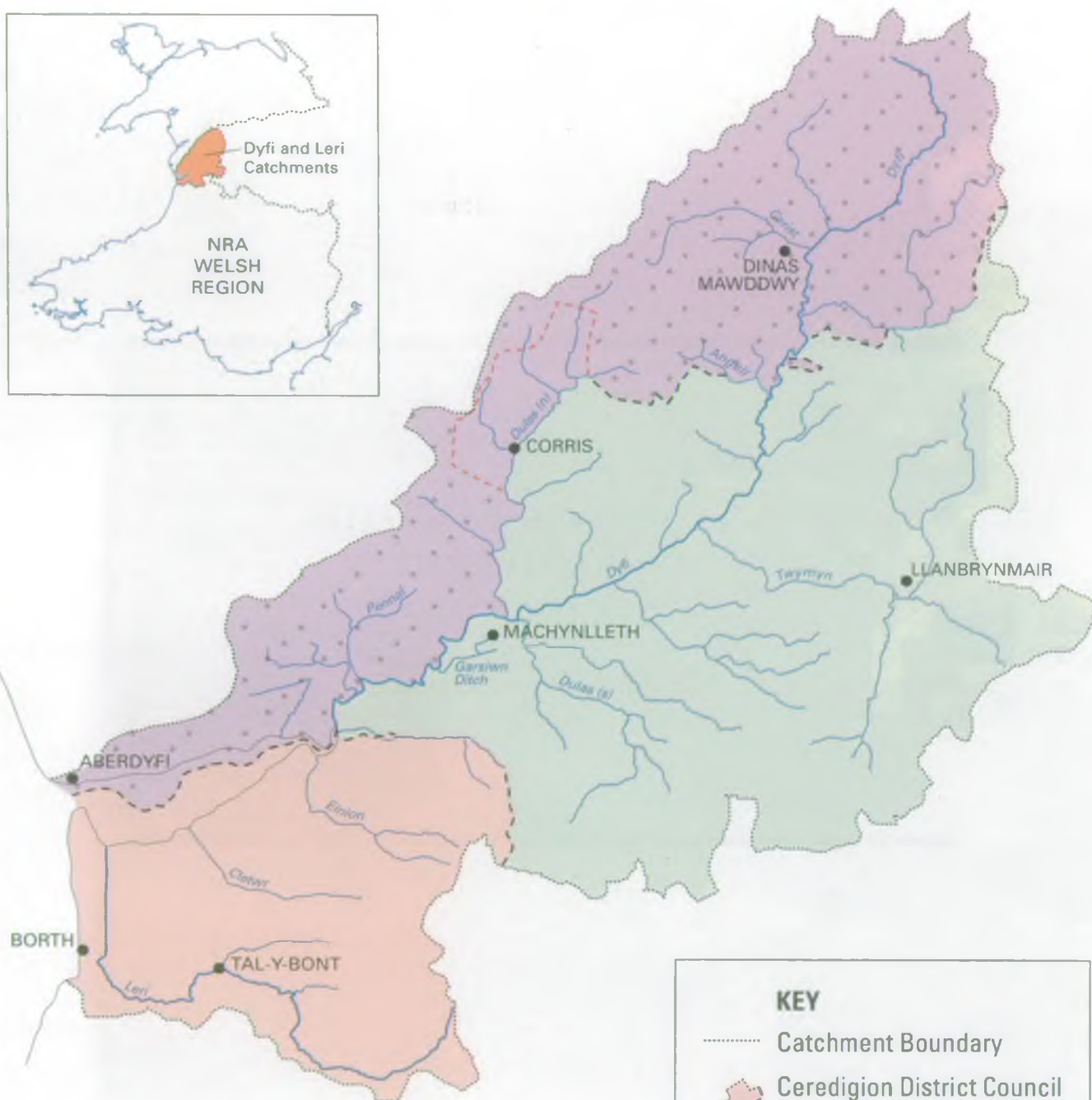
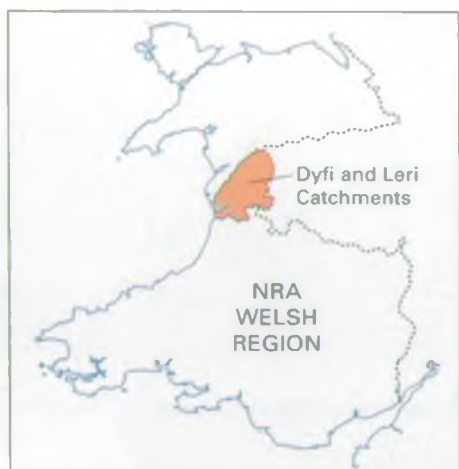
The government has recognised both the success of integrated river basin management, as developed and practised by the NRA, and the importance of CMPs as an integral part of that philosophy. It is therefore anticipated that CMPs will continue as the focus for river basin management in the Agency, although they may be developed in the context of wider management plans for the protection and enhancement of water, land and air.



## **2.0 AN OVERVIEW OF THE DYFI AND LERI CATCHMENTS**

**MAP 1.**

**DYFI AND LERI CATCHMENTS**



**KEY**

- ..... Catchment Boundary
- Ceredigion District Council  
(Dyfed County Council)
- Montgomery District Council  
(Powys County Council)
- Meirionnydd District Council  
(Gwynedd County Council)
- Snowdonia National Park



0 10km

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## 2.0 AN OVERVIEW OF THE DYFI AND LERI CATCHMENTS

---

### 2.1 INTRODUCTION

The Dyfi and Leri catchments are situated deep in the heart of Wales. Approximately 30 percent of the catchments is within the Snowdonia National Park. The scenery in the upper reaches of both, while spectacular, is less rugged than that of Snowdonia to the north. It consists of rounded peaks and upland blanket bog which in turn give way to deeply incised valleys as the rivers descend to the floodplains. There are several large forests within the catchment, the largest of which is the Dyfi forest situated on the Dulas (n), a tributary of the Dyfi.

Downstream of Dinas Mawddwy, the Dyfi floodplain consists of improved and semi improved grassland through which the river, by now treelined and shaded in places, meanders. The lower floodplain has been extensively drained to reclaim land for agricultural purposes. It is separated from the estuary by floodbanks and the railway line.

Drainage for agricultural purposes is particularly noticeable on the lower reaches of the Leri which is canalized and lies within the Borth Bog Internal Drainage District

The Dyfi estuary is the largest in Cardigan Bay. It is bounded by steep mountains to the north which is in contrast to the extensive mudflats, saltmarsh and raised mire to the south. Sand dunes surround the estuary and the area is of international importance, being both a Ramsar site and Biosphere Reserve.

### 2.2 INFRASTRUCTURE

The area is served by a number of trunk and main 'A' roads which link the main population centres. The vast majority of the larger settlements are located along the main road corridors. Smaller settlements are accessed by 'B' and unclassified roads.

The main Shrewsbury to Aberystwyth railway line follows the course of the Afon Twymyn and lower Dyfi valley; Dyfi Junction providing access to Aberdyfi and ultimately the North Wales coast. There are no airport facilities within the area.

### 2.3 LAND USE

The catchments of the Dyfi and the Leri overlap several local authority boundaries. Consequently, one or more of the County Council (Gwynedd, Powys, Dyfed) structure plans and District Council (Montgomery, Ceredigion) local plans policies apply to different parts of the catchments. The Snowdonia National Park (SNP) plans are also very influential where they apply. (SNP also acts as the planning authority on behalf of Meirionnydd District Council).

The catchments are predominantly rural with agriculture featuring as the main land use, whilst substantial parts of the area are afforested. The topography of the area has recently attracted a number of renewable energy generation proposals including hydro electric power generation schemes and wind farms, with one wind farm already in place at Mynydd Cemaes.

The area has significant attractions for recreational activities and the tourist industry is important to the local economy. Activities include bathing, water skiing, windsurfing and sailing, predominantly at Aberdyfi and Borth, whilst attractive mountain landscapes serve as the catchment's natural boundaries. These natural attractions have led to the establishment of several outdoor pursuit centres in the Dyfi valley. The Dyfi is also highly regarded as an important sea trout fishery.

Historically the area has been subject to mineral exploitation which included mining for lead, copper, zinc, silver and gold. Most of the mining areas have become obscured by dense coniferous plantations but their impact on water quality is evident in some parts, particularly in the upper reaches of the Twymyn. Slate quarrying is still active at Aberllefenni on the Dulas (n).

Extensive areas of flood and coastal plains and low lying land exist within the area. These present drainage difficulties, which demand regular maintenance. A Flood Warning System is operated on the Dyfi for landowners in the flood plain. We will normally advise local planning authorities that development proposals within these areas are not acceptable.

The catchments have the benefit of an environmentally acceptable sewage disposal infrastructure but, we will advise planning authorities on the suitability of the method of sewage disposal indicated in development proposals.

There are also numerous abstractions in the area and we are guided by our Groundwater Protection Policy in advising planning authorities on the suitability of development near these sites.

## 2.4 FLOOD DEFENCE

Flood defence activity within the catchments is concentrated upon the maintenance of tidal and fluvial defences, main river watercourses and adopted ditches.

As a consequence of the extensive areas of flood and coastal plains throughout the Plan area there is an Internal Drainage District (IDD), known as Borth Bog IDD.

Elsewhere in the catchments flood defence work consists mainly of shoal removal and river management schemes carried out when and where necessary. There are no main river major flooding problems where property is affected, although the agricultural flood plains are inundated from time to time. There are, however, a few isolated cases of flooding to properties associated with ordinary watercourses within the catchments.

Water Level Management Plans will be drawn up for all sites agreed between us and the Countryside Council for Wales. A three year prioritised programme for the production of these plans will be undertaken.

Flood defence is one of the important considerations in the planning process and we will be actively involved in liaison regarding any proposed development or proposed allocation for development in sensitive areas.

We are beginning to prepare maps that show the areas liable to flooding. These will be available as reference documents for the determination of Town and Country Planning applications by the local authorities.

## 2.5 HYDROLOGY AND HYDROGEOLOGY

The Dyfi and Leri catchments are underlain by solid rocks of the Silurian and Ordovician geological periods, which were largely undisturbed by volcanic activity during their long period of deposition. As such, the homogenous nature of the mudstones and shales and the absence of more resistant rocks has led to less rugged scenery than further to the north, giving rise to concordant rounded summits and plateaux country. However, to the north at Corris, the rocks have been changed by pressure into slate, with igneous volcanic intrusions forming veins of lead and zinc in the south. The absence of resistant materials has led to deeply incised valleys, with the Dyfi itself meandering over deep deposits of gravels, which the river continuously re-works to form benches and terraces as it flows to sea. The groundwater present in these gravels is utilized for water supply but is excluded from licensing: elsewhere little water is present in the underlying solid rocks. The wide open estuary itself shows evidence of relative movements between land and sea, with northward moving coastline and estuarine material coalescing to form the spit and bar of Borth Bog.

The rivers are open to the prevailing SW winds with rainfall varying from 1000mm on the coast to 2500mm on Aran Fawddwy. The inundation of the flood plains referred to in 2.4 above affects the whole of the Dyfi valley and is due to the influence of onshore winds, tides and low river gradients.

## 2.6 FISHERIES, CONSERVATION AND RECREATION

The Dyfi is one of the most productive salmon and sea trout fisheries in Wales. It is particularly noted for the size and abundance of sea trout and is justly revered by anglers as one of the finest "sewin" fisheries in the UK. Brown trout are present throughout the Plan area although it is the lakes which provide the best fishing for this species.

The catchments are of very high conservation value, comprising a range of habitats, from steep and mountainous reaches in the upper rivers through to the internationally important estuary, the largest in Cardigan Bay. Notable is the Dyfi SSSI, a complex of sand dunes, saltmarsh, wet grassland and raised bog, which is one of only 3 designated Biosphere Reserves in the UK.

Drainage and agricultural intensification has resulted in extensive land reclamation and loss of wetlands important to wading birds, such as redshank and lapwing.

For most of its length, the Dyfi forms the southern boundary of the Snowdonia National Park. Apart from providing spectacular scenery, this area is greatly enjoyed for bathing and other immersion sports, particularly at the EC identified beaches of Borth and Aberdyfi. Water skiing and jet skiing have become increasingly popular in recent years. Windsurfing and sailing are also enjoyed by a growing number of participants and, deep sea fishing is catered for by a fleet of vessels based at Aberdyfi harbour. With such a range of attractions, it is not surprising that the estuary and coastline are popular destinations for holidaymakers.

We do not have any responsibility for navigational matters within the catchments.

## 2.7 WATER QUALITY

Water quality in rivers covered in this plan is generally very good as reported by the 1992 River Quality Survey. However, even though rainfall acidity is not naturally very high, the volume of rainfall gives rise to a high annual acid deposition. This, coupled with the low concentration of available base elements in the soils, can result in periodic acid flushes and a consequential effect on water quality in the areas where this occurs. The acidity can be exacerbated within some catchments by large areas of afforestation and there are localised problems with elevated levels of zinc due to runoff from historical mining areas and the effects of low pH on mineral outcrops.

There are two very popular EC identified beaches on the coastal part of the catchments, namely at Borth and Aberdyfi, where there is considerable water based recreational activity. Compliance with the imperative standards of the EC Bathing Waters Directive is therefore an important and indeed mandatory objective at these identified waters. Compliance is consistently good at Borth, but currently poor at Aberdyfi. This is mainly due to the discharges of crude sewage from Aberdyfi into the middle of the estuary, at a point adjacent to the main beach. These problems are

currently being resolved by the construction of a pumping station to transfer the sewage to nearby Tywyn for full treatment.

### 2.8 MONITORING

Monitoring of rainfall is undertaken at 13 sites within the catchments: instruments at 5 of these are telemetered to provide instantaneous information on rainfall for flood warning purposes. Three river gauging stations on the Dyfi, Leri and Twymyn provide river flow information for the catchments. There are no groundwater monitoring sites within the Plan area.

A network of 20 monitoring sites is used to gather information on the chemical and biological quality of the rivers in the catchments. This is augmented by samples taken at other points for specific purposes, e.g. to monitor the effects of acidification or farm pollution. The quality of the identified bathing waters at Borth and Aberdyfi is monitored throughout the bathing season and assessed against the standards of the EC Bathing Waters Directive (76/160/EEC).

A strategic survey of the habitat quality of the river corridor has been carried out on the Dyfi, Dulas (n) and Dulas (s).

Populations of young salmon and trout have been monitored annually at various sites throughout the catchments for over ten years.

## 2.9 KEY DETAILS

**Area** 670 km<sup>2</sup>

### Main Towns and Populations (1991 Census)

Machynlleth	2033
Aberdyfi	843
Tal-y-Bont	600

### Topography

<b>Ground levels</b>	Min level	0 m A.O.D.
	Max level	655 m A.O.D.

<b>Tidal levels</b>	Mean High Water Springs	5.5 m A.O.D.
	Mean Low Water Springs	2.5 m A.O.D.

### Administrative Details

<b>County councils</b>	-	Powys County Council Dyfed County Council Gwynedd County Council
<b>District councils</b>	-	Meirionnydd District Council Ceredigion District Council Montgomery District Council
<b>National Parks</b>	-	Snowdonia National Park
<b>NRA</b>	-	Welsh Region - Northern Area
<b>Water companies</b>	-	Dŵr Cymru Welsh Water Severn Trent Water Ltd
<b>Sewage Treatment Works</b>	-	24 Dŵr Cymru Welsh Water 4 Private

## CATCHMENT OVERVIEW

### Water Quality Classification

River length in General Quality Assessment Class, based on results for 1992.

Class A (90.1%)	-	125.9 km
Class B ( 3.7%)	-	5.2 km
Unclassified ( 6.2%)	-	8.6 km

### Estuary Classification

Good (NWC Class A)	-	19.3 km
Fair	-	NONE
Poor	-	NONE
Bad	-	NONE

No. EC identified bathing waters 2 (Aberdyfi, Borth)

Other bathing waters 1 (Ynys Las)

### Water Resources

Annual Average Rainfall 1200 mm

Primary Gauging Stations 3 (Machynlleth, Cemmaes Road, Llandre)

Principal Reservoirs 1 (Llyn Craig y Pistyll)

### Flood Protection

Length of Main River in catchment	103 km
Length of Main River within Internal Drainage District	16 km
Length of Adopted Ditch within Internal Drainage District	30 km
Length of flood banks maintained by NRA	24 km
Area at risk of flood (tidal or river)	2,150 Ha

### Fisheries

Length of watercourse designated under EC Directive (78/659/EEC) on "The Quality of Fresh Waters needing Protection or Improvement in Order to Support Fish Life".

Salmonid	-	42.2km
Cyprinid	-	NONE

Dyfi and Leri Average Annual Declared Catch 1975-94

	<u>Salmon</u>	<u>Sea Trout</u>
Rods	307	1643
Nets	86	1063

Conservation

Sites of Importance	22
---------------------	----

## SECTION 3.0 ISSUES AND OPTIONS

This section of the Plan presents the key Issues that the we have identified from our analysis of the **Dyfi and Leri** catchments. One or more suggestions are made for addressing each issue and you are invited to comment on these. This section relates solely to those areas which have been shown not to be able to support certain of the identified Uses; the rest of the catchment should be regarded as being able to support **all** identified Uses.

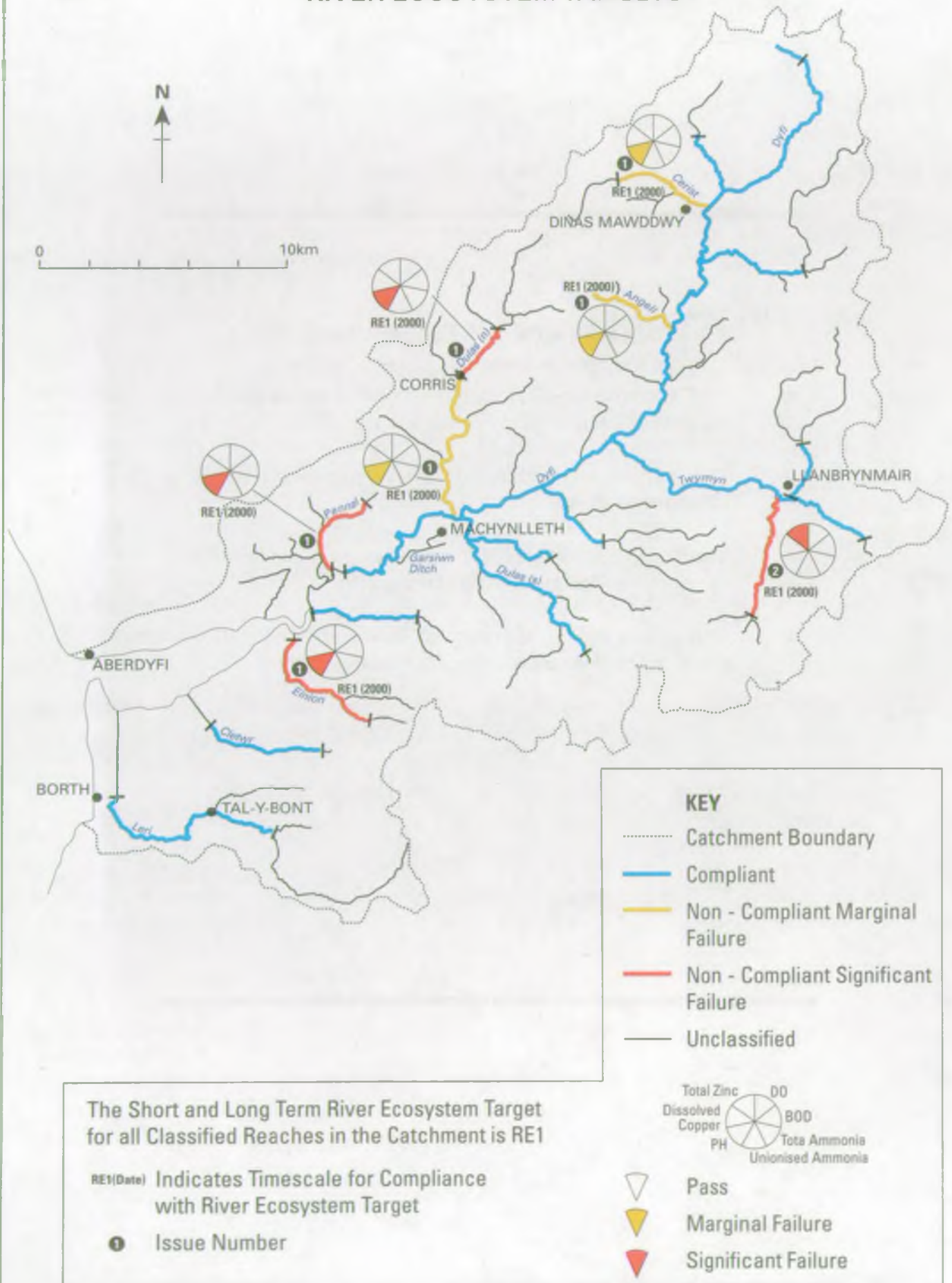
- Section 3.1 identifies in detail, those areas that fail to meet specific targets to support identified Uses. Significant areas of conflict between Uses are also discussed.
- Section 3.2 presents these Issues along with Options, identified by the NRA, to address them.
- The background information that has been used to identify these Issues is provided in **Part II** of this report, which lists the known Uses of the catchments and sets targets to support them.
- You should note that the Issues and Options do not constitute NRA policy but have been considered within our policy framework: no priority should be inferred from the order in which they appear.



### 3.1 THE STATE OF THE CATCHMENT

- This section reviews the current quality of the catchments against the **Targets** set in Section 5 in **Part II**.
- The **Targets** are designed to protect the needs of the identified catchment **Uses**.
- The targets are also guided by the concepts of **sustainable development and environmental capacity**.
- This allows the key management **Issues** to be identified: potential solutions are addressed in **Section 3.2**.

**MAP 2. STATE OF THE CATCHMENT - COMPLIANCE WITH RIVER ECOSYSTEM TARGETS**



---

### 3.1.1 WATER QUALITY

---

#### General

In addition to compliance with water quality targets, we used information from biological monitoring surveys to assess the state of the catchment. Information on the invertebrate fauna found in rivers is particularly useful since the animals present reflect the water quality of the river in the preceding weeks or months, unlike chemical data which presents a series of 'snapshots' of water quality. A further benefit is that invertebrates respond to a far wider range of polluting materials than are routinely tested for by chemical monitoring. We can therefore, use biological data as supporting evidence for issues generated by assessment of chemical quality and to identify new issues which are not detected by chemical sampling alone. Biological monitoring is particularly useful in small streams which are not routinely sampled chemically. In Welsh Region we use biological techniques for the rapid assessment of watercourses affected by acidification (acid rain) and farm pollution. Additionally we employ biological assessments of point sources such as sewage treatment works, industrial sites and mine discharges to identify the need for improvements.

#### Local Perspective

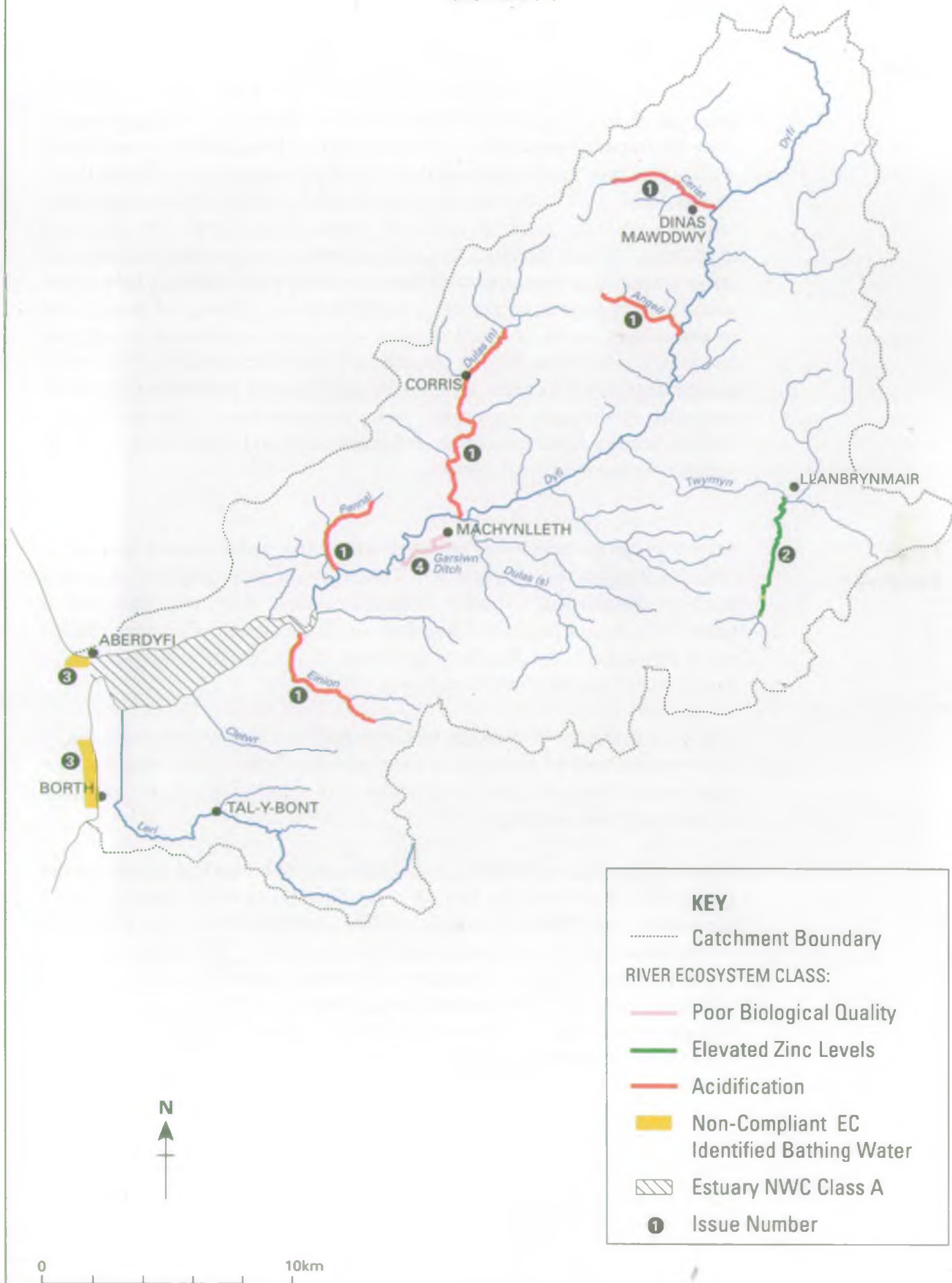
Map 2 identifies those river stretches where the water quality has failed to meet the targets set in Section 5.1. The targets are those required to protect the Uses identified in Section 4 of this document. They are expressed in terms of the River Ecosystem Class into which the stretch of river has fallen when compared to the standards set down in the "Surface Waters (River Ecosystem)(Classification) Regulations 1994".

The water quality, as assessed by both chemical and biological monitoring in the rivers covered by this plan, is generally excellent. The exceptions are those areas of the catchments that are adversely affected by low pH and run-off from old mine workings.

In the south of the catchments, poor chemical and biological quality in the Einion can be attributed to low pH. The low pH is associated with acid deposition, the effects of which can be exacerbated by the extensive coniferous afforestation in that part of the catchment. The abandoned lead mines in this area are also thought to adversely affect the quality of this tributary. Garsiwn ditch, a slow flowing drainage system with a silt bed is atypical of the Dyfi catchment. Its poor biological quality is largely attributable to combined sewer overflows from the Machynlleth sewerage system.

In the North of the Plan area, biological investigations have confirmed the Angell, Dulas (n) and the Pennal as being significantly affected by low pH. Contributing factors to the low pH are the acid sensitive rocks and soil and the very high proportion of upland tributaries which flow through large areas

**MAP 3. STATE OF THE CATCHMENTS - GENERAL WATER QUALITY**



of coniferous afforestation. Fluctuations in biological scores between 1991 and 1994, indicate that the lower reaches of the Dyfi may periodically be adversely affected by these northern acidic tributaries.

An assessment of the major tributaries; Cerist, Cywarch, Dugood, Angell, Twymyn, Dulas (n and s), Pennal, Llyfnant, Einion and Cletwr, against the salmonid standards in the Freshwater Fish Directive (78/659/EEC) show they fail to meet the zinc and/or pH standards required by this directive.

The main river Dyfi, assessed from samples obtained at the A487 road bridge near Machynlleth, only complies with the standards for a salmonid water contained in the Freshwater Fish Directive (78/659/EEC) by the application of a derogation for zinc. The same applies for the Afon Leri, as assessed at Dolybont.

### Public Water Supplies

The quality of surface waters used as sources for public water supplies are monitored by the NRA under the requirements of the EC Surface Water Abstraction Directive (75/440/EEC). The delivery of water to the public is the responsibility of the water companies and it is they who have a duty to ensure compliance with the quality standards contained within the directive. The monitoring of private or independent water supplies is the responsibility of the local authorities' environmental health officers.

Water quality of the source at Corris Uchaf is inconsistent with the standards appropriate for A1 treatment. This is due to the presence of oil and grease type compounds in the raw water. However, the presence of these compounds, and a persistent source for them, is highly unlikely at the location of the abstraction. It has been concluded that many of the "failures" are not due to polluting inputs.

Dwr Cymru Welsh Water's source at Llyn Craig Y Pistyll, associated with the Bontgoch water treatment works, meets the required standards for A2 treatment. However, the operation of the works causes an elevation in aluminium levels in the Afon Leri for a significant length of river downstream of the discharge. The works is currently undergoing major refurbishment and expansion. Improvements in the current treatment regime are required in order to mitigate against the possibility of levels of aluminium toxic to fish in the discharge.

The Severn Trent Water Ltd source at Llanwrin, on the banks of the Dyfi, is by virtue of it being groundwater, exempt from monitoring requirements under the EC Surface Water Abstraction Directive (75/440/EEC).

## Issues Identified

### Acidification

The Dulas (n) is in River Ecosystem Class 5 upstream of Corris due to low pH levels. Acidification has been shown to be more pronounced in areas of afforestation. This river is bordered by the Dyfi Forest for the majority of its length and the upper reaches drain areas with acid sensitive rocks and soils. The rivers Pennal and Einion, further south and west in the Dyfi catchment, are also in River Ecosystem Class 5 for the same reasons as the Dulas (n). Where the cause of the low pH is attributable solely to natural processes and no cost effective amelioration measures are applicable, a derogation for pH will be applied. The public register will be annotated to this effect and an application will be made to have the derogation confirmed when the WQO is made statutory. (Issue 1 Section 3.2).

### Elevated Metal Levels

The Afon Twymyn, a major tributary of the Dyfi, is in River Ecosystem Class 3 upstream of Llanbrynmair because of elevated zinc levels. Whilst this may be due to disused mine workings in this area, in particular the historical lead mines at Dylife, the exact sources for the high zinc levels remain to be identified. (Issue 2 Section 3.2)

### Bacteriological

The identified bathing water at Aberdyfi persistently fails to comply with the EC Bathing Waters Directive (76/160/EEC) mandatory standards. This is almost certainly due to the inadequate sewage disposal system at Aberdyfi, which involves the release of macerated crude sewage into the estuary on ebb tides. Inshore water quality is therefore heavily influenced by wind direction and state of tide. This system is currently being replaced by a pumping station which will transfer the sewage to a new works at Tywyn for full treatment. The scheme is scheduled for completion late 1995 or early 1996. (Issue 3 Section 3.2)

The identified bathing water at Borth has a good compliance record and there is no obvious reason why it failed to comply with EC Bathing Waters Directive (76/160/EEC) mandatory standards in 1995. Contamination from Aberdyfi is possible, however subsequent investigations failed to confirm this. A small stream crossing the beach has been shown to contain significant amounts of sewage derived bacteria. However, the volume of stream water was extremely small and unlikely to affect the Identified sampling point some distance away. Additional sampling will be carried out during the 1996 season to identify possible sources of the failure. (Issue 3 Section 3.2)

### Biological

Poor biological quality in Garsiwn ditch is largely due to combined sewer overflows from the Machynlleth sewerage system. This has resulted in low dissolved oxygen and high ammonia and biochemical oxygen demand (BOD) levels in the ditch system. Sampling has shown that past intermittent overflows from waste tanks at the local livestock mart also had an adverse impact on water quality. (Issue 4 Section 3.2)

### 3.1.2 WATER QUANTITY

#### General

A catchment would fail its targets for water resources if abstraction was causing rivers and streams to dry up or flows to become unacceptably low, or if groundwater levels were declining.

Licences of right had to be granted in 1965 without regard to the ability of the resource to sustain the abstraction in the long term without detriment. Over the years, the actual rates of abstraction have, in some cases, increased to the volumes specified in the licences. As this occurs, the potential arises for low flows or declining groundwater levels.

We have considered carefully the available surface and groundwater resources within the Dyfi and Leri catchments and their degree of utilisation. The following Section summarises the results of this analysis. It must be stressed that where no problems or areas for further investigation have been identified, we are satisfied that resources are adequate. As more information becomes available, for example about the actual flow requirements of the aquatic ecosystem, we will review our management of resources in each catchment.

Assessment of the catchment assumes that existing licence conditions are complied with. The NRA has a policy of active inspection and enforcement of licence conditions.

No allowance has been made for climatic change because future scenarios are uncertain and within the lifespan of this Plan (5 years) any change is unlikely to be significant.

#### Local Perspective

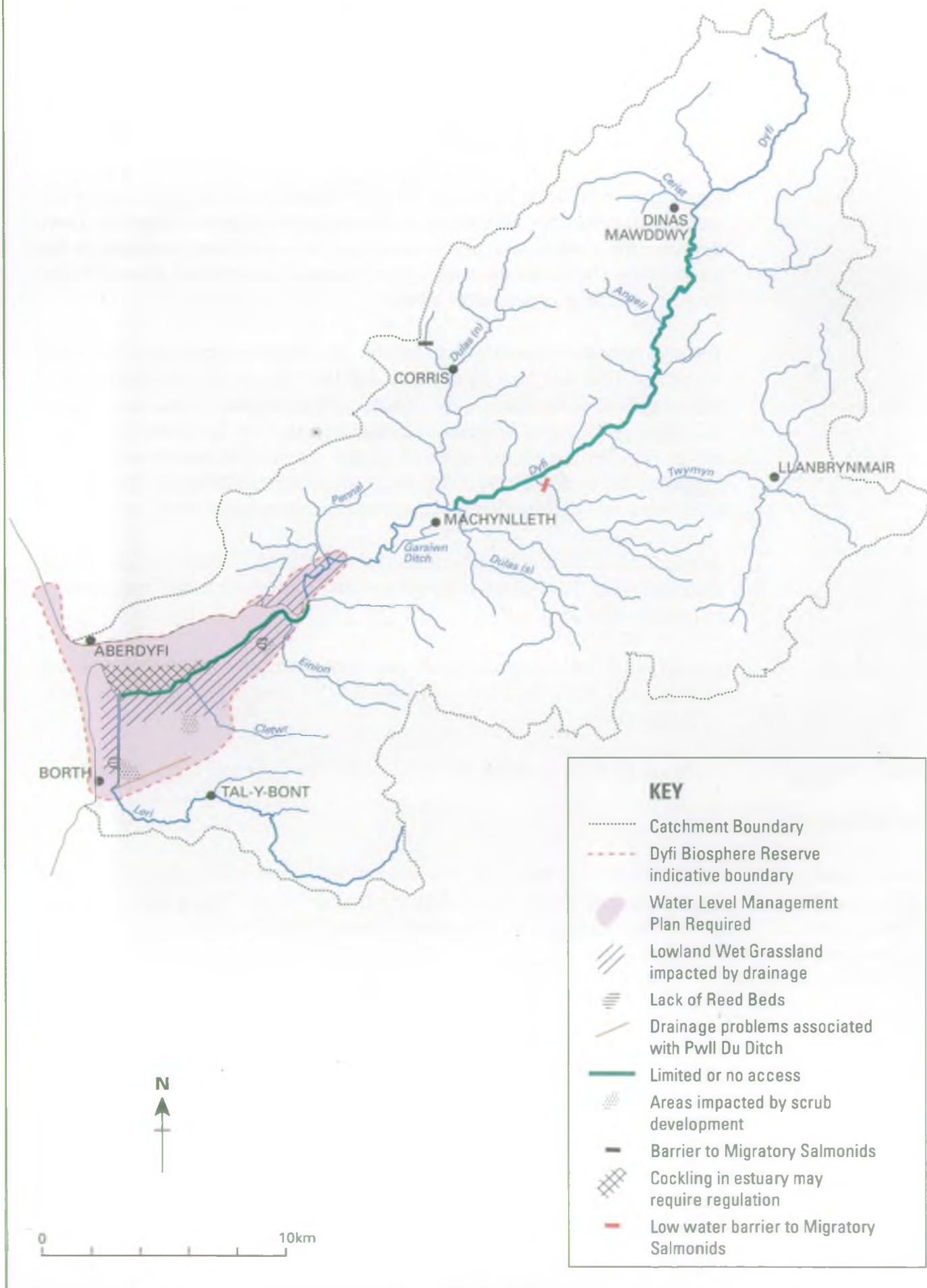
There are no water resource problems within the Dyfi and Leri catchments.

#### Issues Identified

##### Determination of Abstraction Licences for Hydroelectric Generation Schemes

- There is a need for the determination of abstraction licence(s) applications for hydroelectric schemes to be based on consistent environmental considerations. (Issue 5 Section 3.2)

## MAP 4. STATE OF THE CATCHMENTS - PHYSICAL FEATURES



### 3.1.3 PHYSICAL FEATURES

<b>General</b>	<p>Flood risk has been assessed by studying the flood history over the past 25 years and the known distribution of flooding.</p> <p>Many of the environmental targets for Physical Features are necessarily subjective (Section 5.3) and it therefore follows that their assessment often cannot be precise. Data from many sources including routine fisheries, biological and habitat surveys and special investigations are used to identify areas that are apparently deficient in certain essential or desirable features such as spawning gravels, riparian tree cover or in-river habitats.</p> <p>The following section and map illustrate the current state of the catchment and identify areas where there are felt to be deficiencies.</p>
<b>Local Perspective</b>	<p>The conservation status of the Dyfi wetland complex (Cors Fochno, Ynys Hir and Dyfi SSSI) is probably higher than that of any other estuary in Wales. This is recognised by its national, international and global designations. Given the context of Biosphere Reserve Status (UNESCO 1971), the conservation of wetland habitats within the lower catchment needs to be prioritised and resourced accordingly. Historically, core and buffer zones have been damaged by drainage and scrub invasion. Remedial work is required to restore the hydrology of the key component habitats of the Biosphere Reserve.</p>
<b>Issues Identified</b>	
<b>Conservation</b>	<ul style="list-style-type: none"> <li>- The drainage of wet grasslands and reedbeds has led to a decline in the numbers of wetland birds. (Issue 6 Section 3.2)</li> <li>- The special ecosystem of the core site and transition zones is impacted by scrub invasion and drainage. (Issue 7 Section 3.2)</li> </ul>
<b>Recreation</b>	<ul style="list-style-type: none"> <li>- There is a requirement for improved access both along the main section of the Dyfi and along the south shore of the estuary. (Issue 9 Section 3.2)</li> <li>- There is a lack of amenities such as picnic sites, bird hides and interpretative facilities throughout the Plan area. (Issue 10 Section 3.2)</li> <li>- The lack of canoe access agreements and/or regulation of canoeists within the Plan area needs to be addressed. (Issue 11 Section 3.2)</li> </ul>

**Fisheries**

- The regulations governing the use of unlicensed coastal nets need to be reviewed in conjunction with North Western and North Wales Sea Fisheries Committee (NWNWSFC). (Issue 12 Section 3.2)
- Reduce the exploitation of sea trout and salmon by commercial nets through Net Limitation Order Review. (Issue 13 Section 3.2).
- The cost/benefit of easing barriers to fish migration on the Deri and the Gwydol requires evaluation. (Issue 14 Section 3.2)
- Sections of river impoverished by previous forestry operations require a programme of restoration. (Issue 15 Section 3.2)
- The enhancement stocking of sea trout by local Angling Clubs needs to be evaluated to ensure positive cost benefit. (Issue 16 Section 3.2)
- The need for byelaws to regulate cockling in the Dyfi Estuary should be investigated as the level of this activity has increased significantly in recent years. (Issue 17 Section 3.2)

**Flood Defence**

- There is a need to prepare a Water Level Management Plan for the Borth Bog Internal Drainage District. (Issue 8 Section 3.2)

### 3.1.4 CONFLICTS BETWEEN USES

<b>General</b>	Certain conflicts may arise between different catchment uses, irrespective of the catchment's ability to support these uses in terms of Water Quality, Water Quantity or Physical Features. For example, demands placed on the catchment by recreational uses often come into conflict with the need to conserve the wider environment. This section identifies conflicts between uses which are present within the Dyfi and Leri catchments.
<b>Local Perspective</b>	We have set out where significant areas of conflict have been identified within the catchment and suggest that a change in mode of operation by the use/interest shown in bold should be considered. Options for solving these issues are proposed in Section 3.2.
<b>Conflicts Identified</b>	<ul style="list-style-type: none"> <li>- Alleviation of acidification conflicts with the conservation of natural acidic habitats. Liming the upper reaches of catchments to alleviate the effects of acidification could conflict with the NRA's role in conserving these natural habitats. (Issue 1 Section 3.2)</li> <li>- Lack of wetland habitats within the catchments. Resistance to change and mechanisms of landowner compensation for decrease in agricultural production are key aspects to be resolved. (Issue 6 Section 3.2)</li> <li>- Improving facilities for canoeists may conflict with other Uses. Key areas for resolution include potential for licensing, access agreements with landowners and zoning of rivers. (Issue 11 Section 3.2)</li> <li>- Water abstraction for hydroelectric power can conflict with the flow requirements for fish and other fauna, flora, abstractors and dischargers. Conditions required to safeguard river interests over reaches impacted by new abstractors will need to be agreed. Where an agreement cannot be achieved with proposed new abstractors, an abstraction licence will not be issued. (Issue 5 Section 3.2)</li> </ul>

### 3.2 A SUMMARY OF THE ISSUES, AND OPTIONS FOR THEIR RESOLUTION

#### General

This section of the plan considers options to address the issues that have been raised in the preceding section. The options as presented are the initial thoughts of the Northern Area, Welsh Region of the NRA and do not constitute policy statements. We invite you to comment on these issues and options and would welcome any new ideas/suggestions that you may have.

Wherever possible the body responsible for carrying out each option has been identified. In some cases this is identified as an individual(s) or an organisation other than the NRA. However, the options as presented are intended to facilitate improvements to the water environment for the benefit of all users. Their implementation will entail many bodies and individuals co-operating.

In the tables of issues and options that follow, no priority has been assigned to the issues. They are listed in accordance with the current understanding of when the work, or a significant part of the work will be completed.

Abbreviations used within the tables:

BCU	British Canoe Union
CCW	Countryside Council for Wales
CSOs	Combined Sewer Overflows
DCWW	Dŵr Cymru Welsh Water
DOE	Department of the Environment
GIA	Grant in Aid
IDD	Internal Drainage District
NERC	Natural Environment Research Council
NRA	National Rivers Authority
NFFOO(s)	Non Fossil Fuel Obligation Order(s)
NWNWSFC	North Western and North Wales Sea Fisheries Committee
NWWT	North Wales Wildlife Trust
RSPB	Royal Society for the Protection of Birds
SNP	Snowdonia National Park
WCA	Welsh Canoe Association
WLMP	Water Level Management Plan
WO	Welsh Office
WQO	Water Quality Objective

<i>Issue No:</i> 1 Low pH values in the Dulas (n), Pennal and Einion			
OPTIONS	Responsibility	Advantages	Disadvantages
Identify local causes of acidification (e.g. acid rain, /land drainage, afforestation, and investigate cost benefit of remedial measures e.g. liming.	NRA	Gain information to determine future action.	Cost. Potential damage to naturally acidic habitat if liming option pursued.
Research and development to identify and evaluate options for amelioration of impact.	NRA/NERC/other external bodies e.g. Universities	Identification of options and costs.	Cost (>£25k)
Implementation of realistic amelioration measures at specific sites.	NRA, Site Owners	Improvement to water quality.	Cost. May not improve the water quality sufficiently to achieve the River Ecosystem Target of RE1.
Apply for derogations for pH when the WQO is made statutory.	NRA, WO, DOE	Identified stretches will achieve River Ecosystem Target of RE1.	No real improvement in water quality.

<b>Issue No: 2</b> Elevated zinc levels in waters throughout the Plan area			
OPTIONS	Responsibility	Advantages	Disadvantages
Undertake catchment monitoring programme to identify possible sources of contamination.	NRA	Gain information to determine future action.	Cost.
Investigate and implement mitigation measures for discharges from targeted sites.	Site owners (unless "abandoned" mine)	Improved water quality and hence flora and fauna. Also, some stretches may achieve standards.	Cost. Difficulties with implementation at abandoned sites.
Apply for derogation for zinc, in respect of the Twymyn, when WQO made statutory.	NRA/WO/DOE	River will achieve River Ecosystem RE1.	No improvement in water quality for Twymyn. Some stretches may still fail.
<b>Issue No: 3</b> Failure of identified bathing waters at Aberdyfi and Borth to meet EC Directive (76/160/EEC) Mandatory standards			
OPTIONS	Responsibility	Advantages	Disadvantages
(1) Aberdyfi  Improve existing sewage disposal regime by April 1996.	DCWW	Compliance with EC Bathing Waters Directive mandatory standards in identified water.	Cost.
(2) Borth  Undertake additional sampling during 1996 bathing season to identify possible sources of contamination.	NRA	Gain information to determine future action.	Cost.

<b>Issue No: 4</b> Poor biological quality in Garsiw n Ditch, Machynlleth			
OPTIONS	Responsibility	Advantages	Disadvantages
Regular inspection of effluent handling/storage facilities at Machynlleth livestock mart.	NRA, Mart Owner	Ensure waste handling facilities and operating procedures meet required standards and identify further improvements as appropriate.	Effectiveness of improvements on water quality may be masked by impact of CSOs.
Improve screening and re-set spill weirs on CSOs. (Not in DCWW priority list for 1995-2000).	DCWW	Improved biological and chemical quality.	Cost.
Re-evaluate current impact of CSOs and if appropriate change priority ranking to bring forward improvement works.	NRA	Improvement in water quality within shorter timescale.	Cost. Change in priority ranking may impact on CSO problems in other catchments.
<b>Issue No: 5</b> Determination of abstraction licence(s) applications for hydroelectric schemes needs to be based on consistent environmental considerations			
OPTIONS	Responsibility	Advantages	Disadvantages
Seek to target schemes to least sensitive rivers.	NRA, CCW, SNP	Sensitive rivers protected. Better use of NRA, CCW and developers resources. Fewer licence applications refused.	Development costs to NRA and CCW. Reduction in power generation potential. Inconsistent with NFFOO(s).
Developers only to apply for licences at environmentally robust sites.	Power generators	As above.	As above.

<b>Issue No: 6</b> Drainage of wet grasslands and reedbeds has led to decline in numbers of wetland birds			
OPTIONS	Responsibility	Advantages	Disadvantages
Manage existing habitats.	NRA, CCW, RSPB NWWT	Site protection. Management agreements available. WLMP may resolve concerns.	Limited enhancement. Potential resistance to WLMP from landowners.
Create new habitats.	NRA, CCW, RSPB NWWT	Site enhancement. WLMP may resolve concerns.	Cost. Resistance to WLMP. On-going management required.
<b>Issue No: 7</b> Special ecosystems impacted by scrub invasion and drainage			
OPTIONS	Responsibility	Advantages	Disadvantages
Relocate the Pwll Du ditch.	NRA	Site hydrology more appropriate for a wetland habitat.	Costs.
Vegetation management	CCW, NRA, RSPB	Restore wetland vegetation/hydrology	Costs.
Block existing drains	CCW, NRA	Restore wetland vegetation/hydrology	Costs.
<b>Issue No: 8</b> Water Level Management Plan required for Borth Bog IDD			
OPTIONS	Responsibility	Advantages	Disadvantages
Produce plan.	NRA, WO, CCW, NWWT, RSPB, Councils, Landowners.	Working document to manage for conservation/agriculture	Costs. Possible landowner resistance. Lack of compensation mechanism. Hydrological data required.

<b>Issue No: 9</b> Improve the access along the Dyfi and along the south shore of its estuary			
OPTIONS	Responsibility	Advantages	Disadvantages
Improve footpath network.	NRA, CCW, Councils	Improve amenity. Reduce single Authority cost. Increase public access to the area.	Cost. Landowner agreement required.
<b>Issue No: 10</b> Improve the amenity value of the Plan Area			
OPTIONS	Responsibility	Advantages	Disadvantages
Provide birdwatching and interpretation facilities and picnic sites.	NRA, RSPB, CCW, councils	Improve facilities for public enjoyment of the environment.	Cost £3k/hide. Landowner agreement required. New public access may be required.
<b>Issue No: 11</b> Lack of canoe access agreements and/or regulation of canoeists in the Plan area			
OPTIONS	Responsibility	Advantages	Disadvantages
In conjunction with riparian owners, angling interests and WCA encourage access agreements.	NRA, riparian owners, WCA	Increased access provides for an element of controlled river use by canoeists. Reduction in conflict.	NRA Costs. Anglers against access agreements. In absence of registration/licence system incomplete control of canoeists.
Encourage development of legislation to licence.	NRA, BCU, WCA	Greater control of access in available waters. Financial contribution from users.	Enforcement costs. Conflict of opinion with canoeing bodies.

<b>Issue No: 12</b> The regulations governing the use of unlicensed coastal nets needs to be reviewed			
OPTIONS	Responsibility	Advantages	Disadvantages
Enforce existing byelaws.	NRA, NWNWSFC	Ensure byelaw compliance.	Costs.
Monitor the level of netting in uncontrolled waters.	NRA, NWNWSFC	Obtain evidence for new byelaws if necessary.	Costs.
<b>Issue No: 13</b> Reduce exploitation of sea trout and salmon by commercial nets			
OPTIONS	Responsibility	Advantages	Disadvantages
Reduce exploitation through Net Limitation Order Review and reduce number of nets from six to two.	NRA	Increase in spawning escapement and improved egg deposition.	Costs.  Possible Public Inquiry.
<b>Issue No: 14</b> Barriers to fish migration on the Deri and the Gwydol			
OPTIONS	Responsibility	Advantages	Disadvantages
Construct fish passes or easement works, subject to cost/benefit analysis.	NRA, fishery owners	Increased spawning and nursery areas.	Cost, may be prohibitive.
<b>Issue No: 15</b> Restore section of river impoverished by previous forestry operation			
OPTIONS	Responsibility	Advantages	Disadvantages
Ensure Forestry and Water Guidelines are followed. Establish close liaison with local forestry officers to ensure future developments take due regard of soil type.	NRA, Forest Enterprise	Restoration of impoverished areas of river. Increase numbers of juvenile fish. Ensure future developments only take place on non-sensitive soil sites.	Cost.

## ISSUES AND OPTIONS

<i>Issue No: 16</i> Enhancement stocking of sea trout by local Angling Clubs			
OPTIONS	Responsibility	Advantages	Disadvantages
Give scientific support to angling clubs initiative on the development of release methods for sea trout.	NRA, Angling Clubs	Collaborative experience. Obtain good scientific data.	Cost.  NRA costs for microtagging and advice £2k.
<i>Issue No: 17</i> Investigate the requirement to promote byelaws to regulate cockling in the Dyfi estuary			
OPTIONS	Responsibility	Advantages	Disadvantages
Monitor current levels of cockling.	NWNWSFC in collaboration with NRA	Provide management information to determine need for regulation.	Cost.
Promote introduction of Byelaws if required.	NWNWSFC in collaboration with NRA	Controlled management of a commercial resource in a sensitive conservation area.	Cost of enforcing regulation.

## **PART II**

# **SUPPORTING INFORMATION**

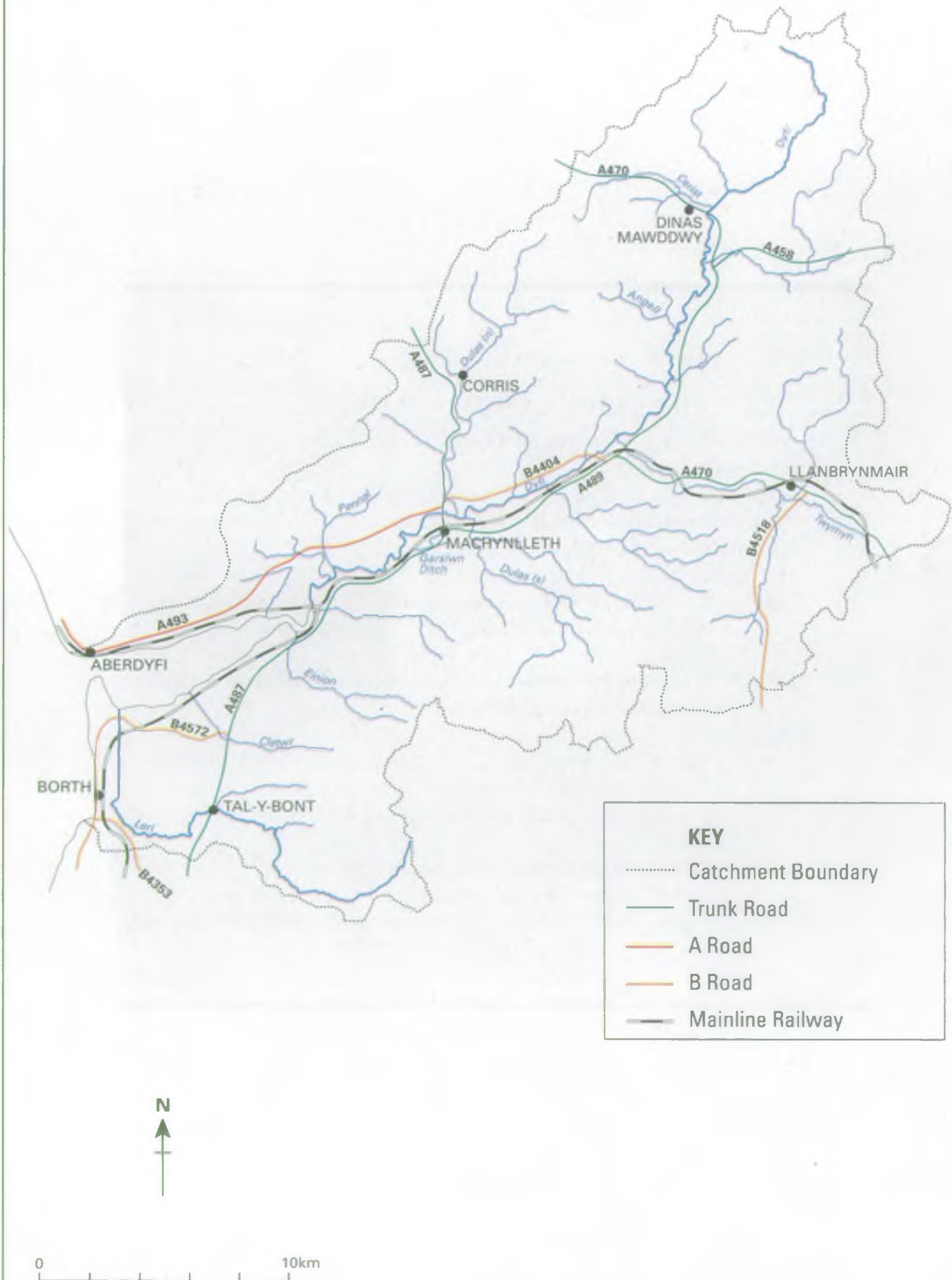


#### 4.0 THE USES OF THE DYFI AND LERI CATCHMENTS

The following sections catalogue the legitimate Uses of the **Dyfi and Leri** catchments which fall under our control or affect us in one way or another.

- The **General Information** gives an outline of the nature of our responsibility towards each Use.
- The **Local Perspective** gives more detailed information about the Uses, within the catchments.
- We have set management **Aims and Environmental Requirements for each Use**. These are designed to protect both the environment and the needs of other Uses.
- In **Section 5** these specific targets are used to help us set overall **targets**, for the whole Plan area, for water quality, water quantity and physical features, that reflect our view of the balance of interests between the different users of water.

**MAP 5. URBAN DEVELOPMENT AND INFRASTRUCTURE**



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#### 4.1 URBAN DEVELOPMENT (including road and rail)

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##### **General Information**

The development of the urban or "built" environment is a land use which can affect the water environment and its uses. Such development is generally controlled via the local authority planning process involving the production of development plans and the approval of specific development proposals. The move to plan led development has further increased the importance of development plans.

We attach great importance to the effective influence of the planning process through all its stages. Detailed comments are provided on all development plans and development proposals received by the NRA as a statutory planning consultee. The Authority has produced the document "Guidance Notes for Local Planning Authorities on the methods of protecting the water environment through development plans". Responses to planning consultations often include proposed "planning conditions" which the planning authority may include within planning approval.

Certain types of development are promoted for approval by other statutory procedures. These include major developments such as roads, railways, airports and barrages. These also are influenced and controlled by early consultation.

A key purpose of this plan is to provide planning authorities and prospective developers with information about the management and use of the water environment in this catchment, our policies and potential environmental constraints including flood risk. This should also facilitate the identification of appropriate development opportunities.

The final decision on development plan policies and development proposals are taken by planning authorities, planning inspectors or the relevant Secretary of State. However government guidance includes reference to the need to fully consider our comments when determining development plans or proposals.

When the Authority objects formally to a development proposal then supporting evidence will be provided at any subsequent Planning Appeal or Public Inquiry.

The NRA's policies for the management of the water environment are based on the sustainability principle. It is hoped that this plan can effectively link with other plans for the built environment so as to provide mutual support for development which is environmentally and economically sustainable.

**Local Perspective** The Plan area spans the three counties of Gwynedd, Powys and Dyfed and their respective district councils of Meirionnydd, Montgomery and Ceredigion. Much of the catchment within Meirionnydd lies within the Snowdonia National Park.

The overall plan area is approximately 670 km<sup>2</sup>, 215 km<sup>2</sup> of which lies within Gwynedd, 317 km<sup>2</sup> in Powys, and 138 km<sup>2</sup> in Dyfed. The Meirionnydd District Council area within the Snowdonia National Park (SNP) extends to 203 km<sup>2</sup>. As such the SNP Committee is responsible for all planning development control activities in this district council's administrative area.

Development Plans are at various stages of preparation by planning authorities within the Plan area, and these are summarised in Table A.

**TABLE A** **CURRENT STATUS OF DEVELOPMENT PLANS WITHIN THE PLAN AREA**

<b>ADMINISTRATIVE COUNCIL</b>	<b>DEVELOPMENT PLAN STATUS</b>
Gwynedd County Council	Structure Plan adopted 1993.
Snowdonia National Park	Consultation Draft Park Wide Plan expected end of 1995.
Powys County Council	Publication expected October 1995 and adoption early 1996.
Montgomery District Council	Local Plan Deposit expected September 1995.
Dyfed County Council	Structure Plan approved in 1989 - valid until 1996.
Ceredigion District Council	Pre-deposit expected end of 1995. Plan would be valid until 2006

**TABLE B PLAN AREA POPULATION FIGURES (1991 CENSUS)**

<u>ADMINISTRATIVE COUNCIL</u>	<u>POPULATION</u>	<u>MAIN TOWNS</u>
Meirionnydd	2396	Aberdyfi
Montgomery	4762	Machynlleth
Ceredigion	2803	Tal-y-Bont

The total resident population of the catchments is almost 10,000, 20% of which live in the Machynlleth Community Council area.

The catchments are predominantly rural and agriculture is by far the most abundant land use. However, due to severe limitations on its use, the uplands of the plan area are predominantly rough grazing land which chiefly supports sheep farming. Much of the Plan area, particularly to the north west of the Dyfi valley, has been utilised for afforestation.

Tourism provides a significant contribution to the income of the area. Attractions range from water based activities centred around the EC 'identified' bathing waters at Aberdyfi and Borth, to those associated with the undeveloped rural areas of the catchments.

The topography of the catchments has attracted a number of proposals for renewable energy as required by the Government's Non-Fossil Fuel Obligation introduced in 1989. Most noticeable is the development of a 24 turbine wind farm at Mynydd Cemaes; a second development of 60 turbines, partially within the Plan area at Carno, has recently been approved by the local planning authority. Proposals for a hydro electric power scheme on the Nant y Garreg Wen are currently under consideration by the NRA and the Snowdonia National Park.

#### Transport

The Plan area is intersected by two important primary routes, namely the A487 Fishguard to Bangor and the A470 Cardiff to Glan Conwy trunk roads, which are linked by the A489 trunk road. The vast majority of the larger settlements are located along the main road corridors, whilst a number of smaller villages and hamlets are accessed by 'B' and unclassified roads.

The main Shrewsbury to Aberystwyth railway line follows the course of the Afon Twymyn and lower Dyfi valley, Dyfi Junction providing access to Aberdyfi and ultimately the North Wales coast. There are no airport facilities within the area.

<b>Aims</b>	To ensure that development or construction activity does not damage the water environment or detract from its use.
	To ensure that development does not affect the water environment so as to threaten life or property.
	<u>To promote opportunities within developments that will enhance the water environment and its use.</u>

**Environmental Requirements:**

<b>Water Quality</b>	Development should not adversely affect the water quality requirements of other uses in the catchment.
	Development must not cause the failure of any Statutory Water Quality Objective within the catchment.
	Developments should be consistent with relevant NRA policies. These include the "Policy and Practice for the Protection of Groundwater", and policy on "Development in Sewered Areas".
<b>Water Quantity</b>	To protect inland waters from the detrimental effects of development, including afforestation and other changes in land use.
<b>Physical Features</b>	Development should not have an unacceptable flood risk.
	Development should not create an unacceptable flood risk in other areas.
	Developers must pay for work needed to assess and reduce flood risk.
	Development should be consistent with NRA policies, including the Flood Plain Policy (in production), and Policy and Practice for the Protection of Groundwater.
	Development should not adversely affect the requirements of other uses in the catchment, including those associated with the conservation of the natural water environment.

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## 4.2 FLOOD DEFENCE

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### General Information

This Use relates to the protection of people and property against flooding from rivers and the sea and primary role of the river as a drainage system for surface water.

Flooding normally follows from extreme climate conditions such as very heavy rainfall causing high river flows and, in coastal areas, surge and storm generated waves combining with high tides. The severity of an individual flood event is generally described in terms of its frequency of occurrence. This is often expressed as a return period in years, for example, 1 in 50 years (i.e. a flood of this severity would, on average, be expected to occur once in a 50 year period).

Areas of land next to rivers known as flood plains or washlands take the additional flow or naturally store water when the channel capacity is exceeded. If significant areas of flood plain are embanked, tipped or built upon the lost storage volume leads to higher river levels elsewhere.

The Coastline of Wales has been divided into a series of Coastal Cells. The boundaries of each cell has been set to reflect the boundaries of the natural physical processes acting on that section of coast. Coastal Groups have been formed containing representatives of each Maritime District Council, the NRA and other bodies with an interest in the management of the Coastline.

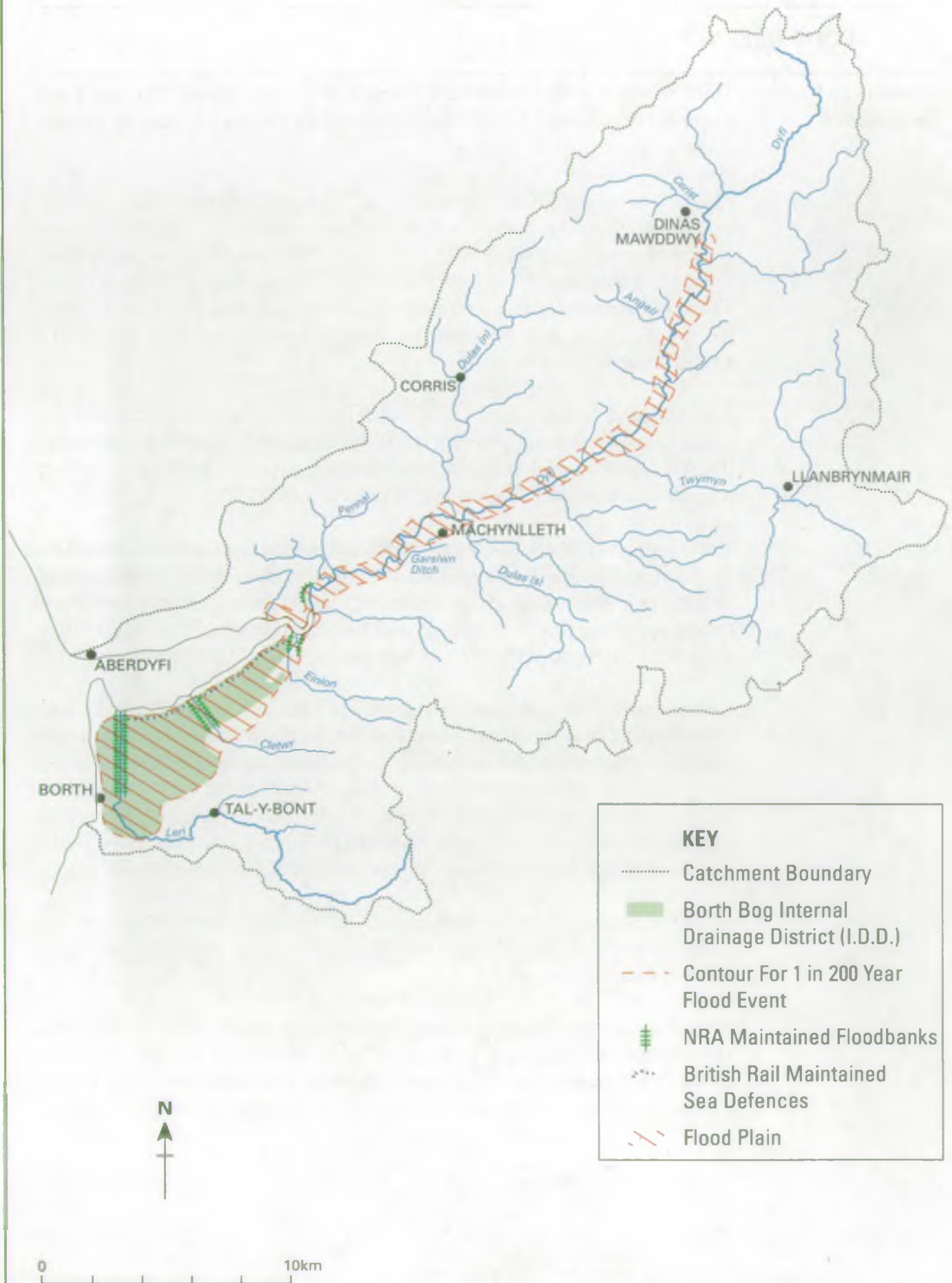
Recent Government publications such as the PPG on Coastal Planning and Circular 68/92 Development in Flood Risk Areas, place a requirement on local planning authorities to take account of coastal processes and flood risk in their determinations. The sources of information to assist these decisions will be the S.105 Survey presently under preparation by the NRA and the Shoreline Management Plan as agreed with the Coastal Group formulated from study work undertaken on the physical influences affecting the coastline.

Recent guidance has now been issued by Central Government on the preparation of Shoreline Management Plans to ensure a consistent approach between Coastal Groups.

Flood alleviation schemes are constructed where necessary and cost effective. The standard of protection to be provided is determined by an analysis of the options for the most economically and technically advantageous solution. For a scheme to proceed the benefits in financial terms must outweigh the costs.

MAP 6.

# FLOOD DEFENCES



The Water Resources Act 1991 requires the NRA to exercise general supervision over all matters relating to flood defence. Powers are also provided for the issue of consents for works on rivers and watercourses designated as Main River and for ensuring the maintenance of flow in river channels and the removal of obstructions.

The Land Drainage Act 1994 (as amended by the 1994 Act) provides the Local Authority and where appropriate Internal Drainage Boards with powers to carry out flood defence works to ensure the proper flow of water. The Act also provides the NRA with additional consenting powers on ordinary watercourses.

The provision of flood defences including the maintenance of channel capacity, needs to be executed with care if other Uses - notably fisheries and conservation - are not to be affected unduly. Consultations are carried out within and outside the NRA during the formulation and undertaking of schemes. In this way, wherever feasible, and consistent with the original purpose, habitat enhancements and the needs of landscape and heritage will form part of the scheme.

Water Level Management Plans will be drawn up for sites agreed with the Countryside Council for Wales and/or English Nature in accordance with the guidance issued by MAFF/Welsh Office.

The NRA provides and operates a flood warning system on designated main rivers and coastal areas at risk from flooding by the sea. The system provides warnings to the Police who pass the warnings to the general public.

### Local Perspective

Within the catchments the necessary powers to maintain or improve sea and tidal defences are shared by district councils (maritime defences) and the NRA. There are also lengths of defence in private ownership, e.g. British Rail, which are mainly rock armour. The type of sea defence varies between natural dune systems, the traditional concrete sea wall/promenade of a seaside town e.g. Aberdyfi, and earth banks.

The tidal defences within the Dyfi estuary and the remaining fluvial defences maintained by us are earth embankments. The fluvial defences on the Leri consist of earth embankments on both sides of the river from the confluence with the Dyfi to the high ground at Borth.

The existence of extensive areas of flood and coastal plains and low-lying land presents drainage difficulties. This has led to the formation of an Internal Drainage District, namely the Borth Bog IDD. This IDD is administered by the Gwynedd Local Flood Defence Committee (GLFDC).

The effectiveness of the IDD is dependent upon regular maintenance of the main rivers and adopted ditches within the system. It is also dependent on regular inspection and maintenance of the tidal flaps through which the IDD drains and, upkeep of associated floodbanks. Elsewhere in the catchments, flood defence work consists mainly of shoal removal and river maintenance schemes carried out as necessary.

The main area requiring a Water Level Management Plan is the Dyfi Estuary and Borth Bog IDD. Once a final list of sites is agreed with the Countryside Council for Wales, a 3 year prioritised programme for the production of the plans will be undertaken.

A Flood Warning System is operated on the Dyfi for landowners in the flood plain.

There are no major flooding problems within the catchment although large areas of agriculture land within the flood plain are inundated from time to time. However, limited incidents associated with ordinary river systems have been recorded.

## **Aims**

To maintain existing flood defences for people and property against flooding from rivers and the sea, taking account of environmental requirements.

To improve the standard of flood defences where appropriate by promoting and constructing new flood defences.

To maintain effective drainage, taking account of environmental requirements.

To provide warnings of imminent flooding to the public (via the police) where appropriate.

## **Environmental Requirements:**

### **Physical Features**

In protected areas, the flood defences/river bank should not be overtopped by a flood flow within a specified return period.

In areas where land use is primarily agricultural, the watercourse should provide effective drainage, taking account of environmental requirements.

No development should be permitted which would impair the effectiveness of any flood defence scheme or prevent access for maintenance of flood defences.

To ensure where possible that the effectiveness of the flood plain to store and convey flood waters is not impaired.

## DEVELOPMENT USES

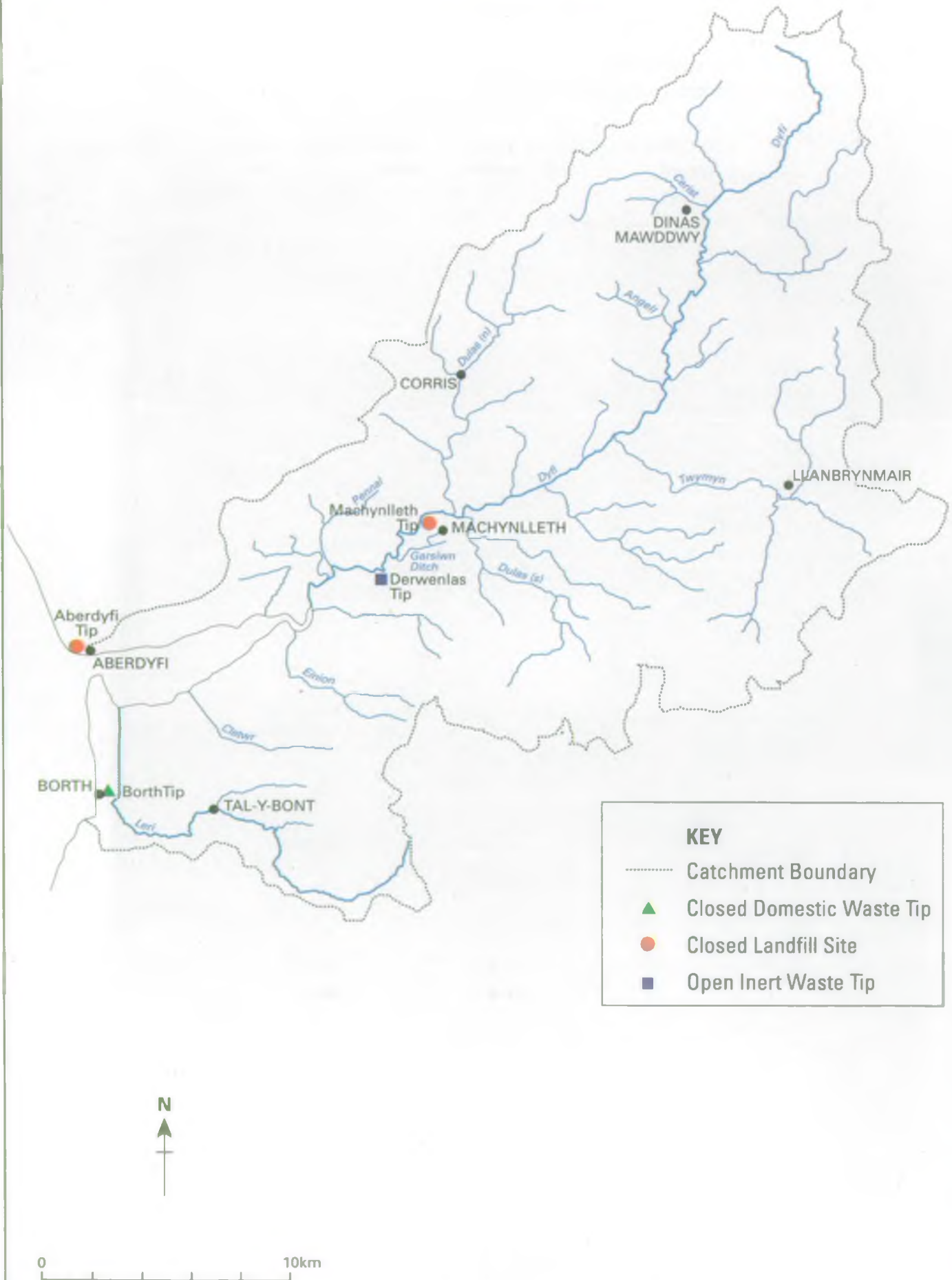
Adequate arrangements should be provided for flood warning.

Environmental requirements will be taken into account when designing and undertaking flood defence works.

The operating practices agreed in Water Level Management Plans will be followed.

# MAP 7.

# SOLID WASTE DISPOSAL



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### 4.3 SOLID WASTE DISPOSAL (LANDFILL)

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**General Information**

The disposal of domestic commercial and industrial waste into landfill sites is a common form of waste disposal in England and Wales. Sites receiving material that is not inert have the potential to produce a toxic liquid effluent (leachate) which can pollute surface and groundwater. Consequently the NRA's policy is for all new sites to be designed and operated in a way that contains any liquid effluents. This is monitored by the NRA. Older sites may cause pollution long after tipping has ceased and in these cases, the owner or operator may be required to undertake remedial works.

Waste Regulation Authorities (WRAs) presently issue licences to handle waste or operate a waste disposal site under the Environmental Protection Act 1990. The NRA is a statutory consultee on applications for landfill waste disposal licences.

**Local Perspective**

There are currently no active putrescible waste disposal sites within the catchments. The most recently active site was located at Borth. The site was licensed to accept up to 100 tonnes per day of domestic and general commercial waste, and served as a disposal site for the northern half of Ceredigion. The site had been in operation since the late 1960s and historically operated on the dilute and disperse principle. The thick peat blanket of the area was considered suitable for natural attenuation of leachate thereby preventing any contamination of ground or surface waters. However, sampling of surface waters in the drainage ditches surrounding the site highlighted a gradual increase in the level of contaminants emanating from the site. Therefore, on our advice, Ceredigion District Council closed the site and, the construction of a treatment plant for the leachate is currently under way. It is envisaged that the tipped area will be capped with a low permeability membrane by the end of 1996, which should reduce the amount of leachate produced at the site.

Historical landfill sites at Machynlleth and Aberdyfi, do not cause any water quality problems that we are aware of.

There is a privately owned and operated site at Derwenlas which is licensed to accept inert materials only. This mainly provides a disposal site for waste soil, rock, bricks etc from the local building trade.

**Aims** To ensure that waste disposal sites are designed and operated in a way that does not adversely affect other uses of surface water or groundwater.

To protect the quality of groundwaters by implementing the NRA's Groundwater Protection Policy.

**Environmental Requirements:**

**Water Quality** Waste disposal sites must be designed and managed to prevent liquid effluent from adversely affecting the quality of surface water and groundwaters.

All Waste Management sites must comply with the conditions included in the licence, enforced by the WRA.

Sites must comply with the conditions included on any discharge consent or prohibition notice, issued and enforced by the NRA.

**Water Quantity** Waste disposal activities must not harm groundwater resources or adversely affect the rights of water abstractors.

The NRA's Position Statement regarding landfill and waste management can be found in the document "Landfill and the Water Environment".

**Physical Features** Windblown litter from waste disposal sites must not be permitted to create an aesthetic problem in adjacent rivers, estuaries or coastal waters.

Following the cessation of tipping, all aftercare provisions stated on the planning consent, or licence surrender conditions, must be carried out by those responsible.

#### 4.4 FISHERIES

##### General Information

The Fisheries Use addresses the protection, maintenance and improvement of fish stocks within the catchment: angling is covered in Section 4.13 as a recreational Use.

In order to protect different types of fishery the EC Freshwater Fish Directive (78/659/EEC) provides two levels of protection for water quality to support:-

- Salmonid fisheries - eg. salmon and trout.
- Cyprinid fisheries - generally referred to as coarse fisheries.

A third category:-

- Migratory waters - ie. waters that are only used for the passage of migrating fish such as salmon and sea trout.

is largely protected by the provisions of the EC Dangerous Substances Directive which applies to all controlled waters. In addition, standards contained in our policy for the protection of estuarine water are applied to this use.

While the Freshwater Fish Directive can only be applied by statute to certain 'identified waters', the standards it contains will be used informally, for the purposes of CMPs, to assess the whole catchment for this Use.

Water quantity and the physical habitat are also very important factors in the conservation of fish stocks. While these factors do not receive the protection from formal targets, as applied to water quality, the CMP process will help to identify the requirements for their protection in the clearest manner possible.

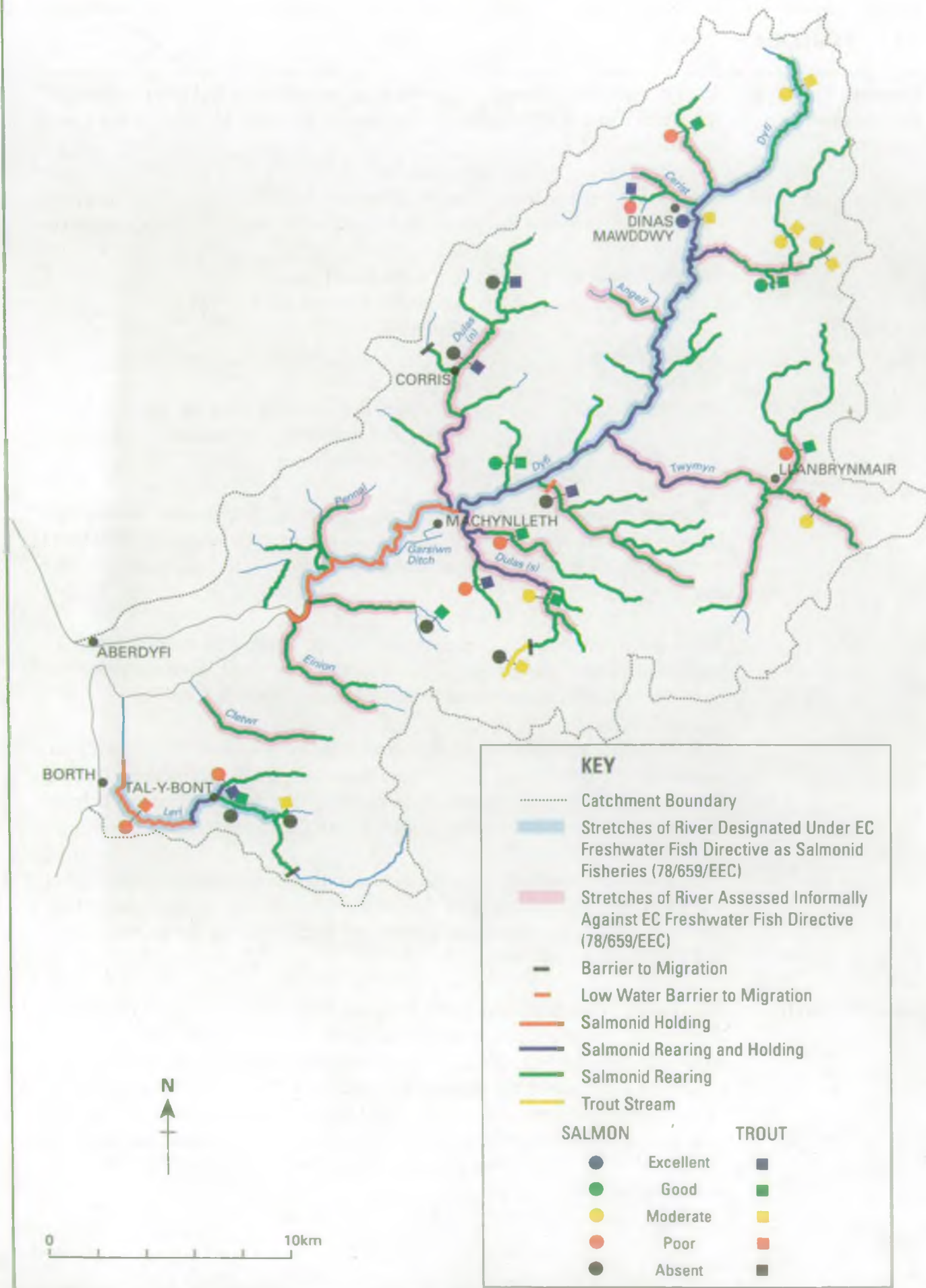
The control of 'poaching' is a vital aspect in the conservation of fish stocks and the NRA employs a sizeable Bailiff force to enforce the legal protection offered to fish stocks by both the Salmon and Freshwater Fisheries Act (1975) and the Salmon Act (1986).

##### Local Perspective

The quality of the three designated statutory stretches (see Map 8) has been assessed against the mandatory EC Freshwater Fish Directive (78/659/EEC) Salmonid fisheries standards. The designated stretches on the Dyfi are subject to a derogation for copper and zinc due to the naturally high levels encountered within the catchment. The designated stretch on the Leri is subject to a derogation for zinc. Any failure to comply with the standards in the Directive on these stretches, excepting these derogations will be considered as an issue in the plan.

MAP 8.

# FISHERIES



The EC Freshwater Fish Directive standards have also been applied to seventeen other (undesigned) stretches within the catchment on an informal basis. Any failures to comply with the standards for salmonid waters in these non statutory stretches will be carefully considered on their merit for inclusion as issues in the plan.

The freshwater fish populations of the Dyfi are dominated by three principal species; eel, salmon and trout (brown trout and sea trout, are the resident and migratory forms respectively). Other species known to be present are the sea lamprey, brook lamprey, river lamprey, minnow, 3 spined stickleback and the bullhead. All of this latter group are very localised in the catchment and their distribution is not fully known.

Atlantic salmon and sea trout are present in all sections of river downstream of permanent barriers to migration. Information from juvenile salmonid surveys undertaken since 1986 indicates that salmon have a far more restricted distribution than trout. This is partly a natural phenomenon, with salmon preferring the main river and larger tributaries for spawning. However, it is also influenced by water quality with salmon being more susceptible to the increased acidity present in some of the rivers. There are very few sections of river upstream of permanent barriers on the Dyfi. The lakes and sections of river upstream of permanent barriers contain isolated brown trout populations of importance due to their unique genetic make up.

Acidification associated with afforestation has been identified as a major problem for some of the Dyfi tributaries, in particular those draining the northern side such as the Dulas(n) and Angell. The Institute of Freshwater Ecology is undertaking long term research on the Cleifion, a tributary of the Twymyn, which should provide valuable information on the impact of afforestation on fisheries.

Sea fish or estuarine fish such as grey mullet, flounder and bass are present in the Dyfi estuary. In addition, the outer estuary is probably utilised by a range of sea fish and is an important nursery area, particularly for bass, though little survey work has been undertaken.

**Aim**

To sustain or assist the recovery of the populations of wild fish species at the levels appropriate to a catchment of this type and to protect the passage of migrating fish into and from freshwater.

**Environmental Requirements:**

**Water Quality**

**Rivers** Waters should comply with the appropriate standards under the EC Freshwater Fish Directive (78/659/EEC).

**Stillwaters** These waters should comply with the same standards as set for rivers.

**Estuaries** These waters should comply with the appropriate standards of the EC Dangerous Substances Directive and the appropriate standards in the NRA policy for the protection of estuarine water quality.

**Water Quantity** The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

**Physical Features** An appropriate diversity of natural instream and bankside habitats should be maintained to support the fish typical of the river type.

Appropriate levels of riparian and instream vegetation should be maintained to provide adequate cover for fish.

Artificial barriers should not obstruct passage of migratory fish.

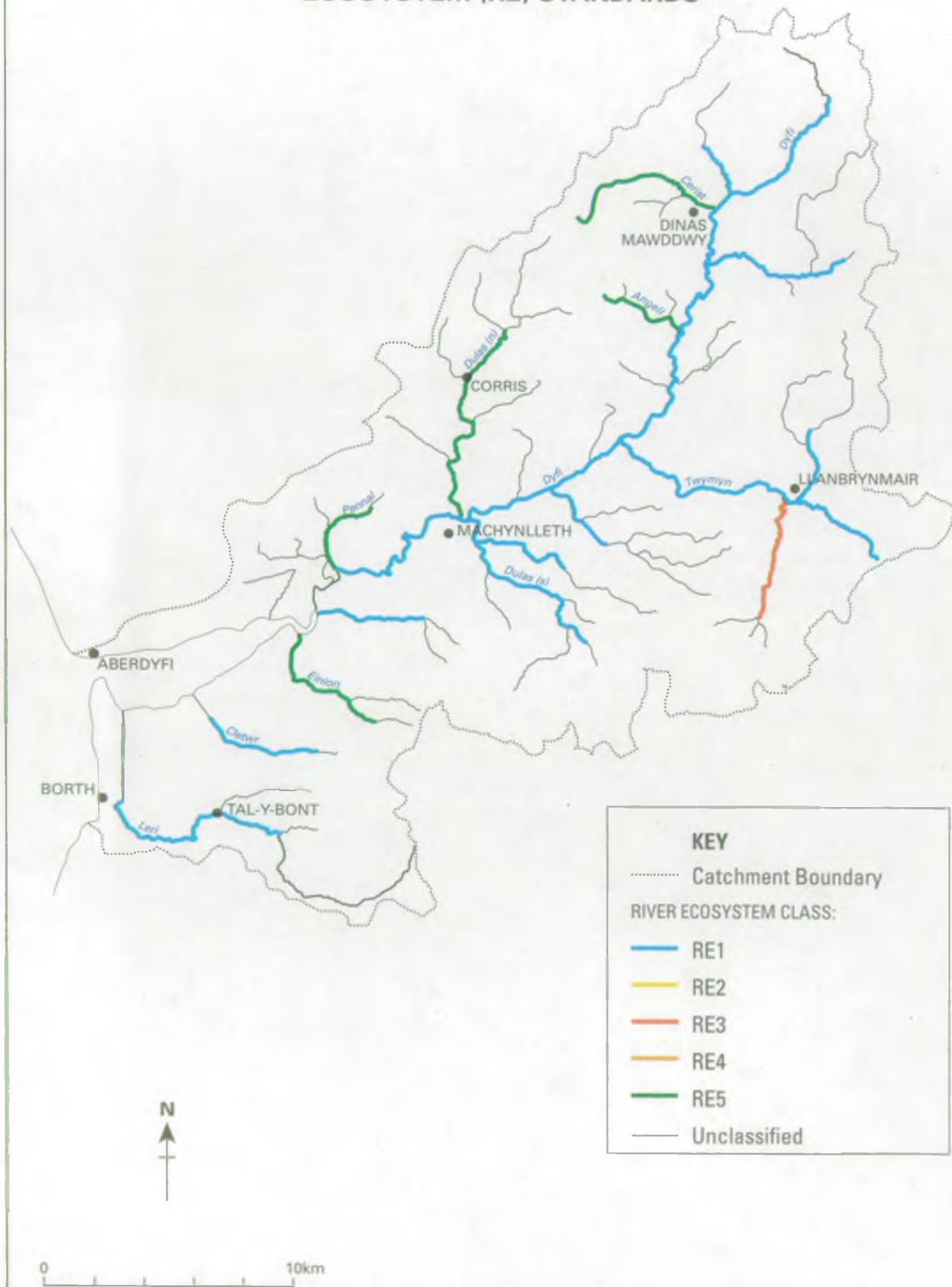
Natural or artificial barriers should not lead to excessive exploitation of fish.

River maintenance and other works should be carried out in a way that causes the least detrimental impact on the fishery.



MAP 9.

CURRENT QUALITY AS DEFINED BY RIVER  
ECOSYSTEM (RE) STANDARDS



## 4.5 RIVER ECOSYSTEM

<b>General Information</b>	<p>The River Ecosystem (RE) Use addresses the protection, maintenance and improvement of the basic water quality required to support different types of river ecosystem (including fisheries). The Use is based on the River Ecosystem Classification Scheme which comprises five classes of water quality of which RE Class 1 has the highest quality.</p> <p>RE Class 1: Water of very good quality (suitable for all fish species)</p> <p>RE Class 2: Water of good quality (suitable for all fish species)</p> <p>RE Class 3: Water of fair quality (suitable for high class coarse fish populations)</p> <p>RE Class 4: Water of fair quality (suitable for coarse fish populations)</p> <p>RE Class 5: Water of poor quality (which is likely to limit coarse fish populations)</p> <p>Further details of the scheme may be found in Surface Waters (River Ecosystem) (Classification) Regulations 1994.</p> <p>This scheme is especially useful for setting objectives which we use as planning targets to manage catchment water quality (see section 5.1).</p>
<b>Local Perspective</b>	<p>The map opposite represents the current assessment of water quality of the rivers in the catchments. From the map it can be seen that much of the Plan area achieves the desired target class of River Ecosystem 1 (RE 1). Exceptions to this include the Cerist, Angell, Dulas(n), Pennal, Einion and part of the Twymyn. Close inspection of the data shows that the failure of the Twymyn is due to the presence of elevated levels of zinc. The remaining stretches have failed to achieve the desired class due to occasional pH failures. However, when a more rigorous statistical appraisal is undertaken - as in the production of data for the 'State of the Catchments - Compliance with River Ecosystem Targets' Map (Map No2) - the Cerist, Angell and a large part of the Dulas(n) are shown to be only marginal failures of the desired target class of RE 1. The remaining stretch of the Dulas(n), the Pennal and Einion are significant failures due to the adverse affect of acidification.</p>
<b>Aim</b>	<p>To provide water quality suitable to support a healthy River Ecosystem appropriate to the type of river.</p>

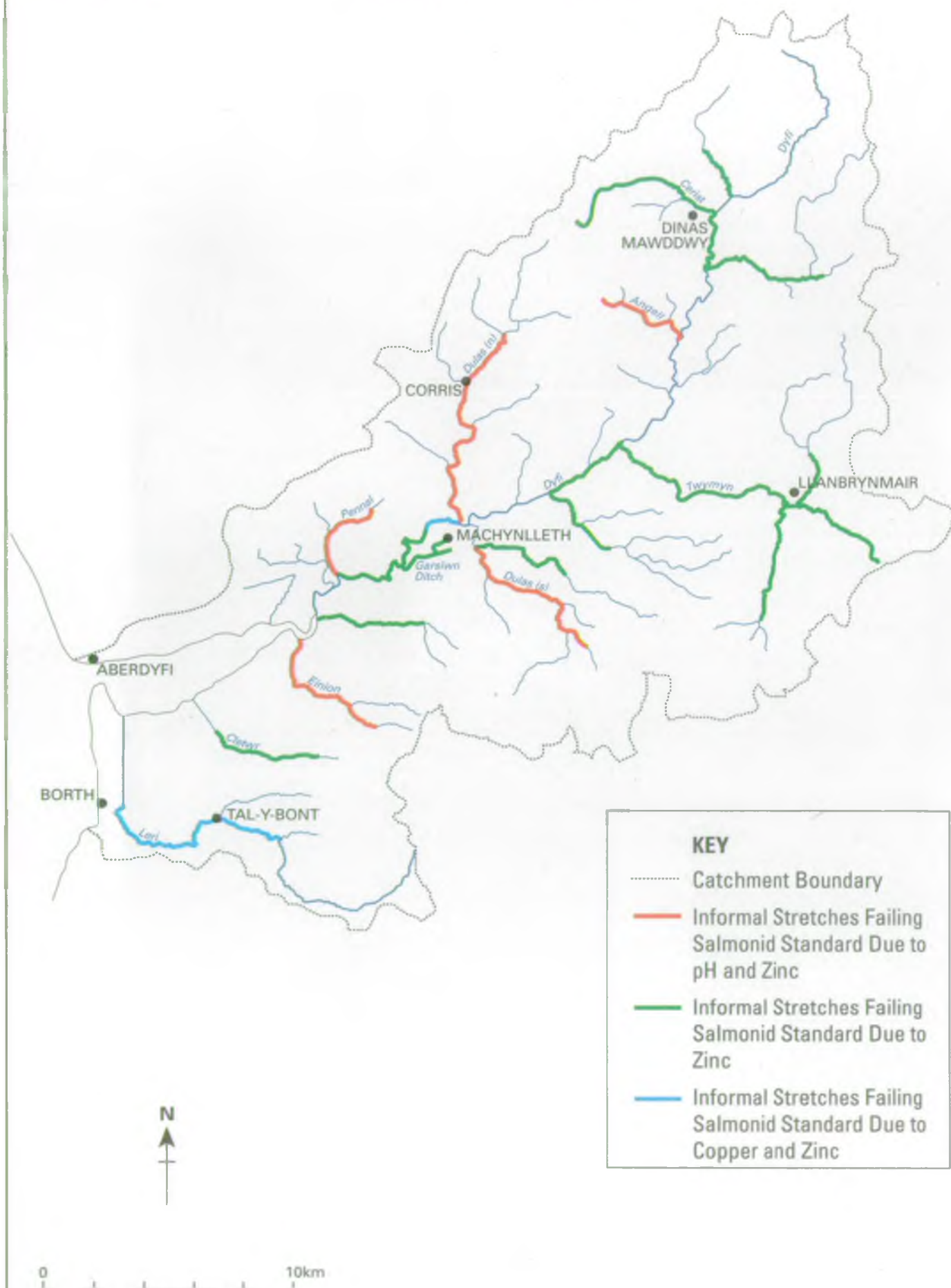
**Environmental Requirements:**

- |                          |   |
|--------------------------|---|
| <b>Water Quality</b>     | Waters should comply with the appropriate standards, applied formally or informally, under the Surface Waters (Rivers Ecosystem) (Classification) Regulations 1994.   |
| <b>Water Quantity</b>    | The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions. |
| <b>Physical Features</b> | An appropriate diversity of natural instream and bankside habitat should be maintained to support the Ecosystem typical of this river type.   |



MAP 10.

# GENERAL ECOSYSTEM



#### 4.6 GENERAL ECOSYSTEM

##### General Information

This Use relates to the protection of aquatic flora and fauna along with dependent organisms in the river corridor. In this context, dependent organisms are those which rely, at some stage of their life cycle, on the aquatic and bankside environment.

This basic Use is applied to **all** controlled waters within the catchment and provides protection to the aquatic environment from substances identified as "Dangerous to aquatic life" under the EC Dangerous Substances Directive. There is also a requirement to protect physical features and water quantity at appropriate levels.

Where areas of the catchment are important for more specific ecological reasons their protection/development is dealt with in the specific Use related chapters that follow and suitable, rigorous water quality standards will be applied.

##### Local Perspective

The water quality of all stretches in these catchments has been assessed on an informal basis against the standards set down for a salmonid fishery in the EC Dangerous Substances Directive (76/464/EEC). This approach is appropriate because the sites are not associated with point discharges of dangerous substances, nor are they designated background sites downstream of designated discharges. From the map it can be seen that there are two types of failures. First, those associated directly with low pH. Here the failures are due to pH and zinc. Second, those associated indirectly with low pH. Here the failures are due either to the level of zinc, or to the level of both copper and zinc.

Streams in the south and in the east of the catchments, drain areas of upland moorland and can be described as pristine in terms of their habitat and fauna. Exceptions arise as a result of small pockets of historic metal mining and coniferous afforestation, most notably on the Einion (coniferous afforestation and abandoned lead mines) and the Twymyn (abandoned lead mines).

The north side of the catchment has acid sensitive rocks and soils, combined with a high degree of coniferous afforestation; here streams are particularly susceptible to acidification. Streams with significant acidity problems include, the Angell, Dulas (n) and the Pennal. The Dyfi itself has good biological quality in its mid reaches but, there are indications of intermittent problems in the lower reaches as a result of the acidified tributaries entering from the north.

The biological assessment of the catchments confirms the chemical data in that it indicates a fauna typical of streams draining upland areas with acid sensitive rocks and soils.

**Aim** To protect the basic general ecosystem associated with the aquatic environment and its associated corridor.

**Environmental Requirements:**

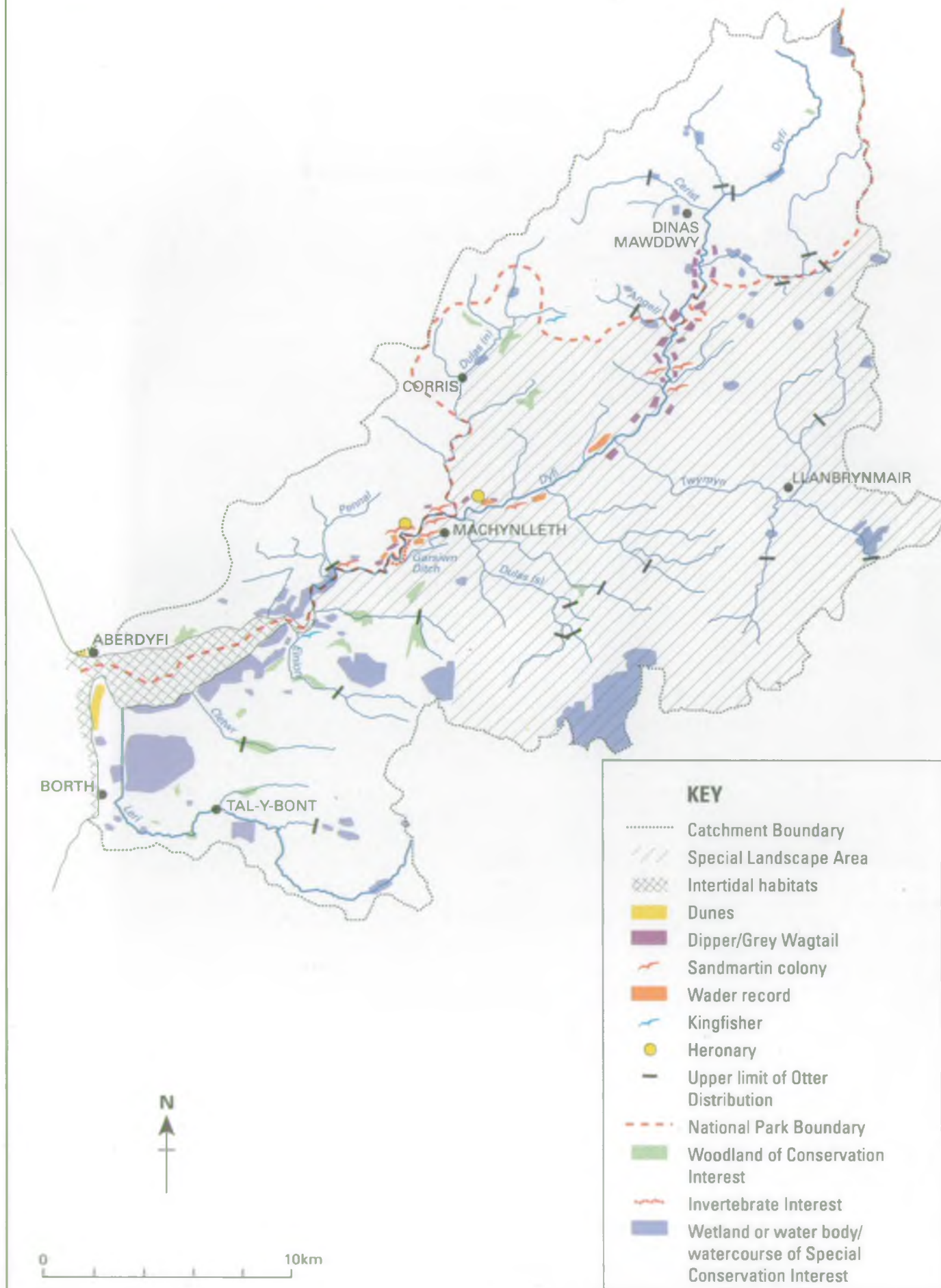
**Water Quality** Waters should comply with requirements of the EC Dangerous Substances Directive.

**Water Quantity** The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

**Physical Features** The diversity of natural instream features and river plants and animals should be maintained and enhanced.



## MAP 11. CONSERVATION - ECOLOGY AND LANDSCAPE



#### 4.7 CONSERVATION OF NATURE, LANDSCAPE AND HERITAGE

##### General Information

The protection of the aquatic ecosystem and designated sites for nature conservation are covered in the General Ecosystem and Special Ecosystems sections respectively. This section deals with the broader aspects of the conservation of wildlife, landscape and heritage features associated with inland waters but which may be located away from the river corridor.

The landscape and features of conservation or archaeological interest are of great importance in many catchments and may attract large numbers of visitors.

We have a duty to promote and further conservation of flora and fauna while carrying out our business. This includes the protection of water based or associated plants and animals that are so vital to the water environment. We also have to pay regard to any features of natural beauty or interest and must also consider the desirability of improving access to these features.

Exceptionally beautiful landscapes may be protected by being designated as Areas of Outstanding Natural Beauty (AONBs), for which the NRA is an informal consultee, or as National Parks.

Sites of historic or heritage interest may be classed as Scheduled Ancient Monuments (SAMs) or as 'listed buildings' but can be any feature of interest.

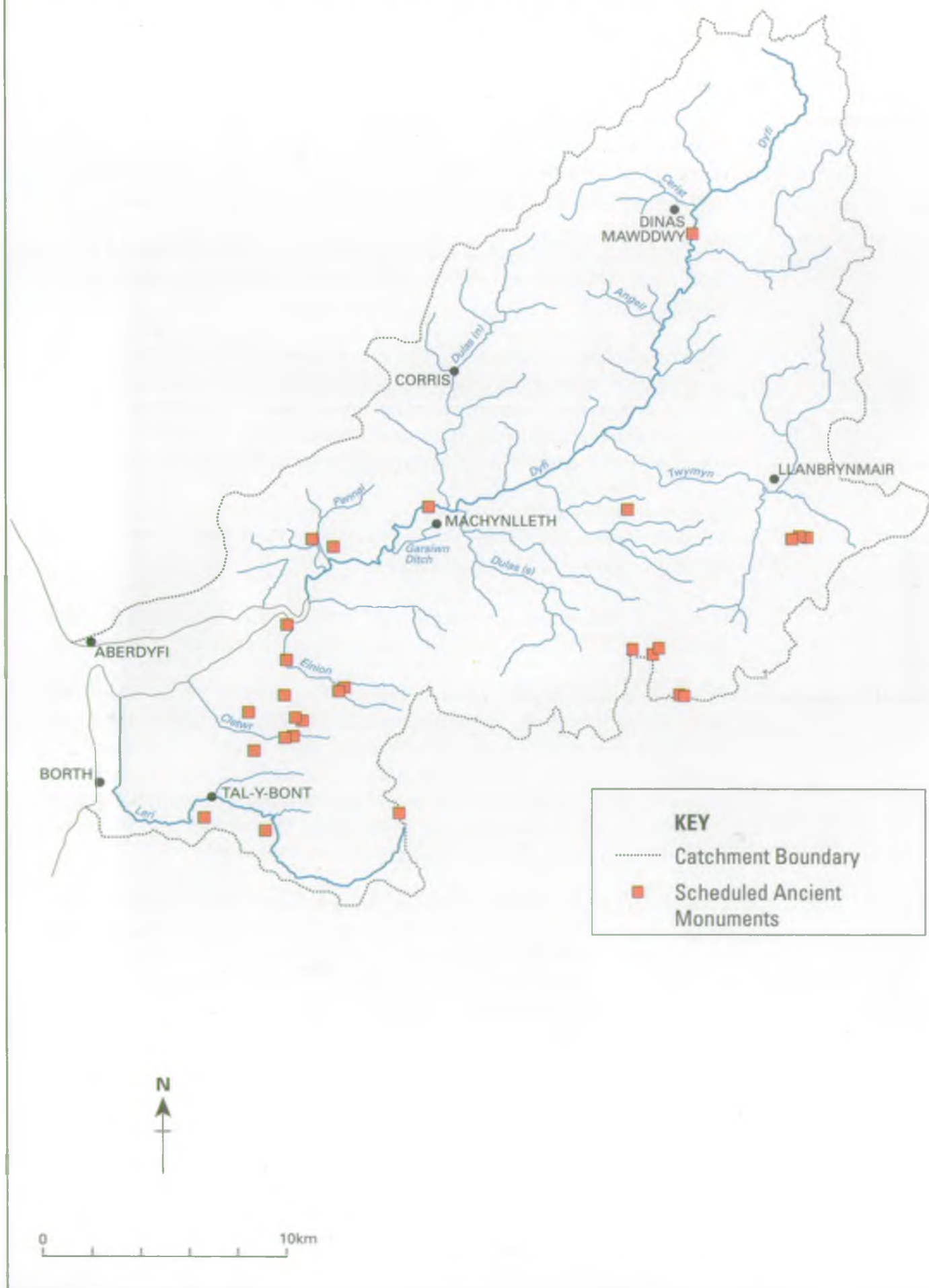
##### Local Perspective

The Dyfi estuary is the largest within Cardigan Bay. It is steep and mountainous to the north, contrasting with the expanse of mudflats, saltmarsh and raised mire (Cors Fochno) to the south. Both sides of the estuary are flanked by sand dune systems. Although of international importance for its flora and fauna, the estuary is also notable for its coastal geomorphology. It is a key site of a national network recording fluctuating environmental conditions and coastal changes during the Holocene period.

The presence of floodbanks and the railway has isolated the influence of the estuary from the lower floodplain. Drainage and agricultural intensification has resulted in extensive reclamation of land, particularly the canalization of the Leri. Here and elsewhere within the upper estuary, drainage has resulted in losses of wading birds, in particular lapwing, curlew, redshank and snipe which were formerly widespread and abundant. Field surveys have demonstrated that waders are no longer breeding at a number of wet grassland sites.

MAP 12.

ARCHAEOLOGY AND HERITAGE



From the estuary upstream to Dinas Mawddwy, the floodplain is primarily improved and semi improved grassland with few records of wetland birds. However, the morphology of the river which is meandering and partially treelined has resulted in a variety of features. These include shingle bars, islands and earth cliffs that provide habitat for other bird species as well as being important for nationally rare invertebrates. No fossil channel features of biological interest occur within the floodplain. Upstream of Dinas Mawddwy and, on other major tributaries (including the Leri), the river narrows within steep sided valleys. Flows become more torrential and river banks are increasingly eroded. However, a common feature throughout the catchments is relatively unrestricted livestock access to the river bank. This can cause bank degradation, impoverishment of riparian flora and lack of regeneration of riverside trees. Dippers and grey wagtails occur throughout the section with scattered sand martin colonies and occasional kingfishers. Common sandpipers are recorded breeding on shingle mounds, and mergansers and goosanders occur throughout the system.

Otters occur throughout the Dyfi and Leri and have been recorded on all tributaries. A survey carried out in 1991 showed no change in the number of positive recordings on the 1984/85 surveys results. The Dyfi is a low priority catchment for otters within the Regional Otter Strategy which recommends maintaining a watching brief for this catchment.

Beyond the floodplains of the Dyfi and Leri, land use is predominantly upland sheep grazing and coniferous afforestation. Pristine upland landscapes of blanket bog, and rock outcrops are largely confined to the upper Dyfi catchment (Mon mountain) and upper Dulas(s) (Plynlimon). The landscape within the Plan area is reflected by the National Park and Special Landscape designations over much of the catchments. Surprisingly though, much of the Dyfi Biosphere Reserve is outside of the landscape designation.

Within the Catchments, there are 23 Scheduled Ancient Monuments (SAMs) representing about 10% of the known archaeological sites. Sites range from prehistoric barrows, cairns and standing stones, to post medieval farmsteads, hafodydds and field systems and perhaps dark age settlements in the Dyfi Valley itself.

Around the Einion, Cletwr and Leri, there are many former lead mines of the 19th century and earlier. Water was used extensively for processing and transportation, hence many watercourses were modified to form leats, weirs etc. One of the more significant developments in terms of the aquatic environment was the drainage of parts of Cors Fochno and, the canalization of the lower reaches of the Leri and Cletwr, to facilitate transportation to and from the sea. An example of the use of water power for processing is Dyfi

Furnace. Built on the Afon Einion, it used a water wheel to operate two huge bellows which elevated temperatures within the furnace high enough to melt iron ore.

Patterns of human settlement and communications have in the past been closely linked to rivers. Settlements grew up around fording and bridging points. In the southern part of the Plan area these would have been stimulated by the growth of the lead mining industry. Today one of the most significant river crossing points is the Dyfi bridge at Machynlleth. A scheduled ancient monument, it is thought to date from the late eighteenth century although a bridge appears to have existed in this location in the early 16th century.

**Aim** To ensure that wildlife, landscape and heritage features of interest (particularly designated sites) are protected and, where appropriate accessible.

**Environmental Requirements:**

**Water Quality** Generally there will not be any specific water quality requirements to protect landscape or heritage sites although water around such public places should at least conform with the standards used to protect the General Ecosystem Use (Section 4.6).

Where water quality is a key factor, it should comply with the appropriate River Ecosystem class, while estuarial and coastal waters should conform with standards for the Protection of Sensitive Aquatic Life.

**Water Quantity** The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

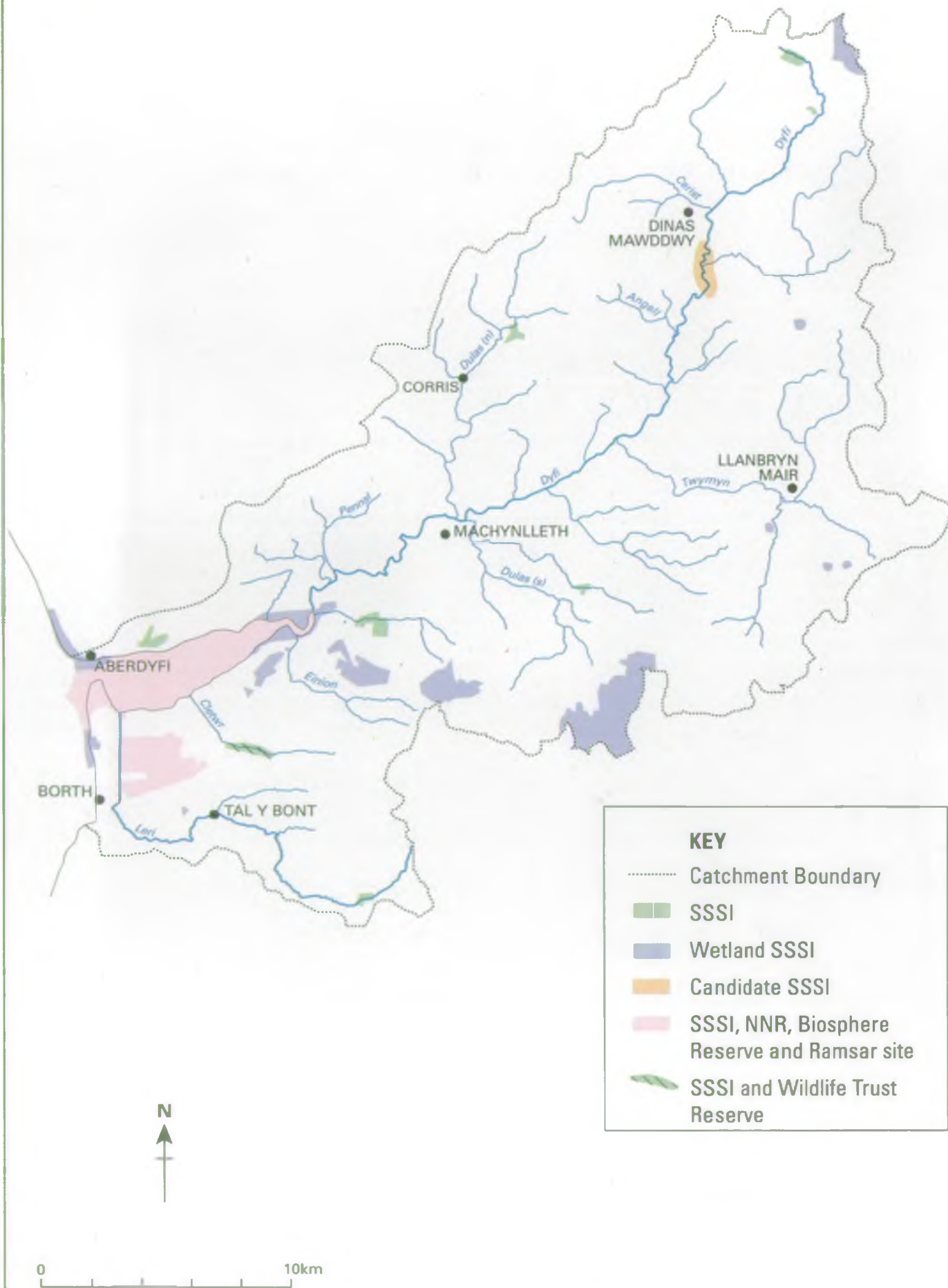
**Physical Features** Physical features that give rise to natural beauty should be protected.

Sites and buildings of interest should, where cost-effective, be protected from damage by flooding and/or drought.



MAP 13.

SPECIAL ECOSYSTEMS



## 4.8 SPECIAL ECOSYSTEMS

### General Information

Special ecosystems are regarded as those areas that are formally designated for their high conservation value. Such areas include National Parks, National Nature Reserves (NNRs), Sites of Special Scientific Interest (SSSIs) and Special Areas of Conservation and Special Protection Areas designated under the EC Habitats and Birds Directives.

This Use is extended to sites that are valuable in conservation terms but are not formally protected eg. Nature Reserves and County Trust Sites and other non-statutory nature reserves.

It is possible that a WQO for the Special Ecosystems Use will be introduced by the DoE during the lifespan of this Plan. Proposals by the NRA and English Nature are being considered and will be the subject of separate public consultation.

### Local Perspective

There are 22 sites of Special Scientific Interest within the catchments. Of these, 11 are wetland sites, the most important of which is the Dyfi SSSI which also has NNR, SPA, Ramsar and Biosphere Reserve status. The Biosphere Reserve is part of a global network of sites nominated under the UNESCO 'Man and the Biosphere' programme in 1971. It comprises core, buffer and transition zones, including both the SSSI and adjacent, non-designated areas. Dyfi is one of three Biosphere Reserves in the U.K. It is globally important for its complex of sand dunes, saltmarsh, wet grassland, raised bog and associated rare flora and fauna. Cors Fochno (part of Dyfi SSSI) is one of the most extensive tracts of actively growing raised bog in Britain. The area is noted for its wetland plants, birds and internationally important dragonfly fauna. The estuary is also of international importance for its wildfowl and wader populations.

We have a key operational role within the Biosphere Reserve by maintaining the lowland drainage system to the south and north coast. We also co-operate with CCW and RSPB to restore wetland ecosystems. Conservation management takes place at Ynys Hir reserve, managed by RSPB.

We are required to prepare a Water Level Management Plan for the Dyfi SSSI. This aims to integrate the requirements of conservation with those of other users.

The plan will form part of a larger collaborative project currently being developed for the Biosphere Reserve. In this project CCW, RSPB and ourselves are seeking to restore wetland habitats and to promote the Reserve through integrated land management, public awareness and access.

Outside the Biosphere Reserve, wetland or water associated designated sites include, the upland blanket mires of Pencarreg Gopa, Pencreigiau'r Llan and Berwyn. Also several river valley sites such as Coed Cwm Clettwr and Coed Afon Crewi. The former is the only Wildlife Trust reserve within the Plan area.

**Aim** To protect the special features interest for which the site has been designated for their ecological or landscape importance.

**Environmental Requirements:**

Special Conservation Areas are likely to have their own specific environmental requirements for water quality, water quantity or physical features. Currently no designatory agency has identified environmental targets for any sites and, inevitably, consultation would be required before such standards could be implemented.

**Water Quality** At sites where water quality is a key factor in the protection of a special ecosystem, appropriate standards will be applied.

**Water Quantity** The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

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## 4.9 ABSTRACTION

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### General

The removal of water from streams, rivers or groundwater by man is termed **abstraction**. The various uses to which the water is put are all grouped under this general heading. Abstractions are controlled by licences granted under the Water Resources Act 1991. The abstraction licensing process ensures that we can manage water resources so as to ensure that the right balance is struck between the needs of abstractors and the environment.

Exemptions from the requirement for a licence include most types of water supplies to a single household, and small (not more than 20 cubic metres a day) general agricultural uses from surface water (excluding spray irrigation) - see table in Appendix 1b. Also, large areas of North and West Wales are exempted from the licensing requirement for abstractions from groundwater (wells and boreholes), regardless of use. There are a number of other specific types of abstraction (eg. firefighting) which are exempt from the need for a licence. The requirement for an abstraction licence is shown in Appendix 1b.

All abstraction licences specify maximum volumes that the licence holder may take, and many contain conditions to protect the environment and other abstractors. The exceptions are licences granted as Licences of Right in 1965, or "Licences of Entitlement" in 1990 where the legislation did not permit us, or our predecessors, to restrict pre-existing abstractions.

In considering applications for new licences, we must ensure that there is no derogation of existing abstractors without their agreement, and that the aquatic environment and associated habitats are properly safeguarded. We do not guarantee that the authorised volume will be available, nor that the water will be fit for the purpose for which it will be used.

We have a duty to protect the quality of water resources and will specify zones or areas around sources that will seek to control certain potentially polluting activities. The Groundwater Protection Policy (appendix 1a.) forms the basis for our activities relating to groundwater. For surface waters we can apply to the Secretary of State to designate protection zones upstream of major abstractions. In such zones risk assessment could identify whether certain chemicals should be prohibited and/or safety procedures improved so that the abstractions downstream, are protected.

Certain types of abstraction have specific issues associated with them, as follows:

**Private and Public Water Supply**

Water Companies provide public water supplies, mainly from surface waters - rivers, streams and reservoirs - but groundwater sources can be important on a local scale. The Water Companies have the responsibility to ensure that water supplied by them satisfies statutory standards.

Properties and farms not connected to Water Company supplies obtain their water from small private supplies such as springs and boreholes. The quality of these sources is monitored by the Local Environment Health Officer.

**Spray Irrigation**

Spray irrigation is a high impact use of a water resource and as such is more strictly controlled than other types of abstraction. This is because it takes place during the driest times of year when flows are lowest, and little or no water is returned to the river after use. It is, therefore potentially damaging to the water environment. We encourage winter abstraction into storage and consequently set winter abstraction charges at only one-tenth of those for summer abstraction.

**Fish Farming**

A fish farm is usually a series of off-stream reservoirs in which fish are reared. This can severely affect a watercourse by diverting a large proportion of the flow through the farm. Although all the water is returned downstream, this does mean that a length of the river is reduced in flow. The requirement for an adequate residual flow to protect the river can restrict the viability of a fish farm.

**Water Transfer**

Water is not always used in the same place as it is abstracted from. It may be transferred elsewhere, within or outside the catchment. Transfers clearly represent a nett loss of water to the immediate area and so their impact is generally mitigated by the release of regulation or compensation water during period of low flows. All transfers are subject to abstraction licences.

**Industry**

Industrial uses of water range from those where water loss is low - such as mineral washing, to those with high loss - such as evaporative cooling. Most large industrial abstractions take water directly from surface and groundwater, but supplies from the public mains may supply water where quality is important.

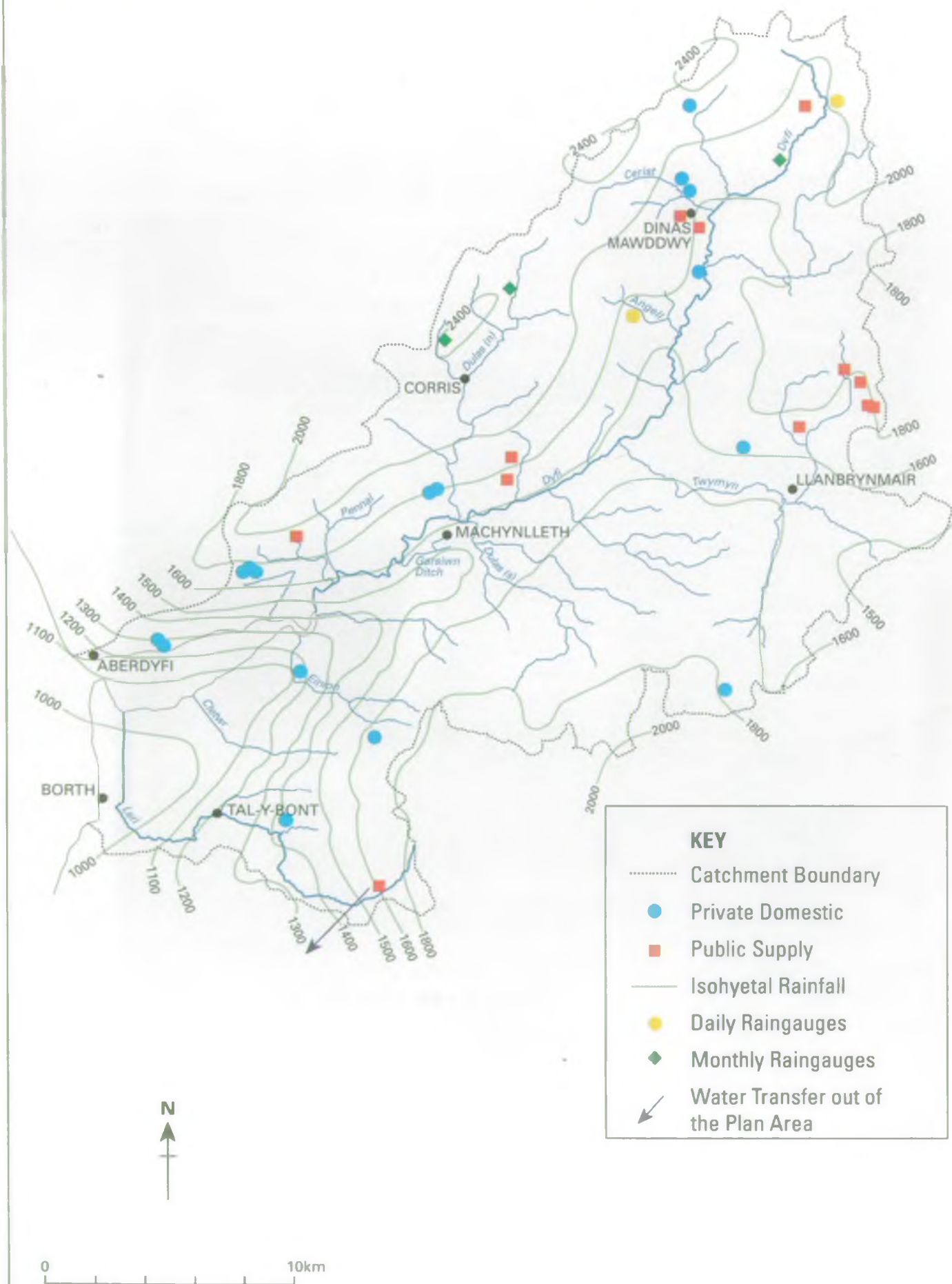
**HydroPower**

The energy of flowing water can be used to generate electricity, or to provide the power to drive millwheels. Both uses are growing in popularity in the search for sources of renewable energy, and as old mills are restored. However, the very large volumes of water diverted away from the river can have a significant effect on the in-river flora and fauna and other users of the watercourse, particularly where the points of abstraction and return are remote from each other.



MAP 14.

ABSTRACTION FOR POTABLE SUPPLY



All hydropower abstractions require an abstraction licence.

Use of water for hydropower can result in appreciable changes in the flow regime which can have a large impact on the downstream channel and its flora and fauna.

## Amenity

There is an increasing demand for water to supply a wide range of amenity ponds and lakes to meet needs as diverse as nature conservation and water sports. Water for these ponds and lakes can be taken from ground or surface water supplies and is subject to the normal abstraction licensing procedure. There may also be a requirement for a discharge and/or land drainage consent.

Ponds created by the damming of a watercourse will generally require an impounding licence.

Many amenity ponds are constructed in flood plain areas and are potentially of concern. We will seek to ensure that such developments and associated works do not affect the natural river regime.

To stop the indiscriminate spread of alien fish species and the spread of disease, all stocking of fish into amenity ponds is subject to our normal authorisation procedures.

## Local Perspective

### Surface Waters

There are 40 licensed abstractions from surface water sources within the catchments. Twenty four of these are for potable supply purposes of which 6, with a licensed volume of 2264.7 Ml/a, are for public supply by Dŵr Cymru Welsh Water. A further 2 licences, one consisting of 5 and the other two abstraction points, with a licensed volume of 613.9 Ml/a, are for public supply by Severn Trent Water Ltd. in the area around Machynlleth. The licence with 5 abstraction points is destined to be abandoned when the position with regard to supply for farm water troughs has been resolved. Only one of the two abstraction points of the second licence has been retained for use, as an emergency standby.

Some 65% of the total licensed volume for public supply comes from just one source, Llyn Craig y Pistyll. This is a net loss to the catchments as it is used to supply Aberystwyth. The remaining 16 licences with a total abstraction volume of 8.99 Ml/a are for potable use by small private abstractors.

There are only 6 abstraction licences for industrial use with a total abstraction volume of 29.2 Ml/a, which illustrates the rural nature of the catchments. The uses for the abstracted water include aluminium pellets production by the recycling of labelling material, the production of slate products and, its bottling for selling as mineral water.

By far the largest use of water within the catchments is the generation of hydropower. There are 3 licensed abstractions which allow a total of 8538 Ml/a to be abstracted for this purpose, all the water is returned to the Plan area.

Several small scale hydroelectric power schemes are currently being promoted in the area under the Non Fossil Fuel Obligation (NFFO) Order(s). Whilst generally perceived as "green" power generation, some of the schemes, due to design and/or location would be damaging to the water environment. This is of concern to us and our statutory consultees and there is a need to identify those rivers which are best able to support hydro schemes without significant environmental damage. Power generators could then target their schemes at those rivers where they would be most likely to succeed with an abstraction licence for the appropriate type of scheme.

The one mill in the area is licensed to abstract 49.1 Ml/a of water which is all returned to the Plan area.

There are only 6 licensed agricultural abstractions in the area, totalling 203.5 Ml/a. Five of the abstractions are for general agricultural purposes, whilst the sixth is for the supply of water to the Dyfi Valley Trout farm. There are no licensed abstractions for spray irrigation within the catchments.

### Groundwaters

There are no major aquifers in the catchments. Groundwater sources are limited to a few surface fractured weathered zones, with some water being locally available in the alluvial gravel layers of the Dyfi flood plain. The area is exempted from the need for a licence for groundwater abstraction irrespective of use. As such, the Severn Trent Water Ltd. abstraction for potable water supply at Llanwrin does not need a licence. Spring water within the catchments is classed as surface water and its abstraction is controlled by the appropriate licensing procedure.

## **Aims**

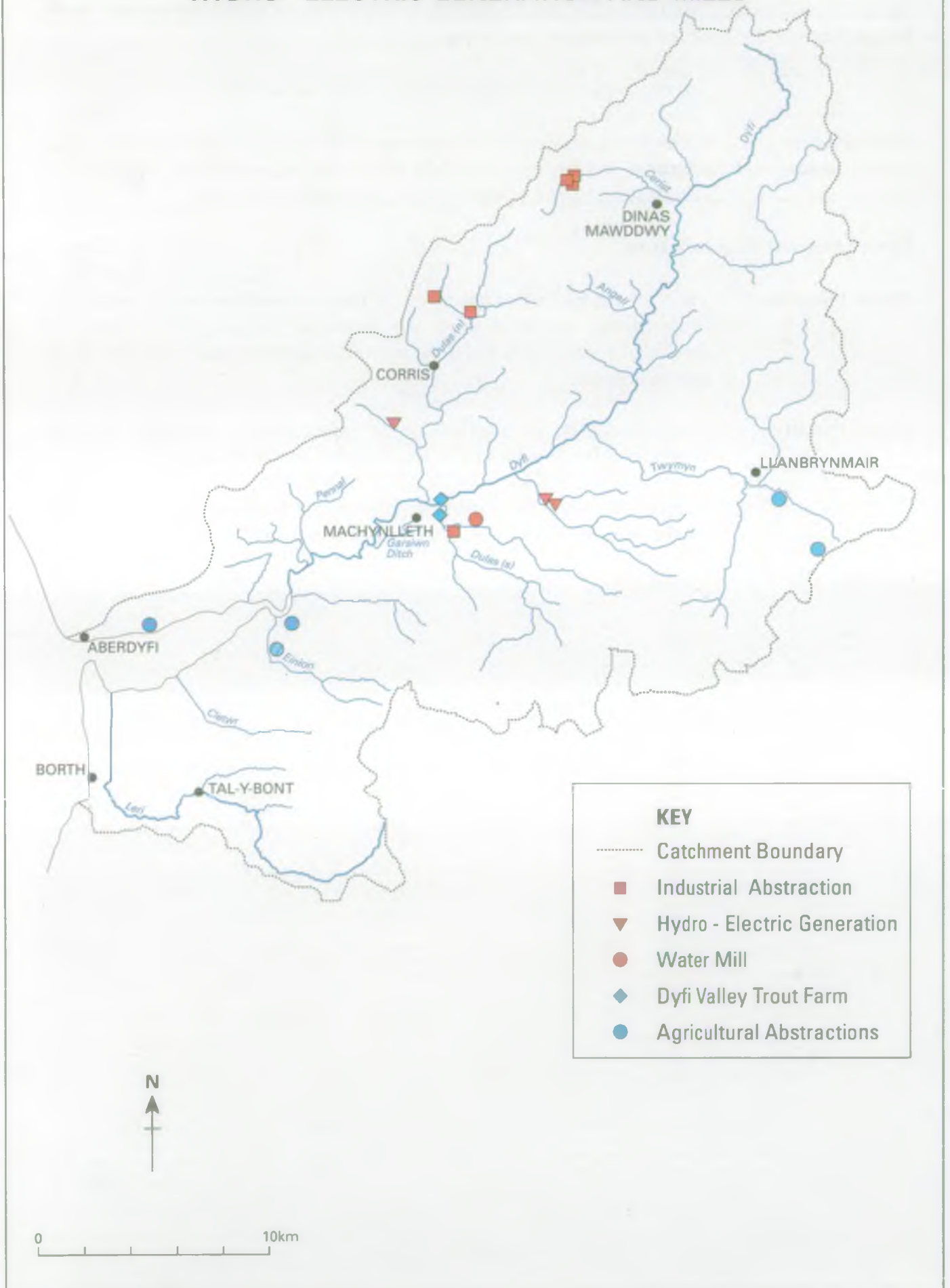
To manage water resources so as to safeguard licensed and exempt abstractions and the environment. This includes the active enforcement of abstractions.

To encourage abstractions to be made as far downstream as possible and discharges to be made as close to the point of abstraction as is practicable.

To encourage efficient water use and to optimise re-use of water.

To plan for the sustainable development of water resources, developing criteria to assess the reasonable needs of abstractors and the environment.

**MAP 15. ABSTRACTION FOR INDUSTRIAL, AGRICULTURAL, HYDRO - ELECTRIC GENERATION AND MILLS**



**Agricultural/Spray Irrigation** To minimise the impact on summer flows of spray irrigation and other forms of nett abstraction.

To encourage winter storage abstraction for use in summer.

**HydroPower** HydroPower developments that restrict the ability to use upstream water resources will be opposed unless the licence authorising the abstraction is subject to an agreed volume of derogation and a time limit.

**Environmental Requirements:**

**Water Quantity** The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

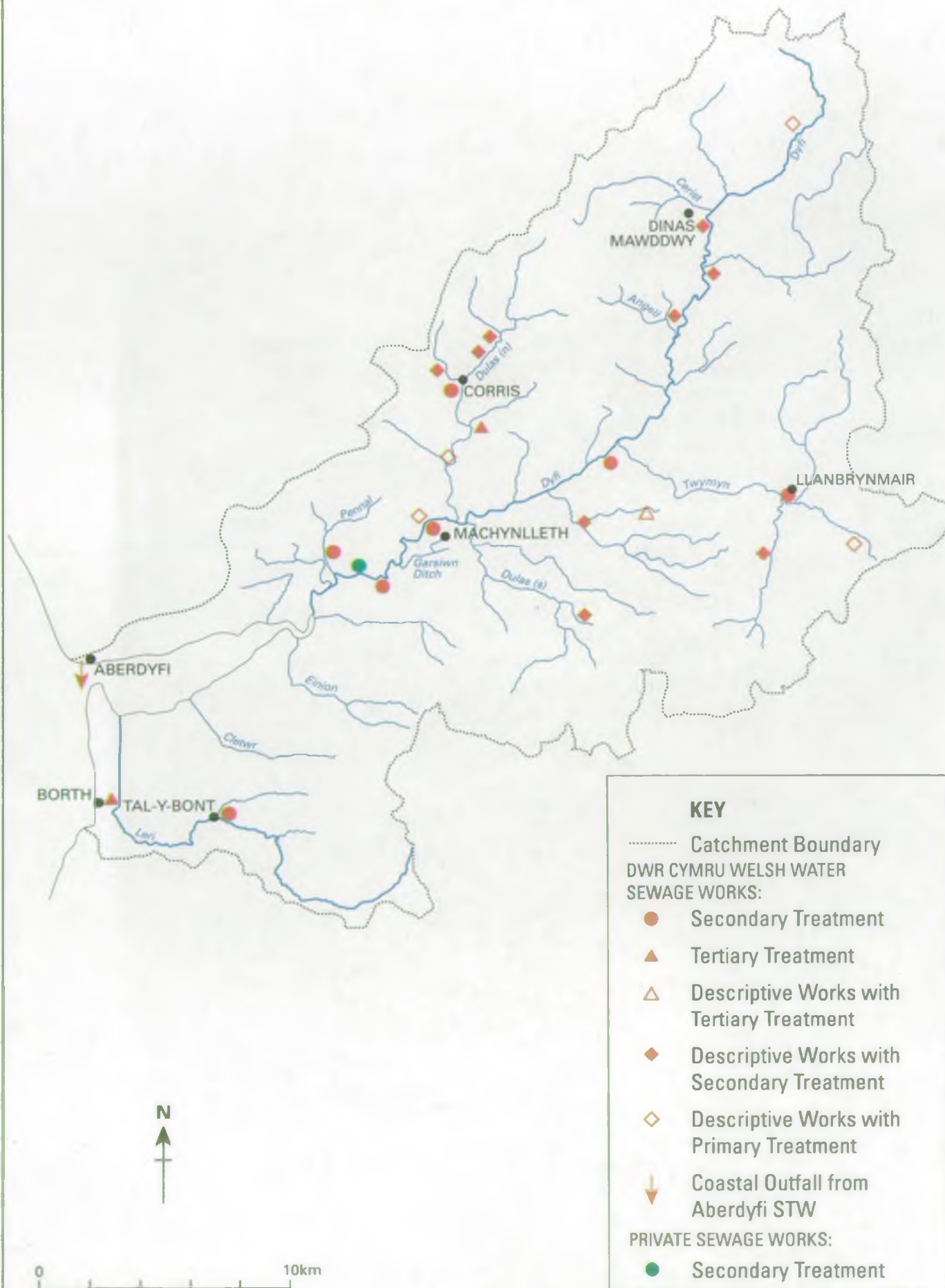
**Water Quality** There should be no deterioration in water quality, below the point of abstraction, due to reduced dilution of authorised discharges.

Waters abstracted for potable supply should conform with the relevant standards of the EC Surface Waters directive.



MAP 16.

# SEWAGE EFFLUENT DISPOSAL



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#### 4.10 SEWAGE EFFLUENT DISPOSAL

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##### **General Information**

In Wales most sewage effluent is discharged into freshwaters having first been treated in a sewage treatment works (STW) or smaller facility such as a septic tank. However, some untreated sewage is occasionally discharged into rivers from overflows on the sewerage system. The overflows act as safety valves to stop the treatment works being overloaded or the sewerage system damaged and also to prevent flooding of property. They are designed to operate only under storm conditions when river flows are high. We regulate all these types of discharge and monitor compliance with their consents. In order to protect the water environment these consents may contain conditions that variously specify the quantity, quality or circumstances of effluent discharge. In Wales Dŵr Cymru Welsh Water handles the bulk of sewage effluent discharged to freshwaters, although the greater number of STWs are privately owned.

Coastal sewage discharges which serve the majority of the population of Wales, are also generally owned by Dŵr Cymru Welsh Water although at present few of them receive the level of treatment associated with freshwater discharges.

In Welsh Region, the continuing improvements in sewage effluent treatment and disposal facilities feature highly in Dŵr Cymru Welsh Water's second Asset Management Plan (AMP2), which has been produced in close liaison with us. This plan specifies the capital investment required for Dŵr Cymru Welsh Water's assets (mainly to ensure compliance with the EC Urban Wastewater Treatment Directive). Consequently, we have, over the past two years, assessed the environmental impact of every Dŵr Cymru Welsh Water owned STW discharge and those from Combined Sewer Overflows (CSOs) in order to provide a basis for establishing investment priorities. Any sewage effluent related issues identified within this CMP will be considered within the agreed AMP2 programme.

##### **Local Perspective**

There are 24 sewage disposal works operated by Dŵr Cymru Welsh Water (DCWW) and 4 privately operated works in the catchments. Where discharges of treated effluent have an adverse impact upon water quality to a degree that affects legitimate uses of the water, we will review the consent and impose stricter standards. Where works fail to meet consent standards then we may start formal legal proceedings if the discharger fails to implement a plan of improvements to enable the works to fully comply.

We seek to ensure that environmentally protective discharge standards are imposed on all works discharging to surface/coastal waters. Where a discharge to a soakaway of more than 5m<sup>3</sup>/day is within an aquifer protection zone, eg. as applies within one kilometre of the Severn Trent Water Ltd. boreholes at Llanwrin, then these are also consented.

Many of the treated effluent discharges within the catchments are from small works serving communities in the rural areas. Due to the high dilution available in most of the receiving watercourses, the majority of the discharges have little or no effect on the water quality.

The most significant discharges are made from the disposal facilities serving the coastal towns of Borth and Aberdyfi, and at the inland town of Machynlleth. The coastal towns in particular, are affected by the large seasonal influx of tourists to the area. During the summer months anything up to a tenfold increase in sewage volumes can take place at Aberdyfi and Borth whilst the volume at Machynlleth can double.

Recent capital expenditure by DCWW at Tywyn will provide for the transfer of sewage from Aberdyfi to the new full treatment plant which will include disinfection. This should eliminate the intermittent problems at the identified EC bathing water at Aberdyfi caused by the existing crude outfall, and should ensure compliance with the EC Bathing Waters Directive (76/160/EEC) mandatory standards.

Improvements have also been undertaken at Machynlleth sewage treatment works to ensure discharge consent compliance. The construction of new primary, storm and final humus tanks has resulted in this works now complying with its discharge consent.

#### **Aims**

To prevent pollution that would affect other uses of water by controlling the disposal of treated and untreated sewage effluent and sludge.

To protect the quality and volume of groundwaters by implementing the NRA's Groundwater Protection Policy.

The NRA would generally seek to ensure that discharges were made as close as possible to the point of abstraction.

#### **Environmental Requirements:**

##### **Water Quality**

Discharges should comply with all conditions stated within discharge consents. This will be enforced by the NRA.

There should be no significant deterioration in the quality of waters receiving discharges, beyond that assumed when setting the discharge consent.

##### **Water Quantity**

Consent conditions will be derived taking into account the upstream dilution available under average and dry weather flow conditions.

The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been

developed to ensure that this is carried out consistently and effectively for all new abstractions. No deterioration in the quality of water above discharges, beyond that assumed when setting the consent for an authorised discharge.

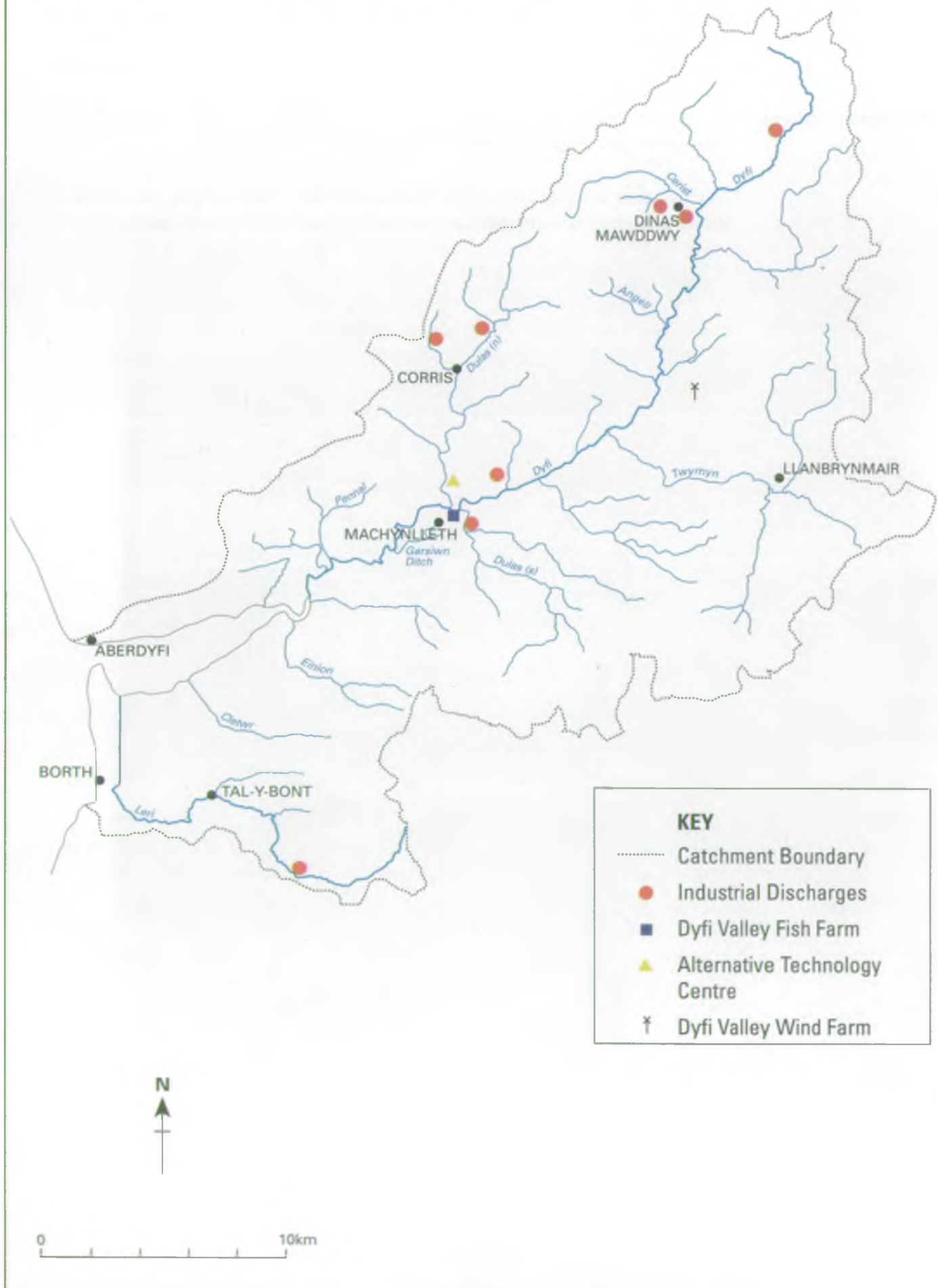
**Physical Features**

No discharge of sewage from overflows should occur at sewer flows less than those specified in consents.

No reduction in the quality of the physical habitat should occur as a result of the discharge of sewage effluent or construction of the outfall works.

MAP 17.

# INDUSTRIAL EFFLUENT DISPOSAL



#### 4.11 INDUSTRIAL EFFLUENT DISPOSAL

##### General Information

In many places it is necessary to dispose of liquid wastes from industry into fresh and coastal waters. However, the material discharged can be highly polluting and close control is therefore vital if the water environment is to be protected.

We use a system of "consents to discharge" to control pollution from industrial effluents, at most sites. However, where a site is subject to Integrated Pollution Control (IPC) any discharges will be authorised by Her Majesty's Inspectorate of Pollution (HMIP), in close consultation with the NRA. Within this framework we will seek to ensure that any authorisation issued is consistent with protecting the Uses of the receiving water and also the broader commitment to the reduction of dangerous materials in the environment. Where pollution prevention measures are stated by HMIP these must also be consistent with our pollution prevention policy.

Trade effluent is discharged to sewers with the permission of the sewerage undertaker (Dŵr Cymru Welsh Water in Welsh Region) and is then subject to the sewage effluent treatment and disposal controls outlined in Section 4.10.

##### Local Perspective

Although the catchments are predominantly rural in nature they do contain an interesting variety of relatively small industries.

Cerist Mineral Water, caters for a demand for approximately four thousand bottles of mineral water per week. The company takes its water from a spring on the hillside adjacent to the Afon Cerist from which it takes its name. The small amount of wastewater generated from rinsing the sterilised bottles with some of the mineral water prior to filling, is discharged to a soakaway.

Wincilate Ltd at Aberllefenni Quarry, produces a variety of slate products and is consented to discharge up to 300 cubic metres of process water per day. The water is mainly used for dust suppression during the sawing and drilling operations. The process water is directed to a series of settlement tanks before discharging to the adjacent Dulas (n).

Cemmaes Windfarm, is located on a windswept hilltop and consists of twenty four 300 kilowatt windturbines. They are each supported by 25 metre high columns and have 33 metre diameter rotors. The whole windfarm can generate up to 24 million kilowatts of electricity per year, sufficient for over 6,000 average homes. Although there is no discharge from the complex, we were involved during the site development and construction stage in order to ensure that the appropriate pollution control measures were adopted.

The Centre for Alternative Technology, located on the banks of the Dulas (n) has a range of exhibits such as solar, water, wave and wind power systems. The sewage disposal system for the centre is relatively novel and aims to be very environmentally friendly, as is appropriate for such a site. Most of the toilet waste is directed to composting pits and subsequently used as fertiliser. Waste water from the washrooms and kitchens is directed to phragmites reed beds and from there to soakaways planted with numerous willow bushes. This method allows for the biological treatment of the effluent by bacteria that live in the root- zone of the plants.

Mountstar Metals Ltd is located at the confluence of the Crewi and the Dulas(s) on the outskirts of Machynlleth. The company re-cycles labelling material to produce raw pellets of aluminium for use in associated industries. The process involves the incineration of the waste material to separate the paper from the metal. Whilst there is no effluent discharge, we monitor the site to ensure that there is no contamination of surface water from the general yard and storage areas.

The Dyfi Valley Trout Farm located just upstream of Machynlleth abstracts water from two boreholes. It is consented to discharge up to 543 cubic metres of water per day. The site is regularly monitored by us ensure compliance with its consent conditions.

In addition to the above industries there are five water treatment works (WTW) in the Plan area. Dwr Cymru Welsh Water own four, namely Bontgoch, Corris Uchaf, Dinas Mawddwy and Llanymawddwy. The works at Bontgoch can supply water to a population of around 23,000 at peak demand, which includes the University and seaside town of Aberystwyth. The main source reservoir, Llyn Craig y Pistyll, located high up in the north west edge of the Plynlimon hills, is relatively acidic and contains a peaty sediment. As a consequence of this latter phenomenon, the raw water has to be subjected to high pressure filtration before being put into supply. The filters have to be 'backwashed' regularly to remove the sediments etc that would otherwise clog them. The WTW is consented to discharge this water, along with other waste process water on site, to the adjacent Afon Leri. This is only allowed following treatment to reduce any contaminants to within the consented limits.

The three other works at Corris, Dinas Mawddwy and Llanymawddwy are all relatively small. They supply local rural villages only, consequently the volume of waste water from them is correspondingly low. The treatment methods at Dinas Mawddwy and Llanymawddwy are currently being upgraded to include filtration of the raw water. Therefore, there will shortly be a requirement to discharge filter backwash water and, consents are now being reviewed to reflect this change.

The WTW at Llanwrin is operated by Severn Trent Water Ltd and utilises groundwater abstracted from boreholes adjacent to the Dyfi. This water is comparatively clear, consequently only small volumes of waste water are discharged from the works.

**Aims** To control the discharge of liquid industrial waste to prevent pollution that would affect other Uses of the water.

**Environmental Requirements:**

**Water Quality** Discharges should comply with all conditions stated within discharge consents. This will be enforced by the NRA.

There should be no significant deterioration in the quality of waters receiving discharges, beyond that assumed when setting the discharge consent.

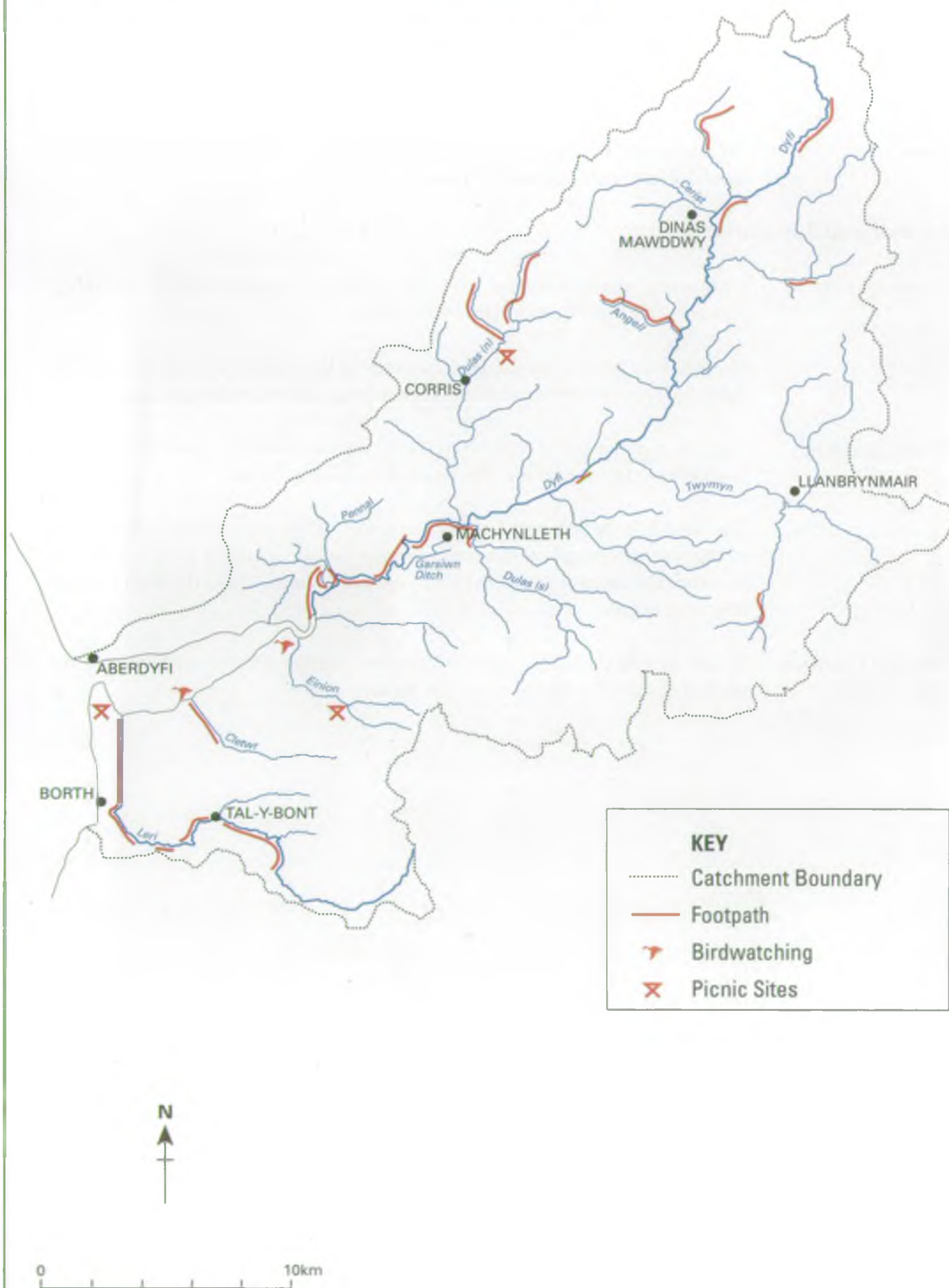
**Water Quantity** Consent conditions will be derived taking into account the upstream dilution available under average and dry weather flow conditions.

The NRA has the task of balancing the needs of the environment, with those of the abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

**Physical Features** No alterations should be made to the river channel which would reduce the mixing of the effluent and receiving water.

MAP 18.

BASIC AMENITY

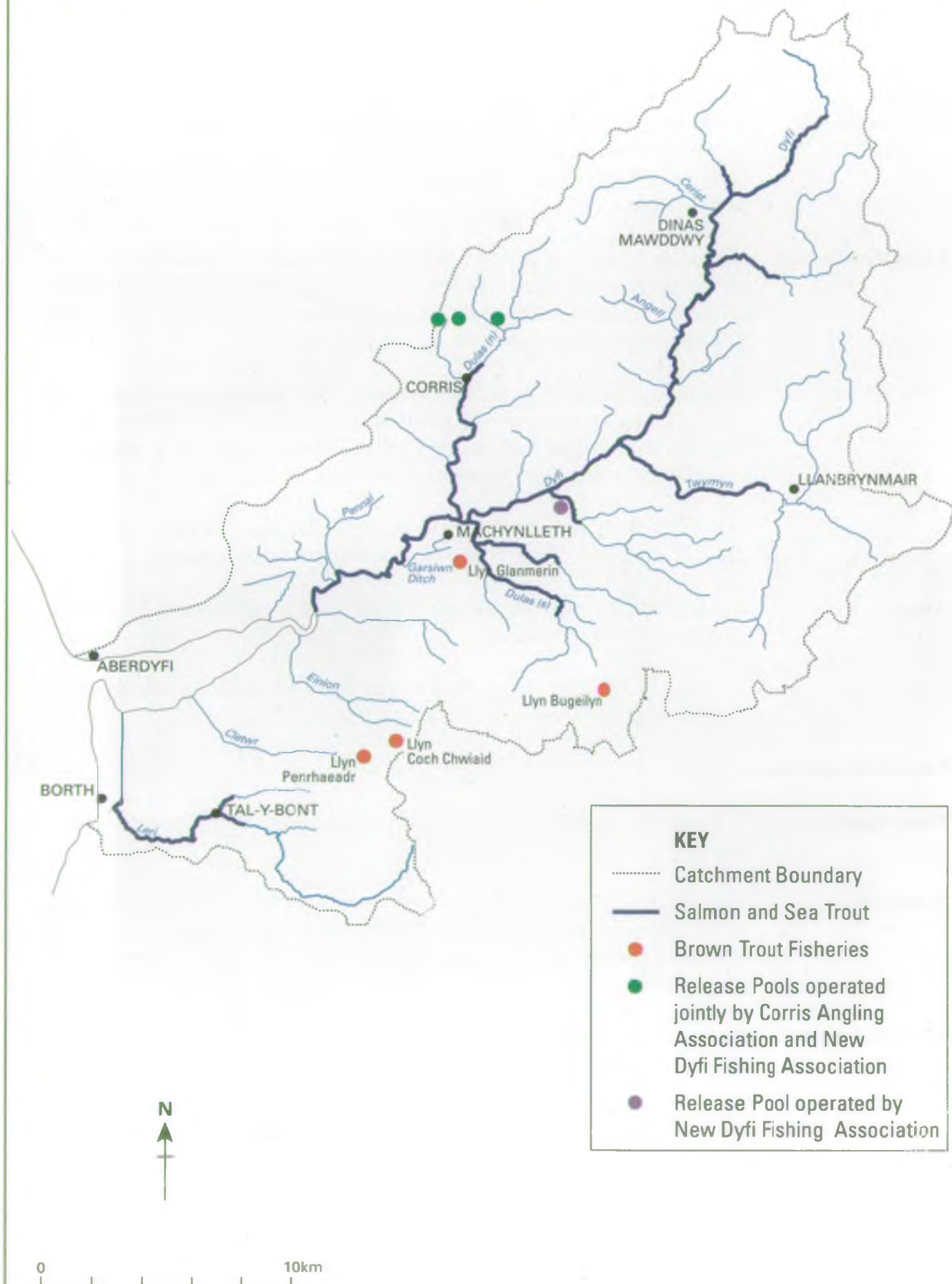


#### 4.12 BASIC AMENITY

<b>General Information</b>	Basic amenity relates to those activities that are principally land based but could by their nature, attract people to the river environment. Examples include walking, picnicking and bird watching. The main areas of concern are therefore the general aesthetic acceptability of the river corridor, access and public safety.
<b>Local Perspective</b>	<p>The amenity value of the river corridor and estuary in terms of available access and facilities is generally low. There are no public footpaths along the estuary downstream of Glandyfi, and upstream they are disjointed. Upstream of Machynlleth, access along the river is very limited.</p> <p>Considering the importance of the estuary to birds, birdwatching facilities are poor, with the exception of the RSPB Reserve at Ynys Hir. Interpretation facilities are provided both at Ynys Hir and Ynys Las (CCW), but only 2 riverside picnic sites have been provided within the Plan area.</p> <p>One of the long term objectives of the Dyfi Biosphere Strategy will be to promote the estuary through better information and public access.</p>
<b>Aims</b>	<p>To maintain the watercourse so that the public enjoyment of bankside environment is not impaired.</p> <p>To provide safe and easy access to the waterside without unreasonably constraining other Uses.</p>
<b>Environmental Requirements:</b>	
<b>Water Quality</b>	Water quality should be maintained at a level appropriate to prevent aesthetic nuisance.
<b>Water Quantity</b>	The NRA has the task of balancing the needs of the environment, with those of the abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.
<b>Physical Features</b>	<p>An appropriate network of riverside paths and access points should be maintained and, where appropriate, promoted.</p> <p>The development of recreational sites should be promoted at suitable locations as opportunities arise.</p> <p>Development of recreational uses of the catchments should take account of their potential impact on the environment and other uses.</p>

MAP 19.

# ANGLING



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#### 4.13 ANGLING

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**General Information**

This section deals with the recreational activity of fishing with rod and line, rather than the protection of fish stocks. The latter are dealt with in the Fisheries section.

In many ways the requirements for angling are very similar to those for the basic amenity use. However, we do have formal responsibility towards angling, and issue rod licences that are a legal requirement for fishing for any freshwater fish. The income generated by licence sales contributes to fisheries management costs.

Traditionally, in Wales, game fishing for salmon and trout has been the predominant form of freshwater angling, although coarse fishing for other freshwater species is locally popular in many areas. Angling for sea fish takes place at many sites covered by Catchment Management Plans. However, we have neither control of, nor responsibility for, sea angling and it is not covered specifically in CMPs.

**Local Perspective**

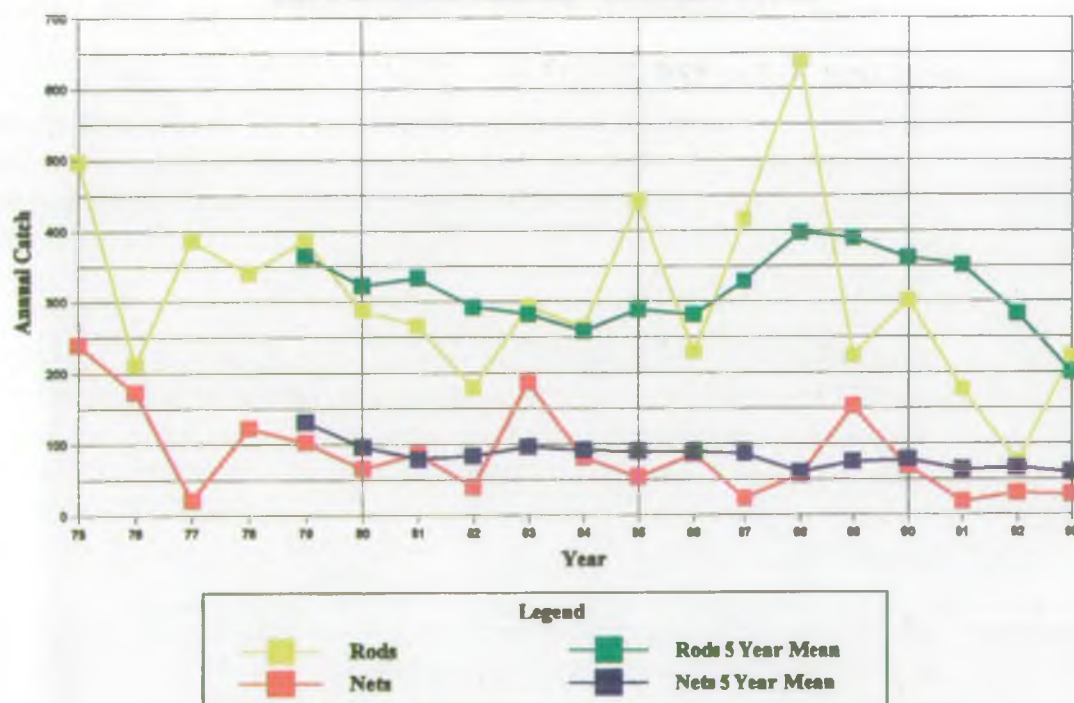
The Dyfi is highly regarded as an important sea trout fishery and also has a significant salmon catch.

Over the last ten years annual sea trout angling catches averaged in excess of 1,000, with the peak catches being taken in July. Over the same period, annual salmon catches have averaged around 300 with peak catches being taken during the months of August, September and October. Although the Dyfi does not have a significant spring salmon run, a few fish are usually caught in April and May. There is however a very significant run of late run salmon (bluebacks) that enter the river after the angling season and continue to spawn until the middle of February.

The majority of the fishing is under the control of the New Dyfi Fishery Association based in Machynlleth. Other angling clubs with significant waters are, the Powys and District Angling Association, which has waters on the Dulas (n), and the Prince Albert Association whose main water is on the Dulas (s).

Historically, catches of salmon and sea trout show considerable variation (see Figures 1 and 2). In recent years the catches of sea trout have shown a significant decline, whereas, salmon catches have remained relatively constant.

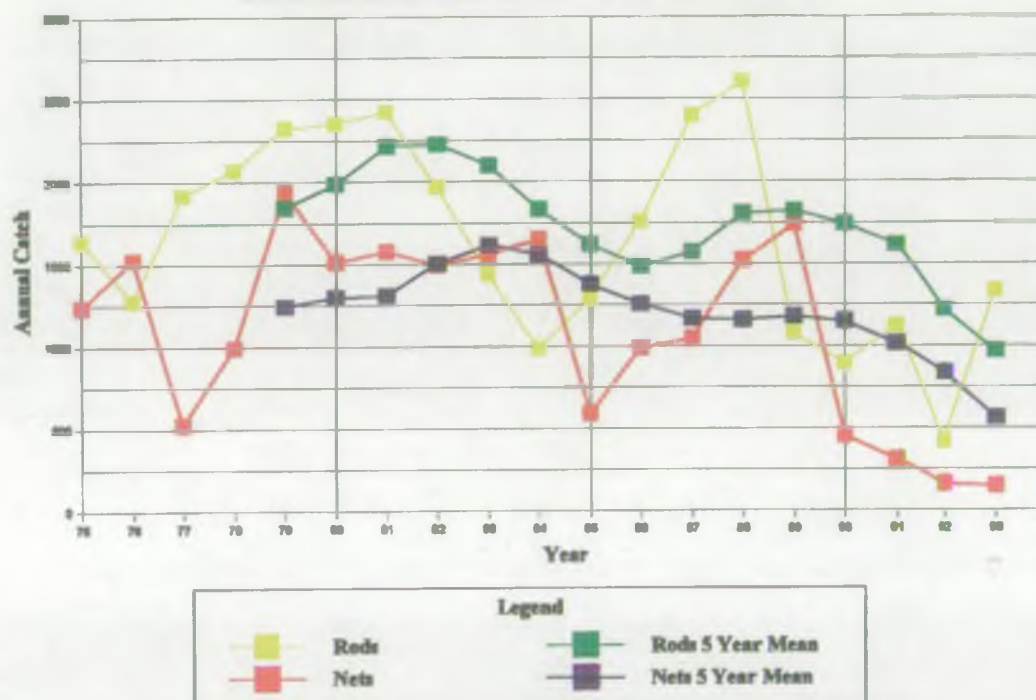
FIG 1 ANNUAL SALMON CATCHES 1975-93



From 1991 catches are lower, due in part to the introduction of a national return system which resulted in fewer rod licence holders making a return.

For the last 8 years, we have undertaken a joint hatchery/fish rearing operation with the Corris Anglers on the Dulas (n). We obtained broodstock sea trout and reared the fish to the fed fry stage before stocking into a small natural release site in a quarry lake at Corris. Fish cages have been installed in this lake and the local angling club have reared the fish on to the parr/smolt stage, at which time the fish have been allowed to migrate. Although it has not been possible to monitor this project, local anglers consider it a success. During the last two years, the New Dyfi Fishery Association has expanded this project to include other sites in the Dyfi catchment, utilising sea trout reared at the private Dyfi Valley hatchery in the lower catchment. Although brown trout fishing is limited in the catchment, there are some good lakes, particularly in the headwaters of the Dulas (s) such as Llyn Bugeilyn a noted wild brown trout fishery. We also recently assisted the Llanbrynmair anglers in introducing local brown trout into Llyn Coch Chwiaid. In contrast, Llyn Glanmerin is operated as a put and take fishery.

FIG 2 ANNUAL SEA TROUT CATCHES 1975-93



From 1991 catches are lower, due in part to the introduction of a national return system which resulted in fewer licence holders making a return.

The angling season for migratory fish extends from the 20th March until the 17th October and for brown trout from the 30th March to the 30th September. Tighter restrictions, (31st May to 30th September), apply to brown trout fishing on the lower reaches downstream of the A487 Dyfi road bridge. Details of where to fish in the area are available from the NRA.

**Aim** To ensure that the water environment can sustain angling at least at its current distribution and quality.

#### Environmental Requirements

**Water Quality** Water quality should be maintained at a level appropriate to prevent aesthetic nuisance.

**Water Quantity**      The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

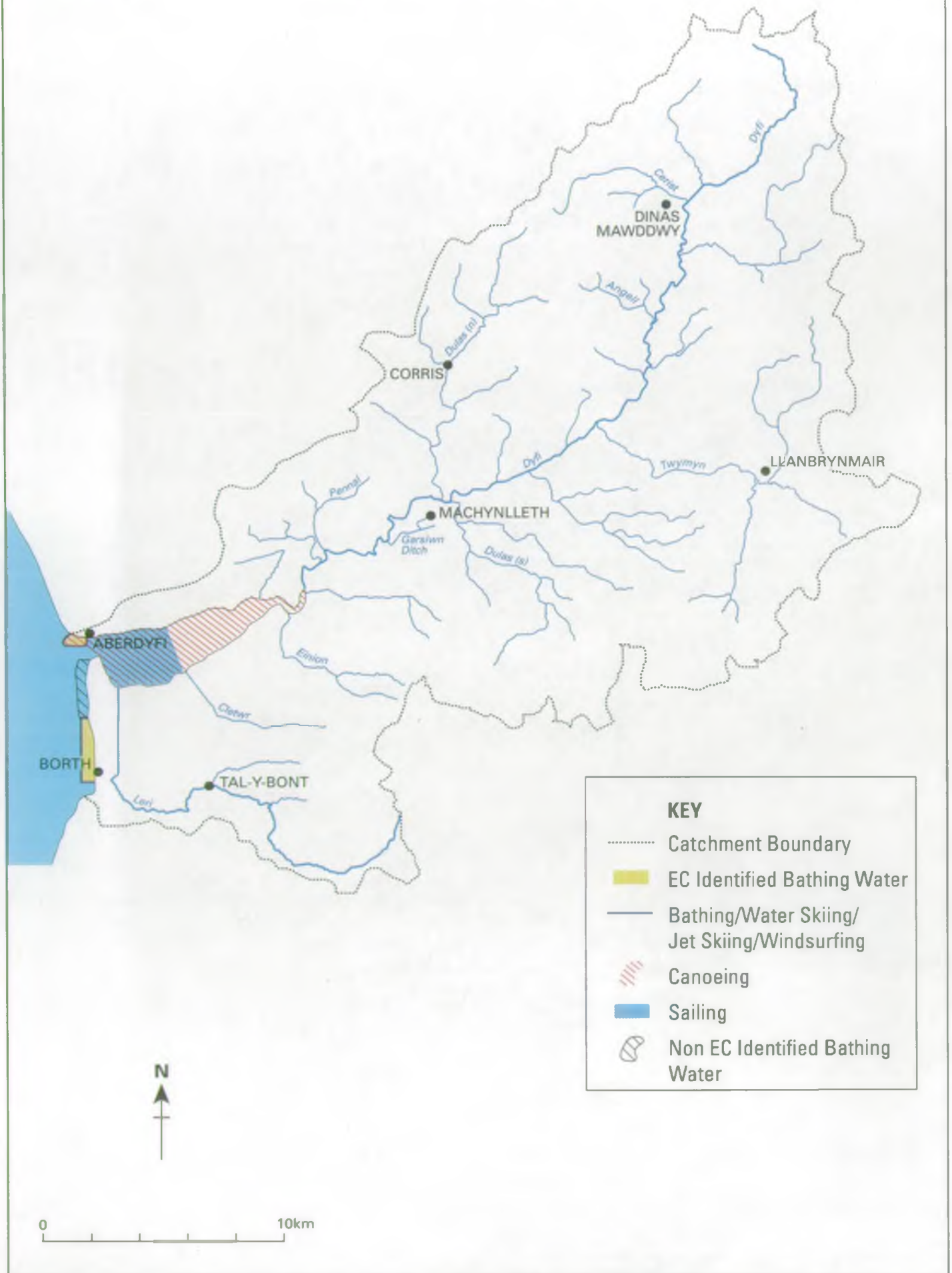
**Physical Features**      Safe access to and from the waterside should be promoted.

                                 The waterside features required for angling should be maintained and developed.



MAP 20.

# WATER SPORTS ACTIVITY



#### 4.14 WATER SPORTS ACTIVITY

<b>General Information</b>	<p>Waters used for sports and recreation fall into two broad categories; Identified Bathing waters and Water Contact/Recreational Use waters. Each category is treated separately below.</p> <p>It is possible that in the future this Use will be included within the proposed scheme of Water Quality Objectives being developed by the DoE.</p>
<b>Identified Bathing Waters</b>	<p>To be identified by the Department of The Environment (DoE)/Welsh Office (WO) as falling within the terms of the EC Bathing Waters Directive (76/160/EEC), several criteria are taken into consideration including: high numbers of bathers, first aid facilities, life guards and toilets. Identified waters are required to achieve the standards in the EC Directive and are sampled according to the DoE/WO guidelines during the bathing season (May to September inclusive). In Wales, these are exclusively saline waters.</p>
<b>Water Contact/Recreational Use Waters</b>	<p>All waters where water sports occur, other than identified bathing waters, fall into this second category. These could include rivers, stillwaters, estuaries and coastal water and may support activities such as canoeing or water skiing where total immersion is likely, or other non-immersion based recreation. Bathing may also take place. It should be noted that the NRA does not recommend bathing in freshwaters.</p>
<b>Local Perspective</b>	<p>Sport activities associated with the water environment are important attractions for the local tourist industry. Bathing activity is found at Aberdyfi, Borth and Ynys Las. Both the Aberdyfi and Borth beaches are identified under the EC Bathing Waters Directive.</p> <p>Other immersion sports, particularly water skiing and jet skiing have become increasingly popular in recent years. These activities mainly take place in the outer estuary seawards of Aberdyfi. Windsurfing takes place on both the identified waters and sailing is an increasingly popular activity, with Aberdyfi being the main centre. Several outdoor pursuit centres are based in the Dyfi Valley and all make use of the facilities at Aberdyfi.</p> <p>Canoeing is the main water contact sport that takes place on the fresh water reaches. Currently there are no management agreements between the canoe users and land owners. Access for canoeists on the freshwater reaches is problematic where permission must be sought from the riparian owners, or fishing clubs, before taking part in the sport.</p>

**Aim** To ensure that the catchment is maintained to an appropriate standard to support bathing in Identified Waters, and other water sports to at least their current levels of use at existing locations.

**Environmental Requirements:**

**Bathing in Identified Waters:**

**Water Quality** At Identified Bathing Waters (EC Directive), water quality should conform with the standards contained within the EC Bathing Waters and the EC Dangerous Substances Directives.

**Physical Features** Promotion of safe and easy access to and from Identified Bathing Waters.

**Water Contact/Recreational Use Waters:**

**Water Quality** Where marine waters are used for immersion sports, including bathing, we are guided on appropriate standards to protect public health by MAFF and local Environmental Health departments. We are unable to set bacteriological standards in CMPs for freshwaters where immersion sports or bathing take place, but waters should comply with the requirements of the EC Dangerous Substances Directive.

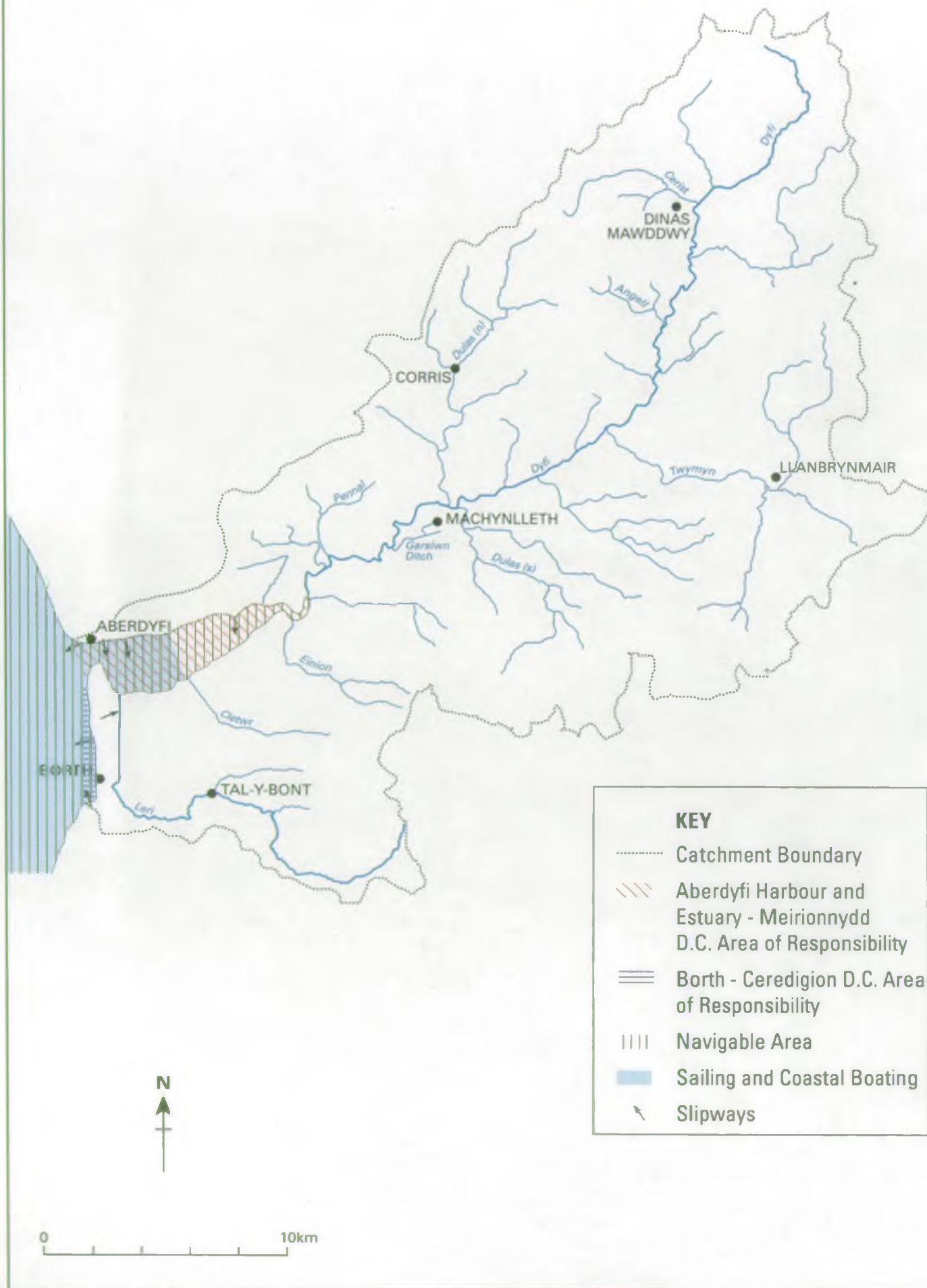
**Water Quantity** The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

**Physical Features** To protect and, when possible, improve access to contact/recreation waters.



MAP 21.

# NAVIGATION AND BOATING



#### 4.15 NAVIGATION AND BOATING

##### General Information

Navigation is considered to be the use of pleasure and commercial craft in waters that fall under our general control, where a right of navigation exists. This includes the maintenance of navigation aids (such as buoys, perches and marks) which are required for the safe passage of vessels.

In Wales the navigation authority is usually the local port or harbour authority who will liaise with us. However, in the Dee estuary we are the navigation authority. Elsewhere in tidal waters we have neither control over, nor responsibility for navigation.

While we are not the navigation authority for either of the two freshwater rights of navigation that exist in Wales we may under certain circumstances introduce byelaws to control navigational use of a river. We must also pay regard to the needs of those rights of navigation that do exist.

Boating is regarded as the use of boats for pleasure, rather than commercial purposes, and includes rowing, sailing and powered boats where no significant water contact is involved. Where no right of navigation exists, access to and use of the water is by formal or informal agreement of the land/fishery owners and our concern is principally for the participants' enjoyment of the activity.

##### Local Perspective

There is one sailing club, the Aberdyfi Yacht Club located in Aberdyfi. The club has approximately 250 members and it utilises mooring facilities within the harbour area. A public slipway is available in the harbour. Increasing numbers of power boats and coastal cruisers also make use of these facilities. Fishing parties are a lucrative source of income throughout the year and Aberdyfi is well known for deep sea as well as inshore fishing trips.

We do not have the responsibility for provision of navigation aids in this particular estuary. Access to the estuary upstream of Aberdyfi is restricted due to the presence of extensive tidal flats.

Trinity House is responsible for the maintenance of buoys and channel markers approaching the Aberdyfi harbour. Meirionnydd District Council is the Harbour Authority responsible for the navigation marks associated with the inner harbour. Ceredigion District Council has responsibility for perches etc off the beach at Borth.

**Aims**

To ensure that waters in the catchment can support boating and related activities to at least their current levels of use at existing locations, provided there is no detriment to other uses.

To encourage and support canoe access agreements on the rivers within the catchments.

Ensure that works to the river channel do not prejudice these activities as far as is practicable.

**Environmental Requirements:**

**Water Quality**

Water quality should be maintained at a level appropriate to prevent aesthetic nuisance.

**Water Quantity**

The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

**Physical Features**

Where waters under the control of the NRA are used for navigation no obstruction to the passage of vessels should be created.

Any maintenance of navigation channels or aids to navigation should take into account other uses of the water.

Areas used for boating should be protected from development that would constrain this use.

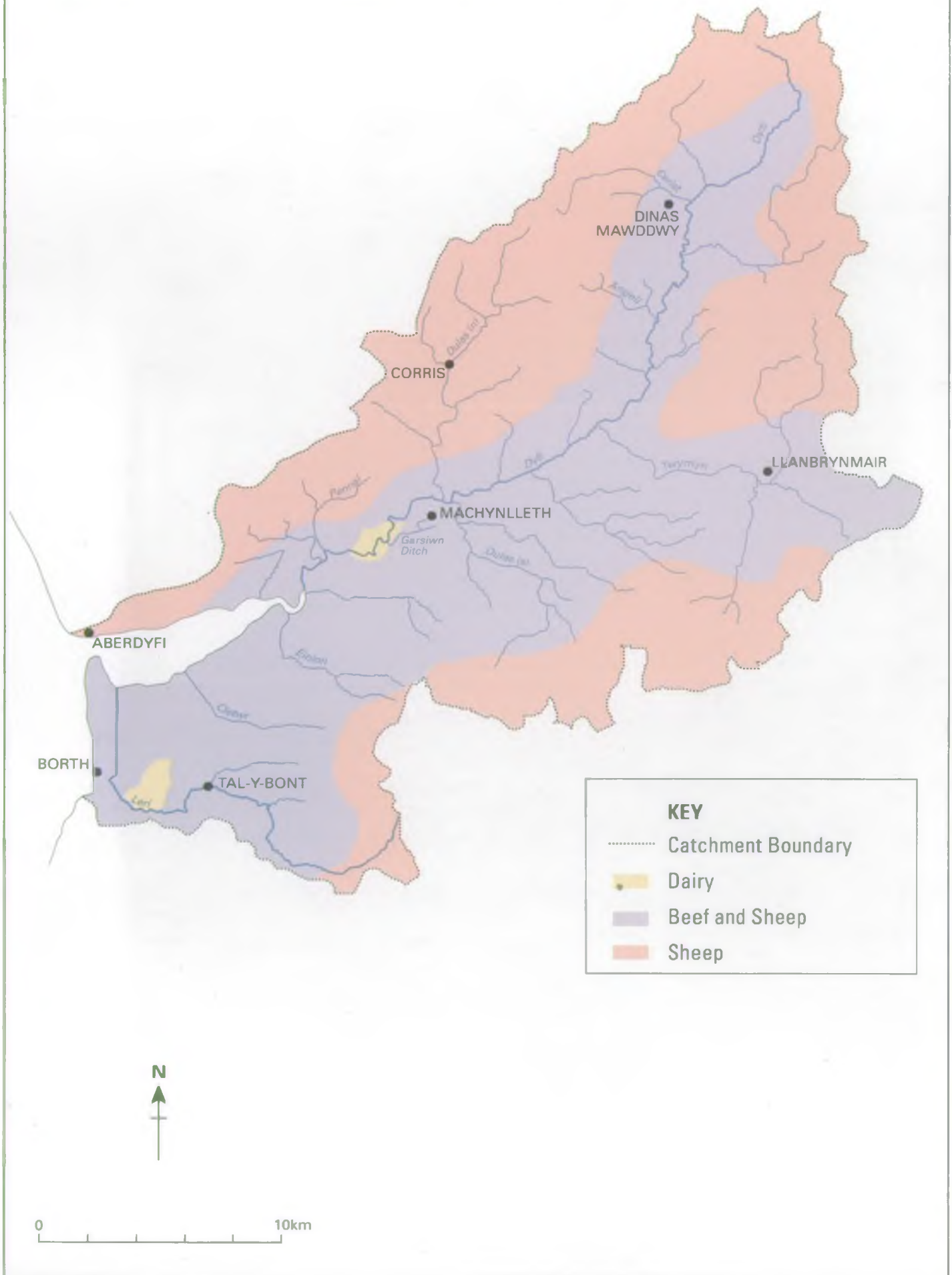
The encouragement and promotion of safe access points for boating, where appropriate.

Features required for navigation or boating should be maintained and enhanced where appropriate. This would include adequate freeboard and freedom from obstructions.



MAP 22.

AGRICULTURAL ACTIVITY



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#### 4.16 AGRICULTURAL ACTIVITY

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**General  
Information**

The processes and by-products of agriculture are a major potential threat to the water environment, especially in more intensively farmed areas. Our key areas of concern include:-

- pollution by animal and other agricultural wastes;
- contamination of groundwater and surface waters by fertilisers and other agro-chemicals;
- the effects of land drainage on water tables and water courses;
- the impact of uncontrolled stock grazing on river banks;

Where there is a specific discharge of effluent from a farm site this will be dealt with via the general discharge consenting process described in the discharge uses sections. However, the highly polluting nature of agricultural waste normally precludes this option and our approach is aimed at control at source by minimising the volumes of effluent produced and stored. Often it is background pollution caused by large numbers of diffuse discharges that causes the most significant impact and these are of greater concern to us. Consequently we have worked closely with farming organisations to develop waste handling guidelines that seek to control this type of pollution. The Authority can also enforce legal minimum standards for new silage, slurry and agricultural fuel oil installations. In key areas our programme of farm visits helps to alert farmers to potential and existing problems.

We issue codes of practice for the use of fertilisers, herbicides and pesticides, to protect the water environment and, in certain places (Nitrate Sensitive Areas), may control the application of fertilisers to protect groundwater supplies.

Farmers are encouraged to fence riverbanks to prevent uncontrolled access by stock. Cattle and sheep can severely damage riverbanks in a way that can lead to channel instability, increased flood risk and a marked reduction in the fisheries and conservation value of the river.

Fish farming can severely affect a watercourse by diverting a large proportion of the flow through the farm, leaving a length of the river reduced in flow. The requirement for an adequate residual flow can restrict the viability of a fish farm.

**Local Perspective**

The catchments support a wide range of agricultural activities. The upper reaches are predominantly sheep farming with a progressive change to mixed beef and sheep moving down the valleys. Although pollution risks from sheep farms are minimal, there remains a very real risk when dipping takes place. Guidance is given to farmers on how to avoid contaminating surface water or groundwater during the use and disposal of dipping liquids.

The more fertile lowlands support a number of large dairy units. The operation of these units, including the mixed beef farms, has intensified in the past 20 years. In some cases, this has occurred without comparable investment in effluent handling and storage facilities. The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 have begun to set new standards of construction and management. This will serve to reduce the incidence of agricultural pollution.

Farm catchment inspections will continue during the lifetime of this plan as part of our routine resource protection measures.

The Dyfi Valley Trout Farm, located just upstream of Machynlleth on the confluence of the Dulas (s) and the main Dyfi, rears some 200,000 fingerling trout and some 12,000 adult trout per year. The majority of the fish are rainbow trout which are sold to other farms or angling associations rearing units for growing on. The rest are a mixture of brown trout and sea trout which are sold to angling clubs for stocking into local rivers.

**Aim**

To protect the water environment from the potential adverse effects of agricultural activity.

To protect the quality and volume of groundwater by implementing the NRA's Groundwater Protection Policy.

**Environmental Requirements:**

**Water Quality**

Discharges should comply with all the conditions stated within the discharge consent. This will be enforced by the NRA.

The codes of practice for the handling and use of Pesticides, Herbicides and Fertilisers should be strictly followed.

Where applicable, the management practices set out for Nitrate Sensitive Areas should be strictly followed.

The Code of Good Agricultural Practice for the Protection of water should be complied with as should the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991.

**Water Quantity**

The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

Agricultural activities must be designed and managed to prevent liquid effluent from adversely affecting the quality of surface and groundwaters.

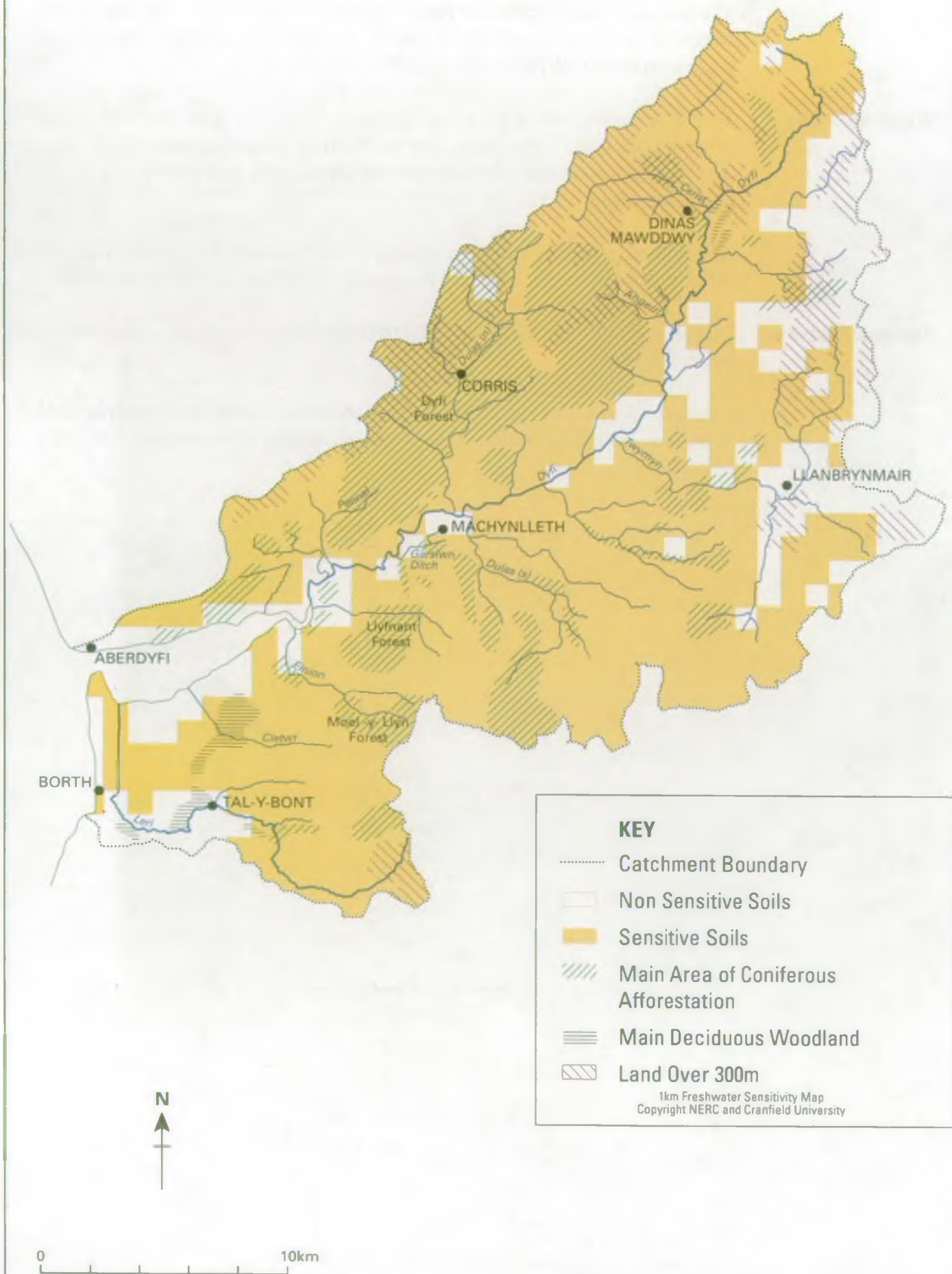
**Physical Features**

Land drainage activity should not adversely affect the fishery and conservation value of rivers.

Agricultural processes should not lead to a reduction in the quality of physical habitats of fishery and conservation value nor increase river instability or flood risk.

MAP 23.

# FORESTRY



#### 4.17 FORESTRY

**General Information** Well managed woodland in the right places does not harm the water environment and will often bring benefits. However, in certain circumstances forestry development and management can cause problems. Areas of concern to the NRA, nationally, include acidification, soil erosion, pollution, water yield, increased flooding risks and damage to wildlife habitats.

While we have duties and powers to regulate some forestry works, overall regulation of forestry is the responsibility of the Forestry Authority. In recognition of the potentially harmful impact of poorly managed forest development, the Forestry Authority has published The Forests and Water Guidelines, against which all forest operations are assessed.

We are currently consulted on a non-statutory basis on applications for new planting under the Woodland Grant Scheme (where considered necessary by the Forestry Authority) and in relation to acid sensitive areas documented in the Forest and Water Guidelines. However, we are seeking improved national links with the Forestry Authority to achieve a consistent and effective approach to the general environmental assessment of forestry schemes and operations, including felling and restocking.

To ensure that the water environment is properly considered, we will continue to liaise with Local Authorities, the Forestry Authority and local forest managers about the production of Indicative Forest Strategies, and general forest management issues.

**Local Perspective** The Map (Map No 23) shows acid sensitive areas generalised from Institute of Terrestrial Ecology data together with the main areas of afforestation. There are a number of forests within the catchments, the largest one being the Dyfi forest on the Dulas (n). However, areas vulnerable to increased acidification due to forestry development are restricted to those above 300 metres in altitude.

Acidification can occur in all the upper reaches of the Dyfi catchment, mainly as a consequence of acid deposition (both wet and dry) on to base- poor geology and naturally peaty upland soils. This phenomenon is exacerbated by the presence of conifer afforestation where the forest canopy enhances the capture of acid producing compounds such as sulphur and nitrogen from the atmosphere. It is not surprising therefore that the most prominent occurrences of acidic events have occurred on the upper reaches of the Dulas (n), Einion and the Pennal, all of which have a high percentage of mature conifer afforestation.

Further consultation and discussion on possible action to mitigate against adverse effects on water quality will occur during the life of the plan. It should be noted that due to the highly sensitive soil conditions, acidic waters can occur at all flows throughout the catchments.

**Aims**

To protect the water environment from the potentially negative effects of forestry activities.

To encourage forestry practices that improve the water environment.

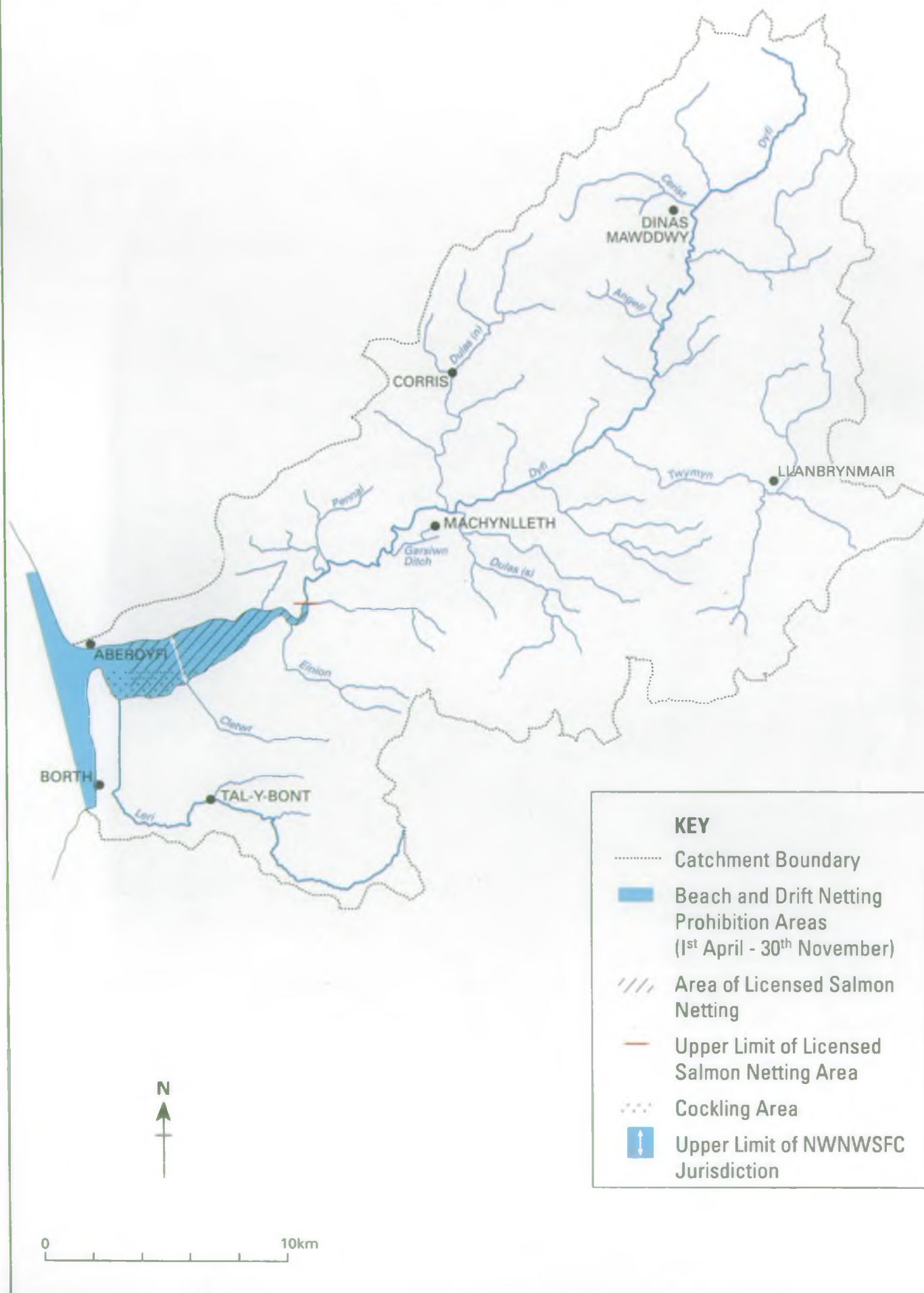
**Environmental Requirements:**

The Forests and Water Guidelines should be followed.



MAP 24.

# COMMERCIAL FISHING



#### 4.18 NET FISHING FOR SALMON, TROUT AND EELS

##### **General Information**

This Use is principally concerned with the use of nets and other types of gear to catch migrating eels, salmon and trout. Other than sea fish, migrating adult salmon and sea trout are the main quarry for net fisheries in Wales and these are restricted to coastal waters and estuaries. The number of these fisheries is closely controlled by Net Limitation Orders and Byelaws which are designed to conserve stocks. We license salmonid net fisheries within the terms of the Orders and enforce Byelaws. In many places the fishing techniques allowed reflect local culture, and consequently in Wales there is a very wide variety of fishing methods employed. These range from coracles and nets to ranks of fixed traps, called putchers, which have significant heritage interest.

We also license net fishing for eels. While there is no limit to the number of licences that can be issued, we specify certain methods that can be employed, and may refuse to issue a licence for a location if we feel that fish stocks could not support the fishery, or that the migration of salmon and trout could be impaired.

##### **Local Perspective**

Six draft net licences for salmon fishing are available from us annually under the terms of a Net Limitation Order. Nets which are controlled by byelaw, are allowed to operate in the Dyfi estuary, downstream of a line from the marker post just south of the railway bridge, between 1st April and 31st August. In recent years the average salmon catch has declined to around 30 in total and the average sea trout catch to around 150 in total. This is partly due to a decrease in the uptake of the net licences, with only three being issued in 1994.

Coastal netting is controlled by the North Western and North Wales Sea Fisheries Committee (NWNWSFC) and byelaws agreed with us are enforced to protect the salmonids on their return from migration into freshwater. This is achieved by prohibiting beach and drift netting in a designated area from Borth to north of the Dyfi estuary during the period 1st April to 30th November inclusive. Elsewhere along the coast such netting is permitted within the terms of the NWNWSFC byelaws but, any salmon or sea trout accidentally captured must be returned immediately.

##### **Aim**

To ensure that net fishing takes place in a manner that does not over-exploit fish stocks or interfere with other legitimate uses of the water environment.

**Environmental Requirements:**

**Water Quality**      Water quality should be maintained at a level appropriate to prevent aesthetic nuisance: fish stocks are protected by the provisions within the Fisheries and River Ecosystem Uses (Sections 4.4 & 4.5)

**Water Quantity**      The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

**Physical Features**      To enforce the provisions of the Net Limitation Orders and Byelaws to ensure that stocks of salmon and sea trout are not endangered by net fishing.

To license and regulate net fishing for eels and non-salmonid freshwater fish to protect stocks.

To minimise conflict between the requirements of different fisheries.

Access points for net fisheries should be protected.

#### 4.19 COMMERCIAL HARVESTING OF SEA FISH AND SHELLFISH

<b>General Information</b>	Commercial fishing for sea fish and shellfish is controlled by a variety of laws and EC Directives. The NRA has some responsibility for each type of fishery although this is often shared with others, such as Local Authorities, Sea Fisheries Committees and the Ministry of Agriculture, Fisheries and Food (Welsh Office Agriculture Department, in Wales).
<b>Sea Fisheries</b>	<p>Sea fisheries are regulated by local Sea Fisheries Committees who control fishing sites and methods using bylaws that are drawn-up, where appropriate, in consultation with us.</p> <p>In Wales the Welsh Office monitors fish stocks and catches and is responsible for the registration of fishing vessels and enforcement of quotas.</p> <p>Environmental Health Departments monitor the health and quality of fish flesh.</p> <p>While we have responsibilities in some coastal waters our main concern is the protection of migrating salmon and sea trout, although in some places we have powers (by agreement with local Sea Fisheries Committees) to enforce the protection of bass stocks in coastal waters.</p>
<b>Shellfisheries</b>	<p>Like sea fisheries, shellfisheries (not including crabs, lobsters and other crustacea) are regulated by several different authorities, including the NRA. The shellfish themselves are protected by the provisions of the EC Shellfish Waters Directive that allows us to protect and monitor water quality in designated shellfisheries. However, the Menai Strait is the only commercial shellfishery in Wales that has been designated under this Directive.</p> <p>Shellfish are known to concentrate materials such as toxic algae, metals and pathogenic bacteria which can be harmful to people who eat them. Thus the quality of shellfish harvested for sale for human consumption is protected by the EC Shellfish Hygiene Directive that is administered by environmental health departments and MAFF (Welsh Office Agriculture Department, in Wales). So far about 30 sites in Wales have been designated under this directive.</p>
<b>Local Perspective</b>	<p>Some commercial fishing takes place in inshore coastal waters by boats from Borth and Aberdyfi. The main catches are skate, mackerel, herring and bass.</p> <p>The fishing for bass in the Dyfi estuary is the subject of national control. Juvenile bass predominate in the estuary during the summer months and the estuary has been designated as a nursery area. It is prohibited to fish for bass between 1st May and 31st October. Although the restriction does not apply to fishing from the shore, it is expected that shore anglers and their associations</p>

will respect the need for conservation and return any bass caught within the nursery area. There are no established local shellfisheries but, in recent years some people have started to harvest cockles, particularly on the south side of the estuary. Most of the activity falls within NWNWSFC jurisdiction. A small area, particularly on the southern side, is upstream of the sea fisheries limit and falls under our control.

**Aims** To maintain and where possible enhance, marine and shellfisheries.

To protect migrating salmon and sea trout from interference by marine fishing activities.

### **Environmental Requirements:**

#### **Marine Fisheries**

**Water Quality** Discharges to coastal waters should be controlled to meet the requirements of the EC Dangerous Substances Directive.

**Physical Features** Marine fishing activities should not interfere with the migration of salmon or sea trout.

The physical marine environment should not be altered in a manner that would affect migratory fish stocks.

To enforce statutory measures that protect bass and other sea fish stocks, where appropriate.

#### **Shellfisheries**

**Water Quality** Discharges to coastal waters should be controlled to meet the requirements of the EC Dangerous Substances Directive.

Water quality at shellfisheries designated under the EC Shellfish Waters Directive should comply with the appropriate standards. The Shellfish Hygiene Directive has no associated target classes and therefore no Environmental Requirements can be set.

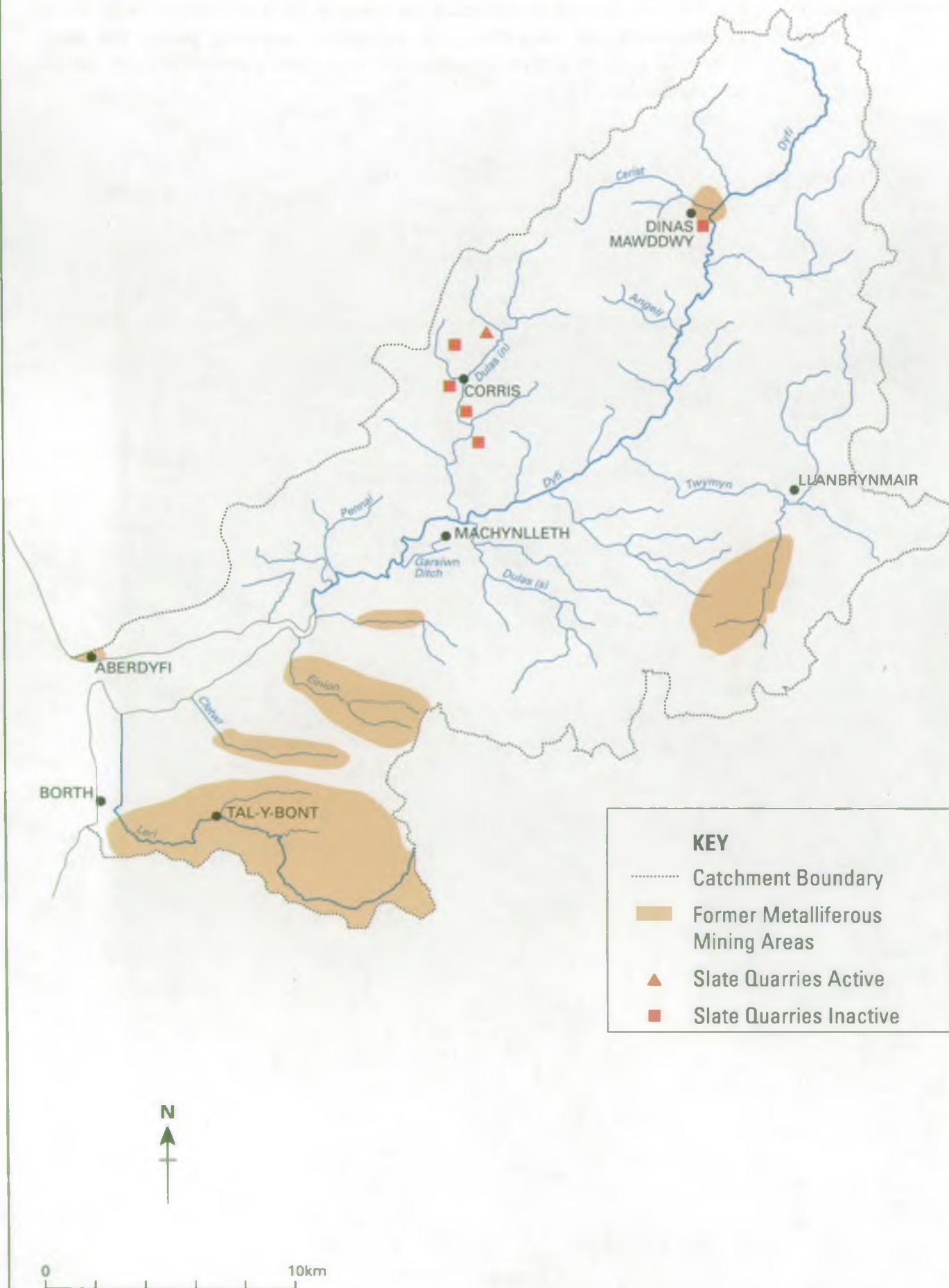
Where a recognised commercial shellfishery has not been officially designated under the EC Shellfish Waters Directive, we will, for the purpose of setting informal targets for Catchment Plans, be guided by the provisions of that directive.

**Water Quantity**

The NRA has the task of balancing the needs of the environment, with those of abstractors and other users. An abstraction licensing policy has been developed to ensure that this is carried out consistently and effectively for all new abstractions.

MAP 25.

# MINERAL EXTRACTION



## 4.20 MINERAL EXTRACTION

### General Information

Mineral extraction can affect surface and groundwaters in a wide variety of ways. Discharges from active quarries and mines can contain toxic and suspended materials that are harmful to aquatic life and are subject to the normal discharge consenting procedure described in the Discharge Uses section. However, discharges from abandoned mines are not adequately controlled by the law and may cause locally severe problems.

The exploitation of minerals can have major impact on water resources by altering groundwater flows and hence affecting streamflows. The removal of material from above the water table reduces the opportunity for natural filtering and attenuation of pollutants, which will consequently enter groundwater more readily. Summer springflows can be reduced as a result of the loss of the water storage capacity of the mineral that has been removed. Reclamation with impermeable materials will increase run-off and reduce the recharge of groundwaters by rainfall.

Open cast mining can be of particular concern to us. These mines can also affect the fishery and conservation value of long lengths of diverted river as well as groundwater quality and quantity.

Gravel extraction may take place from the river channel or floodplains and is controlled by planning law, but may also require a land drainage consent from the NRA. If works are not properly managed, the river channel can be seriously damaged by gravel removal.

In some areas land reclamation schemes may cause renewed problems as toxic metals are exposed or fine solids run off into watercourses. Consequently we license and monitor such discharges.

All mineral workings are subject to general planning control and we are consultees on such applications and considers each application on a case by case basis.

### Local Perspective

#### Metal Mining

A considerable amount of mining activity has occurred within the catchments. Some of the mines date back to Roman times. Literature on past mining activities indicate that the area yielded lead, copper, zinc, silver and gold in that order of abundance. There are no active mines and very little is known about the effect of the drainage from the historical workings. Most of the mining areas have now been obscured by dense conifer plantations.

One of the more well known mining sites, Dylife, is located on the upper reaches of the Twymyn. It is reported to have produced up to 1,000 tons of

lead per annum between the 1850s and 1870s. There are elevated metal levels in the Twymyn downstream of this site. An investigation will be required to ascertain whether the levels are attributable to point sources. If they are, possible remedial action to mitigate against their effects can be proposed.

At a much smaller site in the Einion valley, Dyfed County Council has recently carried out some reclamation work. This included the capping of old slime pits (settling tanks for water used to process the ore) with a low permeability cover made of polyethylene plastic. The cover is to exclude rainfall and thus reduce the risk of any residual metals leaching into the adjacent Einion.

#### Quarrying

Significant quantities of slate were historically produced in the Dulas (n) valley. However, there is only one active site in the Plan area. This site, at Aberllefeni, is owned by Wincilate Ltd. and produces a variety of slate products. There are no known problems associated with the current or previous quarrying activities.

#### **Aims**

To ensure that mineral extraction and associated activity, including land reclamation, does not adversely affect the water environment.

To protect the quality and volume of groundwaters by implementing the NRA's Groundwater Protection Policy.

#### **Environmental Requirements:**

##### **Water Quality**

All consented discharges must comply with the conditions stated within the consent. This will be enforced by the NRA.

There should be no significant deterioration in the quality of waters receiving discharges beyond that assumed when setting the discharge consent.

Measures must be taken to prevent diffuse pollution that may arise from rainfall run-off.

##### **Water Quantity**

Mineral working and land reclamation should not have an adverse effect on surface and groundwater resources or the rights of licenced water abstractors.

##### **Physical Features**

Mineral working, land reclamation and associated activity should not reduce the quality of the physical habitats available in the water environment.

The aesthetic quality of restored landscapes should be in keeping with the overall nature of the catchment and reflect the local needs for amenity and recreation.

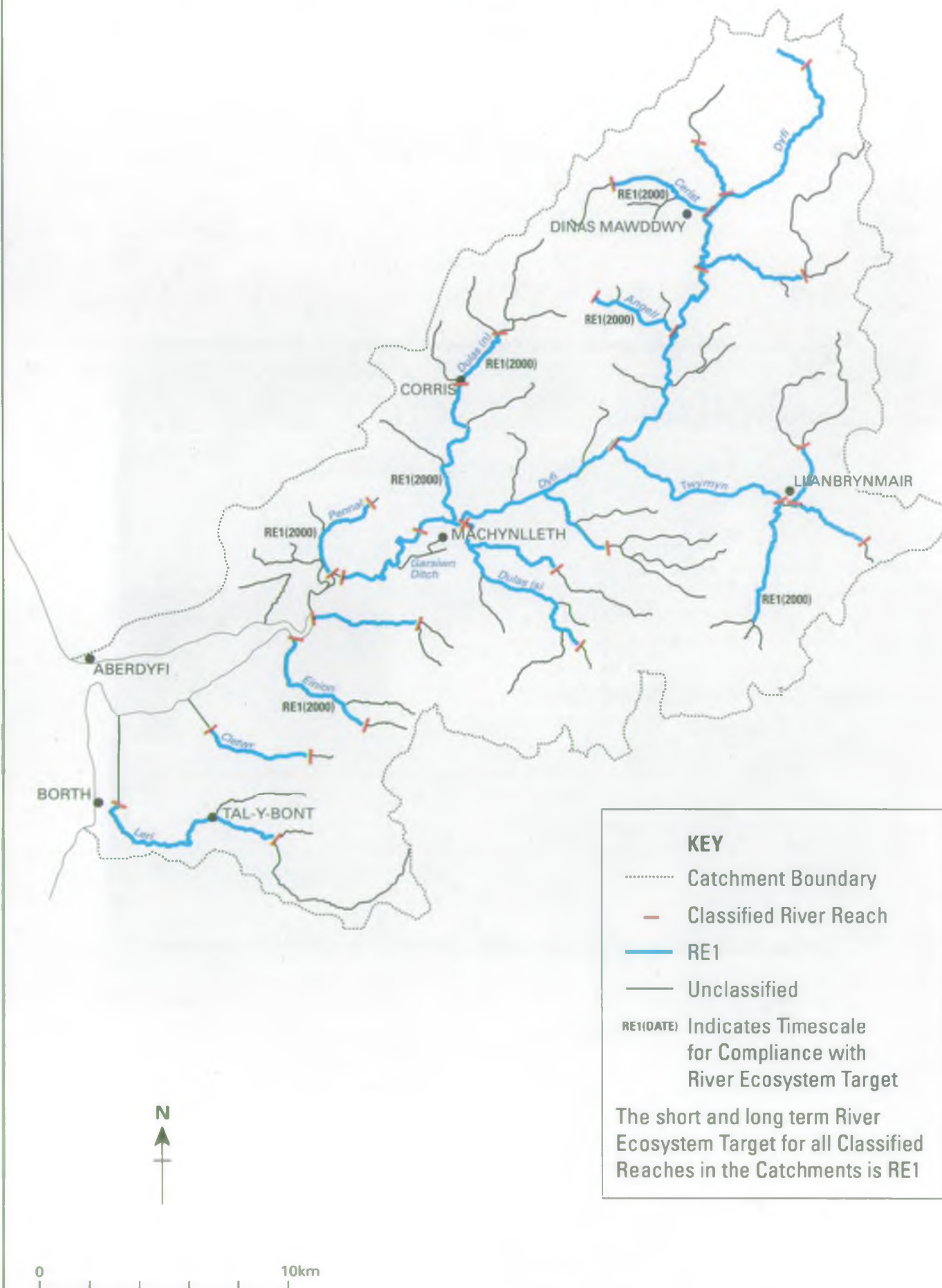
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## 5.0 CATCHMENT TARGETS

In this section targets are set for:-

- Water Quality
- Water Quantity
- Physical Features
- These targets reflect the needs of the Uses identified for any area of the catchment and are set using the guiding principles of:-
  - Sustainable development
  - Environmental capacity

**MAP 26. WATER QUALITY TARGETS - RIVER ECOSYSTEM**



## 5.1 WATER QUALITY TARGETS

### General

Section 4 of this report identified the many Uses to which the Dyfi and Leri catchments are put, and the appropriate water quality requirements of each Use. These requirements provide the basis for setting targets to ensure the protection of legitimate Uses.

Targets are commonly derived from water quality standards contained in relevant EC Directives such as those concerning Dangerous Substances, Freshwater Fisheries and Bathing Waters. These targets are applied on a statutory basis in certain parts of the catchment. Elsewhere we may informally apply standards contained within appropriate EC Directive to provide planning targets for the protection of legitimate Uses.

### SWQOs

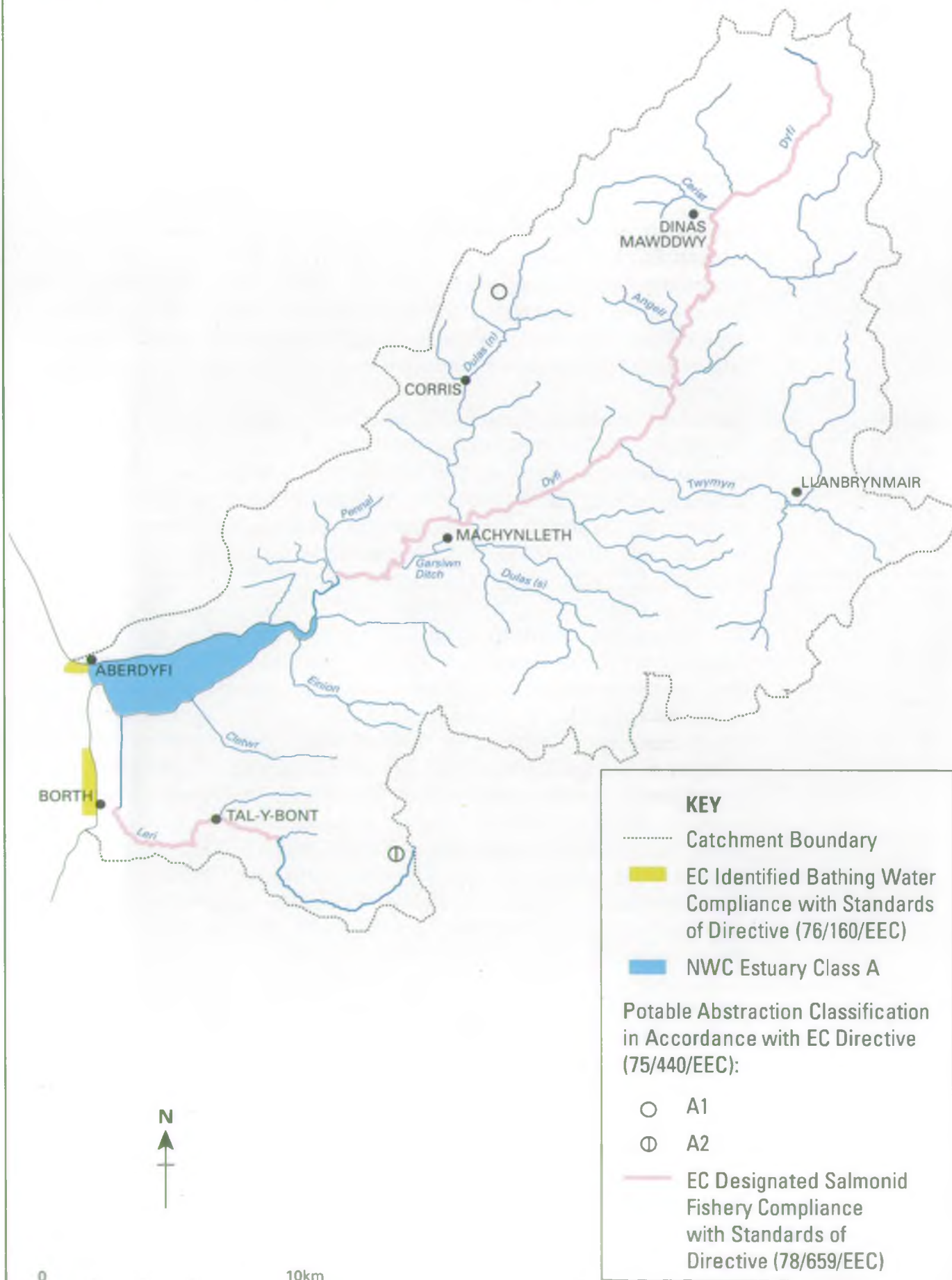
Provision for setting Statutory Water Quality Objectives (SWQOs) in controlled waters was made under the Water Resources Act (1991). The scheme is based on recognised Uses to which a river may be put and includes River Ecosystem, Potable Abstraction, Agricultural/Industrial Abstraction and Watersports. At present only standards for the River Ecosystem Use have been formally developed and were introduced by the Surface Waters (River Ecosystem) (Classification) Regulations 1994.

The Government is currently conducting a pilot implementation of SWQOs following which it is hoped they will be applied more widely. Until then objectives proposed using the River Ecosystem scheme in this CMP will remain informal. They will however, form the basis of our approach to water quality management (replacing the National Water Council scheme). In this CMP we propose two RE objectives for each river stretch. The first, or long-term objective, represents our aspiration for water quality. Attaining this level of quality may not always be possible during the lifespan of a CMP (5-10 years) therefore we also propose a second RE objective. This reflects what improvements in water quality are achievable during the CMP's lifespan and therefore represents an interim objective which will be reviewed periodically. It is these interim objectives which will be given a statutory basis when and if implementation of the SWQO scheme proceeds.

Where Uses are not supported by formal water quality standards we may set informal targets to protect a particular Use. These then provide additional water quality planning targets. Such standards have been developed for example to protect migratory salmonid fish in estuarine waters.

### Specific Catchment Targets

20 uses have been identified within the catchments, each with its own water quality requirements. The accompanying maps (Map 26 and 27) shows which Uses are the most demanding in terms of water quality for the different reaches. Map 26 shows that the main rivers Dyfi and Leri and all the major



tributaries have a River Ecosystem target of RE1. This reflects the very good water quality of the catchments (predominantly salmonid requiring a target of River Ecosystem classes 1 or 2) from the headwaters to the tidal limit. The quality target for the estuary of the Dyfi and Leri is NWC Class A (map 27) and for the identified bathing waters at Aberdyfi and Borth there is a need to comply with the mandatory standards contained in the EC Bathing Waters Directive (76/160/EEC).

Compliance with the EC Freshwater Fisheries Directive (78/659/EEC) Salmonid Waters standards is the target for those stretches designated under that directive (Map 27). High quality water is also required to protect flora and fauna, especially otters, dippers and rare aquatic insects.

Where a potable abstraction occurs, the River Ecosystem standards are augmented by those from the EC Surface Water Abstraction Directive (75/440/EEC). The different classification (A1, A2) shown in Map 27 for potable abstractions reflects the different type of treatment required for the current quality of water abstracted, and the quality of water and treatment remain as the targets for this use.

To protect the other Uses in the catchments, the need to ensure that all discharges comply with environmentally sensitive consent conditions remains a target of high priority. By the end of 2005 all public sewage discharges should comply with the requirements of the EC Urban Waste Water Treatment Directive. It is likely that most discharges incorporated into AMP2 will meet these standards at an earlier date.

The prevention of groundwater contamination is one of our major objectives. We require all those whose activities may compromise groundwater quality to have regard to our Groundwater Protection Policy. Activities of particular significance in this context are:

- (i) waste disposal to land
- (ii) disposal of slurries and sludge to land
- (iii) physical disturbance of aquifers affecting quality and quantity
- (iv) contaminated land
- (v) diffuse pollution

It is important to note that the definition of 'controlled water' provided by the Water Resources Act, 1991, includes groundwater.

## 5.2 WATER QUANTITY TARGETS

### General

The implementation of the Water Resources Act 1963 required almost all types of abstraction to be authorised by a licence. Pre-existing abstractions had to be granted a Licence of Right in 1965 that reflected the historical abstraction regime and could not take into account its impact. Subsequently, licences have been granted only if they do not adversely affect existing abstractors and the environment, or if conditions can be imposed which restrict their impact.

We take a precautionary approach to the granting of new licences, and will only grant them if we are confident that the available resources are able to sustain the proposed abstraction in the long term without harm to the environment or existing abstractors. We also regularly monitor the compliance of abstractors with licence conditions and enforce them as necessary.

We will adopt an abstraction licensing policy that will allow us to consider, in a structured way, the environmental needs of the river system and to balance these with the needs of abstractors. The policy will permit a review of the volume of existing abstractions in the catchments.

A methodology for the assessment and prioritisation of rivers that suffer artificially reduced flows is already in use. In Welsh Region we will use Catchment Management Plans to assist this process.

We will seek to balance the needs of existing and potential abstractors with those of the environment.

We have powers to limit abstraction and take other conservation measures in periods of drought.

### Flow Requirements

To prosper, the natural river ecosystem requires a certain flow, minimum flow or pattern of flows. While research towards identifying these specific needs is underway, an interim minimum flow has been set. For most rivers this is equivalent to the flow that would, on average, be exceeded for 95% of the time (Q95). Although new abstractions would not generally be permitted to cause flows to drop below this level, rivers will naturally fall below it, from time to time.

### Water Level Requirements

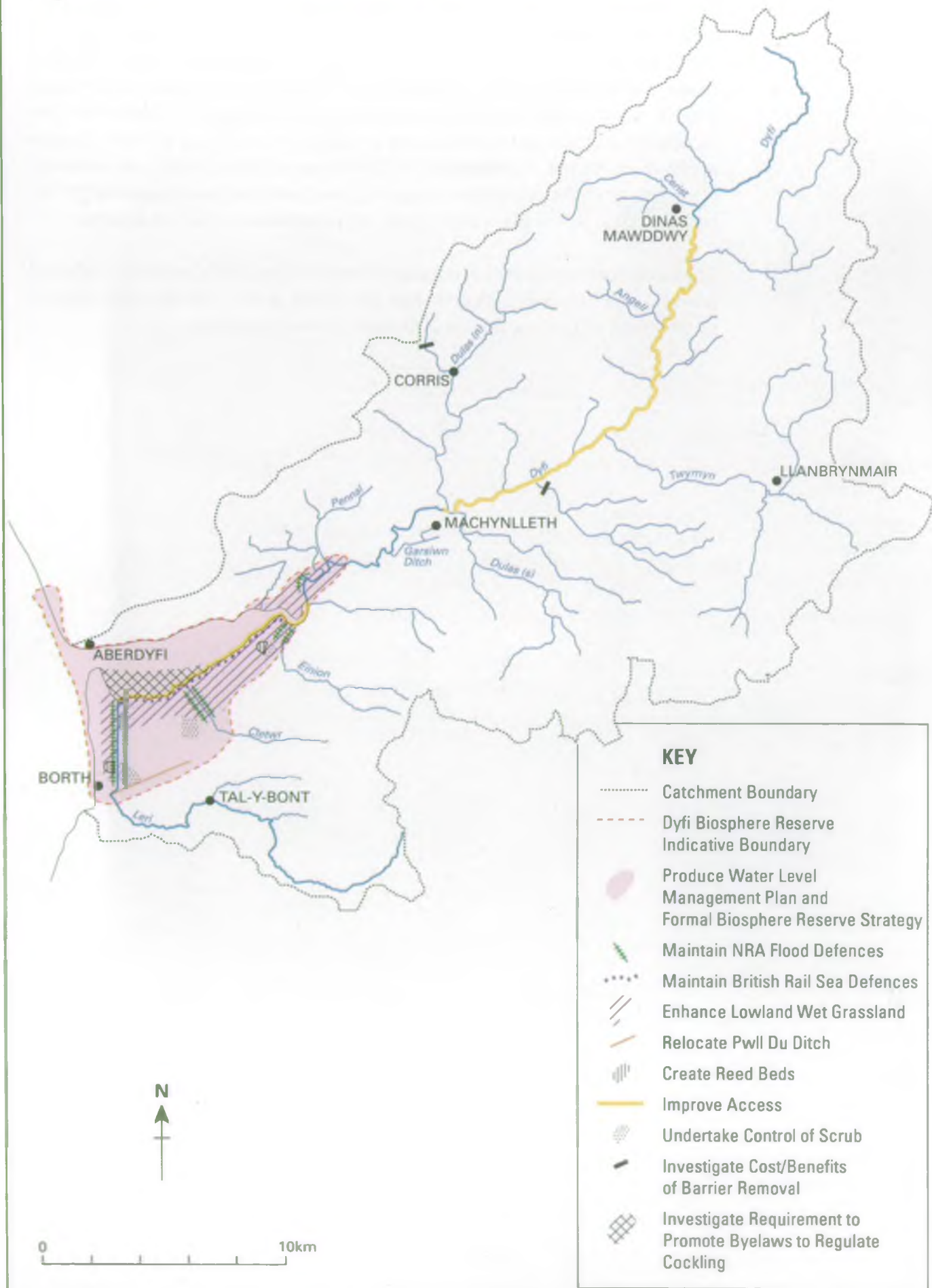
At some designated wetland conservation sites we will agree Water Level Management Plans, with the Countryside Council for Wales, to manage water levels to meet the needs of the protected ecosystem.

**Additional Targets** The catchments under the present management regime are able to support existing abstractions and water transfer requirements without environmental detriment. One of the Authority's prime targets for the catchments will be to ensure, within the realms of practicability, that these exiting abstractions and transfer scheme (Nant-y-Moch) are not subject to derogation. Moreover, the Authority's surface water abstraction policy as it applies to all new licence applications will be implemented in a consistent manner, this is particularly important given the catchments' potential albeit not necessarily suitability for hydro electric power generation under the government's NFFO scheme.

The catchment's groundwater resource is very limited and confined to alluvial gravels. The Authority's groundwater protection policy will be implemented to safeguard all groundwater and its users in the catchment.

MAP 28.

PHYSICAL FEATURES TARGETS



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### 5.3 PHYSICAL FEATURES TARGETS

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<b>General</b>	<p>Many Uses are affected by the physical characteristics or features of the river and this is especially true of Uses related to wildlife and its conservation. The habitat requirements of the wildlife associated with rivers are too complex to allow simple targets to be set, even if such habitats could be effectively measured. Consequently until such a time as quantitative physical targets can be set, Catchment Plans will adopt the general theme that the abundance and diversity of physical features typical of the type of river, should be maintained and where possible, improved. This requires subjective assessment by trained staff. To assist this assessment we are developing a habitat classification system and use related targets for physical features such as spawning and nursery sites for fish.</p> <p>In a similar manner the physical features requirements of recreational Uses of waters cannot yet be quantified in order to set firm targets, again professional judgement must be used.</p> <p>Flood Defence targets nearly all relate to physical features and the requirement for the river channel to contain certain specified flows at different points in its length.</p>
<b>Local Perspective</b>	<p>There are many Uses in the Dyfi and Leri catchments which have their own physical features requirements. The following targets are considered appropriate to cater for these.</p>
<b>Flood Defence</b>	<p><u>Flood Protection</u></p> <p>Where economically, technically and environmentally justifiable, the NRA will aim to maintain or improve in a cost effective manner, designated "Main Rivers" to standards of service (SoS) which accord with the following Land Use bands:</p>

Land Use Band	Typical Description of Reach	Reference SOS - Flood Return Period (Years)	
		Fluvial 50 - 100	Tidal 100 - 200
A	Contains residential and non-residential properties distributed over a significant proportion of its length. Amenity uses may be prominent.		
B	Reaches containing residential and non-residential property over some or all of the reach length but at lower density than Band A. Intensive agriculture may be present.	25 - 100	50 - 200
C	Isolated rural communities at risk with limited numbers of residential properties. Agricultural interests will be more apparent than in band A and B.	5 - 50	10 - 100
D	Isolated properties at risk. Agricultural use will probably be the main use with arable farming a feature.	1 - 10	2.5 - 20
E	Very few properties at risk. Agricultural use will be predominant with extensive grass land the main feature.	<2.5	<5
X	No recorded areas at risk of flooding.		

**NOTE:** The above standards of service table does not imply an entitlement to the provision of this or any standard but is indicative of the standards considered reasonable for the land use defined.

Water Level Management Plans will be prepared for all sites agreed with the Countryside Council for Wales (CCW).

#### Regulation and Enforcement

The NRA, in its role as statutory consultee under the planning legislation and by use of its consenting powers under the Water Resources Act (1991) (as amended by the 1994 Act) will:

- Ensure provision of suitable access for maintenance of river/channel and sea/tidal flood defence and for the construction of new defences by the limitation of development within 7m of the top of the river bank (use of byelaws and planning laws).
- Ensure that obstructions to flow do not result in an increased flood risk (consent under WRA 1991 and LDA 1994).

- Ensure development on the flood plain is identified and encourage planning authorities to use the planning process to guide development away from these areas (section 105 (2) survey and W.O. Circular 68/92).
- Ensure that there is no increase in flood risk to existing properties as a result of further development either remote/or adjacent to existing development (catchment planning to manage flows and/or loss of flood plain storage).

#### Flood Warning

Where flood warning schemes are in place, the NRA will aim to provide a two hour warning of commencement of flooding.

#### **Fisheries**

Through our operational, regulatory and advisory activities, and particularly in our role as a statutory consultee to the Local Planning Authorities, we will endeavour to ensure that there is:

- suitable habitat for fish breeding with an adequate distribution of redd sites and nursery areas.
- unimpeded access for migratory fish through the estuary and river to and from all potential spawning reaches (where appropriate), with adequate holding pools and cover throughout the catchment.
- effective fish screening on all abstractions and discharges (where necessary) to protect wild fish stocks and prevent escapement from fish farms.

Our intention to set specific targets relating to fish stocks and spawning success was recently announced in our published Fisheries Strategy. We will use the results of continuing fisheries monitoring surveys in the catchments to help in the determination of these targets, as well as data collected from rod and net catch returns.

#### **Conservation**

We will endeavour to set specific, objective targets for conservation in each catchment. To do so we will use the results of the national River Habitat (RHS) and River corridor surveys.

Through our operational, regulatory and advisory activities and particularly in our role as a statutory consultee to the local planning authorities we will endeavour to ensure that:-

- biodiversity is maintained by:

- retention of the current diversity of natural features such as riverbanks, wetlands, emergent vegetation, meanders, pools and riffles. We will encourage the fencing of water fringe zones and clearly defined livestock watering points to protect the riparian corridors from damage.
- standards of service will be agreed with CCW/EN to maintain and if possible enhance the conservation value of SSSIs that could be affected by our activities. Priority will be given to NNRs and SACs, together with the adoption of water level management plans.
- species management plans that may contribute to national species action plans, will be implemented for species that have a high conservation need.
- site management plans will be prepared, implemented and regularly reviewed for all of our sites which have conservation interest or potential.

- degraded habitats are restored by:

- identification of areas degraded wetland and riverine habitat and, where possible, rehabilitation to a level where they can support a range of species which is typical of similar habitats in other parts of the catchment.
- an agreed programme of control, in conjunction with others, where Japanese Knotweed or other alien weeds cause operational or other problems.

- riparian and wetland landscape characteristics are conserved.

- the physical structure and setting of historic and archaeological sites, associated with water, is maintained and if possible enhanced. We will recognise the interdependence of many sites and monuments and where unavoidable change occurs will ensure that the detail of the site is carefully recorded.

Specific Conservation targets for the Plan area will include the following:

- To develop the Dyfi Biosphere Reserve project to co-ordinate the funding and management of required action.

## CATCHMENT TARGETS

- To undertake a hydrological survey and negotiate with interested parties on the production of a Water Level Management Plan (WLMP) for the Borth Bog Internal Drainage District.
- To maintain and enhance wetland habitats within the transition zone of the Dyfi Biosphere Reserve.
- To establish, where possible, 25ha of wet grassland for breeding waders through implementation of the WLMP.
- To identify roosting and breeding areas for bat species dependent on the river environment.
- To maintain and enhance the core reserve wetland habitats, particularly raised mire ecosystems, primarily through scrub control.
- To participate in the management of 150 ha of Reserve by 1998.
- To establish 20 ha of reedbed by 1998.
- To relocate the Pwll Du drainage ditch to facilitate more favourable hydrological controls within Cors Fochno.
- To maintain and enhance hydrological controls within the Aberleri field system to promote wader interest.

### Recreation

Through our operational, regulatory and advisory activities, and particularly in our role as a statutory consultee to the Local Planning Authorities, we will endeavour to ensure that:

- an appropriate network of riverside paths and access points is maintained and, where appropriate, promoted.
- protection is given to existing recreational sites, and that the development of new sites is promoted at suitable locations, as opportunities arise.
- consideration is given to the design of paths, access points and recreational developments, taking into account, wherever possible, the needs of the infirm and disabled.
- provision is made for both canoe touring and white water canoeing, where appropriate, within the catchment.

Specific recreation targets for the Plan area will include the following:

## CATCHMENT TARGETS

- To improve public access along the south shore of the Dyfi Estuary, along the river upstream of Machynlleth and adjacent to core wetland areas.
- To provide disabled access at Ynys Hir.
- To improve the bird watching facilities within the estuary and adjoining land.
- To increase the number of picnic sites available within the Plan area.
- To promote the production of a booklet on the bird species within the Plan area.
- To promote the use of interpretative panels and leaflets at Llancynfelyn Common, Borth Golf Course and on the Dyfi Biosphere Reserve walks.
- To improve the existing canoe access by the promotion of at least one access agreement during the lifetime of the Plan.

## APPENDICES



**APPENDIX 1a****THE GROUNDWATER PROTECTION POLICY**

The preservation of groundwater quality and quantity is a major objective of the NRA. Limiting the risk from pollution and over abstraction must be dealt with in a structured methodical manner.

The NRA has therefore produced a "Policy and Practice for the Protection of Groundwater" which provides advice on the management and protection of groundwater on a sustainable basis. The Welsh Region is implementing this national framework policy for the protection of groundwater which will effectively manage groundwater protection in the Dyfi and Leri Catchments. This new policy deals with the concept of vulnerability and risk to groundwater from a range of human activities. It considers both source and resource protection, together with policy objectives of the NRA with respect to the threat to groundwater from abstraction, physical disturbance of groundwater flows, waste disposal, contaminated land, discharges to underground strata, disposal of sludges to land and diffuse pollution.

The implementation of the policy relies in part on the construction of a series of protection zone maps. Resource protection maps will be produced after consideration of vulnerability of groundwater based on the nature of the strata and type of soil and drift.

The Policy recognises three groundwater source protection zones:

**Zone I (Inner Source Protection)**

Immediately adjacent to the source area defined by a 50-day travel time from any point below the water table to the source (based on biological contaminant decay).

**Zone II (Outer Source Protection)**

Area defined by 400-day travel time (based on the delay and attenuation of slowly degrading pollutants).

**Zone III (Source Catchment)**

The complete catchment area of a groundwater source. The controls to be exerted on a given activity will be more stringent the more vulnerable the resource and the nearer the source.

**APPENDIX 1b****The Requirement for an Abstraction Licence**

	<b>0 - 5 m<sup>3</sup></b>	<b>5 - 20 m<sup>3</sup></b>	<b>Above 20 m<sup>3</sup></b>
One off, any purpose	No restriction	Consent	Licence
	<b>0 - 5 m<sup>3</sup>/d</b>	<b>5 - 20 m<sup>3</sup>/d</b>	<b>Above 20 m<sup>3</sup>/d</b>
Domestic, to one household	No restriction in most cases		Licence
Agriculture (from surface water)	No restriction for land adjoining water course		Licence
Agriculture (from groundwater)	Licence	Licence	Licence
All other purposes	Licence	Licence	Licence

**APPENDIX 2****THE NATIONAL BIOLOGICAL CLASSIFICATION SCHEME (PROPOSED)**

A National biological classification scheme is currently being prepared as part of the General Quality Assessment (GQA) scheme (DoE 1992)\*. The diversity of the aquatic macroinvertebrate fauna can reflect water quality and is useful in detecting intermittent reductions in quality, and pollution caused by chemical parameters that are not monitored. These events may not be detected by routine water quality monitoring because of their infrequent occurrence and short duration.

The proposed classification scheme would allow rapid comparison between chemical and biological quality for a given river and therefore highlight areas where disparity between the two occurs for further investigation.

**The Dyfi and Leri Catchments**

Data from biological surveys carried out during 1990, 1991 and 1992 were classified using a prototype classification system. This scheme, called BAPC (BMWP\*\* averages which parallel the chemical grading system), classifies sites according to the ratio of observed and predicted BMWP scores derived from family level identification of invertebrates. A class (a-f) was calculated for each site where biological information existed. This was then compared with the chemical classification for the respective site using the Regional application of an earlier version of the chemical component of the GQA scheme. Descriptions of the biological and water quality classifications used are provided overleaf.

\* DoE/WO 1992: River Quality, The Governments Proposals: A Consultation Document.

\*\* BMWP - Biological Monitoring Working Party.

**General Quality Assessment Scheme for rivers**

Class	Chemical Classification		
	DO % sat 10%ile	BOD mg/l 90%ile	Ammonia mg N/l 90%ile
A	80	2.5	0.25
B	70	4.0	0.6
C	60	6.0	1.3
D	50	8.0	2.5
E	20	15.0	9.0
F	<20	-	-

Note: The NRA are currently developing nutrient, biological and aesthetic components of the GQA scheme which will compliment the established river chemistry component.

**APPENDIX 3****GLOSSARY OF TERMS, UNITS AND ABBREVIATIONS****ABSTRACTION**

When someone takes water, either permanently or temporarily, from a source (river, stream, spring, pond, lake or groundwater) they are 'abstracting' the water and they are making an 'abstraction'.

**ABSTRACTION LICENCE**

Authorisation granted by the NRA to allow the abstraction of water from a source of supply.

**ACUTE**

Used to describe a sudden dramatic effect, eg a major pollution or overnight change in river course. Often used in conjunction with 'chronic' which describes longer term lower level impacts.

**ADIT**

An almost horizontal shaft into a mine, for access or drainage.

**AFFORESTATION**

The process of creating a forest where none existed before.

**ALGAE**

Simple plants which may be floating or attached. They can be microscopic or very large plants but they lack true stems. Like all plants, they are capable of photosynthesis. Algae occur in still and flowing water and are often discussed in the context of Eutrophication (see below).

**ALLUVIAL DEPOSITS**

Layers of sediment resulting from the activity of rivers. Usually fine material eroded, carried, and eventually deposited by rivers in flatter areas such as flood plains or lake beds.

**AMELIORATE**

To cause something to get better.

**AMMONIA**

A chemical which is often found in water as the result of the discharge of sewage effluents. It is one of the chemicals measured to characterise water quality. High levels of ammonia adversely affect the quality and use of water for fisheries and abstractions for potable water supply.

**AOD (ABOVE ORDNANCE DATUM)**

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 above Ordnance Datum.

**AQUATIC ENVIRONMENT**

The rivers, streams, lakes, ponds, springs and features that depend on natural waters such as bogs, wetlands etc.

**AQUIFER (MINOR AQUIFER)**

A sub-surface zone or formation of rock which contains exploitable resources of groundwater. Minor aquifers seldom produce large quantities of water but are important for local water supplies and in supplying base flow for rivers.

**BASE - FLOW**

That part of the river flow that is derived from groundwater sources rather than surface run-off.

**BIOACCUMULATION**

The accumulation, by living organisms, of materials to concentrations higher than those of the surrounding environment. This is particularly important where poisons are accumulated.

**BOD**

An abbreviation for Biochemical Oxygen Demand. This is an estimate of the rate at which biological and chemical processes use up the oxygen available in water. It is one of the features that are used to classify water quality

**BUFFER ZONE**

A strip of land, usually 10-100m wide, at the side of a river which is isolated from the general surrounding land-use and allowed to develop naturally. This provides a number of benefits as well as providing valuable wildlife habitat. These include reduced inputs of silt and some pollutants and protection of river banks from erosion by livestock while allowing the river to respond naturally without undue threat to life or property.

**CATCHMENT**

The area of land draining to a defined point.

**CHRONIC**

Used to describe an effect, usually pollution or physical damage, that has gone on for a long time or takes a long time before an impact is seen. Often used in contrast to 'acute' which describes sudden dramatic effects.

**CLASSIFICATION/CLASSES**

A way of placing waters in categories (classes) according to assessments of water quality based, for example, on measurements of the amount of particular chemicals in the water (especially BOD, dissolved oxygen and ammonia).

**COARSE FISH**

Freshwater fish other than salmon and trout, many belonging to the carp family (Cyprinids).

**CONFLUENCE**

The point where two or more streams or rivers meet.

**CONSENT**

Two types of consent are issued by the NRA:

Discharge Consents are statutory documents issued by the NRA to indicate any limits and conditions on the discharge of an effluent to a controlled water.

Land Drainage Consents authorise works to the beds and banks of a river.

**CONTROLLED WATERS**

All rivers, lakes, groundwaters, estuaries and coastal waters to three nautical miles from the shore.

**CULVERT**

Artificial channel, pipe or conduit that carries water under a road, canal etc.

**CUMECS**

Short for cubic metres per second ( $\text{m}^3/\text{s}$ ). There are 86,400 seconds in a day. This is used to measure river flows.

**DANGEROUS SUBSTANCES**

Substances defined by the European Commission as in need of special control. This is because they are toxic, accumulate and concentrate in plants and animals, or do not easily break down into less dangerous substances. They are classified as List I or List II.

**DEROGATION (Water Quality)**

Derogation (ie. waiving the result) may be applied where water quality fails a target due to natural or man-made conditions that are not readily controllable (eg. low pH and/or elevated metal concentrations). This approach prevents unnecessary downgrading of waters and also carries the benefit that other, more controllable, aspects of water quality can be protected by the NRA at the target level.

**DEROGATION (Water quantity).**

A legal term that describes a diminution of the water rights of existing water users due to a new abstraction.

**DIFFUSE**

Spread out, not associated with a single place or point.

**DISSOLVED OXYGEN**

The amount of oxygen dissolved in water. Oxygen is vital for life, so this measurement is an important, but highly variable, test of the 'health' of a water. It is one of the features that are used to classify water quality.

**ECOSYSTEMS**

A group of animals and plants which live together within a certain type of surrounding or habitat (e.g. woodland, pond).

**EC DIRECTIVE (Control)**

A type of legislation issued by the European Community which is binding on Member States and sets standards and results to be achieved.

**ENVIRONMENTALLY SENSITIVE AREA (ESA)**

An area where the landscape, wildlife and historic interest are of national importance. Payments are made by Welsh Office to ensure appropriate sensitive land use.

**EUTROPHIC/EUTROPHICATION**

Terms which describe water which is rich in nutrients or the process of enrichment. At worst, such waters are sometimes beset with unsightly growths of algae which may pose a health risk to humans and livestock.

**FAUNA**

Animal life.

**FLORA**

Plant life.

**FLUVIAL**

Associated with river processes such as flow and erosion.

**FRESHET**

A naturally or artificially generated increase in river flow after a period of dry weather, having the effect of enhancing water quality and the aquatic environment eg. through improved levels of dissolved oxygen and flushing of accumulated debris and silt.

**FRY**

Fish which are less than 1 year old.

**GAUGING STATION**

A site where the flow of a river is measured. Sometimes a weir is used to assist the measurement.

**GROUNDWATER**

Water contained within pores, cracks and fissures in rocks.

**HABITAT**

The natural home of plants and animals. Different plants and animals have different needs, and so live in different habitats.

**HEAD**

A measure of the height between upstream water level and power generating equipment.

**HEADRACE**

A channel that carries water to a water wheel or turbine.

**INDICATIVE FORESTRY STRATEGY**

These are produced by some local authorities and show the areas of land that are suitable or unsuitable for afforestation. They are divided into 'preferred areas', 'potential areas' and 'sensitive areas'.

**LEACHATE**

This is the product of the removal of soluble substances by action of water percolating through soil, waste or rock. Often used in association with dumped waste materials.

**LEAT**

A channel which conveys water to a mill wheel.

**LIST I AND LIST II SUBSTANCES**

European Community Directive 76/464/EEC aims to reduce pollution in controlled waters by certain dangerous substances. These consist of chemicals selected mainly on the basis of their toxicity, persistence and bioaccumulation. These substances are divided into 2 categories:

- List I substances are considered to be the most harmful. Pollution caused by these must be eliminated.
- List II substances are less harmful and pollution caused by these must be reduced.

**m<sup>3</sup>/d**

Short for cubic metres per day. There are 1000 litres in a cubic metre, and 1000 cubic metres in a megalitre (Ml). In Imperial Units, there are 220 gallons in a cubic metre. This unit is often used to measure abstraction of water.

**m<sup>3</sup>/s**

Short for cubic metres per second (cumecs). There are 86,400 seconds in a day. This is used to measure river flows.

**MACROINVERTEBRATE FAUNA**

Small aquatic animals, such as insects, snails and worms which live in the river bed.

**mm**

Short for millimetres. There are 1000mm in a metre. This unit is used to measure rainfall.

**STATUTORY MAIN RIVER**

A legal definition which defines particular rivers and streams on special maps. On the 'Main River', the NRA has permissive powers to construct and maintain defences and to control the actions of others through Byelaws and the issue of Consents. Any proposal that could interfere with the bed or banks or affect the flow of the river requires formal consent from the NRA.

**MI/d**

Short for megalitres per day, a standard international unit of measurement. There are a thousand cubic metres in a megalitre and one million litres in a megalitre. In Imperial Units, one megalitre is about 220,000 gallons. This unit is often used to measure abstraction of water.

**NITRATE SENSITIVE AREAS (NSA) AND NITRATE VULNERABLE ZONES (NVZ)**

Land in areas where water sources exceed or will exceed 50mg/l of nitrate by 2010 are designated as NVZs. Farmers are required to follow regulations designed to reduce nitrate loss from their land in both NVZs and NSAs although they only receive compensation for doing so in NSAs.

**PARAMETER**

A general name for a characteristic or aspect of water quality. It is often a feature which can be described numerically.

**PARCOM**

A monitoring programme for pollutants selected by the **Paris Commission**, carried out by the NRA in England and Wales.

**PARR**

Salmon which are 1 or more year old which have not yet gone to sea.

**PERMEABILITY**

The ease with which liquids (or gases) pass through materials, (often rocks or soils).

**PERMISSIVE POWER**

The NRA is given various powers to do things by a number of Acts of Parliament. Some of these powers are 'permissive', which means the NRA can do these things, but is not under a duty to do them. For example, NRA has permissive powers to construct flood defences, but does not have a duty to do this. In contrast, the NRA has certain statutory duties, i.e. things it must do, e.g. it must authorise abstractions, discharges and works to the bed or banks or main rivers.

**POOL**

A distinct, deeper area of slow flowing water, often with an eddying flow and often found between fast flowing stretches which are known as 'riffles'.

**POROSITY**

The volume of water that can be held within rock or soil. This is determined by the total volume of the rock or soil divided by the spaces (voids) within it.

**POTABLE**

Water suitable for drinking.

**REACH**

A length of a river.

**RED LIST SUBSTANCE**

A substance that has been selected for monitoring due to its toxicity, persistence and bioaccumulation.

**REDD**

Salmon excavate a depression in river gravels into which they lay their eggs. The eggs are then covered with gravel. This 'nest' is known as a 'redd'.

**RIFFLE**

Fast flowing shallow water with a distinctly broken or disturbed surface. Riffles are often found between pools.

**RIPARIAN**

Associated with the river bank. A Riparian owner is the owner of the banks and land adjacent to the river and usually owns the river bed to the mid - point of the wetted channel.

**RIVER CORRIDOR**

A term which describes a stretch of river, its banks, and a varying amount of adjacent land that is affected by the presence of the river.

**RIVERINE**

Something that is associated with the river environment.

**RIVER QUALITY OBJECTIVE (RQO)**

The quality of water that the river should attain in order to support its agreed uses. An RQO may be bound to a certain date for achievement or to a future, indefinite, time. The latter is described as a Long Term RQO (LTRQO).

**SALMONID FISH**

Game fish, e.g. trout and salmon.

**SETASIDE**

The Common Agricultural Policy reform provides for land to be removed (set aside) from food production to reduce surpluses. The land can be set aside temporarily or permanently and can be a valuable opportunity for wildlife habitat improvement or the provision of riparian buffer zones.

**SMOLT**

At a particular stage of their development, young salmon and sea trout migrate to the sea, and at this stage are known as smolts.

**SPATE (flash flood)**

A sudden increase in river flows that may cause flooding or other damage. Typically the flows will fall as quickly as they rose once rainfall ceases. A spate, or flashy river is one that is characterised by such sudden and wide variations in flow as a result of rainfall.

**SPRING RUN**

Salmon return from the sea to freshwater rivers when adults. They migrate up the rivers to spawn, and this upstream migration is known as the 'run'. There are two main periods of the year when the runs occur; spring and autumn. The spring run fish are often larger than later-run fish, and are often more prized by anglers.

**SSSI**

Abbreviation for 'Site of Special Scientific Interest'.

**SURFACE WATERS**

This is a general term used to describe all the water features such as rivers, streams, springs, ponds and lakes.

**TELEMETRY**

Telemetry is a means of collecting information that has been collected by unmanned monitoring stations ( often for river flows or rainfall) using a computer that is connected via the public telephone system.

**TIME LIMITED LICENCE**

Every licence states whether it is to remain in force until revoked or is to expire on a specified date.

**UNCLASSIFIED REACHES**

Stretches of river (usually smaller streams) that do not fall under the General Quality Assessment classification scheme and therefore do not have their water quality monitored routinely.

**WASHLANDS**

Extensive areas of semi-natural flood plain next to a river, where water is stored during floods. The amount of water stored may be altered by man made devices such as weirs and sluices. Washland storage has the effect of reducing the flood peak downstream and may help to protect developed areas from flooding and also provide valuable wildlife habitats.

**WEIR**

A low dam built across a river to raise the water level, divert the water or control its flow.

**WETLAND**

Wet areas where the animals and plants that live there are dependent on that 'wetness' for their survival. They include bogs, reed-swamps and mires but not the river corridor.

**95-PERCENTILE FLOW (Q95)**

The flow which one would expect to be exceeded 95% of the time on average. This is an estimate of the dry weather flow which the river would be at, or below, for 18 days per year on average.