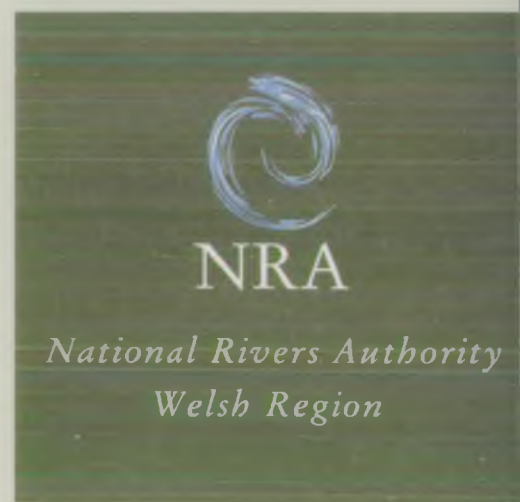


GLASLYN, DWYRYD, ARTRO
CATCHMENT MANAGEMENT PLAN
CONSULTATION REPORT; MAY 1995



**GLASLYN/DWYRYD/ARTRO CATCHMENT
MANAGEMENT PLAN**

CONSULTATION REPORT

MAY 1995

**National Rivers Authority
Welsh Region**

Further copies can be obtained from :

The Catchment Planning Coordinator
National Rivers Authority
Welsh Region
Rivers House
St Mellons Business Park
St Mellons
Cardiff
CF3 OTL

or

The Area Catchment Planner
National Rivers Authority
Highfield
Priestley Road
Caernarfon
Gwynedd
LL55 1HR

Telephone Enquiries :

Cardiff (01222) 770088

Caernarfon (01286) 672247

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PART I

THE

GLASLYN/DWYRYD/ARTRO

CATCHMENT

MANAGEMENT PLAN

**1.0 THE PURPOSE OF
CATCHMENT MANAGEMENT
PLANS**

1.0 THE PURPOSE OF CATCHMENT MANAGEMENT PLANS (CMPS)

1.1 THE ROLE OF THE NRA

Never before have the rivers, lakes, estuaries and coastal waters of Wales been subject to such large and rapidly increasing demands from the users of water. Many different uses interact, or compete for water or water space, and will inevitably come into conflict with one another. The National Rivers Authority (NRA) is the major manager of the water environment in England and Wales and aims to harmonise conflicts between water users as well as its general duties that include: -

- Maintenance and improvement of water quality by control of pollution in surface and groundwater.
- Flood defence for people and property.
- Flood warning.
- The proper management of water resources by conservation, augmentation and control.
- Maintenance and improvement of fisheries.
- Conservation of the natural water environment.
- Promotion of water based recreation.
- Navigation (in some rivers).

The NRA also plays 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. Therefore, we have consequently 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 Glaslyn/Dwyryd/Artro catchments, and is based on a detailed study carried out by the NRA during 1994. A number of proposals are presented for comment and it is intended that, following consultation with you and other river users, a final 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 catchment.

The Final Action Plan will steer us in developing our own management programme for the catchment 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, including information on identified water Uses (including those to be incorporated in the new WQO 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. 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 final workable Action Plan that will be of benefit to you and all users of the Glaslyn/Dwyryd/Artro catchments.

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

The Area Catchment Planner,
National Rivers Authority,
Highfield,
Priestley Road,
Caernarfon,
Gwynedd. LL55 1HR.

Telephone: (01286) 672247

AN OVERVIEW OF THE
GLASLYN/DWYRYD/ARTRO
CATCHMENTS

GLASLYN, DWYRYD, ARTRO CATCHMENTS



2.0 AN OVERVIEW OF THE GLASLYN/DWYRYD/ARTRO CATCHMENTS

2.1. INTRODUCTION

The Glaslyn/Dwyryd/Artro catchments are three river systems situated deep in the heartland of Gwynedd. Despite their individually unique character, they share many similarities ranging from large stretches of unspoilt and often spectacular scenery, acidification and mineralisation, to large areas of afforestation.

The **Glaslyn** rises on the eastern slopes of the Snowdon Massif and could easily be mistaken for an upland alpine stream in its upper reaches. From the cirque lake of Llyn Glaslyn right under the summit of Yr Wyddfa (Snowdon) down through the corrie lake of Llyn Llydaw, the site of a hydro-electric scheme, the river cascades down into the Nant Gwynant Valley. In the valley are found Llyn Gwynant and Llyn Dinas, two of Snowdonia's many picturesque lakes.

Downstream of Llyn Dinas the Glaslyn flows over an ice-deepened floor of rocks, constricted by encroaching hills downstream of Beddgelert the fabled burial site of the legendary hunting dog Gelert. At Beddgelert, the main river is joined by the Colwyn before it descends the dramatic gorge of Aberglaslyn to burst out on to the floodplain where it gradually slows and begins to broaden. Finally, the river flows through marshland close to the town of Porthmadog. Here the 'Cob' embankment with its tidal sluice gates protects some 1500 hectares of land from the sea.

The **Dwyryd** has its beginnings in the area surrounding Blaenau Ffestiniog with its many upland lakes, peat bogs and slate quarries. A large hydroelectric power scheme sited at Tanygrisiau, has done much to revitalise this part of the catchment. To the south of Ffestiniog, the land rolls out into a moorland of bog and heather drained by the Cynfal and further to the south by the Prysor, the Dwyryd's main tributary. The Prysor drains a large area of upland marshland to Trawsfynydd Reservoir, adjoining the Nuclear Electric Power Plant, before flowing out into the Dwyryd south of Maentwrog. From here the Dwyryd flows the short distance to the sea at Traeth Bach.

In the south of the Plan Area the **Artro** has its origins at Cwm Bychan in an upland valley in the shadow of the Rhinogau mountain range. This area is known geologically as the Harlech Dome and contains some of the oldest rocks in the world. The Harlech Dome is what remains following glacial

erosion of the younger, previously overlaying rocks that once extended from Snowdonia to Cader Idris. In the upper reaches of the Artro and its tributary the Nantcol, only the hardier types of vegetation are able to flourish, such is the rocky desolate nature of the area. However, this quickly changes further down the valley to heather, bracken and some small areas of forestry. This in turn gives way to a spartan landscape due to the poor soil typical of the area. Along the coast, the renowned sandy beaches attract many summer visitors, with the sheltered lagoon in the estuary especially popular for sailing.

South of the Artro is to be found the Ysgethin, a catchment steeped in history, folklore and revered in the Mabinogion (Welsh Legends). Indeed the whole Plan area has strong historical links with King Arthur, the Romans and the Mabinogion. Llyn Bodlyn, the reservoir towards the top of this river, is home to a population of 'Torgoch' (Arctic Charr). These fish are reputed to have been introduced into the reservoir by monks during the tenth century and are the most southerly charr population in the United Kingdom.

2.2. INFRASTRUCTURE

The area is served by a number of trunk and main A roads. These connect the major population centres, although all are still single carriageway. Smaller settlements are linked by a network of B roads. During recent years significant improvement work has been carried out on the road infrastructure, future schemes include the proposed Tremadog to Penrhyndeudraeth bypass. This scheme will involve a crossing of the Glaslyn adjacent to the existing main line railway crossing. The narrowness of many roads throughout this mountainous area frequently leads to serious congestion during the holiday period.

The main Pwllheli to Aberystwyth railway line runs along the coast between Criccieth and Barmouth. The Porthmadog to Blaenau Ffestiniog narrow gauge railway links this section of the West Coast line to the Conwy Valley main line, this subsequently links up to the main London to Holyhead line at Llandudno Junction.

There are no airport facilities within the area although there is a Royal Airforce Establishment at Llanbedr.

Settlements within the Plan area are largely served by public sewerage/sewage treatment facilities. The NRA is not currently opposing any development within the Plan area on grounds of inadequate public facilities. However, the situation is being closely monitored, the failure of bathing waters at Morfa Bychan to comply with mandatory EC Directive bacteriological criteria and, the continuing problems with the disposal of effluent from the Porthmadog sewerage system being subject to particular attention.

2.3. LAND USE

The Plan area is predominantly rural, with a population of approximately 19,000 centred in 5 towns which range in size from 1,200 to just over 5,000.

The main agricultural use consists of sheep farming in the upper reaches of the catchment, gradually changing to mixed sheep and beef further down the valleys. Only in the area of the Glaslyn estuary is the land fertile enough to support any large scale dairy units. There are a number of large areas of afforestation, the largest of these are the Beddgelert Forest on the Colwyn and the Llyn y Garnedd Forest on the Dwyryd.

Industrial development is limited, with the main centres for employment being within industrial estates at Porthmadog, Penrhyndeudraeth and Blaenau Ffestiniog. Blaenau Ffestiniog, once the largest slate mining town in the world has a legacy of derelict land.

One of the largest employers in the area, Nuclear Electric, is closing down its nuclear power station at Trawsfynydd, as it is at the end of its working life.

Tourism is of major importance to the area. Traditional attractions such as the outstanding beauty of the Snowdonia National Park, the extensive beaches and castles at Harlech and Criccieth are complemented by popular attractions such as Portmeirion, Llechwedd Slate Caverns and, the Welsh Highland and Ffestiniog railways.

The NRA is a statutory consultee for Town and Country Planning matters (development plans and development control), and it will advise the local planning authorities (LPAS) with regard to all its functions as they are affected by any proposal by the LPAs or developers.

2.4. FLOOD DEFENCE

Flood defence activity within the Plan area is concentrated upon the maintenance of tidal and fluvial defences, main river watercourses and the tidal doors at Porthmadog.

As a consequence of the extensive areas of flood and coastal plains throughout the Plan area there are 4 Internal Drainage Districts (IDDs). Two of the IDDs are associated with the Glaslyn and one each with the Dwyrdd and Artro.

Elsewhere in the Plan area 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 Plan area.

Water Level Management Plans will be drawn up for all sites agreed between the NRA 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 the NRA will be actively involved in liaison regarding any proposed development or proposed allocation for development in sensitive areas.

The NRA during 1994/95 is 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 catchment plan area is underlain by very old rocks of the Cambrian and Ordovician geological periods. These rocks, originally deposited in a deep sea, have been folded, faulted, uplifted, eroded and moulded over millions of years to form the geographical features that are visible today. To the north the Ordovician rocks, which were subject to periodical volcanic activity during their deposition, form the rugged mountains and spectacular scenery of Snowdonia, from which the Glaslyn, Dwyrdd and their tributaries plunge southwards and eastwards to merge in the flat estuarine sands of Tremadoc Bay. To the south of the Glaslyn/Dwyrdd depression, the Cambrian mudstones and shales of the Harlech dome rise to the Rhinogau ridge from which the Artro and Ysgethin drop progressively westwards to the sea. The coastline of the area displays the features of relative movements between land and sea, with the geologically recent formations of spits and bars showing the effects of northwards and eastward longshore drifting of material into the Glaslyn and Dwyrdd estuaries : the Glaslyn mudflats have been reclaimed from the sea and are protected by the Cob and its tidal gates.

Soils over the whole of the catchment area are of glacial origin, they are generally thin, poor, peaty and acidic, but are enriched in places by mineral ores from the underlying rocks. The evidence of small scale mineral working of copper and zinc is widespread, especially in the volcanics of the north. These, together with afforestation of sub catchments in places, have important implications for water quality. In the Blaenau Ffestiniog area the mudstones have been pressurized and cleaved by earth movements to form the slates for which the area is famous, the working of which has, however, left its legacy of rubble tips on the landscape.

This mountainous area, directly open to the prevailing south westerly winds, is subjected to heavy rainfall which rises from 1,000mm per annum on the coast to 4,000mm per year in the upper Glaslyn, where daily falls of 75 - 100mm are not uncommon. Longitudinal river profiles are short, irregular and steep : flow is rapid, variable and sometimes spectacular. Such groundwater that exists is confined to lenses of gravel in the thin overlying boulder clay and to the alluvium of the valley bottoms, where its use is both small and sporadic. As such all groundwater that exists is exempted from licensing. In contrast, the numerous natural lakes and steep gradients which are a feature of the area have been utilized and adapted widely for water supply/industrial activities and particularly hydroelectric generation. The remaining quarries still generate electricity for their own use and direct power stations at Cwm Dyli and Maentwrog, together with the Ffestiniog pumped storage scheme, have supplied power to the grid for many years. More recently, the physical characteristics of the area, together with the need to reduce harmful emissions from fossil fuels, have re-generated much interest in smaller hydro schemes, which abstract large volumes from rivers without the ameliorating benefits of backup storage, and which return the water some distance downstream. In places, this type of scheme is inevitably in conflict with the protection of unique flora and fauna to be found within the deprived reaches of these rivers, with their other lawful uses and with their immense visual attractions, all of which have to be protected and preserved for the future.

2.6. FISHERIES, CONSERVATION AND RECREATION

The fauna and flora of the Glaslyn, Dwyrdd and Artro share many features common to west coast spate rivers. These rivers contain noted salmon and sea trout fisheries with anglers recording, on average, about 90 salmon and 700 sea trout per season. Brown trout, generally of small size, are abundant throughout the catchment both in the rivers and numerous upland lakes. The Arctic Charr is found in Llyn Bodlyn, the most southerly location for this ice-age relic in the UK.

Two salmon draft nets operate in the Glaslyn estuary. Amongst the local angling fraternity this is a controversial fishery, as it is alleged that the NRA-operated tidal doors at Porthmadog harbour delay the migration of sea trout and salmon making them more vulnerable to the harbour net fishery. Studies by NRA fisheries scientists have shown that fish do delay in the harbour. The tidal doors are a partial contribution to this; but there is no evidence that this causes unacceptable exploitation of fish by the nets.

The catchments are of high conservation value, exhibiting a range of key habitats from river source to the sea. These extend from upland peat mire, through valleys faced with ancient woodland which descend into gorges containing oceanic mosses and liverworts, down to extensive coastal dune systems. The Plan area is of exceptional archaeological interest, containing 66 Scheduled Ancient Monuments many of which are pre-historic sites.

As most of the Plan area lies within the Snowdonia National Park it is of high amenity value, particularly for walking and appreciation of a generally unspoilt countryside.

Water based activities are centred on the Glaslyn estuary at Porthmadog and the mouth of the Artro near Shell Island. The use of jet skis, power boats and coastal cruisers is becoming increasingly popular, although access to the harbours is restricted to periods around high tide.

The NRA does not have any responsibility for Navigational matters within the Plan area.

2.7. WATER QUALITY

Water quality in rivers covered in this plan is generally very good as recorded in the 1990 River Quality Survey. However, even though rainfall acidity is not naturally very high, the volume of rainfall within the Plan area gives rise to high annual acid deposition. The absence of neutralising bases within the soil results in periodic acid flushes which affects the water quality of the entire Plan area. The acidity is exacerbated in some parts of the catchments by large areas of afforestation and there are localised problems due to the effects of low pH on mineral outcrops and the resultant elevated levels of copper and zinc.

All the coastal waters in the Plan area attract a large number of visitors in the summer months and compliance with the bacteriological standards of the EC Bathing Waters Directive is an important objective for identified bathing waters. The water at the very popular Morfa Bychan beach, where extensive bathing and other water contact activities take place, does not consistently comply with the standards. The main cause for this is thought to be the crude sewage discharges at neighbouring Criccieth and the significant discharge of primary treated sewage into the adjacent estuary from Porthmadog. A comprehensive improvement scheme, including ultra violet disinfection of the effluent, is presently underway at Criccieth and design plans for a new full treatment plant at Porthmadog are currently being formulated.

2.8. MONITORING

Monitoring of rainfall is undertaken at 13 sites within the plan area : instruments consist of 6 monthly and 7 daily collection gauges, together with 3 recording devices. The data from Cwm Dyli is connected by telemetry to 24 hour emergency centres for use in flood prediction. River flows in the Glaslyn and its tributary the Colwyn are monitored at Beddgelert. Continuous measurement of level is undertaken either side of the tidal doors at Porthmadog. In addition, data on hydrological parameters are available to the NRA from the power stations within the catchment. The need for hydrological data is consistently reviewed according to circumstances at any time, with short term data being correlated to the baseline stations. No groundwater monitoring is undertaken owing to the lack of or minimal utilization of aquifers.

A network of 33 monitoring sites are used to gather information on the chemical and biological quality of the rivers in the Plan area. These are augmented by samples taken at other points for specific purposes, e.g. to monitor the effects of acidification or farm pollution. Compliance with the EC Bathing Waters Directive (76/160/EEC) bacteriological standards for identified bathing waters is assessed by monitoring the quality at each of the 5 identified waters throughout the bathing season.

A strategic survey of the habitat quality of the river corridor has been carried out on large parts of the Glaslyn and Dwyrdd and some of their tributaries. This will continue in future years to include the major tributaries.

Populations of young salmon and trout have been monitored throughout the catchments by periodic electro-fishing since the early 1980s.

2.9 KEY DETAILS

Area 508km²

Main Towns and Populations (1991 Census)

Ffestiniog	5334
Penrhyndeudraeth	1939
Harlech	1233
Porthmadog	4004
Criccieth (*)	862

(*) PART (50% of total resident population of Criccieth)

Topography

Ground Levels Max height 1085 mAOD (Yr Wyddfa, Snowdon)

Sea Levels Mean High Water Springs 2.44 mAOD
Mean Low Water Springs NO DATA

Administrative Details

County Councils Gwynedd County Council

District Councils Meirionnydd D.C., Arfon B.C., Dwyfor D.C.

Local Flood Defence Committee (LFDC) Gwynedd (GLFDC)

NRA Welsh Region - Northern Area

Water Company Dŵr Cymru Welsh Water

Sewage Treatment Works 26 Dŵr Cymru Welsh Water, 7 Private

CATCHMENT OVERVIEW

Water Quality Classification

Very Good	-	72.2km	Poor	None
Good	-	3.2km	Bad	None
Fair	-	None		

Estuary Classification

Good	-	29.9km	Poor	None
Fair	-	0.5km	Bad	None

No. EC Identified Bathing Waters 5 (Talybont, Dyffryn Ardudwy, Llandanwg, Harlech, Morfa Bychan)

Other Bathing Waters 1 (Shell Island)

Water Resources

Annual Average Rainfall 3266 mm (Cwm Dyli)

Primary Gauging Stations 4 (Beddgelert, Colwyn, Porthmadog (2))

Principal Reservoirs 7 (Tanygrisiau, Llydaw, Stwlan, Morwynion, Eiddew Mawr, Eiddew Bach, Tecwyn)

Flood Protection

Length of Main River in catchment 129 km

Length of Main River Within Internal
Drainage District 61 km

Length of Adopted Ditch within Internal
Drainage District 41 km

Length of Flood Banks Maintained by NRA 20 km

Area at Risk of Flood (Tidal or River) 1,700 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	20.3 km
Cyprinid	None

Mean declared catch 1975-93

	<u>Salmon</u>	<u>Sea Trout</u>
Artro Rods	4	100
Dwryd Rods	35	137
Glaslyn Rods	52	469
Glaslyn Nets	28	204

Conservation

Sites of Importance 32

3.0 ISSUES AND OPTIONS.

This section of the Plan presents the key Issues that the NRA has identified from its analysis of the **Glaslyn/Dwyryd/Artro** 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.

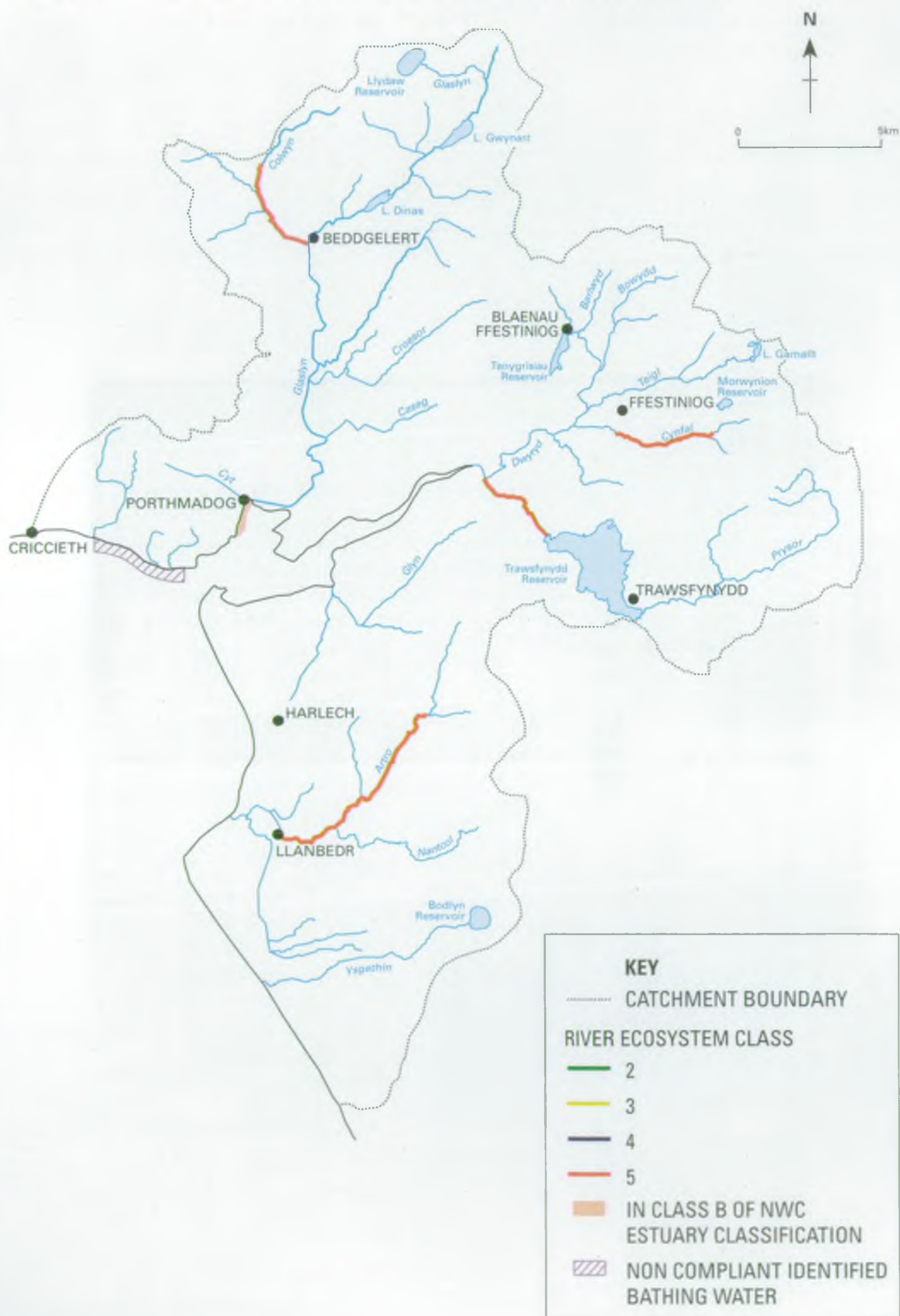
Section 3.1 identifies, in detail, those areas of the catchment which have been identified as failing to meet specific targets to support identified Uses. Significant areas of conflict between Uses are also discussed. Section 3.2 presents these Issues along with options to address them, identified by the NRA.

The information that has been used to identify these Issues is provided in **Part II** of this report which lists the known Uses of the catchment and sets targets to support them. You should note that the Issues and Options do not constitute NRA policy but have been considered within the NRA's policy framework and that no priority should be inferred from the order in which they appear.

3.1 THE STATE OF THE CATCHMENT.

The following section examines the ability of the catchment to support the Uses identified in Section 4, **Part II**, by assessing compliance with the targets set out in Section 5, **Part II**. In this way the key Issues in the catchments are identified. The potential solutions to these Issues are discussed in Section 3.2 .

MAP 2. STATE OF THE CATCHMENTS - WATER QUALITY



3.1.1 WATER QUALITY

General

The current state of the water quality of the Glaslyn/Dwyryd/Arthro Catchments has been assessed against the Use-related targets set in Section 5. This has been achieved largely by the use of data collected from routine sampling points for the past 3 years. In many of the smaller and headwater streams there is no requirement for the NRA to collect routine water quality data and in these reaches data from other sources has been used. These sources are often 'one-off' special surveys and the data cannot carry the same statistical certainty as those from routine points.

Since aquatic animals and plants have to endure the whole range of water quality at each site, biological data can be very useful in supporting the water chemistry data that only represent a series of 'snapshots' of the water quality. This is especially true in the smaller streams that are not routinely sampled. The Welsh Region of the NRA has developed a series of 'biological keys' based upon the presence and absence of certain indicator species, which can be used to detect intermittent or background problems such as acidification (acid rain) or farm pollution. Biological data is also used to qualify the results of much of the water chemistry data assessment. The Authority also routinely samples fish stocks at many sites. All these sources of data are used to assess the state of the catchment and identify areas where the targets set in Section 5 are not met.

The following sections and maps illustrate the results of this analysis: unless it is specifically stated otherwise, the catchment achieves its identified targets.

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 set in Section 5.1 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) Regulation 1994".

The water quality, as assessed by both chemical and biological monitoring in the rivers covered by this plan, is generally excellent. An exception in the Glaslyn system is the Colwyn and its tributaries, where there are problems associated with low pH. This is confirmed by the consistently poor biological quality of this river. In addition, evidence of deteriorating chemical and biological quality has been found on the Caseg with its slow flowing floodplain drainage channels. This is likely to be attributed to diffuse organic input resulting from farming influenced by land drainage activities.

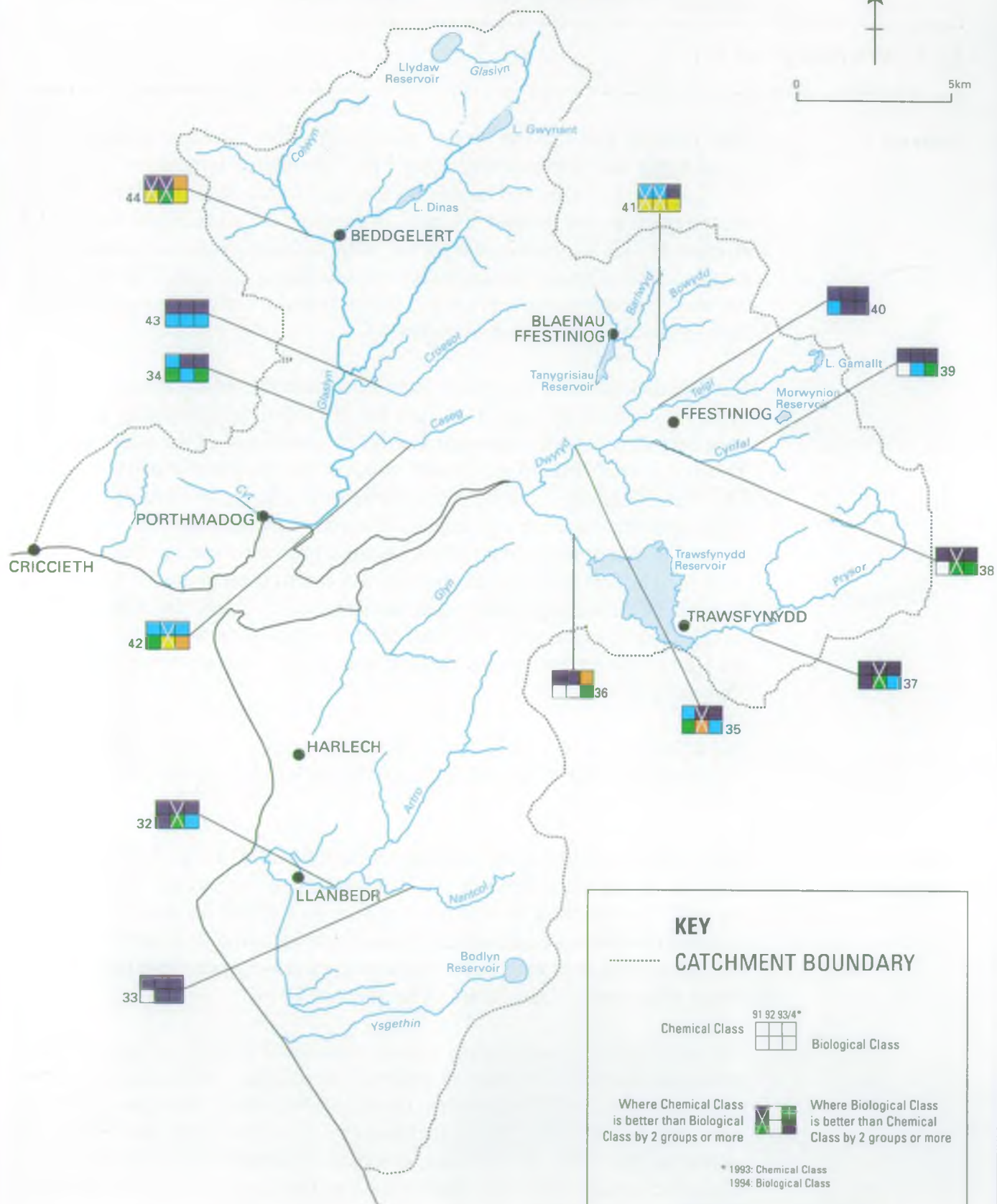
MAP 3.

COMPARISON OF BIOLOGICAL AND CHEMICAL WATER QUALITY

N



0 5km



THE STATE OF THE CATCHMENT

Within the Dwyryd catchment, the Bowydd and the Barlwyd at Blaenau Ffestiniog, have consistently poor biological quality. This may be due to discharges from storm sewer overflows, certainly aesthetic problems arise from such discharges on the Barlwyd and also in the Ceunant Sych. As these discharges are intermittent, any detrimental effect on the watercourse is more readily identified by biological monitoring than by routine chemical monitoring. Slate dust run-off from the quarries also contributes to the poor biological quality of the Barlwyd. There are indications that the biological quality of the Prysor downstream of the Trawsfynydd reservoir is influenced by acidic flushes. Notwithstanding these exceptions, the chemical and biological quality of the Dwyryd catchment is generally very good.

Further south, biological investigations have confirmed the effects of acidification in the upper reaches of the Artro, in particular around Llyn Cwm Bychan and Llyn Eiddew Mawr. However, the chemical and biological quality for the remainder of the Artro catchment is generally very good.

Data for the recently identified bathing waters at Dyffryn and Talybont suggests that, whilst they comply with the current mandatory bacteriological standards, they are at risk of failure from periodic high counts of Faecal Streptococci should this be included in the mandatory standards.

There are six Dŵr Cymru Welsh Water potable abstractions to be found predominantly in the upland areas of the plan. Sampling results for these sources indicate the waters fail to meet the required standards which accord with the A1 treatment given them. Statistical assessments indicate failures are 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 abstractions, the data was further reviewed. As a result, it has been concluded that many of the "failures" are due to inappropriate detection levels.

Issues Identified

Acidification

- The Colwyn, a major Glaslyn tributary, falls into River Ecosystem Class 5 for much of its length because of low pH. The large Beddgelert coniferous forest, borders much of the tributary and is considered to be a major contributing factor to the acidification of this watercourse. The acidity and associated elevated level of zinc in the river give rise to impoverished invertebrate fauna populations in the Colwyn. (Issue 1 Section 3.2)
- The Prysor between Trawsfynydd and its confluence with the Dwyryd is in River Ecosystem Class 5 due to periodic low pH levels associated

THE STATE OF THE CATCHMENT

with acidic deposition, forestry in its upper reaches and acid sensitive rocks and soils. (Issue 1 Section 3.2)

- The Cynfal in the upper reaches of the Dwyryd is in River Ecosystem Class 5 due to periodic low pH. Here, the problem associated with acid deposition, the acid sensitive rocks and soils and some afforestation, is exacerbated by the draining of an extensive area of naturally acidic peaty upland soil. (Issue 1 Section 3.2)

- The Artro is in River Ecosystem Class 5 for much of its length due to periodic low pH. Again this is as a result of acidic deposition on acid sensitive rocks and soils. Despite this acidity the river supports an excellent salmonid fishery. (Issue 1 Section 3.2)

Elevated Metal Levels

- Some reaches of the Glaslyn, due to the numerous disused mine-workings and, abundance of natural outcrops of metal ores within the catchment, have elevated metal levels. (Issue 2 Section 3.2)

Bacteriological

- The identified bathing water at Morfa Bychan periodically fail to comply with the EC Bathing Waters Directive (76/160/EEC) bacteriological standards. Detailed statistical analysis of data collected over many years indicate that this water has only a marginal probability of compliance. (Issue 3 Section 3.2)

Aesthetic

- The identified bathing waters at Harlech and Llandanwg are of poor aesthetic quality due to sewage derived debris. (Issue 4 Section 3.2)
- The Barlwyd and Ceunant Sych in and near Blaenau Ffestiniog respectively, have poor aesthetic quality due to sewage derived debris from storm sewer overflows. (Issue 7 Section 3.2)

Aesthetic/ Shellfishery

- The Glaslyn Estuary in the vicinity of Porthmadog Harbour is in Class B primarily due to the aesthetic effects of discharges from the town's sewage treatment works and from storm sewage overflows. The discharges adversely affect the re-establishment of a commercial shellfishery in the harbour and outer estuary. (Issue 5 Section 3.2)

High Ammonia and Low Dissolved Oxygen Levels

- The lower section of the Caseg is in River Ecosystem 2 as a result of elevated ammonia and, depressed dissolved oxygen levels. This is ascribed to diffuse agricultural run-off, an abundance of stagnant drainage channels and the river being tide locked downstream. (Issue 6 Section 3.2)

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High Suspended Solids

- Dust from slate quarrying activities periodically contaminates and discolours rivers in the Blaenau Ffestiniog area. This is particularly evident in the Barlwyd and upper reaches of the Goedol.
(Issue 8 Section 3.2)

MAP 4. STATE OF THE CATCHMENTS - WATER QUANTITY



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 or groundwater quality deteriorating.

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.

The NRA has considered carefully the available surface and groundwater resources within the Glaslyn/Dwryd/Artro catchments and their degree of utilisation. The following Section and Map summarise the results of this analysis. It must be stressed that where no problems or areas for further investigation have been identified, the NRA is satisfied that resources are adequate. As more information becomes available, for example about the actual flow requirements of the aquatic ecosystem, the NRA will review its resources management in each catchment.

Assessment of the catchments 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.

Low or Unnatural Flows

- All the major abstractors within the plan area, and in particular the hydroelectric schemes at Ffestiniog, Cwm Dyli and Maentwrog together with the water supply reservoirs, are covered in law by Licences or other alternative parliamentary powers that were granted many years ago. However, whilst these schemes have operated in accordance with these powers, the variable releases made from these stations create unnatural regimes and adverse environmental impacts in stretches of the rivers concerned. There may be ways in which these effects can be ameliorated though subject to discussion and agreement with generators and Dwr Cymru Welsh Water, and to consideration of the economic consequences.

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- The Cwm Dyli hydroelectric power scheme has induced an unnatural flow regime in the Glaslyn upstream of Llyn Gwynant. This has resulted in a decline in spawning activity and consequent decrease in fish populations. The NRA will attempt to negotiate a more natural flow pattern, without, if possible, severe operational impact.
(Issues 9 Section 3.2)
- The Tanygrisiau hydroelectric power scheme imposes an unnatural flow regime on a section of the middle Dwyryd which, adversely impacts on flora, fauna, and fish spawning. The NRA will attempt to negotiate a more natural flow pattern, without, if possible, severe operational impact.
(Issue 10 Section 3.2)
- There is an unsatisfactory compensation flow associated with the Maentwrog hydroelectric scheme. This is supported by abstraction from the neighbouring Eden catchment, where water loss affects salmonid waters and fisheries. Sudden changes in water levels are impacting on the fish populations upstream of the discharge. The NRA will attempt to negotiate a more natural flow pattern, without, if possible, severe operational impact.
(Issue 11 Section 3.2)
- The compensation flow from Eiddew Mawr is inadequate to maintain the tributaries of the Artro. (Issue 13 Section 3.2)
- Several small 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 the NRA and their 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 rivers where they would be most likely to succeed with an abstraction licence for the appropriate type of scheme.
(Issue 12 Section 3.2)

Determination of Abstraction Licences for Hydroelectric Generation Schemes

MAP 5.

STATE OF THE CATCHMENTS - PHYSICAL FEATURES



3.1.3 PHYSICAL FEATURES

General

Since Physical Features targets are the most subjective (Section 5.3) it follows that much of the assessment of the state of the catchment must be similarly subjective. 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.

Flood risk has been assessed by studying records of the flood history and the known distribution of flooding of the catchments.

The following section and map illustrate the current state of the catchments and identify areas where there are felt to be deficiencies.

Issues Identified

Conservation

- The lack of wet grasslands due to drainage and agricultural improvement has led to a decline in wader populations. (Issue 14 Section 3.2)
- A management strategy is required for the control of invasive alien plants on the Upper Glaslyn. (Issue 15 Section 3.2)
- A programme to monitor and encourage the recolonisation of the Lower Dwyrdd, Artro and Ysgethin by otters is required. On the Glaslyn a programme to monitor and protect this priority catchment in line with the Otter Conservation Strategy for Wales will be required. (Issue 16 Section 3.2)
- A management programme is required for the reinstatement of the reedswamp and open water within the Ystymlyn SSSI. (Issue 17 Section 3.2)

Recreation

- There is a lack of bird watching facilities within the Glaslyn/Dwyrdd estuary. (Issue 18 Section 3.2)
- Improved riverside access is required along the Colwyn, Prysor and Middle Dwyrdd. (Issue 19 Section 3.2)
- Canoe access agreements are lacking within the plan area. (Issue 20 Section 3.2)

THE STATE OF THE CATCHMENT

Fisheries

- There is a need to improve the mooring facilities and maintain an adequate channel for boating at Shell Island. (Issue 21 Section 3.2)
- Brown trout genetic integrity is at risk of damage by stocking. (Issue 22 Section 3.2)
- The low trout and salmon levels in parts of the Glaslyn and Dwyryd Catchments requires investigation. (Issue 23 Section 3.2)
- The potential for easing barriers to migrating fish on the Croesor and Edno requires evaluation. (Issue 24 Section 3.2)
- There is a lack of coarse fishery within the Plan area. (Issue 25 Section 3.2)
- The potential for introducing a naturally sustaining fish population into Llyn Mair requires evaluation. (Issue 26 Section 3.2)

Flood Defence

- There is a need to prepare Water Level Management Plans for all sites agreed with the Conservancy Council for Wales (CCW). (Issue 27 Section 3.2)

3.1.4 CONFLICTS BETWEEN USES

- | | |
|---------------------------|--|
| General | 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 Glaslyn/Dwyryd/Artro catchments. |
| Local | Only a limited number of specific conflicts have been identified within the catchments. Whilst not a specific issue within this Plan the potential for conflict exists with the operation of the tidal doors at Porthmadog Cob. The operation of the doors to prevent inundation by the sea is perceived as restricting free access for salmon and sea trout at certain times. |
| Specific Conflicts | <ul style="list-style-type: none"> - Alleviation of acidification conflicts with the conservation of natural acidic habitats. Liming of any of 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) - 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 unnatural or low flows need to be agreed with new abstractors. Discussion with existing abstractors need to be undertaken to seek their agreement for mitigating known adverse impacts. Where an agreement cannot be achieved with proposed new abstractors, an abstraction licence will not be issued. (Issues 9, 10, 11 and 13 Section 3.2) - Lack of wetland habitats within the catchment. Resistance to change and mechanisms of landowner compensation for decrease in agricultural production are key aspects to be resolved. (Issue 14 Section 3.2) - The perceived need to increase birdwatching facilities may be at odds with the views of landowners. Key areas for resolution include obtaining landowner agreement, and possibly the introduction of new public access. (Issue 18 Section 3.2) - 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 20 Section 3.2) |

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. Comments on the issues and options are invited together with any new ideas/suggestions.

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.

Abbreviations used within the tables:-

CCW	Countryside Council for Wales
DCWW	Dŵr Cymru Welsh Water
DOE	Department of the Environment
GCC	Gwynedd County Council
NERC	National Environmental Research Council
NRA	National Rivers Authority
NFFO	Non Fossil Fuel Obligation Order (s)
Order (s)	
NWWT	North Wales Wildlife Trust
RSPB	Royal Society for the Protection of Birds
SNP	Snowdonia National Park
WCA	Welsh Canoe Association
WO	Welsh Office

<i>Issue No: 1</i> Low pH values and elevated zinc levels due to acidification on the Colwyn, Prysor , Cynfal and Artro.			
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	Information to determine future action.	Cost (unknown). Potential damage to naturally acidic habitat if liming option pursued.
Research and development to identify and evaluate options for amelioration of impact.	NRA,NERC,WO, DOE	Identification of best option and costs.	Cost (£25K).

Issue No: 2 Elevated metals in some reaches of the Glaslyn due to disused mine-workings and natural outcrops of metal ores.			
OPTIONS	Responsibility	Advantages	Disadvantages
Undertake catchment monitoring programme to identify specific sources of contamination.	NRA	Information to determine future action.	Cost (unknown).
Evaluate possible mitigation measures for discharges from targeted sites.	NRA	Management information to determine future action.	None.
Implementation of realistic mitigation measures at specific sites.	Local Authorities, Site Owners	Improvement to water quality and landscape.	Cost (unknown). May not be able to implement as no liabilities on previous owners of abandoned sites. Conflicts with archaeological interests.
Apply for derogations for zinc, copper and pH if demonstrated a natural phenomenon.	DOE,NRA	All reaches will achieve River Ecosystem RE1.	No real improvement in water quality.

<i>Issue No: 3</i> Periodic failures of identified bathing water at Morfa Bychan beach to meet EC Directive (76/160/EEC) mandatory standards.			
OPTIONS	Responsibility	Advantages	Disadvantages
Full sewage treatment at Criccieth (scheduled for 1995).	DCWW	Assured compliance at Criccieth and contribution to improvement at Morfa Bychan.	Cost (unknown). Scheme will not address other source inputs and waters may still fail to comply.
Evaluate compliance following completion of remedial work at Criccieth.	NRA	Information to assess compliance and to establish whether other inputs affect the water.	None.
Improve sewage treatment at Porthmadog. Current regime known to give rise to very high levels of bacteria in estuary adjacent to EC beach. (Scheduled for 1996).	DCWW	Improved WQ at high amenity harbour and at popular but unidentified estuary beaches. Reduce bacterial levels in estuary adjacent to EC beach. Protection of and possible improvement of shellfishery.	Cost (unknown). A need to relocate outfall may affect SSSI. Scheme will not address other source inputs and waters may still fail to comply.
Investigate bacterial levels inshore of the Morfa Bychan outfall after completion of the Porthmadog scheme.	NRA,DCWW	Information on the effect of all the schemes on the water's compliance.	Cost (unknown).

Issue No: 4 Poor aesthetic quality of identified bathing waters at Harlech and Llandanwg beaches due to sewage derived debris.			
OPTIONS	Responsibility	Advantages	Disadvantages
Install screening facilities on outfalls and improve treatment system at -	DCWW	Improved aesthetic quality of identified beaches.	
Llandanwg (scheduled for 1999) and Harlech (scheduled for 2003).	DCWW		Cost (unknown).
	DCWW		Cost (unknown).
Issue No: 5 Glaslyn estuary in Class B due to aesthetic effect of sewage discharges from Porthmadog STW and storm sewage overflows.			
OPTIONS	Responsibility	Advantages	Disadvantages
Improve sewage disposal facilities at Porthmadog and improve storm overflows to reduce their spill frequency. (Scheduled for 1996).	DCWW	Improved aesthetic quality of the estuary. Upgraded classification of the estuary. Protection of and possible improvement of shellfishery.	Cost (unknown).

<i>Issue No: 6</i> High ammonia and low dissolved oxygen levels in the Caseg due to diffuse agricultural pollution and stagnant drainage channels.			
OPTIONS	Responsibility	Advantages	Disadvantages
Programme of farm inspections/liaison with agricultural community, NFU/FUW.	NRA	Establish targeting of sites for improvements.	Cost (unknown).
Improve farm effluent management and handling/storage facilities.	Farmers	Water quality improvements and reduced risk of prosecution.	Cost (unknown).
Examine potential for improvement by changing the flow regimes in low lying drainage channels.	NRA/Riparian landowner	Management information to determine future action.	Cost (unknown). Impact on agricultural interests, if implemented.
<i>Issue No: 7</i> Poor aesthetic quality in the Barlwyd and Ceunant Sych due to storm sewage discharges.			
OPTIONS	Responsibility	Advantages	Disadvantages
Improve screening and re-set spill weirs. (In DCWW priority list for 1995-2000).	DCWW	Improved aesthetic quality.	Cost (unknown).
Assessment to determine impact of scheme.	NRA	Assessment of improvement in aesthetic quality and identification of any resolved problems.	Cost (unknown).

Issue No: 8 Periodic solids contamination in the Afon Barlwyd and upper reaches of Afon Goedol by slate quarry dust.			
OPTIONS	Responsibility	Advantages	Disadvantages
Undertake catchment monitoring programme to identify specific sources of contamination.	NRA	Establish targeting of sites for improvements.	Cost (unknown)
Improve pollution prevention methods at identified sites.	Site Owners	Improved Water Quality.	Cost (unknown).
Issue No: 9 Induced unnatural Flow Regime on the Glaslyn upstream of Llyn Gwynant due to the Cwm Dyli Hydroelectric Scheme.			
OPTIONS	Responsibility	Advantages	Disadvantages
Seek to negotiate a more natural flow pattern.	NRA	Restored fish population. Increased recreational resource. Improved opportunity for stock conservation.	Cost (unknown). Owner resistance. May reduce power generation.
Issue No: 10 Reduced fish population in the middle Dwyrdd due to the un-natural Flow Regime imposed by the Tanygrisiau Hydroelectric Scheme.			
OPTIONS	Responsibility	Advantages	Disadvantages
Seek to negotiate a more natural flow pattern.	NRA	Restored fishery and improved fishing conditions. Increased recreational resource. Improved opportunity for stock conservation.	Cost (unknown). Owner resistance. May reduce power generation.

Issue No: 11 Adverse impact on fish populations of Maentwrog Hydroelectric Scheme due to unsatisfactory compensation flow.			
OPTIONS	Responsibility	Advantages	Disadvantages
Seek to negotiate a more natural flow pattern.	NRA	Restored fishery and improve fishing conditions. Increased recreational resource. Improved opportunity for stock conservation.	Cost (unknown). Owner resistance. May reduce power generation.
Issue No: 12 Determination of abstraction licence(s) applications for hydroelectric schemes need 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. Both use of NRA, CCW and developers resources. Fewer licence applications refused.	Development costs to NRA and CCW (unknown). Reduction in power generation potential. Inconsistent with NFFO Order(s).
Developers only to apply for licences at environmentally robust sites.	Power generators	As above.	As above.

Issue No: 13		Compensation flow from Eiddew Mawr is inadequate to maintain the tributaries of the Artro.	
OPTIONS	Responsibility	Advantages	Disadvantages
Increase compensation flow from Eiddew Mawr.	NRA	Restored fish populations. Increased recreational resource. Improved opportunity for stock conservation.	Cost (unknown). Owner resistance. Impact on water supply.
Issue No: 14		Decline in area and quality of wet grassland due to drainage and agricultural improvement has impacted on wader populations.	
OPTIONS	Responsibility	Advantages	Disadvantages
Restore wet grassland habitats.	NRA, CCW, SNP	Restored bird populations. EC Habitats Directive requirements satisfied.	Cost (unknown). Landowner resistance. Lack of compensatory mechanism. Requirement for ongoing management.

Issue No: 15 Impact on riparian habitats/native species by spread of alien plants.			
OPTIONS	Responsibility	Advantages	Disadvantages
Eradicate /control invasive species.	NRA, CCW, GCC, SNP	Restoration of riparian habitats.	Cost (unknown). Ongoing management required.
Issue No: 16 Glaslyn and Dwyrdd are priority otter catchments requiring immediate implementation of a management strategy in line with the Otter Strategy for Wales.			
OPTIONS	Responsibility	Advantages	Disadvantages
Implement Strategy.	NRA, CCW, GCC, SNP, NWWT	Secured and enhanced otter populations.	Cost (unknown). Habitat restoration requires landowner consent. May not enhance otter populations.
Issue No: 17 Damage to Ystymllyn SSSI through drainage.			
OPTIONS	Responsibility	Advantages	Disadvantages
Control willow scrub rise water levels and control grazing.	NRA, CCW, Landowner, RSPB	Restored site as regionally important wetland.	Capital cost £100K+ ongoing management required.
Issue No: 18 Lack of birdwatching facilities within Glaslyn/Dwyrdd estuary.			
OPTIONS	Responsibility	Advantages	Disadvantages
Provide Hides.	NRA, GCC	Improved recreational facility for birdwatchers.	Cost - £3K/hide. Landowner agreement required. New public access may be required.

Potential

Issue No: 19 Need for improved riverside access.			
OPTIONS	Responsibility	Advantages	Disadvantages
Improve footpath network.	NRA, SNP	Improved amenity.	Cost (unknown). Landowner agreement required.
Issue No: 20 Lack of Canoe Access Agreements within the Plan Area.			
OPTIONS	Responsibility	Advantages	Disadvantages
Establish 1 access agreement within the area.	NRA, WCA	Facilitation of controlled access for canoeists.	Cost (unknown). Landowner resistance. Fishermen resistance.
Issue No: 21 Need to improve the mooring facilities and maintain adequate channel for boating at Shell Island.			
OPTIONS	Responsibility	Advantages	Disadvantages
Agree and establish a maintenance programme for moorings and channel.	Meirionnydd D.C., NRA, SNP	Simplified maintenance procedures, better access and mooring facilities.	Cost (unknown).
Issue No: 22 Risk of damage to brown trout genetic integrity from stocking.			
OPTIONS	Responsibility	Advantages	Disadvantages
Effective stocking policy and/or development of a brown trout strain suitable for local water.	NRA, Fishery Owners	Re-established or preserved locally adapted population.	Cost (unknown). Timescale if selected breeding needed.

Issue No: 23 Low fish population levels in parts of the Glaslyn and Dwyryd catchments.			
OPTIONS	Responsibility	Advantages	Disadvantages
Continue regional monitoring programme.	NRA	Identification of problem areas to target remedial action.	Cost (unknown).
Issue No: 24 Physical barriers to fish migration on the Croesor and Edno.			
OPTIONS	Responsibility	Advantages	Disadvantages
Investigate the potential for easing permanent barriers.	NRA, Fishery Owners	Identification of potential for improving the fisheries.	Cost (unknown). Resistance from some local user groups. Implications for genetic integrity of natural trout populations if access provided.
Issue No: 25 Lack of coarse fishing venues within the Plan Area.			
OPTIONS	Responsibility	Advantages	Disadvantages
Encourage introduction of coarse fisheries when advising potential developers.	NRA, Tourist Board, Fishery Owners	Facilitate the establishment of coarse fishing venues.	Cost (unknown). Potential for escape of alien species into salmonid waters.

Issue No: 26 Llyn Mair is devoid of fish.			
OPTIONS	Responsibility	Advantages	Disadvantages
Undertake a study to identify the factors limiting the introduction of a sustainable fishery.	NRA, SNP	Management information on the factors limiting the introduction of a sustainable fishery.	Cost (unknown).
Evaluate options to allow the introduction of the fishery.	NRA, SNP	Management information to determine future action.	None.
Implement most cost effective option.	NRA, SNP	The reintroduction of fish into an otherwise fishless lake in a high profile tourist area.	Cost (unknown). A sustainable fish population may not be achieved.
Issue No: 27 Preparation of Water Level Management Plans.			
OPTIONS	Responsibility	Advantages	Disadvantages
Prepare plans for all sites agreed with CCW.	NRA, CCW, WO, NWWT, RSPB, Councils, Landowners	Working document to manage for conservation/ agriculture.	Cost (unknown). Possible landowner resistance. Lack of compensating mechanism. Hydrological data required.

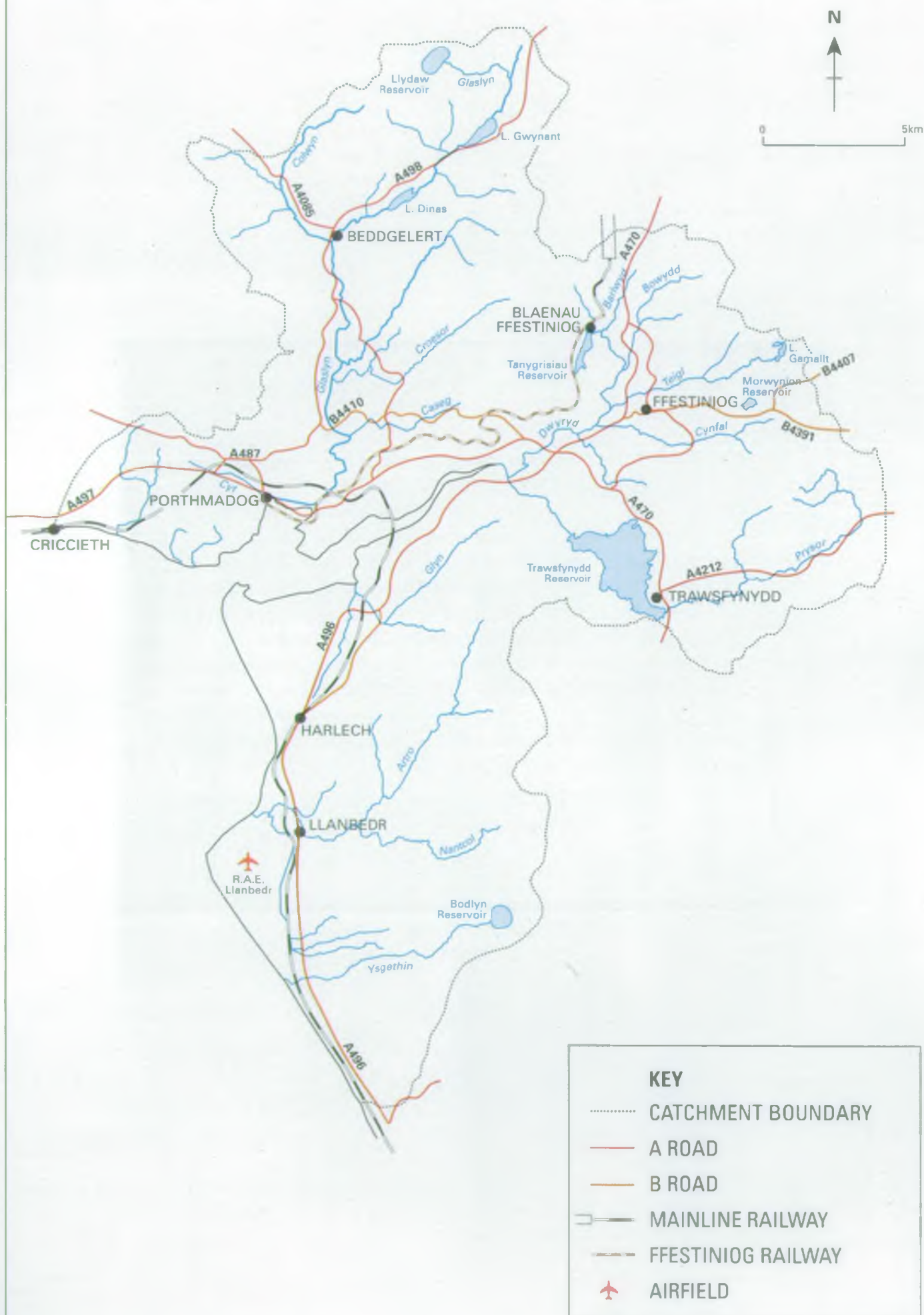
PART II

SUPPORTING INFORMATION

4.0 THE USES OF THE GLASLYN/DWYRYD/ARTRO CATCHMENTS

The following sections catalogue the legitimate Uses of the **Glaslyn/Dwyryd/Artro** catchments which fall under the control of the NRA in one way or another. A general description of the nature of the NRA's responsibility towards each is given, complete with a set of management aims and environmental quality targets. These are designed to protect both the environment and the requirements of other Uses. In Section 5 these specific targets are used to help us set overall targets, for the whole catchment, for water quality, water quantity and physical features, that reflect the NRA's view of the balance of interests between the different users of water.

MAP 6. URBAN DEVELOPMENT AND INFRASTRUCTURE



4.1 URBAN DEVELOPMENT (including road and rail)

General

Development must be considered when planning the management of a river catchment because it can directly and indirectly affect other Uses. This Use is related to existing and predicted residential, commercial and industrial development that is identified in the county structure and district local plans. These plans identify policies against which planning authorities consider development proposals.

While the NRA has statutory powers and responsibilities to protect the water environment, these can be complemented by effective control of land use to prevent anticipated problems at an early stage.

The NRA is a statutory consultee under planning legislation and advises local authorities on development proposals that can have an impact on matters relevant to the NRA. Consequently, a major objective of this Catchment Management Plan is to provide the planning authorities with a clear picture of the NRA's responsibilities and policies towards development of this catchment. The Plan identifies all legitimate users of the catchment so that their interests can be taken fully into account during the planning process. This approach is consistent with the Government's declared objective of "plan led" development.

The NRA seeks to pursue its aims and policies regarding development through the planning consultation process. Although the final decision on planning matters rests with the planning authority, government guidelines advise on the need to consider the NRA's concern when determining proposals.

The NRA has produced a series of Guidance notes for LPAs that outline methods of protecting the water environment. The NRA proposes that these should be incorporated into the LPAs' own Development Plans, whenever possible.

Local Perspective

The Plan area is entirely within the County of Gwynedd. The vast majority of the catchments lie within the District Councils of Dwyfor and Meirionnydd, although the headwaters of the Colwyn catchment arise in Arfon Borough Council's administrative area. The overall Plan area is approximately 508km² (7km² of which lies in Arfon, 125km² in Dwyfor and 376km² Meirionnydd). Approximately 430km² of the Plan area is within the Snowdonia National Park (SNP). The SNP Committee is responsible for Planning/ Development Control activities in the whole of Meirionnydd and for those areas within Dwyfor and Arfon which lie within the Park. Development Plans are at various stages of preparation by Planning Authorities within the catchment, and these are summarised in Table A.

**TABLE A CURRENT STATUS OF DEVELOPMENT PLANS WITHIN
THE GLASLYN/DWYRYD/ARTRO CATCHMENTS**

<u>PLANNING AUTHORITY</u>	<u>DEVELOPMENT PLAN STATUS</u>
GWYNEDD COUNTY COUNCIL	GCC Structure Plan - adopted 1993.
DWYFOR DISTRICT COUNCIL	Pre-Deposit District Wide Local Plan draft prepared. Consultation period ended April 1994.
SNOWDONIA NATIONAL PARK (MEIRIONNYDD & ARFON)	Consultation draft Park Wide Plan expected during 1995.

TABLE B PLAN AREA POPULATION FIGURES (1991 CENSUS)

<u>ADMINISTRATIVE COUNCIL</u>	<u>POPULATION</u>	<u>MAIN TOWNS</u>
MEIRIONNYDD DISTRICT	13700	Ffestiniog Penrhyndeudraeth Harlech
DWYFOR	5400	Porthmadog Criccieth (*)
ARFON	-	-

(*) Part of settlement lies outside Plan area - 50% of total population estimated to be within Plan area

The total resident population of the catchments is just over 19,000, distributed as illustrated in Table B. The Plan area is predominantly rural and agriculture is by far the most abundant land use. However 85% of Gwynedd's agricultural land has severe or very severe natural limitations on its use, the upland/hills of the Plan area being predominantly rough grazing land of Grades 3,4 and 5 which chiefly support sheep farming. Sheep farming in Meirionnydd alone represents over 35% of the total population of sheep in the County of Gwynedd.

Historically, the mineral industry has been an important component of Gwynedd's economy. Slate quarrying in particular is common and there are currently five active workings in the Plan area, chiefly centred in and around Ffestiniog.

The history of mineral exploitation in the County has, however, left a legacy of derelict land characterised by accumulation of mineral wastes. Modern workings are now only approved subject to reclamation upon completion of extraction.

Current and planned housing developments are chiefly within the main towns indicated in Table B, whilst employment provision is encouraged at "Prestige Sites" and existing Employment Estates in Porthmadog, Penrhyndeudraeth and Blaenau Ffestiniog.

A number of energy schemes have developed in the area, most notable of which is the Magnox Nuclear Power Station at Trawsfynydd commissioned in 1965. The development and operation of the station were major sources of employment in the area, although power generation has now ceased and an alternative use for the site is currently under consideration. Hydroelectric stations at Maentwrog, Cwm Dyli and Tanygrisiau supply power to the National Grid and proposals involving a number of smaller installations within the area are currently under consideration.

Tourism is a major industry within the Plan area. Features range from the beaches at Llandanwg, Harlech, Morfa Bychan, Talybont and Dyffryn Ardudwy with identified bathing waters under the EC Bathing Water Directive, to the unspoilt serenity of the Snowdonia National Park.

Table C indicates the number of visitors to a selection of the most popular tourist attractions in the Plan area during 1991.

TABLE C VISITORS TO ATTRACTION

<u>ATTRACTION</u>	<u>NO. VISITORS</u>
HARLECH CASTLE	88,381
CRICCIETH CASTLE	37,958
PORTMEIRION	285,461
LLECHWEDD SLATE CAVERNS	248,416
FFESTINIOG POWER STATION	35,000
FFESTINIOG RAILWAY	183,591
WELSH HIGHLAND RAILWAY, PORTHMADOG	17,343

The area is served by a number of Trunk and A roads linking the main settlements. A number of trunk road improvement works have been completed or proposed within the Plan area. Perhaps the most significant scheme from the NRA's viewpoint is the proposed Tremadog to Penrhyndeudraeth bypass, which involves a crossing of the River Glaslyn adjacent to the existing main line railway crossing. The main line Pwllheli to Aberystwyth railway runs in the Plan area along the coast between Criccieth and Barmouth, and the narrow gauge railway links Porthmadog with the Conwy Valley main line at Blaenau Ffestiniog. There are no airport facilities within the area although there is a Royal Airforce Establishment at Llanbedr.

Aims

To ensure that development does not adversely impact and, wherever possible to ensure that it proceeds in a way that benefits, the water environment and its users.

To ensure that development does not impact on the water environment to a degree that threatens life and property.

Environmental Requirements

Water Quality The water environment should not suffer any detriment due to development.

Adequate pollution prevention methods, that are consistent with the Groundwater Protection Policy and the NRA's Guidance Notes, should be incorporated into developments.

Water Quantity To protect inland waters (and groundwater which is a locally important source of water supply) from the detrimental effects of development, including afforestation and other changes in land use.

Physical Features Development should not be at risk from flooding and should not put other areas at risk of flooding which could endanger life and damage property.

Any work that is needed to reduce the risk of flooding created by a development is paid for by the developer and not from public funds.

Conservation features associated with the water environment should not suffer any detriment, and wherever possible should be enhanced by development.

4.2 FLOOD DEFENCE

General

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 30/92 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 Plans 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.

The Water Resources Act 1991 requires the NRA to exercise general supervision over all matters relating to flood defence. Powers are also

MAP 7.

FLOOD DEFENCES



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 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 1994 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 form part of the scheme.

Water Level Management Plans will be drawn up for sites where flood defence works influence water levels and there is significant conservation interest. Sites and locations will be agreed with Countryside Council for Wales/English Nature and the plans will be developed in accordance with the guidance issued by MAFF/WO.

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 area covered by this plan, the necessary powers to maintain or improve defences is shared by District Councils (maritime defences) and the NRA. There are also some lengths of defence in private ownership such as British Rail. The Cob at Porthmadog, with its 5 tidal doors through which the Glaslyn flows into the sea, is maintained and regularly inspected by the NRA. The type of sea defence varies between natural dune systems, rock armour and earth embankments. The tidal defences within the Artro and Dwyryd catchments are predominantly earth banks reinforced with rock armour.

There are no major fluvial flood defence structures on the Glaslyn. On the Dwyryd from east of Penrhyndeudraeth to Maentwrog there are earth banks on both sides of the river which are tied into higher ground. On the Artro there are no fluvial defences upstream of Llanbedr, although there are limited tidal defences downstream of this point.

The existence of extensive areas of flood and coastal plains and associated low-lying land presents difficulties with drainage. This has led to the formation of Internal Drainage Districts. The Gwynedd Local Flood Defence Committee (GLFDC) administers the 4 IDD's in the Plan Area. Two of the IDD's, namely the Glaslyn/Pensyflog and the Llanfrothen, drain to the

Glaslyn. The Harlech and Maentwrog IDD is associated with the Dwyryd catchment whilst the Ardudwy Marsh IDD is within the Artro catchment. The effectiveness of these IDD's is dependent on the regular maintenance of the main rivers and adopted ditches within the system. This includes regular inspection and maintenance of all tidal flaps through which the IDD's drain and upkeep of associated floodbanks.

Elsewhere in the catchments, flood defence work consists mainly of shoal removal and river management schemes carried out as necessary.

There are no major flooding problems on the 'main rivers' within the catchments, although large areas of agricultural land within the flood plains are inundated from time to time. However, limited incidents associated with ordinary river systems have been recorded.

The main areas likely to require Water Level Management Plans are Llyn Ystumlllyn and Glaslyn Marshes SSSIs, and the Afon Glaslyn. 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.

There is no formal flood alert monitoring station within the Plan area. Although this would appear to be at odds with NRA policy, local conditions are such that the absence of a flood warning system is not considered an issue in these catchments. However flood alerts triggered in neighbouring catchments are indicative of likely flood conditions within the area.

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 defence 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.

The river banks should contain flows up to a defined maximum, expressed as

the calculated probability of occurrence.

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.

Adequate arrangements should be provided for flood warning.

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

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

MAP 8.

SOLID WASTE DISPOSAL



- KEY**
- CATCHMENT BOUNDARY
 - OPEN DOMESTIC WASTE TIPS
 - CLOSED LANDFILL SITES
 - ▲ CLOSED DOMESTIC WASTE TIPS

4.3 SOLID WASTE DISPOSAL (LANDFILL)

General

The disposal of domestic and industrial waste into landfill sites is a common form of waste disposal in England and Wales. All sites that receive 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

The one active site within the Plan area, located at Morfa Harlech, is presently operated by Meirionnydd District Council, and it receives all the waste from the Council's area. The site has been in operation since the early 1980s and has historically operated on the dilute and disperse principle. Here, the natural attenuation of the leachate flowing through the fine sands of the site prevents possible contamination of adjacent ground and surface waters. Boreholes located within, and surrounding the site, are sampled to monitor the situation. The Council is currently seeking tenders from companies with a view to privatising the site in accordance with the requirements of the Environmental Protection Act, 1990. If this is successful, then the site will almost certainly be extended and the NRA has stipulated that any new areas will have to be operated on a containment basis, where the leachate produced is collected for treatment prior to disposal.

The other recently active site is at Cwm Bowydd, Blaenau Ffestiniog, and this is now operated as a civic amenity site only.

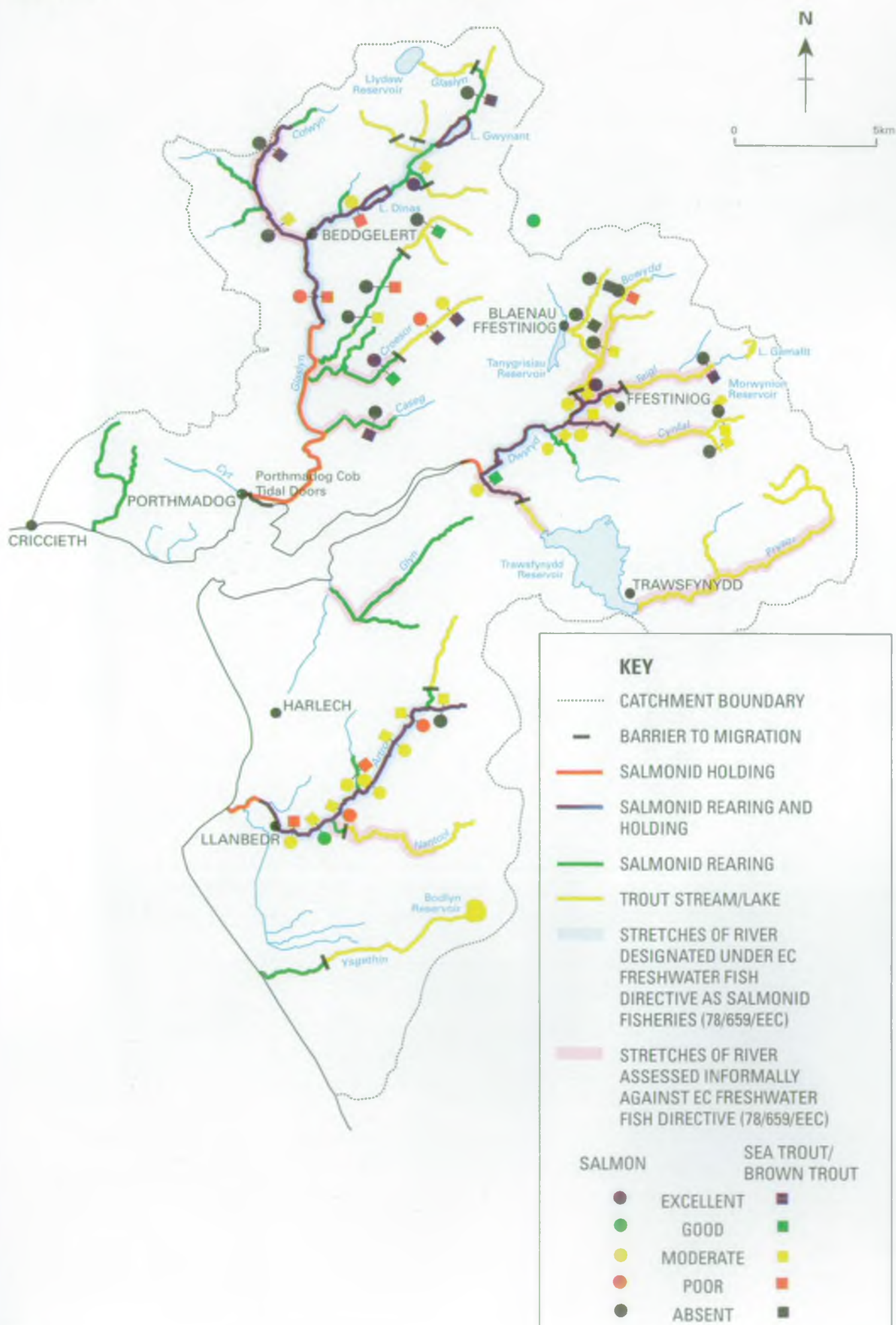
It is normal practice these days to cap finished sites with a low permeability material, such as clay, in order to minimise the amount of rainfall that comes into contact with the waste and thus reduce the amount of leachate produced. Five historical tipping sites within the catchment where such capping has not taken place have been inspected but no contamination problems have been detected to date.

- 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 and volume 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.
 - Where appropriate waste disposal sites must comply with prohibition notices or discharge consent conditions. These will be enforced by the NRA and WRAs.
- Water Quantity**
- Waste disposal activities must not harm groundwater resources or adversely affect the rights of water abstractors.
- 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 must be carried out by those responsible.

FISHERIES



4.4 FISHERIES

General

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:-

- | | | |
|---------------------------|---|---|
| <i>Salmonid fisheries</i> | - | e.g. salmon and trout |
| <i>Cyprinid fisheries</i> | - | generally referred to as coarse fisheries |

A third category:-

- | | | |
|-------------------------|---|--|
| <i>Migratory waters</i> | - | i.e. 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 Substance Directive which applies to all controlled waters.

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 yet receive the protection from similar formally quantifiable 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

This use deals solely with the quality of the water required to protect, maintain and improve the fisheries within the Plan area. The quality of the three designated statutory sites has been assessed against the mandatory EC Freshwater Fish Directive (78/659/EEC) Salmonid waters standard values. The designated sites on the Dwyrdd and the Artro are subject to a derogation for pH, copper and zinc due to the naturally acidic and mineralised conditions experienced within the catchments. The designated site on the Glaslyn is also

subject to a derogation but in this case only for copper and zinc. Any failure to comply with the standards in the Directive on these stretches, subject to the aforementioned derogations and statistical appraisal, will lead to a mandatory inclusion of the failure as an issue in the Plan.

The EC Freshwater Fish Directive standards have also been applied to another twelve undesignated stretches within the catchment on an informal basis. In this case any failure to comply with the standards for salmonid waters at these non statutory sites will be carefully considered on merit for inclusion as an issue in the Plan.

The freshwater fish populations of the Rivers Glaslyn, Dwyryd and Artro are dominated by three principle species; eel, salmon and trout (brown trout and sea trout, the resident and migratory forms respectively). Other species known to be present are the sea lamprey, brook lamprey, river lamprey, minnow, and three-spined stickleback. All of this latter group are very localised within the catchment and the distribution is not fully known. Llyn Bodlyn on the Ysgethin contains the most southerly population of Arctic Charr in the United Kingdom and one of three remaining natural populations in Wales.

Salmon and sea trout are present in all catchments and occupy all sections of river downstream of permanent barriers to migration. Information from juvenile salmonid surveys undertaken since 1986 indicates that the salmon has a far more restricted distribution than the trout on all three catchments. This is partly a natural phenomenon, with the salmon preferring the main river and larger tributaries for spawning. However, it is also influenced by water quality as the salmon is more susceptible to increased acidity. Upstream of the barriers, there are important brown trout populations in the rivers and the many lakes of the area. These form a very important genetic resource as stocking has been limited or absent in most waters leaving stocks in a mainly pristine genetic condition.

Acidification has been identified as a major problem on some of the Glaslyn tributaries, particularly the Colwyn and some of the lakes and upper sections of the Dwyryd and Artro systems. The NRA, in collaboration with CCW, is undertaking a long term study on the impacts of acidification and consequence of catchment liming at Llyn Gamallt in the headwaters of the Afon Dwyryd. The Institute of Terrestrial Ecology (ITE) in Bangor has also undertaken long term research on the Afon Colwyn in the afforested area upstream of Beddgelert.

The presence of tidal sluices upstream of Porthmadog has always been a contentious issue. Extensive survey work in 1981 and 1982 indicated that conditions for the passage of sea trout were suitable for most of the open period and the sluices were not considered to have been a significant factor in an alleged decline in catches.

Sea and estuarine fish such as the mullet, flounder, and bass are present and support recreational fisheries in the estuaries of all three catchments. In addition the outer estuaries are utilised by a range of marine fish, and are particularly important as nursery areas. However, very little survey work has been carried out on those species in the Plan area.

Aims To sustain 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 of 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 identified for migratory fisheries element of the Fisheries Use.

Water Quantity To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

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.

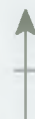
Natural or artificial barriers should not lead to excessive exploitation of fish.

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

MAP 10.

RIVER ECOSYSTEM

N



0 5km



KEY

- CATCHMENT BOUNDARY
- RIVER ECOSYSTEM CLASS 1
- RIVER ECOSYSTEM CLASS 2
- RIVER ECOSYSTEM CLASS 3
- RIVER ECOSYSTEM CLASS 4
- RIVER ECOSYSTEM CLASS 5

4.5 RIVER ECOSYSTEM

General

The River Ecosystem Use addresses the protection, maintenance and improvement of the basic water quality required to support different types of River Ecosystem. The Use has five classes with Class 1 being of the highest water quality. The details of the Use classes are defined in the "Surface Waters (River Ecosystem) (Classification) Regulation 1994". The Use applies to all watercourses in the catchment.

Within the classified stretches, the River Ecosystem Target Class will be used to replace the existing Long Term River Objective (LTRQO) based upon the old National Water Council (NWC) system.

These targets represent the long term aspirations for the catchment and may not, in some instances, be achievable in the short-medium term. Consistent with this, the targets, set for this Use, for river stretches covered by this CMP will reflect what can be achieved within its intended life of 5-10 years.

As the River Ecosystem is the first Use introduced under the Water Quality Objective scheme (See page 97), it is hoped that these "interim" targets will be translated into Statutory Water Quality Objectives during the lifespan of this CMP. Once set as formal objectives the NRA will have a duty to ensure compliance with them.

Local Perspective

The map included here represents the current "face value" assessment of the water quality in the rivers in the Plan area. From the map it would appear that large areas of the catchment are in River Ecosystem Class RE 5. However, when a more rigorous statistical appraisal is undertaken - as in the production of data for the State of the Catchments Map (Map No.2) - large areas of the catchments in fact achieve the target of Class RE1. As the area is subject to natural acidification, resulting in derogations for pH on both the Dwyrdd and Artro for the EC Freshwater Fish Directive monitoring, similar derogations may also be sought for the inferred objectives.

Aims

To provide water quality suitable to support a healthy River Ecosystem appropriate to this type of river.

Environmental Requirements

Water Quality	Waters should comply with the appropriate standards of the Surface Waters (Rivers Ecosystem) (Classification) Regulations 1994.
Water Quantity	To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.
Physical Features	An appropriate diversity of natural instream and bankside habitat should be maintained to support the Ecosystem typical of this river type.

MAP 11.

GENERAL ECOSYSTEM

N



0 5km



KEY

- CATCHMENT BOUNDARY
- INFORMAL STRETCHES PASSING SALMONID STANDARDS
- INFORMAL STRETCHES FAILING SALMONID STANDARD DUE TO ZINC
- INFORMAL STRETCHES FAILING SALMONID STANDARD DUE TO pH AND ZINC

4.6 GENERAL ECOSYSTEM

General

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 in their life cycle, on the aquatic and bankside environment.

Thus this is the basic Use that 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. However, there is also a requirement to protect physical features and water quality 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 suitably rigorous water quality targets will be applied.

Local Perspective

A number of stretches in the Plan area have had water quality assessments on an informal basis against the standards set down for a salmonid fishery in the EC Dangerous Substances Directive (76/464/EEC). This informal approach is appropriate because they are not associated with point discharges of dangerous substances nor are they designated background sites downstream of a designated discharge. From the map it can be seen that there are two types of failures, those associated directly with low pH when the failure is due to pH and zinc and, those associated indirectly with low pH where the failure is due entirely to the level of zinc present.

The biological assessment of the catchment indicates a typical fauna associated with streams draining upland acidic moorland habitat. Acidification effects are further exacerbated by coniferous afforestation around tributaries of the Glaslyn near the village of Beddgelert. Both the Glaslyn and (on a smaller scale) the Artro catchments have a history of metal mining of the intrusive igneous rocks enriched with mineral ores, and this has resulted in elevated metal levels within the river system. Localised farm inputs in lowland areas in particular on the Glaslyn floodplain, are important in terms of water quality.

The Dwyrdd catchment is affected by both the slate quarrying in and around Blaenau Ffestiniog, and the general acid sensitive rocks and soils of the area which gives rise to metal contamination and acidification problems.

All three catchments are relatively untouched by industrial development, with the biological habitat and the flora and fauna generally pristine, and are only significantly influenced in parts by upland acidity, metalliferous inputs, slate quarrying and some lowland farming activities.

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

Environmental Requirements

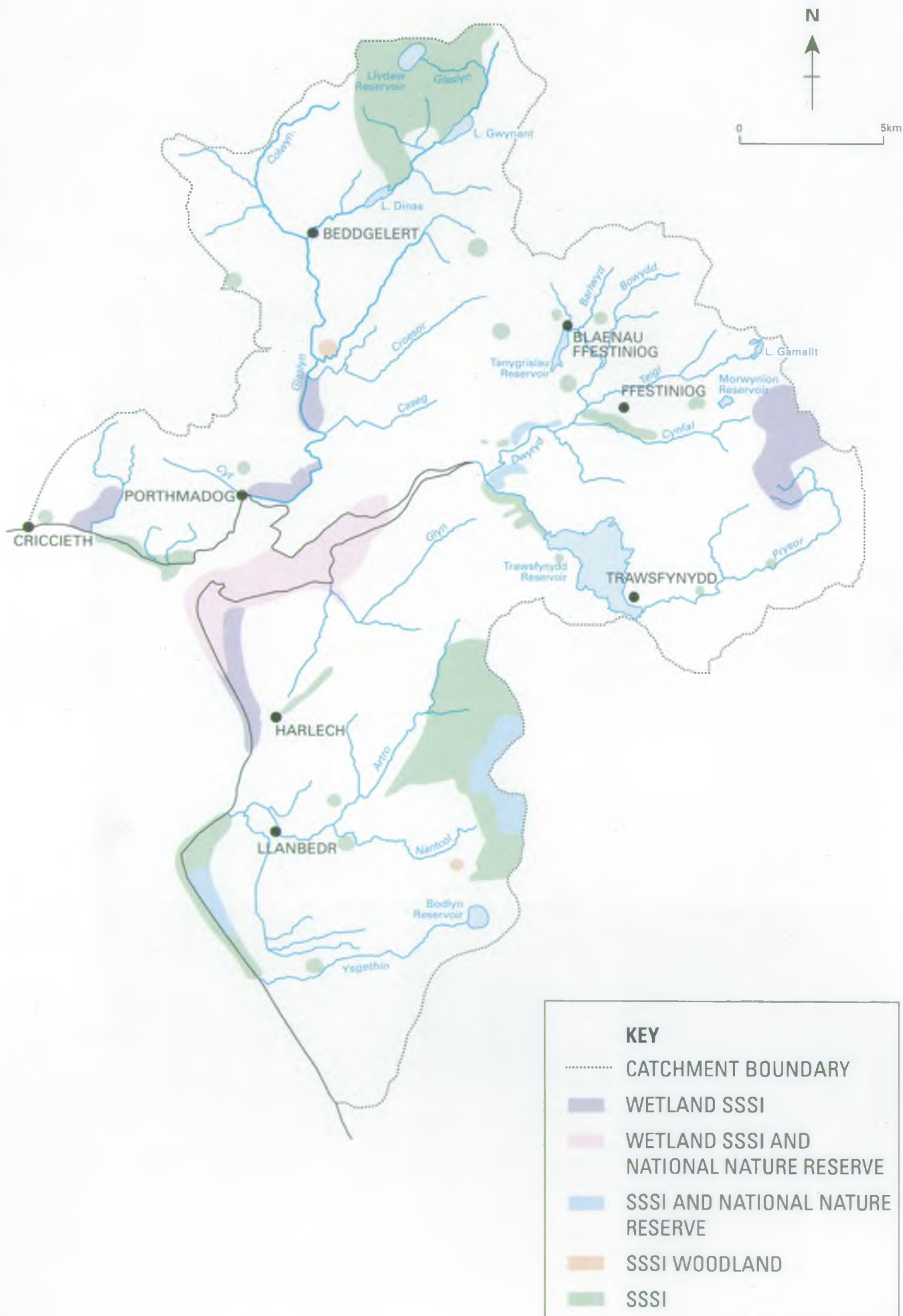
Water Quality Waters should comply with requirements of the EC Dangerous Substances Directive.

Water Quantity To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

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

MAP 12.

SPECIAL ECOSYSTEMS



4.7 SPECIAL ECOSYSTEMS

General	<p>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) and Sites of Special Scientific Interest (SSSIs) and Special Areas of Conservation and Special Protection Areas designated under the EC Habitats and Birds Directives.</p> <p>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.</p> <p>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.</p>
Local Perspective	<p>Within the Plan area there are 32 sites of Specific Scientific Interest (SSSIs), 4 of which have National Nature Reserve (NNR) status over part of the site.</p> <p>Coastal sites include the extensive dune systems of Morfa Harlech, Morfa Dyffryn and Morfa Bychan, adjacent to which are small areas of saltmarsh and extensive mudflats. Slightly inland, Llyn Ystumllyn, Pont Croesor, and Glaslyn marshes are important for wildfowl and wading birds, although the former has been degraded by drainage and resultant scrub invasion.</p> <p>Common to all three catchments, and particularly flanking the upper tributaries, are areas of ancient semi-natural woodland. Where these occur in damp gorges, known locally as Ceunant, conditions are suitable for the growth of mosses and liverworts typical of the west coast. In the upper catchment the key wetland sites are Llynnau Llagi and Adar, Hafod Garregog acidic mire and the extensive blanket bog of the Migneint. Llyn Llagi is also one of only two lake sites in Wales that form part of the UK Acid Waters Monitoring Programme.</p> <p>Impacts to protected sites include development (e.g. golf courses), hydroelectric power schemes, drainage of wetland sites, and overgrazing of moorland.</p>
Aims	<p>To protect the special features interest, for which the site has been designated for their ecological or landscape importance.</p>

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.

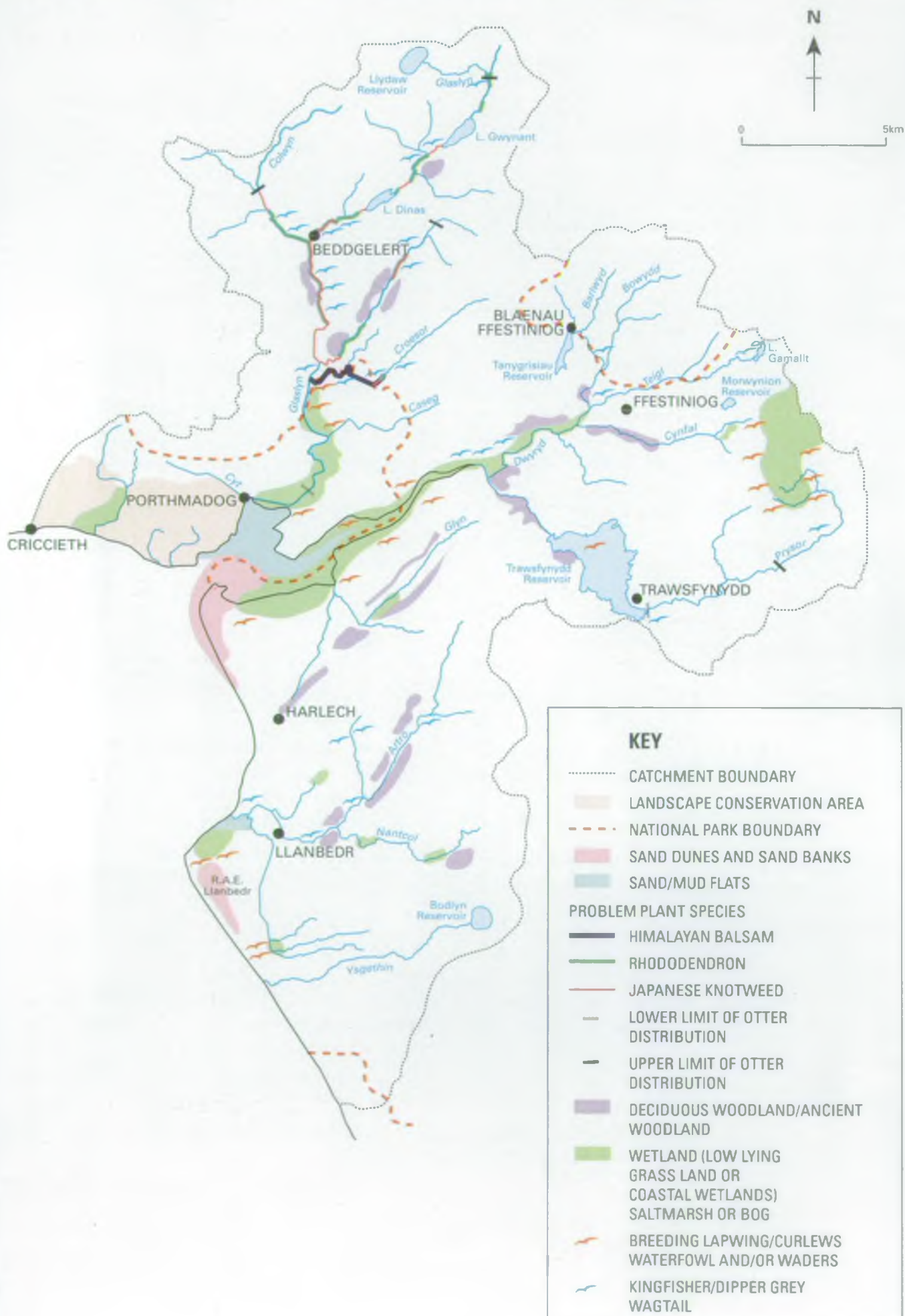
Water Quality

At sites where water quality is a key factor in the creation of a special ecosystem, the most stringent standards for water quality (i.e. River Ecosystem Class 1) will be applied, in addition to any other known water quality standards.

Water Quantity

To develop and implement a Regional licensing policy that will, at catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

MAP 13. CONSERVATION - ECOLOGY AND LANDSCAPE



4.8 CONSERVATION - OF NATURE, LANDSCAPE AND HERITAGE

General

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.

The NRA has a duty to promote and further conservation of flora and fauna while it carries out its business. This includes the protection of water based or associated plants and animals that are so vital to the water environment. It also has 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 coastal zone of the Plan area is characterised by extensive dune systems flanked by lowland damp grassland, much of which has been degraded by afforestation, caravan development and an airfield. Nevertheless, these areas, particularly Morfa Harlech, are locally important wintering and breeding sites for lapwing, snipe, curlew and redshank.

The Glaslyn estuary has largely been reclaimed by the construction of the Cob embankment in 1810 but is still important for wildfowl, waders and wintering whooper swans. Changes to the course of the river over many centuries have left features throughout the floodplain that are of geomorphological and botanical interest. All these low lying areas within the Plan area are drained by a network of ditches and embanked channels which are maintained by the NRA.

The Dwyrdd estuary is very narrow, has a restricted topography and contrasts sharply with the shallow inland lagoon of the Artro estuary, which is protected by shingle promontories.

In the upper catchment the rivers are steep, cobble or boulder bedded and torrential with impoverished channel flora, although gorge sections have abundant bryophyte assemblages.

Both upland and lowland river sections are ideal for birds notably kingfisher, merganser, sand martin, wagtails and dippers, the latter being particularly abundant on the Dwyryd with up to 8 pairs/km.

The predominant land use is upland sheep grazing with locally extensive coniferous afforestation. The importance of the landscape is reflected in the designation of much of the Plan area as National Park or landscape conservation area.

The quality of riparian habitats on the Glaslyn is reflected by the continued increase in numbers of recorded signs of otters and the extension of their range, particularly in the upper catchment. For this reason the Regional Otter Strategy has identified the Glaslyn as a priority catchment where the population should be maintained and protected. This contrasts with the very low numbers on the Dwyryd (only recorded above Trawsfynydd) and absence from the Artro and Ysgethin. In the case of the Dwyryd, the Regional Otter Strategy has identified it as a priority catchment where the population should be enhanced and its range extended.

Adverse impacts on the catchments in general include past and present drainage of damp grassland and consequential loss of waders, quarrying, afforestation, and spread of alien plants, particularly the Himalayan Balsam and Rhododendron on the Glaslyn.

Within the Plan area there are 66 Scheduled Ancient Monuments (SAMs), which represent some 10% of the archaeological heritage of the area. Many of these sites are concentrated in the foothills of the Harlech dome (Ardudwy) between Talsarnau and Llanaber, lying in a landscape, of exceptional historic interest. Work is currently underway between CCW and SNP on a joint initiative to compile an indicative register of prehistoric sites. Ardudwy represents a potential grade 1 historic landscape, primarily because of the density and quality of sites and their setting from Neolithic through to recent times.

The Glaslyn floodplain, extending to Traeth Bychan and Penrhyndeudraeth has also been identified as being of exceptional landscape interest but from a later period. Elsewhere, non-scheduled sites include iron age hill forts, hut groups and field systems in the uplands of both the Glaslyn and Dwyryd catchments, and the slate quays on the Dwyryd estuary.

Aims 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 informal standards for Aesthetic Standards criteria.

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 To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

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.

4.9 ABSTRACTION

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 the NRA 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). 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.

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 the NRA and its predecessors to restrict pre-existing abstractions.

In considering applications for new licences, the NRA must ensure that there is no derogation of existing abstractors without their agreement, and that the aquatic environment and associated habitats are properly safeguarded. The NRA does 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.

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

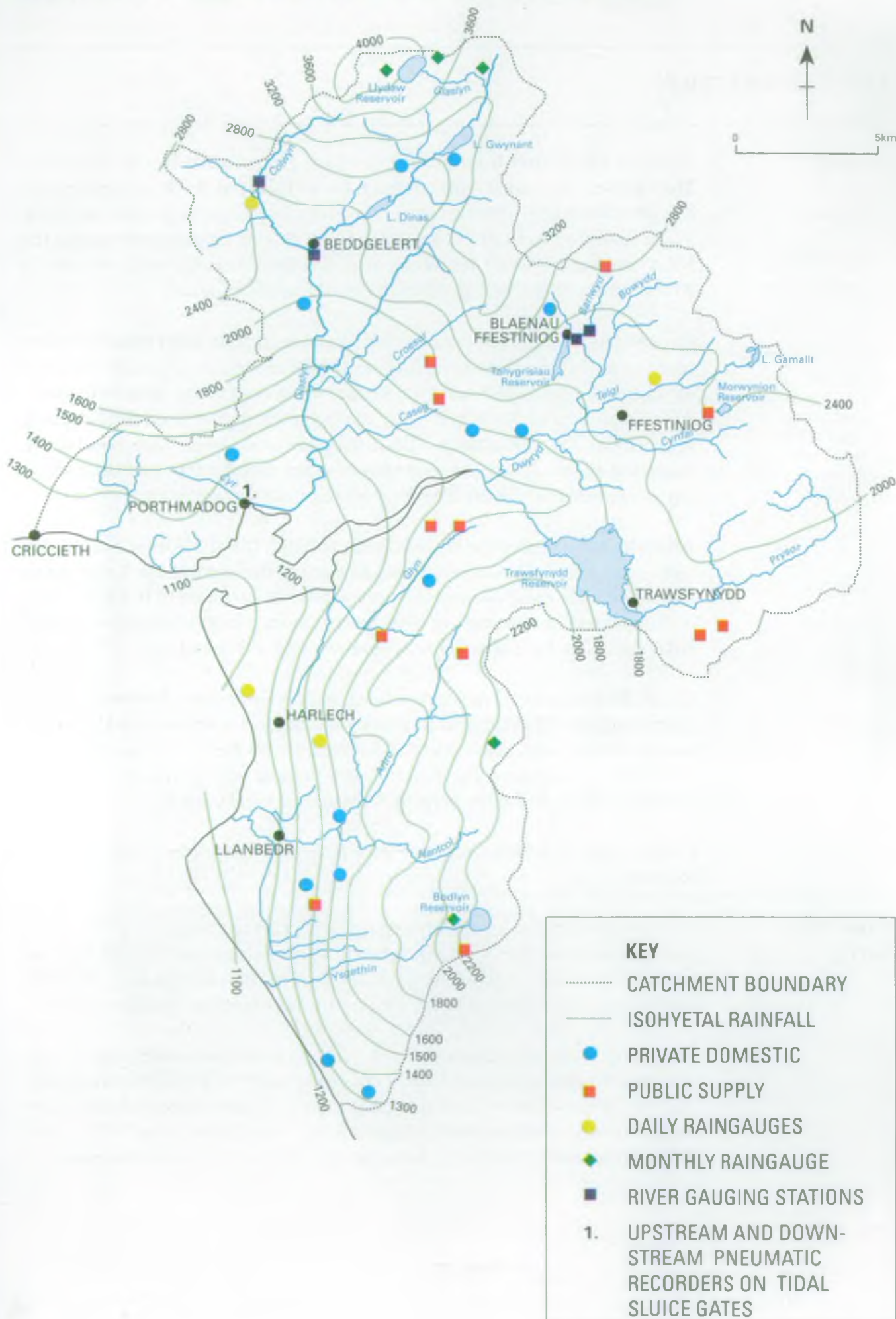
Public Water Supply

Public water supplies are mainly taken from surface waters - rivers, streams and reservoirs - but groundwater sources can be important on a local scale. Private supplies are generally derived from springs and boreholes and their quality is monitored by the Local Environmental Health Officer.

The NRA is not responsible for the quality of the raw water, nor of the delivered, treated water. However, it does have a duty to protect water quality and will specify protection zones around groundwater sources that seek to control certain potentially polluting activities. The Groundwater Protection Policy (Appendix 2) forms the basis for the NRA's activities in this area.

MAP 15.

ABSTRACTION FOR POTABLE SUPPLY



**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. The NRA encourages winter abstraction into storage and sets 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 reduced in flow. The requirement for an adequate residual flow to protect the river can restrict the viability of a fish farm.

**Hydro
Power**

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.

For this reason, the NRA would usually require a minimum residual flow to be left within the river to protect the legitimate needs that would be affected. New licences would be time-limited and would be subject to an agreed volume of derogation - otherwise the NRA could not grant any new licences for nett abstraction upstream as they would derogate the hydropower abstraction.

All hydropower abstractions require an abstraction licence.

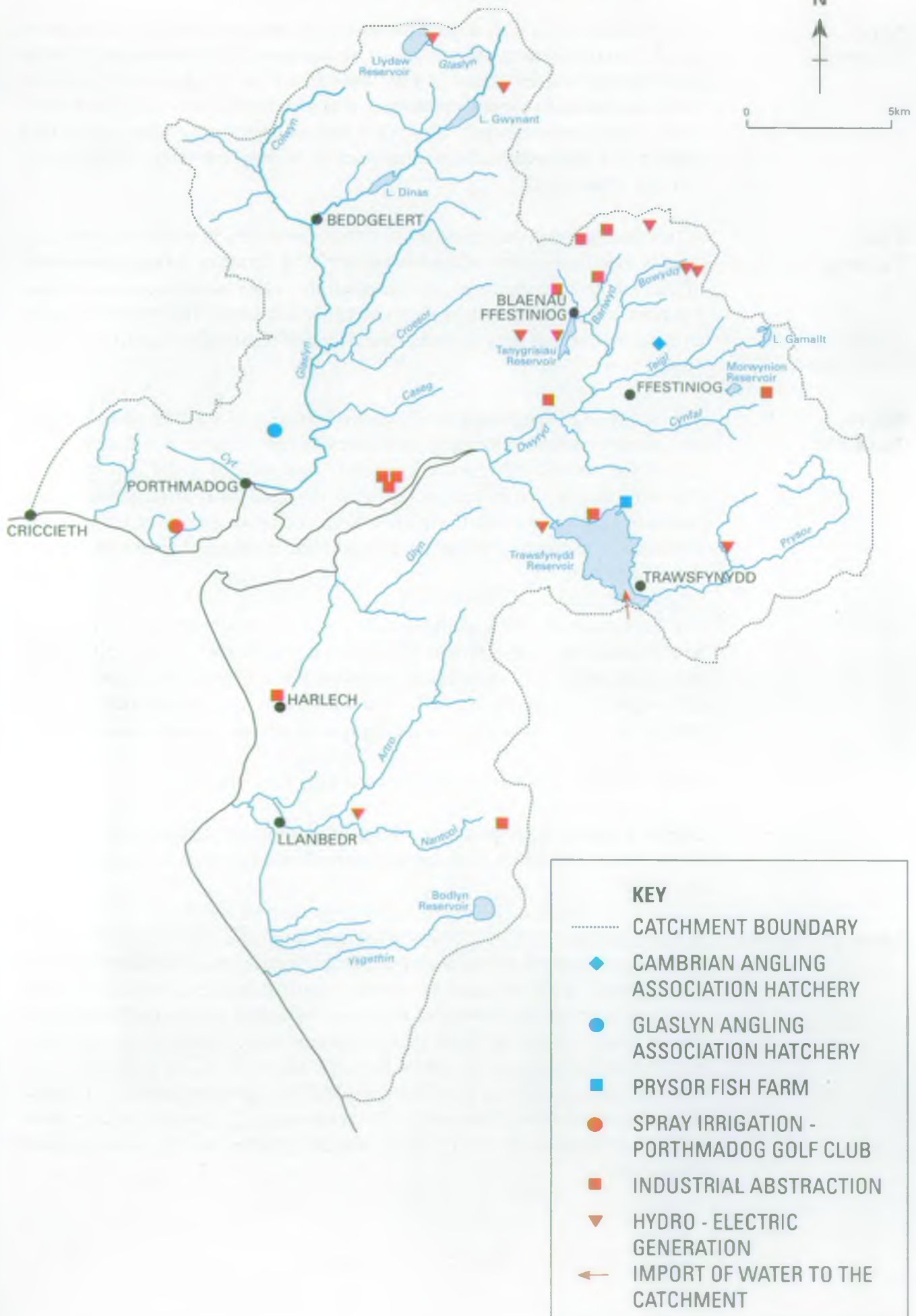
Use of water for hydropower can result in appreciable changes in the flow regime which can have a large impact on the downstream channel and its flora and fauna.

Local PerspectiveSurface Waters

There are 51 licensed abstractions from surface water sources within the Plan area. Twenty five of these are for potable supply purposes of which 12, with a total licensed volume of 4093.7 Ml/a, are for public supply by Dŵr Cymru Welsh Water. Some 89% of this licensed volume comes from just four undisturbed upland sources. These are Llyn Morwynion at Ffestiniog, Llyn Tecwyn near Llandecwyn, Llyn Bodlyn at Dyffryn Ardudwy and Llyn Eiddew Mawr reservoir near Talsarnau. The remaining 13 licences with a total abstraction volume of 21.33 Ml/a are for potable use by small private abstractors.

MAP 16.

INDUSTRIAL, AGRICULTURAL AND HYDRO - ELECTRIC ABSTRACTION



There are a total of 12 abstractions licensed for industrial use with a total abstraction volume of 232,205 Ml/a. The use to which the water is put ranges from the manufacture of explosives at the Nobel Explosives Plant at Penrhyndeudraeth to the production of slate products in the Blaenau Ffestiniog area and steam raising and cooling at the nuclear power station at Trawsfynydd.

By far the largest use of water within the Plan area is that abstracted for the generation of hydroelectric power. The 10 licensed abstractions allow up to a total of 1,094,211 Ml/a to be abstracted for this purpose. Water is also imported into the Dwyryd Catchment from the neighbouring Eden catchment to support the hydroelectric power scheme at Maentwrog. However, all the water abstracted is returned to the Plan area. Such abstraction has an effect on the relevant catchment in that in many instances unnatural flow regimes have resulted below the abstractions, which may be impacting upon the fish populations in these reaches.

There are also a significant number of potential small scale hydroelectric power scheme sites within the Plan area. Many of the identified sites are at environmentally sensitive locations. As such, appropriate conditions to safeguard the environment will be applied to each application for a licence to abstract, or else it will be refused.

In terms of agricultural abstraction there are only 4 licensed abstractions, totalling 110.52 Ml/a. Two of the abstractions are for the supply of water to the fish hatcheries run by the Cambrian Angling Association and the Glaslyn Angling Association. A further licence is for the Prysor Fish Farm at Trawsfynydd, whilst the fourth licence is to the Porthmadog Golf club for spray irrigation of its greens.

Ground Waters

The geology of the area ranges predominantly from Ordovician shales and mudstones in the north of the catchment to Cambrian mudstones and shales within the area of the Harlech Dome to the south. Consequently, there are no major aquifers in the Plan area, with groundwater sources being limited to a few surface fractured weathered zones. The area's exemption from the need for a licence for groundwater extraction, irrespective of use reflects this. However spring water within the catchment is classed as surface water and its abstraction is controlled by the appropriate licensing procedure.

Aims

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

**Agricultural/
Spray Irrigation**

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

To minimise the impact on summer flows of spray irrigation and other forms of nett abstraction.

**Hydro
Power**

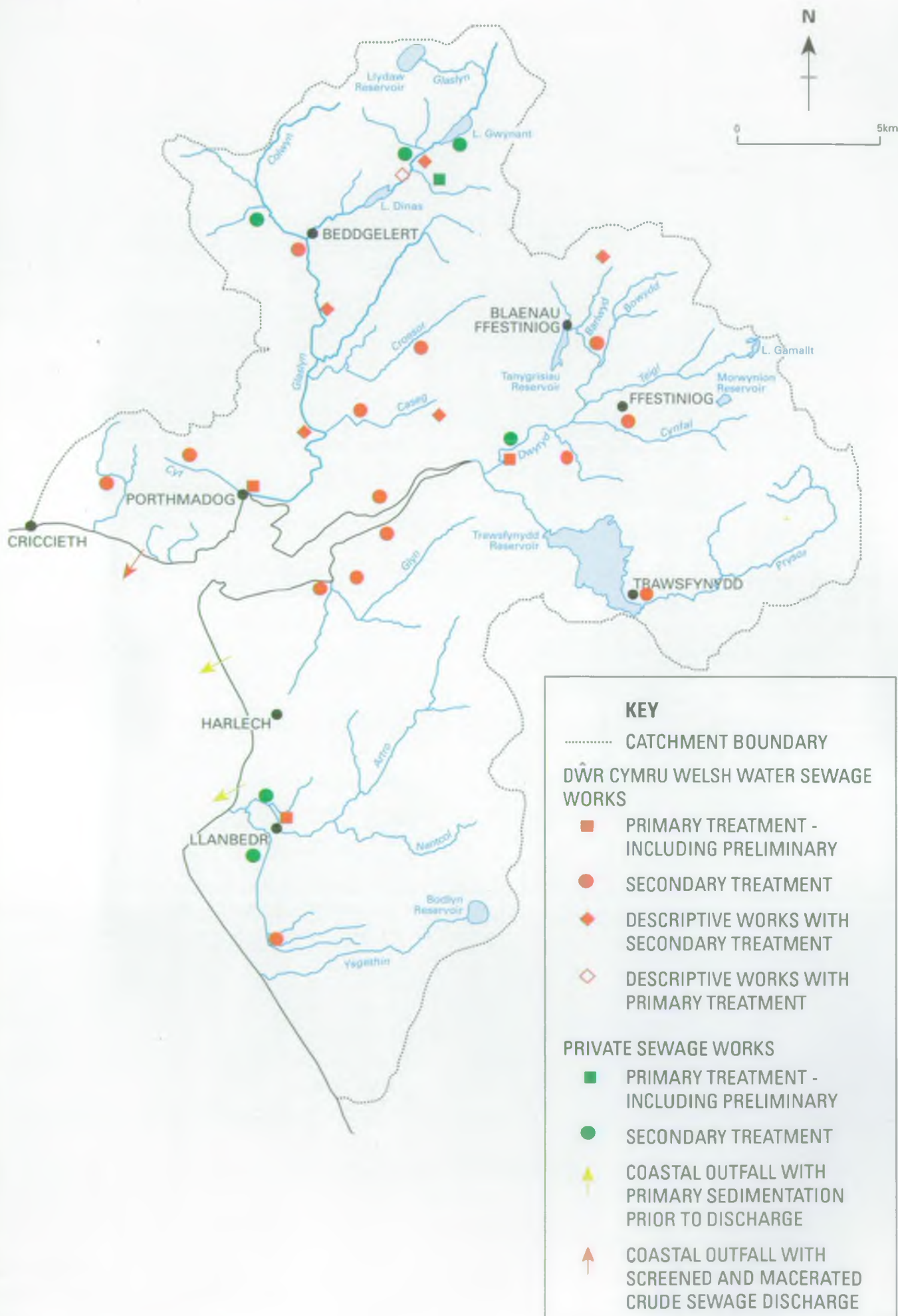
Hydro Power developments that restrict the ability to use upstream water resources will be opposed unless the licence authorising the abstraction is subject to an agreed volume of derogation and a time limit.

Environmental Requirements

To develop and implement a Regional Licensing Policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

MAP 17.

SEWAGE EFFLUENT DISPOSAL



4.10 SEWAGE EFFLUENT DISPOSAL

General

In Wales most sewage effluent discharged into freshwaters has 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 very high. All these types of discharge are regulated by the NRA which issues, and monitors compliance with, consents to discharge. 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 handles the bulk of sewage effluent discharged to freshwaters, although the greater number of STWs are privately owned.

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

In Welsh Region, the continuing improvement in sewage effluent treatment and disposal facilities will be the subject of Dŵr Cymru's second Asset Management Plan (AMP2), which is being produced in close liaison with the NRA. This plan specifies the capital investment required for Dŵr Cymru's assets (with regard to the terms of the EC Urban Wastewater Treatment Directive and other statutory obligations) covers the period 1995-2015. In preparation for AMP2 the NRA has, over the past two years, assessed the environmental impact of every Dŵr Cymru owned STW discharge and those from Combined Sewer Overflows (CSOs) in order to provide a basis for establishing AMP2 priorities. Any sewage effluent related issues identified within this CMP will be considered within the agreed AMP2 programme.

Local Perspective

There are 26 sewage disposal works operated by Dŵr Cymru Welsh Water (DCWW) in the catchment, all of which are monitored by the NRA at a frequency determined in accordance with the discharge volume and potential impact on the receiving waters. In addition, there are 7 privately owned works that are monitored to ensure compliance with discharge consent conditions. Where discharges of treated effluent have an adverse impact upon water quality to a degree that affects legitimate uses of the water, then the NRA will review the consent and impose stricter standards. Where works fail to meet consent standards, the NRA may start formal legal proceedings if the discharger fails to implement a plan of improvements to enable the works to fully comply.

The NRA seeks to ensure that environmentally protective discharge standards are imposed on all works discharging to surface/coastal waters. Where a discharge to a soakaway is within an aquifer protection zone, or more than 5m³/day, then these are also consented.

Many of the treated effluent discharges within the catchment 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 Criccieth, Morfa Bychan and Porthmadog, and at the inland town of Blaenau Ffestiniog. The area, and coastal towns in particular, attract large numbers of seasonal tourists, thus appreciably increasing the volumes of sewage to be disposed of during the summer months.

Recent capital expenditure by DCWW at Criccieth involves the construction of a new full treatment plant and, the disinfection of the treated effluent prior to discharge. In addition to ensuring compliance with bathing water standards at Criccieth, the improvement will also contribute to the elimination of intermittent contamination of the EC identified bathing water at Morfa Bychan.

There are also planned improvements at Porthmadog, where the existing STW provides screening and primary settlement only. The works is hydraulically overloaded resulting in premature discharges into an area of high amenity value. The aesthetic impact in the inner harbour is significant, whilst the situation leads to high levels of sewage derived bacteria in the waters along the estuary's popular beaches. The discharge may contribute to contamination of the EC identified bathing water at Morfa Bychan.

Unsatisfactory performances of sewerage systems, particularly the premature and/or prolonged operation of combined storm sewage overflows, can result in deterioration of water quality. This has been a particular problem in Blaenau Ffestiniog where excess infiltration and the poor conditions of the sewers cause problems. The major problem areas were identified by inspecting the system with close circuit television cameras. Ongoing capital improvement works by DCWW should gradually mitigate against such problems in the future.

Aims

To control the disposal of treated and untreated sewage effluent and sewage sludge in a way that protects other water uses.

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 are made as close as possible to the point of abstraction.

Environmental Requirements

Water Quality No deterioration in the quality of water above discharges, beyond that assumed when setting the consent for an authorised discharge.

No deterioration in water quality, below the area of mixing for the discharge, which causes detriment to other uses.

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

To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

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 18.

INDUSTRIAL EFFLUENT DISPOSAL



4.11 INDUSTRIAL EFFLUENT DISPOSAL

General

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.

At most sites the NRA controls pollution from industrial effluents by a system of consents to discharge. 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 the NRA will seek to ensure that any authorization 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 NRA pollution prevention policy.

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

Local Perspective

The Plan area is predominantly rural in nature, supporting only a small number of industries including quarries, plastic product manufacturer, and an explosives manufacturer.

A number of improvement works at numerous quarries have been undertaken in consultation with the NRA. These have included the installation of settlement facilities to reduce the environmental impact of discharges. Consultation has also resulted in the introduction of process water recycling at a number of sites, with subsequent cost and environmental benefits arising from the reduced need to abstract and discharge water.

ICI Nobel's Explosives Company Ltd. manufacture a range of chemicals primarily for use in the commercial explosives, defence, aerospace, and nitrocellulose businesses. Their plant at Penrhyndcudraeth, known locally as Cooke's Works, is located on the banks of the Dwyrdd estuary. It is a Health and Safety Executive Licensed Explosives Factory and manufactures nitroglycerine for use in commercial blasting explosives. This site is subject to Integrated Pollution Control (IPC) and the discharge is authorised by HMIP in close consultation with the NRA.

- Aims**
- To control the discharge of liquid industrial waste to prevent pollution that would affect other Uses of the water.
 - 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 are 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 deterioration in water quality above the discharge below that assumed when the discharge consent was calculated.
- Water Quantity**
- Consent conditions will be derived taking into account the upstream dilution available under average and dry weather flow conditions.
 - To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.
- Physical Features**
- No alterations should be made to the river channel which would reduce the the mixing of the effluent and receiving water.

MAP 19.

BASIC AMENITY



4.12 BASIC AMENITY

General	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.
Local Perspective	<p>The majority of the Plan area lies within the National Park and is of high amenity value, particularly for walking. Riverside access is sporadic and disjointed but key areas include the Glaslyn upstream of Aberglaslyn bridge, the lower Ysgethin and the lower Cynfal and Teigl.</p> <p>The National Park Authority is currently developing a public strategy for the Park and the NRA will be collaborating on projects to facilitate public access along the rivers and coast. The NRA sees key areas for development being the old railway tracks adjacent to the Prysor, upper Colwyn and the lower reaches of the Glaslyn.</p> <p>Picnic sites are relatively few and far between and few facilities exist for bird watchers even though the quality of birdwatching, particularly in the coastal areas, is high.</p> <p>Wildfowling occurs on the saltmarsh, estuary and marshes of the Glaslyn and Dwyrdd, and is under local club control.</p>
Aims	<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>
Environmental Requirements	
Water Quality	Water quality should comply with the targets for Aesthetic Criteria which effectively define the minimum water quality acceptable for any water body.
Water Quantity	To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

Physical Features An appropriate network of riverside paths and access points should be maintained and, where appropriate, promoted.

The development of recreational sites should be promoted at suitable locations as opportunities arise.

MAP 20.

ANGLING

N



0

5km



KEY

- CATCHMENT BOUNDARY
- HATCHERY
- TRAWSFYNYDD FISH FARM
- SALMON AND SEA TROUT
- BROWN TROUT
- COARSE FISH
- MIXED TROUT AND COARSE FISHERY

4.13 ANGLING

General

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 the NRA has formal responsibility towards angling, and issues 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, the NRA has neither control of, nor responsibility for, sea angling and it is not covered specifically in CMPs.

Local Perspective

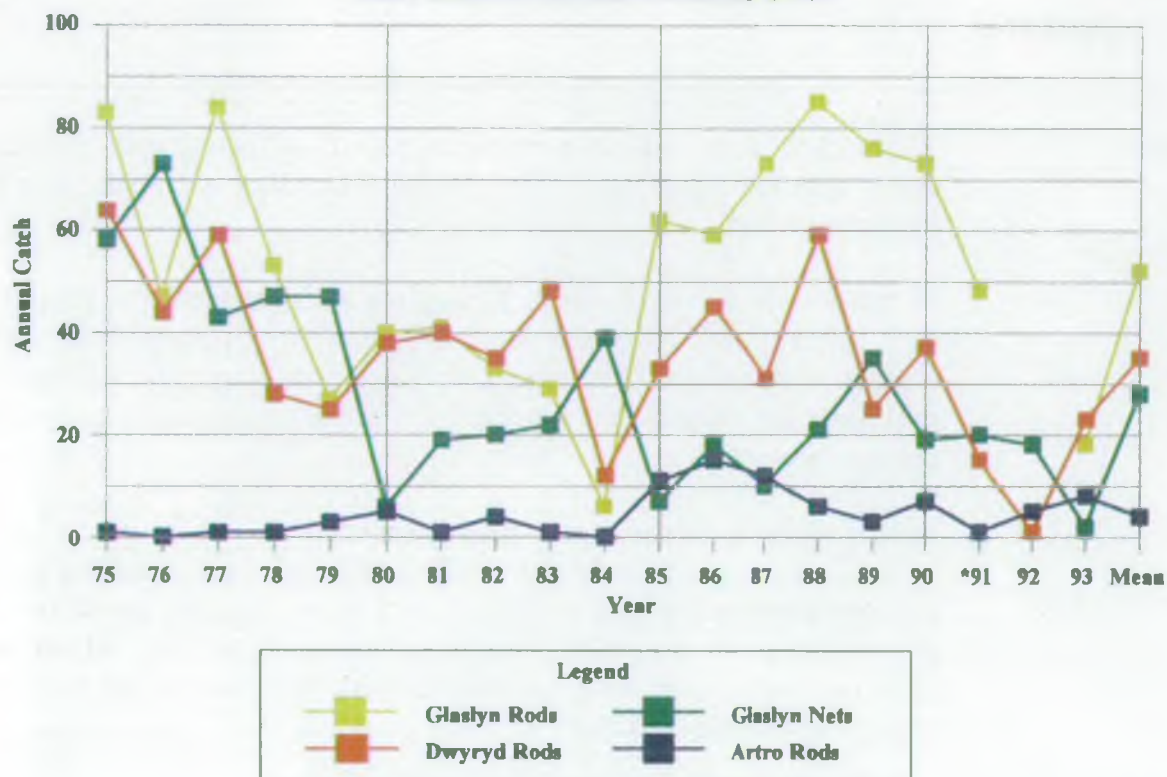
All three rivers drain some of the highest mountains in Wales. As a consequence they are all spate rivers where the water level can change rapidly over a very short period of time. All three catchments are highly regarded as important rivers for salmon and sea trout.

Sea trout form the bulk of the angling catch on all three rivers, with the peak catches being taken in July. Although fewer salmon are caught, they provide good sport primarily during the months of August, September and October. The Afon Glaslyn is the only one of the three rivers that has a small run of spring salmon

There are four main angling clubs fishing these catchments, the Glaslyn Angling Association has water on the Glaslyn, the Cambrian Angling Association and the Dwyrdd Anglers Limited have waters on the Dwyrdd and, the Harlech and Talsarnau District have waters on the Artro and Ysgethin. All clubs are affiliated to Genweirwyr Gwynedd, which provides an effective representative body for many of the Gwynedd Game Fishing Associations.

Historically, catches of salmon and sea trout show considerable variation (see Figures 1 and 2). In recent years, the catches of sea trout have declined on the Dwyrdd and the Artro, but seem to have held up on the Afon Glaslyn. Salmon catches have remained relatively steady on all three catchments.

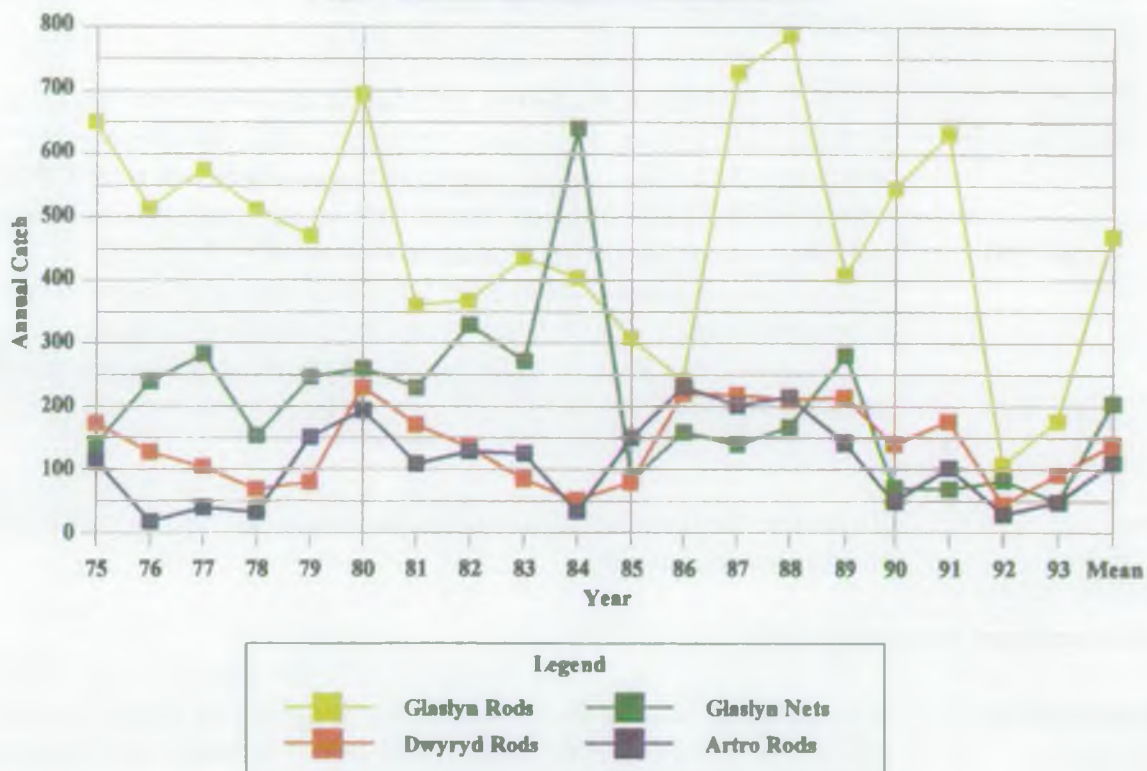
FIG 1 ANNUAL SALMON CATCHES 1975-93



* From 1991 returns of catches are lower, due to introduction of a national return system.

The lower Glaslyn has an early sea trout fishery in April and May. Extensive survey work by the NRA and predecessors has indicated that kelts, estuarine trout and small sea trout that have delayed their migration form the bulk of this catch. The delay in migration is probably due to good feeding conditions in the relatively sheltered waters upstream of the Cob embankment. The many lakes in the area provide good wild brown trout fishing although, in recent years, several of these have been affected by acidification and some are now devoid of fish. Catchment source liming at Llynnau Gamallt has restored a seriously acid impacted lake into a thriving brown trout fishery, and the longer term effectiveness and conservation consequences of liming are being considered by the NRA and the Countryside Council for Wales (CCW). Other acidified lakes are still doing reasonably well, and it is possible that this is due to genetic differences between local brown trout stocks.

FIG 2 ANNUAL SEA TROUT CATCHES 1975-93



* From 1991 returns of catches are lower, due to introduction of a national return system.

The NRA has assisted the Cambrian Anglers in establishing a small hatchery for introducing local stock, and has utilised its own hatchery resources to rear from Llyn Cwmorthin broodstock for restocking some of the lakes in this area. Recently, broodstock have been obtained from Llyn Bodlyn to offer assistance to the Harlech and Talsarnau Angling Clubs which have similar problems on their mountain lakes.

Over the past five years the Glaslyn Angling Association, with assistance from the NRA, has operated a small hatchery for restocking sea trout and salmon into parts of the Glaslyn where the water quality is good.

Several lakes, principally Llyn Fedw, Cooks Dam, Tanygrisiau, Trawsfynydd and Llyn Morwynion have been operated as put and take fisheries for brown trout and/or rainbow trout.

Coarse fishing for perch and roach is available at Llyn Hafod near Harlech, and in Trawsfynydd Reservoir rudd and perch provide sport for coarse fishermen.

Angling seasons for migratory fish extend from the 20th March until 17th October, and brown trout from 3rd March until 30th September. Tighter restrictions (31st May to 30th September) apply to brown trout fishing on the lower reaches of all three catchments to protect smolts. At present there is no close season for coarse fishing in Gwynedd. Proposals to introduce a uniform close season (16th March to 14th June) for coarse fishing on all rivers and canals in England and Wales are currently being considered by the Secretary of State for Wales. Details of where to fish in the area are available from the NRA.

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

Environmental Requirements

Water Quality The standards relating to Aesthetic Criteria should be maintained so that the enjoyment of the waterside is not diminished. Fish stocks are protected by the provisions in the Fisheries Ecosystem use.

Water Quantity To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

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

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

MAP 21.

WATER SPORTS ACTIVITY



0 5km



KEY

- CATCHMENT BOUNDARY
- EC IDENTIFIED BATHING WATER
- NON EC IDENTIFIED BATHING WATERS
- FRESH WATER CANOEING
- WATER SKIING/JET SKIING
- WINDSURFING
- SAILING

4.14 WATER SPORTS ACTIVITY

General 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.

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.

Identified Bathing Waters: 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 mandatory total and faecal coliform standards of 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.

Water Contact/Recreational Use Waters: 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.

Local Perspective Sports activities associated with the water environment are important to the local tourist industry. Bathing takes place at Morfa Bychan, Harlech, Llandanwg, Shell Island, Talybont and Dyffryn Ardudwy. The waters at Talybont, Dyffryn Ardudwy, Llandanwg, Harlech and Morfa Bychan are all identified under the EC Bathing Waters Directive.

Other immersion sports, particularly water skiing and jet skiing have become increasingly popular in recent years, with these activities mainly taking place in the estuary downstream of Porthmadog and around Shell Island at the mouth of the Artro. Windsurfing takes place off most of the beaches in the area, and sailing is an increasingly popular activity with important centres near Shell Island and at Porthmadog.

In the fresh water reaches, canoeing is the main immersion sport. Attempts to operate a management agreement between the Welsh Canoe Association and the National Trust, on sections of the Glaslyn between Beddgelert and Aberglaslyn, have run into difficulties due to opposition from angling interests. Llyn Gwynant on the Glaslyn and the sheltered estuary of the Artro are important locations for canoeing organised by local outdoor pursuits

centres and as part of adventure holidays. Access for canoeists on the fresh water reaches is very restricted and, prior permission must be sought from the riparian owners or fishing clubs before canoeing on these waters.

Aims 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 mandatory total and faecal coliform standards contained within the EC Bathing Waters and the mandatory standards in the EC Dangerous Substances Directives and should meet the appropriate standards for Aesthetic Criteria.

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

Water Contact/Recreational Use Waters:

Water Quality Where such marine waters are used for immersion sports, including bathing, the NRA will be guided by the mandatory standards contained within the EC Bathing Waters Directive in assessing water quality requirements for Catchment Plans. The NRA is unable to set bacteriological standards in CMPs for freshwaters where immersion sports or bathing take place but will apply the general Aesthetic Criteria used throughout this report.

Water Quantity To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

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



0 5km



ENLARGEMENT



KEY

- CATCHMENT BOUNDARY
- /// SAILING AND COASTAL BOATING
- 1 2 3 4 SLIPWAYS
- 1 1 CRICCIETH
- 2 2 PORTHMADOG
- 3 3 SHELL ISLAND
- 4 4 LLANBEDR AND PENSARN YACHT CLUB
- PORTHMADOG HARBOUR DWYFOR B.C. AREA OF RESPONSIBILITY
- NAVIGABLE AREA

4.15 NAVIGATION AND BOATING

General

Navigation is considered to be the use of pleasure and commercial craft in waters that fall under the general control of the NRA 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 the NRA. However, in the Dee estuary the NRA is the navigation authority. Elsewhere in tidal waters the NRA neither has control over nor responsibility for navigation.

While the NRA is not the navigation authority for either of the two freshwater rights of navigation that exist in Wales it may under certain circumstances introduce byelaws to control navigational use of a river. The NRA 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 the NRAs concern is principally for the participants' enjoyment of the activity.

Local Perspective

The physical features at the entrance to Porthmadog harbour and at the approach to the moorings at Shell Island presently restrict access for small recreational craft and fishing boats to the periods around high water. Access to the Glaslyn estuary upstream of Porthmadog is prevented by the presence of the Cob tidal barrier with its associated tidal doors. Siltation in the harbour, has in part, been attributed to the effect of these tidal doors.

The NRA does not have any responsibility for the provision of navigation aids in any of the estuaries concerned. Trinity House is responsible for the maintenance of buoys and channel markers approaching the harbour entrances and Dwyfor District Council is the Harbour Authority responsible for the navigation marks associated with the entrance to Porthmadog Harbour.

There are four sailing/boating clubs situated in this particular area. The Royal Madog Yacht Club based in Porthmadog is the largest with around 350 members. The Porthmadog and Trawsfynydd sailing club is also based in Porthmadog and has around 150 members. There is a public slipway available in the harbour at Porthmadog whilst the Porthmadog and Trawsfynydd Club has its own private slipway within the harbour area.

The two other Clubs are based within the Artro Estuary. The Shell Island Sail and Rowing Boat Club which has around 60 members utilises the moorings and two slipways on Shell Island at the mouth of the Artro. The Llanbedr and Pensarn Yacht Club has moorings and a private slipway a little further up the estuary.

In addition to these local yachting clubs there are increasing numbers of power boats and coastal cruisers using the facilities, particularly in Porthmadog. Fishing parties are a lucrative source of income throughout the year and, several boats operate out of Porthmadog to cater for this pastime.

Aims

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

To encourage and support canoe access agreements on the rivers Glaslyn/Dwryd/Artro.

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

Environmental Requirements

Water Quality

The provisions for Aesthetic Criteria should be complied with.

Water Quantity

To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

Physical Features

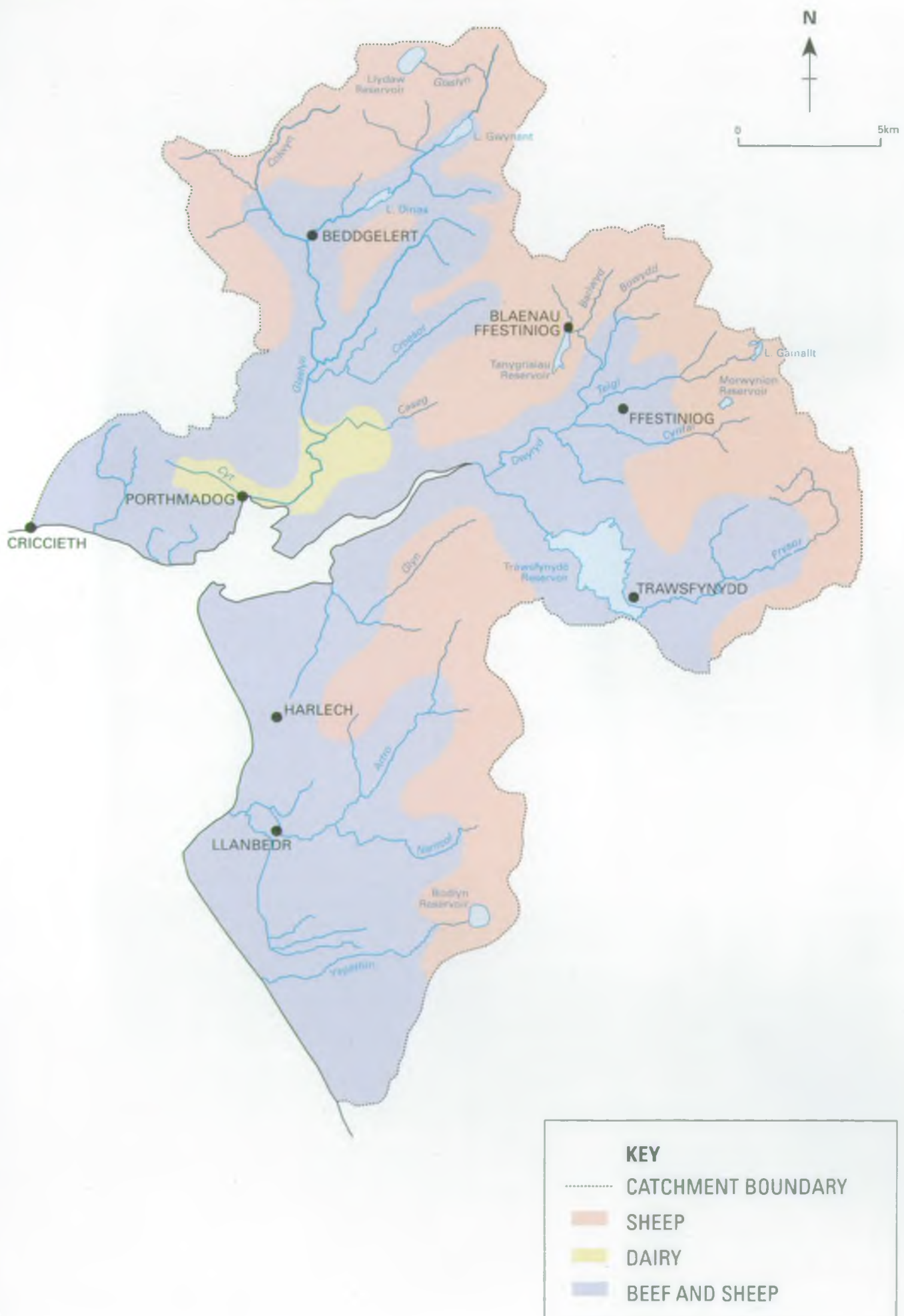
Where waters under the control of the NRA are used for navigation no obstruction to the passage of vessels should be created.

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

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

AGRICULTURAL ACTIVITY



4.16 AGRICULTURAL ACTIVITY

General

The processes and by-products of agriculture are a major potential threat to the water environment, especially in more intensively cultivated areas. Key areas of concern to the NRA 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 the NRA's 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 the NRA. Consequently the NRA has 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 a programme of farm visits by NRA staff helps to alert farmers to potential and existing problems.

The NRA issues 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.

The NRA encourages farmers 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 the river reduced in flow. The requirement for an adequate residual flow can restrict the viability of a fish farm.

Local Perspective A wide range of agricultural activity is supported in the area. The upper reaches of the catchments are predominantly sheep farming which changes to mixed beef and sheep further down the valleys. Although pollution risks from sheep farms are minimal due to the dispersed husbandry, there remains a very real risk when dipping takes place. Guidance is given to farmers on how to avoid contaminating surface or groundwater during the use and disposal of dipping liquids.

The more fertile lowlands of the Glaslyn estuary support a number of large dairy units. The operation of these units and associated run-off results in the quality of the Caseg falling to River Ecosystem Class RE2.

Agriculture has intensified in the past 20 years without, in some cases, 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 which will serve to reduce the incidence of agricultural pollution.

Farm catchment inspections will be carried out over the next few years. The advice and actions arising out of these, together with the existing measures should further minimise the risk of future pollution.

Aims 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 All consented discharges should comply with the conditions expressed in the 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 To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

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.

FORESTRY



4.17 FORESTRY

General

The NRA accepts that well managed forestry, in appropriate areas, can make an important contribution to the environment and the economy. Forestry can, however, influence water quality and quantity through alterations to hydrological and chemical processes in water catchments, and by the import or export of chemicals. Adverse impacts include:-

- Increased sediment load and run-off rate to rivers that can increase the flood defence maintenance requirement and may also destroy key conservation features.
- reduced water yield as the trees intercept more rainfall,
- enhanced acidification in sensitive areas as the trees capture more acidic pollutants from the air.
- pollution by fertilisers and pesticides applied to the crop.

These impacts can have implications for water supply, aquatic conservation and fisheries. Following the rapid expansion in afforestation over the past 40 years, further concerns are the increasing rates of clearfelling and replanting which can have similar adverse effects.

Consequently the NRA has worked closely with the Forestry Authority in the production of Forests and Water Guidelines which lay down standards for best practice designed to minimise impact of forest management on the water environment. The NRA is consulted informally on applications for new planting but has requested statutory consultee status on planting grants and felling licenses. While forest development is outside the normal planning process, some local authorities have decided to produce Indicative Forestry Strategies which will identify preferred and sensitive areas for forestry. The NRA will advise on water interests in relation to these strategies.

Local Perspective

There are a number of afforestations within the Plan area, the largest ones being the Beddgelert Forest on the Colwyn, a tributary of the Glaslyn, and Llyn y Garnedd Forest on the middle reaches of the Dwyryd.

The NRA is concerned about pollution problems arising from the discharge of silt into watercourses when stands of timber are harvested and temporary roads are constructed. The growing awareness of NRA concerns by Forest Enterprise, the operational manager of public forests within the Forestry Commission, has resulted in constructive dialogue and action to implement pollution control measures to minimise the impact of timber harvesting by the application of the "Forests and Water Guidelines".

Acidification can occur in parts of the upper reaches of the Glaslyn, Dwyrdd and Artro catchments, mainly as a consequence of acid deposition (both wet and dry) on to base-poor geology and naturally acid peaty upland soils. This phenomenon is exacerbated by conifer afforestation on acid sensitive soils. Therefore it is not surprising that most of the major occurrences of acidic events have occurred on the Colwyn, which receives the drainage from some 400 Ha of afforestation.

Forest Enterprise has recently completed Forest Re-design Plans which will cover forest management well into the next century. The NRA has examined the completed re-design proposals and has identified sites which give rise to the following concerns:

1. Catchment areas where coniferous afforestation or forestry operations could have a detrimental effect upon important aquatic habitats, water quality or identified downstream uses.
2. Sensitive areas where further planting could increase the levels of acidification.

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 catchment.

Aims To protect the water environment from the potentially adverse effects of forestry and to maximise the environmental benefits.

Environmental Requirements

Water Quality The provisions of the Forests and Water Guidelines should be complied with in all cases to minimise the impact of forestry on water quality.

Water Quantity To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

Forestry activities, afforestation and deforestation must not result in reduced reservoir yields or adverse effects on surface water flows or groundwater resources.

**Physical
Features**

The provisions of the Forests and Water Guidelines should be complied with in all cases to minimise the impact of forestry on the physical environment and to gain the greatest environmental benefit, particularly in riparian areas.

MAP 25.

COMMERCIAL HARVESTING OF SEA FISH AND SHELLFISH



0 5km



KEY

- CATCHMENT BOUNDARY
- BEACH AND DRIFT NETTING PROHIBITION AREAS (1st APRIL - 30th NOVEMBER)
- AREA OF LICENSED SALMON NETTING
- UPPER LIMIT OF LICENSED SALMON NETTING AREA

4.18 COMMERCIAL HARVESTING OF SEA FISH AND SHELLFISH

General	<p>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).</p>
Sea Fisheries	<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 the NRA.</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 the NRA has responsibilities in some coastal waters its principal concern is the protection of migrating salmon and sea trout, although in some places has powers (by agreement with local Sea Fisheries Committees) to enforce the protection of bass stocks in coastal waters.</p>
Shellfisheries	<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 the NRA 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>
Local Perspective	<p>Two draft nets for salmon and sea trout fishing are available for issue annually by the NRA, under the terms of a Net Limitation Order. These nets, which are controlled by byelaw, are allowed to operate in the estuaries of the Glaslyn and Dwyryd downstream of the road bridge in Porthmadog and Brewitt Bridge on the Dwyryd, between the 1st April and 31st August. Due to the physical nature of the estuary the main netting station is immediately downstream of the road bridge in Porthmadog. In recent years, the average reported salmon</p>

catch has remained steady at around 20 fish per year, whereas the average reported sea trout catch has declined from well over 350 fish to around 100 per year. Recent assessment of salmon spawning for Net Limitation Order review suggests that the ten year mean spawning level was slightly below target, but recent catches do not indicate a stock conservation problem.

Coastal netting is controlled by North Western and North Wales Sea Fisheries Committee (NWNWSFC) and, byelaws agreed with the NRA are in force to protect salmonids on their migration into fresh water. This is achieved through designated areas around the Glaslyn and Dwyryd estuary, the Arthro estuary and the Ysgethin, where beach netting and drift netting are prohibited during the periods 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.

Some commercial fishing takes place in inshore coastal waters by boats predominantly from Porthmadog. The main catches are skate, mackerel, herring and bass during the summer months, with whiting and codling predominating over the winter period. Fishing for bass in the Glaslyn and Dwyryd estuary is the subject of national control and, as juvenile bass predominate in the estuary during the summer months, the estuary has been designated as a nursery area. It is prohibited to fish for bass between 1st May and 31st October and, although the restriction does not apply to fishing from the shore, it is expected that shore anglers and their associations will respect the need for the prohibition and return any bass caught within the nursery area. There are currently no local shellfisheries within the Plan area. However, until the introduction of TriButyl Tin (TBT) antifouling paints some 25 years ago a thriving commercial mussel fishery operated in the harbour and estuary at Porthmadog. With the decimation of the beds following the introduction of TBT the fishery died out. Since the prohibition of the use of TBT paint these beds have now started to regenerate. Tests to assess the potential viability of the shellfishery show that during the summer months the quality of the mussels falls into Class C as laid down in the EC Shellfish Hygiene Directive. The discharge from Porthmadog sewage treatment works into the harbour area would appear to be preventing the further potential development of this shellfishery.

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 so that standards for Aesthetic Criteria and Dangerous Substances are complied with.

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 so that standards for Aesthetic Criteria and Dangerous Substances are complied with.

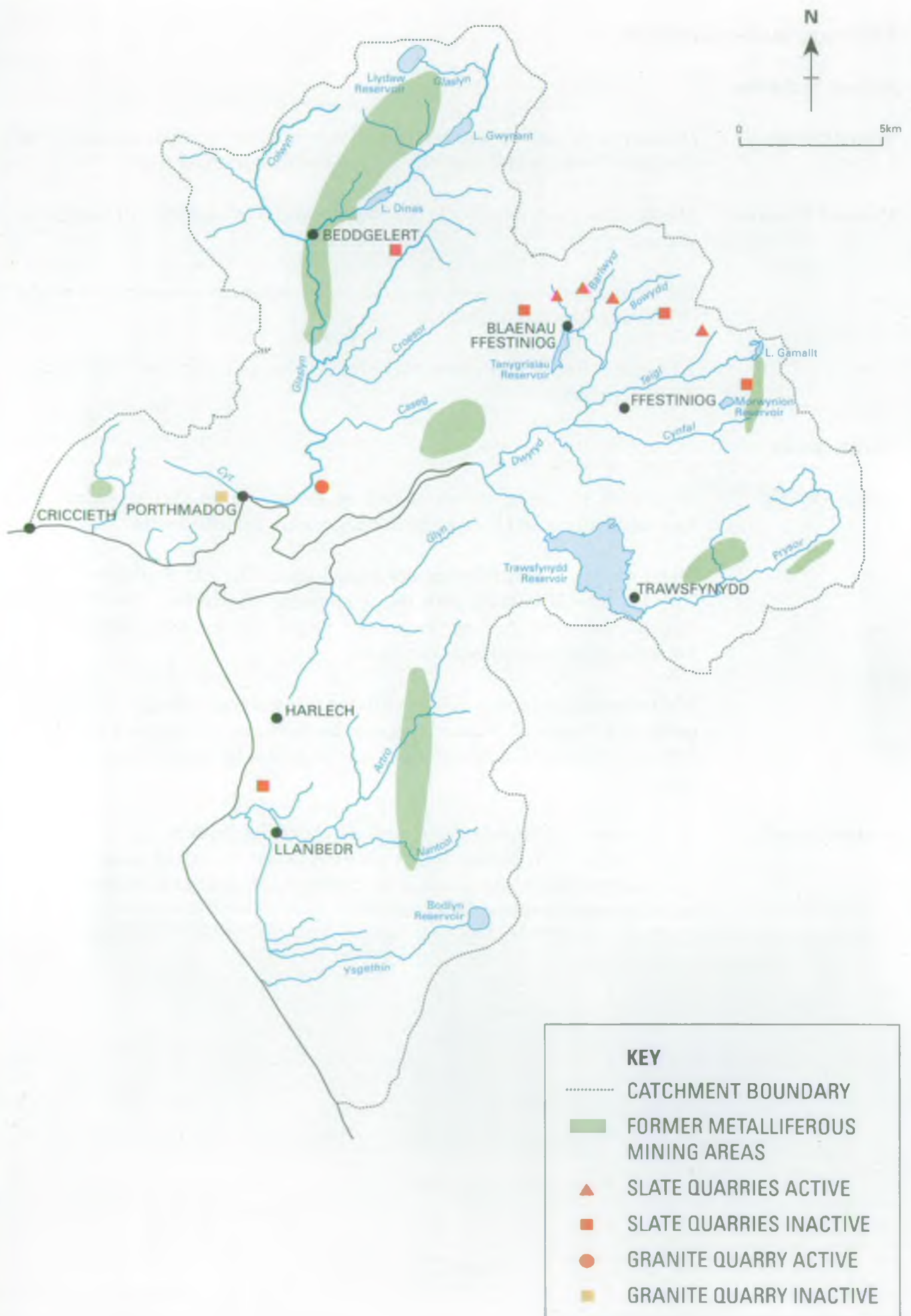
Water quality at shellfisheries designated under the EC Shellfish Waters Directive should comply with the appropriate standards. The Shellfish Hygiene Directive has no associated target classes and therefore no Environmental Requirements can be set.

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

Water Quantity To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

MAP 26.

MINERAL EXTRACTION



4.19 MINERAL EXTRACTION

General

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 the NRA. 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 and 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 such discharges are licensed and monitored by the NRA.

All mineral workings are subject to general planning control and the NRA is a consultee on such applications and considers each application on a case by case basis.

Local Perspective

Metal Mining

Considerable mining activity has occurred within the Plan area since at least Roman times, and probably earlier. The minerals extracted mostly included copper, lead, zinc and iron but there are no active mines at present. There is some evidence to suggest that manganese mining occurred in the Harlech Dome area, with gold and silver mining taking place in the upper reaches of the Prysor.

The most extensive mining appears to have been for copper on the main Glaslyn, which extend from the Aberglaslyn Pass through to Beddgelert, and up to the slopes of Snowdon. There was a productive lead mining area between Llanfrothen and Penrhyndeudraeth, but the area has since been heavily afforested and it is now difficult to pinpoint the adits and associated spoil heaps.

Whilst elevated levels of copper and zinc are found in rivers throughout the area of the Plan, no point sources have been identified, and the high levels are thought to derive from the naturally high mineralisation of the rocks in the area. Despite this, the majority of the rivers are able to support good stocks of fish with the notable exceptions of Afon Cwm Llan at Nant Gwynant and Llyn Mair near Maentwrog.

Quarrying

The quarries at Blaenau Ffestiniog are world famous for the production of high quality roofing slates which are claimed to have excellent resistance to weathering. The Wimpey construction company runs a granite quarry at Minffordd which is mainly concerned with producing material for road building, sea-defences and harbour works.

All the quarries have settlement/treatment tanks to deal with the fine particles and solids arising during the cutting or crushing processes. Despite this, there are still significant intermittent problems with fines being washed off the haul roads during heavy rainfall. A number of companies have implemented schemes to further reduce the solids loadings in their discharges to the aquatic environment.

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 deterioration in water quality above a consented discharge, from that assumed when the discharge consent was calculated.

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 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.

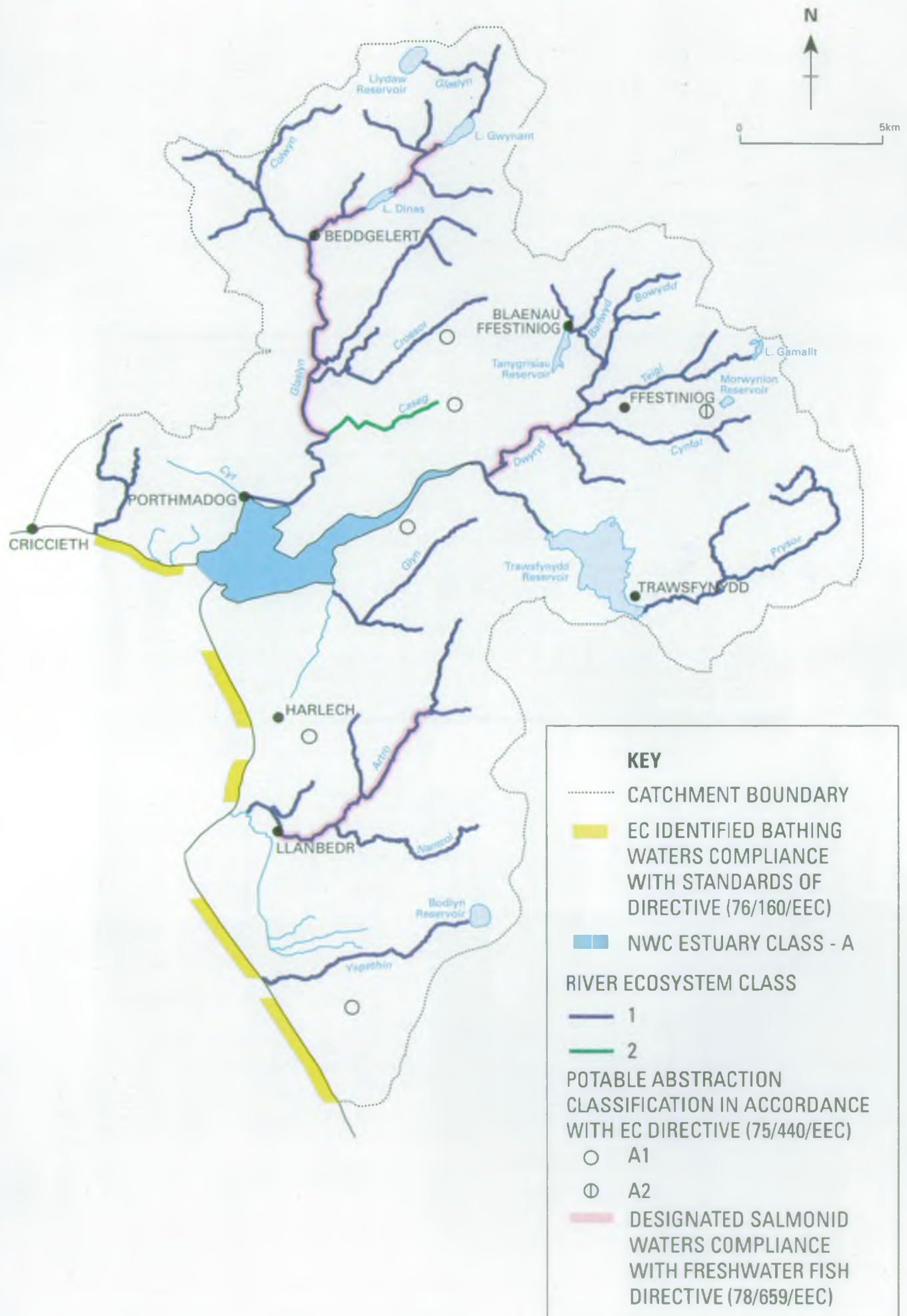
The aesthetic quality of restored landscapes should be in keeping with the overall nature of the catchment and reflect the local needs for amenity and recreation.

5.0 CATCHMENT TARGETS

In this section targets are set for Water Quality, Water Quantity and Physical Features, which are designed to protect the most sensitive Use for each part of the catchment. In this manner any other Uses that have less stringent needs are also protected.

MAP 27.

WATER QUALITY TARGETS



5.1 WATER QUALITY TARGETS

General	The NRA uses two major schemes for the reporting of river water quality: the General Quality Assessment (GQA) scheme, which is used to make periodic assessments of the water quality; and the statutory water quality objectives (WQOs) scheme, which is used for the setting of water quality planning targets. These new schemes have replaced the National Water Council (NWC) scheme, upon which previous references to water quality have been based.
The General Quality Assessment (GQA)	The GQA classification provides a means of accurately assessing and reporting on the general state of river water in a nationally consistent manner. It is used to support periodic assessments of the quality of river water in order to report upon geographical and temporal trends in river water quality. The GQA scheme will ultimately comprise four components - general chemistry, nutrients, aesthetics and biology - each providing a discrete 'window' upon the quality of river stretches. At present only the water chemistry element is established.
Statutory Water Quality Objectives (WQOs)	The WQO scheme establishes clear quality targets in Controlled Waters, on a statutory basis, to provide a commonly-agreed planning framework for regulatory bodies and dischargers alike. The proposed WQO scheme is based upon the recognised Uses to which a river stretch may be put. Of the 5 WQO Uses proposed, only the River Ecosystem Use has been implemented, and so far only informally. However, it is feasible that, at some future date, the River Ecosystem targets proposed for each river stretch in this CMP will be given statutory backing.
Water Quality Targets for CMPs	For Catchment Management Plans the performance of waters is assessed against specific water quality targets. The targets are set to protect specific Uses of the catchment (including those that will ultimately be covered by the WQO scheme) and call on water quality standards that have been determined for each use. These standards are based on the existing sources of data, especially the River Ecosystem Classification regulations and EC Directives for Bathing Water, Freshwater Fisheries, Dangerous Substances and Urban Wastewater Treatment and are constructed to give a complete coverage of water chemistry.
Specific Catchment Targets	19 Uses have been identified within the catchments and each has its own water quality requirements. The accompanying map (Map 27) shows which uses are the most demanding in terms of water quality for the different reaches. In the main Glaslyn/Dwyrdd estuary NWC class A is the target, and for the identified bathing waters at Morfa Bychan, Harlech, Llandanwg, Dyffryn Ardudwy and Talybont there is a need to comply with the standards contained in the EC Bathing Water Directive (76/160/EEC). River Ecosystem

standards form the general basis for water quality targets throughout the freshwater reaches of the catchments. Where a potable abstraction occurs these standards are augmented by those from the EC Surface Waters Directive. The fisheries in the catchment are predominantly salmonid and require a water quality target of Rivers Ecosystem classes 1 or 2. High quality water in the catchments is also required to protect other biological interests, such as otters, dippers and rare aquatic insects.

The different classification (A1, A2) shown for potable abstractions reflect the different type of treatment required for the current quality of water abstracted, and these quality of water and treatment remain as the targets for this use.

To protect the other Uses in the Plan area, the need to ensure that all discharges comply with environmentally protective consent conditions remains a target of high priority. By 2006 all public sewage discharges should comply with the requirements of the EC Urban Waste Water Treatment Directive. It is likely that discharges incorporated into AMP2 will meet these standards at an earlier date.

The prevention of groundwater contamination is a major objective for the NRA. The Authority requires all those whose activities may compromise groundwater quality to have regard to its 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.

MAP 28.

WATER QUANTITY TARGETS

N



0

5km



KEY

..... CATCHMENT BOUNDARY

● MAINTAIN CURRENT FLOW REGIME TO PROTECT ARCTIC CHARR POPULATION IN BODLYN RESERVOIR

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.

The NRA takes a precautionary approach to the granting of new licences, and will only grant them if it is confident that the available resources are able to sustain the proposed abstraction in the long term without harm to the environment or existing abstractors.

The NRA currently is developing an abstraction licensing policy that will allow it to consider in a structured way the environmental needs of the river system and to balance these with the needs of abstractors.

A methodology for the assessment and prioritisation of rivers that suffer artificially reduced flows is already in use. In Welsh Region the production of Catchment Management plans will aid this process.

The NRA will seek to balance the needs of exiting and potential abstractors with those of the environment.

Specific Catchment Targets

In order to protect the Arctic Charr population in Llyn Bodlyn the current abstraction regime should be maintained. This will feature in any proposal by Dwr Cymru Welsh Water regarding the need to enhance the yield from this reservoir.

5.3 PHYSICAL FEATURES TARGETS

General

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. The NRA is also developing a habitat classification system and use related targets for physical features such as spawning and nursery sites for fish.

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.

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.

Specific Catchment Targets

There are many Uses in the catchment which have their own physical features requirements. The following requirements are considered targets for the Glaslyn/Dwyryd/Artro catchments:

Flood DefenceMaintenance and Improvement

Where economically technically, and environmentally justifiable the NRA will aim to maintain or improve in a cost effective manner the designated "Main Rivers" to standards of service which accord with the following Land Use bands. Water Level Management Plans will be prepared for all sites agreed with the Countryside Council for Wales.

CATCHMENT TARGETS

Land Use Band	Typical Description of Reach	Reference SOS - Flood Return Period (Years)	
		Fluvial	Tidal
A	Contains residential and non-residential properties distributed over a significant proportion of its length. Amenity uses may be prominent.	50 - 100	100 - 200
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 and non-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.

Regulation and Enforcement

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 WR Act 1991 and LDA 1994).

Ensure development in flood risk areas is identified and encourage planning authorities to use the planning process to guide development away from these areas (selection 105 (2) survey and WO 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

To provide a two hour warning of commencement of flooding. This NRA target is only applicable where a Flood Warning System is in operation.

General Conservation and Landscape

Maintenance and enhancement of aquatic habitats and related landscapes through development control, NRA authorisations and NRA operations. Particular attention will be paid to erosion control, general development and landfill within the river corridor.

The following actions identify key areas of concern to be addressed if this target is to be progressed:-

- Maintenance and enhancement of wetland habitats, particularly wet lowland grassland.
- Establishment of riparian fencing, where appropriate.
- Identification and protection of roosting and breeding areas for bat species dependent on the river corridor.
- Maintenance, protection and, where possible, enhancement of key rare species, particularly otter.
- Control of invasive plants e.g. Rhododendron, Japanese Knotweed and Himalayan Balsam.

Archaeology and Heritage	<p>Preservation of sites and areas of historical interest through development control and NRA authorisation.</p>
Special Ecosystems	<p>Maintenance and, where possible, enhancement of the special interest of the site through development control, NRA authorisation and collaborative projects.</p> <p>The following action will help considerably the progressing of this target:-</p> <ul style="list-style-type: none"> - Restoration of reedswamp and open water at Ystumllyn SSSI.
Basic Amenity	<p>Maintenance and, where possible, promotion of the development of footpaths, bird watching points, picnic sites and access points along the river.</p> <p>The following actions should significantly contribute to the progressing of this target.</p> <ul style="list-style-type: none"> - As a collaborative partner with the Snowdonia National Park Authority, promote their Public Access Strategy within the Plan area. - Promotion of key river footpath links. - Improve the bird watching facilities at key sites in the catchment.
Fisheries Ecosystem	<p>Maintenance and provision of a diversity of natural river features to ensure a variety of habitats to maximise production of fish populations.</p> <p>This target can be progressed by taking one or more of the following actions:-</p> <ul style="list-style-type: none"> - Removal of migration barriers where appropriate. - Stock restoration to offset reduced fish populations caused by acidification. This target to be progressed via a collaborative project with the Glaslyn and Cambrian hatcheries to improve efficiency of broodstock collection.
Boating	<p>Maintenance and, as required, improvement of access and associated facilities.</p>
Water Sport Activity	<p>Protection and, when possible, improvement of access to contact/recreation waters.</p> <p>The following action will help to progress this target.</p> <ul style="list-style-type: none"> - Improve the existing canoe access by the promotion of at least one access agreement during the lifetime of the Plan.

CATCHMENT TARGETS

Navigation	Any maintenance of navigation channels or aids to navigation to take into account other uses of the water.
Fisheries/ Shellfisheries	Maintenance and, where required, improvement of access and associated facilities.
Angling	Safe access to and from the waterside to be promoted, particularly for the disabled. Maintain the bankside and instream habitat essential for successful and pleasant angling.

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 Glaslyn/Dwyrdd/Artro 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**

	0 - 5 m³	5 - 20 m³	above 20m³
One off, any purpose	No restriction	Consent	Licence
	0 - 5 m³/d	5 - 20 m³/d	above 20m³/d
Domestic, to one household	No restriction in most cases		Licence
Agriculture (from surface water)	No restriction for land adjoining watercourse		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 Glaslyn/Dwyrdd/Artro 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/VO 1992: River Quality, The Governments Proposals: A Consultation Document.

** BMWP - Biological Monitoring Working Party.

General Quality Assessment Scheme for rivers

Class	Chemical Classification			Biological Classification	Aesthetic Classification	Nutrient Status Classification
	DO % sat 10%ile	BOD mg/l 90%ile	Ammonia mg N/l 90%ile	EQI (BAPC) (indicative - to be finalised)	Basic Amenity Score (indicative - to be finalised)	- to be developed
A	80	2.5	0.25	1.0	10	
B	70	4.0	0.6	0.8	8	
C	60	6.0	1.3	0.6	6	
D	50	8.0	2.5	0.4	4	
E	20	15.0	9.0	0.2	2	
F	<20	-	-	<0.2		

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

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

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 horizontal passage or entrance/exit in a mine.

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

Layers of rock (usually sub-surface) that are able to hold or allow water to travel through them.

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.

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.

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.

HABITAT

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

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.

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.

m³/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 river flows.

MACROINVERTEBRATE FAUNA

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

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 river flows.

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.

CLASSIFIED 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.

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.

Targets

- Wetland habitats - wet grassland - Habitats scheme / WMPs / TFCs
- recreation fencing
- protection / resting / breeding birds - consultation with local group - survey
- others - enhancement
- control of invasive plants - collaborate with FWP - database
- restoration / signage
- promote footpath links if required - collaborate (Churn, Rye, etc) with Dymally
- improve bird watching facilities

Others

- all commitments - Wetland Brief Management Plan - tackles main threats
 - check baseline data

Churn - Priority other commitment Management Plan

- check data / liaise
- open establishment
- implement conservation work

WLMPS - Gbohyr marshes, Ystymlynn. - interim plan end '95.

Wetland compensation - Habitats Scheme, WLMPS