NRA-Wales 54

THE LOWER WYE CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT: JUNE 1994

NRA

National Rivers Authority
Welsh Region

Lower Wye
Catchment Management Plan
Consultation Report
June, 1994

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THE NRA'S VISION FOR THE LOWER WYE CATCHMENT

The lower Wye catchment is one of idyllic beauty and unspoilt scenery. For generations animal husbandry and the farming of fruit, potatoes and hops have lent its lowland plain a rural charm and colour which vies for attention with the more dramatic uplands and gorges of the catchment periphery. Little wonder that much of the valley is designated as an Area of Outstanding Natural beauty, or that its towns and villages swell with visitors during the spring and summer.

It is the river which provides a focus for its valley. Each of the historic towns of Hay, Hereford, Monmouth, Ross and Chepstow lie on its banks and it sustains much of the farming, industry and daily water needs of the people of the catchment and beyond.

It is also the river and its many tributaries which afford such a wide variety of recreational uses. Many people come to enjoy the unique landscape, the world famous salmon are avidly sought by fishermen and the river itself attracts canoeists and rafters from far afield.

The NRA's vision is to maintain and enhance the environment of the river, and the tributaries and aquifers which sustain it. As one of the largest rivers in Britain, and one of national importance, this presents a great challenge. This challenge is best met by addressing the existing and foreseen problems identified within this plan, and by continuing to balance the needs of all users of the catchment. In particular, the NRA is seeking to make further improvements in water quality by reducing the impact of sewage and agricultural pollution. The NRA is also to implement a licensing policy which will enable us to manage the water resources of the catchment to allow sustainable development whilst safeguarding the aquatic environment. The flood defences need to be maintained to the appropriate standard of service throughout the catchment and to be improved where appropriate and cost effective. Equally important is the careful conservation, maintenance and improvement of the wildlife of the lower Wye with its rare species of plants, animals and birdlife.

The NRA recognises the importance of this river system and the competing activities for which it is used. It is our intention to work with all other agencies and representative organisations in the catchment to promote an integrated approach to river management. In particular, the NRA anticipates that the plan will influence the planning processes of local authorities.

The realisation of the NRA's vision will be achieved through a balanced management approach so that the required improvements can be made and sustained in active collaboration with all legitimate users of the catchment's resources.

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SECTION 1: THE PURPOSE OF CATCHMENT MANAGEMENT PLANS

SECTION 1: THE PURPOSE OF CATCHMENT MANAGEMENT PLANS

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 NRA is the major manager of the water enviroment in England and Wales and aims to reconcile 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.
- Management of water resources
- Management of 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 enviroments.

We believe that it is important that the interests of all water users are considered in the development and protection of the water enviroment and 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

Catchment Plans have the following common objectives:-

- We want the Plans to provide a focus for the formation of agreements between water users about the future development of the catchment.

- We will use the Plans to provide a consistent and appropriate response to external pressures, including development in the catchment, and strengthen links with the Planning Authorities.

- The Plans will enable us to be more effective and will help in the allocation of our resources.

- The Plans will provide a targeted Action Plan that will detail the measures required of the NRA, and others, to solve problems identified in the catchment.

- We will use the Plans to provide a framework within which we can implement the new system of Water Quality Objectives (WQOs) under development at the Department of the Environment. These objectives will be use-related and may be given a statutory status following public consultation and agreement by the Secretaries of State.

We have adopted a multidisciplinary approach that requires the involvement of all our Departments and a large degree of co-operation with other organisations and the public to resolve problems and conflicts.

As users of the catchment, we want you to have an opportunity to contribute to our CMPs and so the production of each Plan has two separate phases, spread over two years.

Phase 1 In the Consultation Report we identify the legitimate and realistic 'Uses' of the catchment and promote protective targets. We also assess the current ability of the catchment to support the Uses and include a draft outline of the work required to remedy any identified problems. We distribute this document to the public as part of a wide ranging consultation procedure.

Phase 2 The Final Plan is produced after we have considered the comments received on the Consultation Plan and present our Action Plan for the future management of the catchment. The Action Plan details the nature of the work required, the cost, timescale and responsible organisation(s).

The following system is used to produce each Catchment Management Plan:

1. Uses of the Catchment:

   We identify existing and future Uses and describe their key locations and details.

2. Catchment targets:

   After reviewing the Uses and their requirements we set overall targets for water quality, water quantity and physical features that are designed to protect the interests of identified water users.

3. Catchment status:

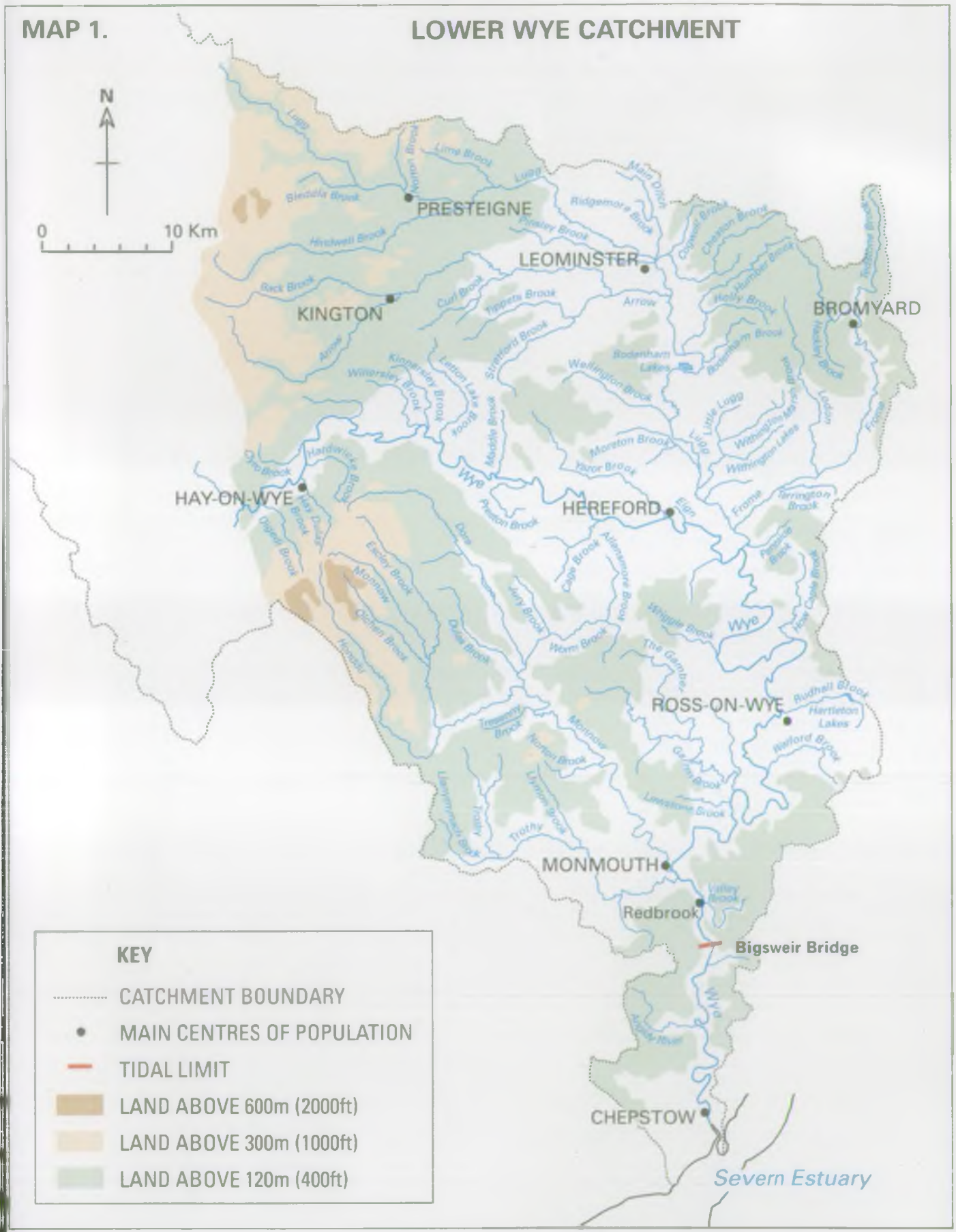
   Areas where the catchment is unable to support identified users are detected by analysis.

4. Issues and Options:

   We outline the issues relating to the identified problems and examine the options available to us. We identify people who are responsible for carrying out the remedial measures and then consult the public and other interested parties about our proposals.

5. Revision:

   To produce a Final Plan we move forward from the Consultation Plan and take your comments into consideration. We also introduce an Action Plan that represents our vision for the catchment over the next 5-10 years. The contents of this Plan will, where this is possible, have been agreed between ourselves and any others who are implicated. There will also be information on the projected costs and timescales for the work that needs to be done.


MAP 1.
LOWER WYE CATCHMENT
N
0
10 Km
PRESTEIGNE
LEOMINSTER
KINGTON
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
Redbrook
Bigsweir Bridge
CHEPSTOW
Severn Estuary
Wye
KEY
CATCHMENT BOUNDARY
MAIN CENTRES OF POPULATION
TIDAL LIMIT
LAND ABOVE 600m (2000ft)
LAND ABOVE 300m (1000ft)
LAND ABOVE 120m (400ft)

FOLD OUT TO SEE MAP 1: LOWER WYE CATCHMENT

SECTION 2: AN OVERVIEW OF THE LOWER WYE CATCHMENT

2.1 CATCHMENT DESCRIPTION

General

The Wye has a total catchment area of 4136 km². In producing Catchment Management Plans, it has been necessary to divide this area into two parts, but the NRA will ensure that issues affecting the whole river will be dealt with in an integrated fashion. The catchment upstream of Hay-on-Wye is covered by the upper Wye Catchment Management Plan. The lower Wye Plan covers the remaining 2513 km² of catchment from Hay-on-Wye downstream. Except where indicated, the text in this plan refers to the lower Wye, rather than the Wye catchment in its entirety. Where there is overlap between the upper and lower Wye Plans, these aspects are addressed by both plans.

The River Catchment

The Wye rises on the Plynlimon mountains at 741m AOD and drains 1623 km² of uplands prior to reaching Hay-on-Wye. In contrast, the lower Wye is lowland in character, falling from 72m AOD at Hay to sea level over a river distance of 157km (a gradient of only 1 in 2000). Initially flowing west to east through a wide floodplain, the river heads abruptly south downstream of Hereford. For the final 60km stretch, the river cuts through the picturesque limestone gorge made famous by the poetry of Wordsworth.

The catchment is predominantly low, though it does contain significant upland blocks in Radnor Forest (660m) and the Black Mountains (700m). It is rural in nature and largely unspoilt, with urban development found at intervals along the river network.

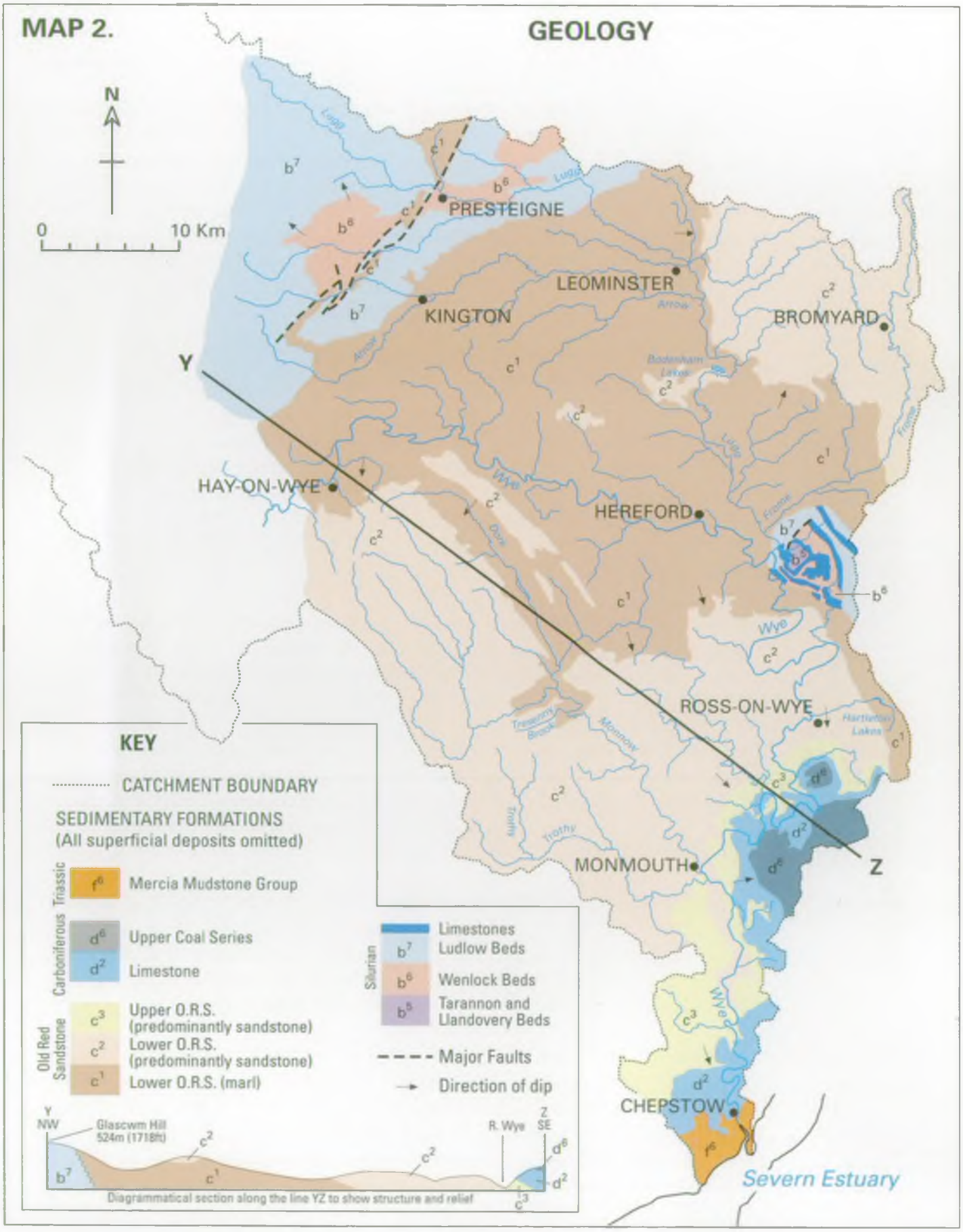
The lower River Wye is an area rich in wildlife and is of considerable landscape value. The river and surrounding land are popular with visitors and residents who participate in a wide range of recreational activities including salmon and coarse fishing, walking, canoeing and rowing. There is some industry, but farming is the predominant land-use.

Rainfall

The average annual rainfall increases from 1000 mm/yr in the south to around 1800 mm/yr on the highest ground. Approximately 500mm of this is lost through evapotranspiration. This compares with an average annual rainfall in Wales of 1385mm/yr and for England and Wales together of 912mm/yr. In an average year, 5300mm of the rain will be lost by evaporation and transpiration.

The River System

Under average conditions, the River Wye has a flow of 74 cumecs at its mouth, making it the fourth largest river in England and Wales. Around half of the flow at the mouth (39 cumecs) is received from the upper Wye at Hay with further inputs from the major tributaries of the Lugg and the Monnow. Their average flows represent 20% and 8% (13 cumecs and 6 cumecs) of the flow at the Wye's mouth. These contributions vary a little during dry periods as the upper Wye


MAP 2.
GEOLOGY
N
0
10 Km
PRESTEIGNE
LEOMINSTER
KINGTON
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
CHEPSTOW
Severn Estuary
Y
Z
KEY
CATCHMENT BOUNDARY
SEDIMENTARY FORMATIONS
(All superficial deposits omitted)
Triassic
Mercia Mudstone Group
Carboniferous
Upper Coal Series
Limestone
Old Red Sandstone
Upper O.R.S. (predominantly sandstone)
Lower O.R.S. (predominantly sandstone)
Lower O.R.S. (marl)
Silurian
Limestones
Ludlow Beds
Wenlock Beds
Tarannon and Llandovery Beds
Major Faults
Direction of dip
Y NW
Glascwm Hill 524m (1718ft)
R. Wye
Z SE
Diagrammatical section along the line YZ to show structure and relief

flows recede quickly, and a higher proportion of the water present in the river comes from the lower Wye and its tributaries.

Flooding in the lower Wye is usually the result of prolonged rainfall over most of the catchment. Snowmelt can be a factor on occasion and short, intense storms may cause localised problems in headwater streams. Floods can take up to 2 days to travel down the river from Hay to Chepstow.

Geology

Much of the catchment is underlain by Old Red Sandstone (Map 2), with soft marls making up the Herefordshire lowlands and coarser, more resistant sandstones forming the Black Mountains. Older Silurian rocks also outcrop in the upper Lugg catchment and there is a raised block of younger Carboniferous Limestones and Coal Measures at the southeastern edge of the catchment.

Overlying these rocks are extensive deposits of glacial till, with alluvial deposits along the river floodplain.

Groundwater

Groundwater occurs in permeable, weathered and fractured rocks and in deposits of sands and gravels near the land's surface. Where larger quantities of water are stored in these rocks and deposits they are referred to as "aquifers". These can be a useful supply of water.

In the lower Wye, small amounts of groundwater exist virtually everywhere, but there are also some locally important aquifers. These are the Yazor and Aymestry Gravels - around Hereford and Leominster respectively, and the highly fissured Carboniferous Limestone around Chepstow. These are important sources for industrial and public water supply. In addition, the minor aquifer of the Old Red Sandstone supports numerous small abstractions.

Where it appears at the surface as springs and seepages, groundwater is also very important in sustaining flows in surface watercourses. The groundwater contribution has a large influence upon the behaviour of a river, particularly during dry spells. Several Sites of Special Scientific Interest depend upon the groundwater seepage.

River Ecosystem (formerly Fisheries Ecosystem)

Throughout the plan refernece is made to a new Fisheries Ecosystem classification system. It has now been decided that the term Fisheries Ecosystem will be superceded by "River Ecosystem" and Regulations issued accordingly. The new Regulations (made jointly by the department of the Environment and the Welsh Office) focus on core chemical properties which determine a river's ability to support a diversity of aquatic life. Following consultations last autumn, the current Regulations, although generally unchanged from the consultative draft, omit the lowest quality class.

2.2 MONITORING

Water Levels and Flows

The NRA operates ten gauging stations to measure river flows in the lower Wye and its tributaries. These are used by the NRA to manage the water resources of the catchment and to control and regulate abstraction. Some of the gauging stations, and an additional 10 stations which measure river levels, are used for flood warning. River and stream flows are also routinely monitored at a number of sites in the catchment by the use of one-off spot gaugings. Groundwater levels are continuously measured at 15 locations in the Chepstow Limestone Block, the Yazor Gravels and the Aymestry Gravels. The groundwater level of the minor aquifer near Ross-on-Wye is also continuously measured. The NRA intends to enhance the groundwater level monitoring network.

Rainfall

Rainfall is measured continuously by the NRA at 11 sites in the lower Wye catchment. A further 23 gauges are read by private observers. These raingauges usually measure daily rainfall totals and these are collated by the NRA and sent to the Meteorological Office at Bracknell.

Water Quality

Water quality samples are taken regularly at 167 sites covering most of the rivers and streams in the catchment. They are analysed for many substances. In addition, all significant discharges are sampled and analysed routinely to ensure that they meet the standards set for them by the NRA.

It is the Welsh Region's intention to instigate a groundwater quality monitoring programme.

Regular inspections are carried out at high risk sites including farms, trade premises, industrial sites and sewage installations as part of the NRA pollution prevention programme and details are kept on a computer database to assist in the catchment management.

Biological Monitoring

Routine biological monitoring is undertaken at 115 of the water quality sampling points. Each site is normally sampled twice a year. An assessment of the biological quality is made from the species of insects and other small aquatic life that are present. Further surveys are carried out to discover the impact of sewage treatment works' discharges on the river.

Habitat Surveys

River Corridor Surveys were carried out by the NRA on the rivers Lugg and Monnow in 1993 as part of the strategic national survey programme. Survey data obtained by English Nature for the River Wye provides a record of the different habitats along the main river.

Fish Stocks

Assessment of juvenile salmon and trout stocks is made annually at about 50 sites throughout the catchment by electrofishing survey.

2.3 KEY DETAILS

Catchment Area: 2,513m^2

Highest Point: 713m AOD

Population:

Year	Population
1991	197,550
2021	232,400 (predicted)

County	District	1991	2021 (predicted)
Gwent	Monmouth	30 300	34 000
Hereford &	Leominster	29 600	35 100
Worcester	Malvern Hills	14 000	16 400
	South Hereford	50 500	60 400
	Hereford City	49 600	59 700
Powys	Radnor	7 950	9 400
Gloucester	Forest of Dean	15 600	17 400

Administrative Details

County Councils:
(% of plan area)

Hereford & Worcester	64%
Gwent	22%
Powys	10%
Gloucestershire	4%

National Rivers Authority

Welsh Region Welsh Region
South East Area South East Area
Hadnock Road Rivers House
Monmouth St Mellons Business
NP5 3NQ Park
St Mellons
Cardif CF3 OLT

Water Companies:

Dŵr Cymru/Welsh Water plc.
Severn Trent Water plc

SECTION 3: ISSUES AND OPTIONS

This section of the Plan presents the key Issues that the NRA has identified from its analysis of the lower Wye catchment. One or more suggestions are made for solving each issue and you are invited to comment on these. The following 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.

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 assesses its ability to support them.

You should note that these Issues and Options are not NRA policy but have been considered within the NRA's policy framework.

3.1 ISSUES IDENTIFIED

3.1.1 WATER QUALITY ISSUES

AGRICULTURAL RELATED IMPACTS

ISSUE 1: WATER QUALITY FAILURES IN THE WORM BROOK, FROME AND LUGG CATCHMENTS DUE TO AGRICULTURAL ACTIVITIES

Agricultural activities result in elevated levels of Biochemical Oxygen Demand (BOD) and reduced levels of Dissolved Oxygen (DO) in a number of stretches of the Worm Brook and tributaries of the River Frome and River Lugg. In many cases the impact of farming on water quality is exacerbated by the low, sluggish summer flows where some sections dry out completely. The effects of abstraction upon these small watercourses will be investigated, but it is not thought to be as important as their naturally low summer flows.

ISSUE 2: POOR BIOLOGICAL QUALITY IN THE UPPER AND MIDDLE RIVER FROME

The biological quality in the upper and middle reaches of the River Frome is poorer than expected when compared to the chemical quality. This indicates that either intermittent polluting discharges or pollutants not detected by routine monitoring are affecting the biology of the river. Apart from the normal organic wastes associated with farming such as slurry, manure and silage effluent there is a significantly high usage of agrochemicals and pesticides in this catchment for use on hops, fruit and potatoes.

SEWAGE RELATED IMPACTS

ISSUE 3: WATER QUALITY FAILURE IN THE STRETFORD BROOK BELOW WEOBLEY SEWAGE TREATMENT WORKS

There are reduced DO levels in the Stretford Brook due to the discharge of treated effluent from Weobley Sewage Treatment Works (STW). Dŵr Cymru has planned improvements for this works to meets its environmentally protective consent, which are due to be completed by May 1994.

ISSUE 4: WATER QUALITY FAILURE IN THE YAZOR BROOK BELOW BURGHILL SEWAGE TREATMENT WORKS

The elevated BOD and ammonia and reduced DO levels in the Yazor Brook are due to the impact from Burghill STW. A programme of operational improvements is being carried out at the works by Dŵr Cymru and this (together with the reduced load to the works resulting from the closure of RAF Credenhill in mid-1994) should result in an improvement in water quality over the next 12 months.

ISSUE 5: WATER QUALITY FAILURE IN THE COLDSTONE BROOK BELOW KINGSTONE AND MADLEY SEWAGE TREATMENT WORKS

The Coldstone Brook below Kingstone and Madley STW is failing to meets its quality target due to elevated ammonia and reduced DO levels. Initially this was due to a poor quality final effluent from the works and as a consequence Kingstone and Madley STW has been included in Dŵr Cymru's Asset Management Programme (AMP2) strategy for post-1995 capital expenditure. However, improved operation at the Works has resulted in better performance and higher quality final effluent and if these improvements in the Coldstone Brook are maintained, it may be possible to remove this works from the capital expenditure programme.

ISSUE 6: POOR BIOLOGICAL QUALITY OF VALLEY BROOK BELOW COLEFORD TOWN

The Valley Brook is affected by sewage discharges arising from sources in the Coleford area:

(i) A number of the illegal sewage discharges from the centre of town into the culverted sections of the brook have been removed but sewage connections from a group of properties in Market Square still require re-routing.

(ii) The combined sewer overflow (CSO) at Newland Street was improved in 1991 when new hydrodynamic separators were installed. However, continuing sewage litter problems in the brook have been traced to a deterioration in performance of the CSO, due to surcharging. The Forest of Dean District Council are pursuing this problem which originates at a local factory site.

(iii) Following heavy rainfall, the trunk sewer from Coleford to Newland STW surcharges near Mill End Farm causes uncontrolled sewage discharges to the brook. This problem is being investigated by the Council to identify the cause and design a scheme to resolve it. In the short-term bolt-down covers have been fitted to alleviate the situation.

ISSUE 7: SEWAGE LITTER IN RUDHALL BROOK FROM HOMMS ROAD PUMPING STATION, ROSS .

There is sewage litter in the Rudhall Brook below Homms Road sewage pumping station. This is occurring because of storm sewage discharges from the pumping station. Improvements are planned to be made to the storm sewage overflow by Dŵr Cymru.

ISSUE 8: LOCALISED POLLUTION OF RIVER FROME FROM BROMYARD PUMPING STATION

Lack of capacity at Bromyard pumping station causes premature discharges of untreated sewage to be made to the River Frome. Dŵr Cymru is planning to upgrade the pumping station which may involve a new, properly designed and controlled storm sewage overflow to the river or the provision of storm water treatment at Bromyard STW. Additionally, as part of the joint Combined Sewage Overflow Strategy between Dŵr Cymru and NRA, three other overflows on the sewerage system have been identified as having an unsatisfactory aesthetic or environmental impact on the River Frome and are the subject of ongoing discussions to determine capital expenditure priorities.

ISSUE 9: SEWAGE LITTER IN WYE ESTUARY DUE TO CRUDE SEWAGE DISCHARGES FROM CHEPSTOW TOWN

Crude sewage discharges from Chepstow Town into the Wye Estuary are the cause of local concern. The discharges are primarily of domestic sewage and are programmed to be intercepted and taken to a single point for treatment under the Urban Waste Water Directive requirements. With current plans this will not be achieved until after the year 2000.

EUTROPHICATION RELATED IMPACTS

ISSUE 10: BLUE/GREEN ALGAL BLOOMS AT HARTLETON AND BODENHAM LAKES WITH POSSIBILITY OF EUTROPHICATION

The development of blue-green algal blooms at Hartleton and Bodenham Lakes indicate the possibility of eutrophication of these water bodies. The NRA liaises with the lake owners and local Environmental Health Departments to make them and the public aware of the potential dangers.

ISSUE 11: PLANT AND ALGAL GROWTH IN THE RIVER WYE BELOW HEREFORD DUE TO NUTRIENT ENRICHMENT

The River Wye below Hereford is characterised by two types of plant growth: microscopic algae and large growths of water crowfoot (Ranunculus fluitans), both of which have been of concern to water users.

The green alga Scenedesmus and the diatom Cyclotella give the water a green colour but are not toxic. The water crowfoot is visible as huge stands of the flowering plant between June and September and can cause problems to anglers and canoeists by entanglement and impeding the passage of craft. Historically there have been significant water quality problems which have resulted in fish kills. These growths provide a habitat for invertebrates and a nursery area for fish fry and cannot be removed without having a major impact on the river ecology.

The food source for these plants are nutrients from primarily sewage and farm inputs. However, the NRA believes that further monitoring will be necessary to determine the cause of excessive plant growth.. The lower Wye classifies for designation as a proposed Sensitive Area under the Urban Wastewater Treatment Directive due to the level of nutrients. If adopted, this would place a strict control on the amount of nutrients, primarily phosphorus, from the STWs at Hereford (Rotherwas and Eign) and Leominster (Worcester Road). This phosphorus reduction would involve significant additional capital and operating costs to Dŵr Cymru.

3.1.2 WATER QUANTITY ISSUES

ISSUE 12: HIGH WATER LOSSES FROM THE PINSLEY AND GARREN SUBCATCHMENTS

In the Pinsley and Garren subcatchments, a significant proportion of the water typically available during a dry summer (Q95) can be lost through abstraction. Most of the water is taken directly from streams for summer spray irrigation, and no water is returned to the river. The licences used in calculating the water loss have no "hands-off flow" conditions so, although the NRA can prevent abstraction using "Section 57" restrictions as an emergency measure, in most years the abstraction can take water despite low river flows. Illegal abstraction can exacerbate the water loss.

As spray irrigators take water sporadically, it is unlikely that they would all abstract at once. But were this to happen, the Q95 flow might be entirely lost from the Pinsley Brook, although it may be that the water stored in the Aymestry Gravels would continue to sustain the flows in a dry summer. Similarly, the water loss from the Garren Brook would be equivalent to nearly half its Q95 flow. As much of the abstraction in the Garren is from smaller watercourses such as the Gamber, there may be higher localised losses from these streams. These loss estimates represent a 'worst case' scenario, but detailed studies of the catchments are required to enable better protection of the water resource from potential over-abstraction.

ISSUE 13: GROUNDWATER RESOURCES IN THE YAZOR GRAVELS AND CHEPSTOW LIMESTONE BLOCK NEED BETTER PROTECTION

The Yazor Gravels aquifer supports the large industrial abstractions of Hereford. At present, it is not known whether the aquifer can support significant additional

abstractions or what the effect of the present abstraction is upon surface flows and aquifer levels. To ensure proper management of this aquifer, the NRA is undertaking a detailed study of the Gravels. This will facilitate better protection of the resource from potential over abstraction.

There are also significant industrial and public water supply abstractions from the Sudbrook Great Spring (Chepstow Limestone Block). Studies have identified a need to fully quantify the available resource in this aquifer, and to understand the interaction of the aquifer with surface water flows, to protect this aquifer from potential over abstraction.

ISSUE 14: POSSIBILITY OF OVER ABSTRACTION OF LOCALISED RIVER STRETCHES AND SMALL WATERCOURSES

Aside from the Pinsley, Yazor and Garren catchments, the Wye and its major tributaries do not appear to suffer from over-abstraction. However, on smaller watercourses, or where large abstractions return water significantly downstream of the abstraction point, there may be a localised impact upon the river environment and on nearby abstractors. To protect the environment and correctly manage water resources, an investigation into the impacts of abstractions at a local scale is required, either at selected sites or over the entire catchment.

ISSUE 15: INSUFFICIENT INFORMATION ON RIVER FLOWS AND GROUNDWATER LEVELS TO PROTECT WATER RESOURCES AND THE ENVIRONMENT FULLY

To manage and protect water resources, the NRA must assess the amount and quality of the water resource throughout the catchment and during different times of the year. This knowledge enables the NRA to:

* understand how much water can be abstracted without adversely affecting existing abstractors or the aquatic environment;

* implement surface and groundwater protection policies to prevent pollution.

At present the NRA has a monitoring network to measure the quality and quantity of surface water flows and to measure aquifer levels. However, there are many smaller watercourses and aquifers which are not directly monitored, so these are not given full protection. In addition to this, sediments and weeds inhibit accurate measurement at some existing river sites.

As a result, the NRA has plans to construct a number of observation boreholes and to extend and improve the river flow measuring network. This will enhance the water resource management of the catchment.

ISSUE 16: RESTRICTIONS ON ABSTRACTIONS CANNOT YET BE BASED UPON THE ENVIRONMENTAL REQUIREMENTS OF RIVER PLANT AND ANIMAL LIFE

The NRA has a duty to balance the needs of all the water users. Often, abstraction is permitted until the river flows fall to a pre-determined level. Once this river level is reached, it is necessary to prevent further abstraction in order to leave sufficient water in the rivers to sustain the aquatic environment. There are two ways in which abstractions can be prevented. Firstly, many licences have conditions written into them which prevent water use when the flow reached a certain level. This is termed a "Hands-off Flow" condition, and the condition is tailored to the water courses which the licensed abstraction might affect. Secondly, during an exceptional shortage of rain or other emergency, the NRA can prevent spray irrigators from making any abstraction which directly affects surface waters. These apply specifically to spray irrigation because this use causes a loss of all the water used from the river, and could seriously damage the environment during periods of very low flow. The present trigger for these 'Section 57' restrictions to be imposed is a flow of 5.26 cumecs (45 Ml/d) at Redbrook Gauging Station.

Unfortunately, it is very difficult to determine how much water the rivers require to sustain their ecological quality and it has been necessary to base conditions and trigger levels upon a more pragmatic assessment, and aim to protect subjectively selected flows in the river (usually Q95). The use of arbitrarily chosen thresholds may restrict abstractors unnecessarily, or in some cases offer insufficient protection to the environment.

In order to determine licences, hands-off flow conditions and to adjust the Section 57 trigger levels, there is a need to quantify the flow required by the river environment. Furthermore, the use of one gauging station (Redbrook) in the whole catchment may be insufficient to safeguard the environment in the smaller watercourses.

Several research programmes are being carried out to determine the environmental flow requirements of the rivers and to develop an objective licensing policy for determining licences so as to balance the needs of all river users. Until these can be applied, it will be necessary to continue with the pragmatic approach.

ISSUE 17: GROUNDWATER ABSTRACTIONS FOR SPRAY IRRIGATION AFFECTING SURFACE FLOWS

Most existing groundwater abstractions are not subject to licence conditions to prevent them from taking water when flows in local streams and rivers are low. As groundwater abstractions intercept water on the way to surface waters, they do impact on river flows. The timing of the impact is important. If an abstraction is taking water which would reach the river within a few days it will have a quick

impact on the aquatic environment during periods of low flow. The groundwater source should then be subject to conditions in much the same way as a surface source would be. In order to treat all abstractions equally, and apply restrictions only to those which are damaging the aquatic environment, assessment of groundwater abstractions is required to identify how they interact with surface water.

ISSUE 18: IMPROVED LAND DRAINAGE AND LAND USE CHANGES IS ALLEGED TO HAVE REDUCED BASEFLOWS AND INCREASED RATES OF RUN-OFF

Over the past decades, there has been a change in land use in parts of the catchment. In particular there has been an improvement in the drainage in upland areas. It is said by some residents that rainfall runs off the catchment much more quickly than previously, making streams more "flashy" and causing lower baseflows, with river levels falling more quickly after rainfall. As yet, there has been no investigation to determine whether the rivers in the lower Wye catchment have changed their behaviour. There is also a need to assess whether any changes could be due to natural variation in the rainfall rather than man's changing use of the catchment. The NRA is to undertake such an investigation.

3.1.3 PHYSICAL FEATURES ISSUES

ISSUE 19: DEGRADATION OF RIVERBANK HABITAT

Despite the designation of the River Wye and the proposed designation of the River Lugg as SSSIs, the riverbank habitat is degraded to a greater or lesser degree in some areas. The reason for the poorer quality of the habitat varies from place to place but is usually due to one or more of the following:

- Overgrazing, leading to lack of tree and shrub regeneration and the gradual loss of tree-cover in the long-term.
- Development of a flora dominated by vigorous plants such as nettles and a consequent loss of other species due to the use of agrochemicals on adjacent land.
- The spread of alien plant species such as Japanese Knotweed and Himalayan Balsam.
- Consented and unconsented channel works involving the removal of shoals and protection of eroding banks.
- Control of riverbank vegetation by anglers.

ISSUE 20: NO STANDARDS OF SERVICE AGREED WITH COUNTRYSIDE COMMISSION FOR WALES OR ENGLISH NATURE FOR NRA OPERATIONS AFFECTING SSSI

Many NRA operations (e.g. flood defence maintenance works, issuing of abstraction licences) can directly or indirectly affect wetland SSSIs. There is therefore a need to identify sites which are sensitive to such operations and agree standards to be applied when dealing with such sites e.g. working only at certain times of the year, maintaining a certain groundwater level.

ISSUE 21: THE PROTECTION OF THE HERITAGE RESOURCE

Man's activities have the potential to damage landscape, archaeological and historic features intentionally or unintentionally. Many activities can damage features and it may be necessary to amend operations or withhold consent for certain activities to protect such features. Adequate procedures are required to ensure that unscheduled sites are also protected.

ISSUE 22: CONSERVATION OF RARE SPECIES

A number of rare and endangered species are associated with the Wye and its tributaries. No clear framework exists to ensure that the status of these species is monitored, or that their specific needs are taken into account in the management of the river. Conservation strategies for each species should be prepared. For example, the Wye is nationally important for the conservation of native crayfish. It is therefore important to protect the populations from crayfish plague by preventing the introduction of non-native crayfish (which act as carriers of the plague) into the catchment. Non-native crayfish require a licence for introduction from MAFF/WOAD under the Wildlife and Countryside Act 1981. But the catchment needs to be designated a "no-go" area for the introduction of non-native crayfish.

ISSUE 23: TIDAL/FLUVIAL FLOODING IN SOME AREAS

The following table lists locations where the most significant main river flooding occurs:

Place	River	No.of Properties at Risk during Major Floods	Flooding of Property Starts	Flood Source	Unresolved Issues
Chepstow	Wye	50	1 in 5 year	Tidal	Finance
Tintern	Wye	25 Additional properties flooded from local watercourses. i.e. Angiddy River*	1 in 3 year	Tidal	Main river flooding Financial viability
Brockweir	Wye	10	1 in 3 year	Tidal/ River	Financial viability and environmental
Lydbrook	Wye	20	1 in 5 year	River	Financial viability
Ross-on-Wye	Wye	50	1 in 15 year	River	Financial viability
Hereford	Wye	200	1 in 10 year	River	Financial viability
Skenfrith	Monnow	25	1 in 5 year	River	Financial viability
Ewyas Harold	Dulas	25	1 in 5 year	River	Financial viability/ practicability
Eardisland	Arrow	40	1 in 5 year	River	Financial viability/ practicality
Kington	Arrow	20	1 in 10 year	River	Financial viability/ environmental

* A scheme on the Angiddy River at Tintern is being promoted at present by Monmouth Borough Council

Flooding also occurs at various locations from ordinary watercourses. In areas of nature conservation significance, flooding can be beneficial.

ISSUE 24: FLOODPLAIN AND RIVERSIDE DEVELOPMENT

Although in comparison with some other catchments the lower Wye is relatively undeveloped, there are many areas attractive to developers particularly where they are situated alongside existing urban developments. The flood plain is an integral part of the overall river system and the NRA considers it essential that they are kept free from development for flood defence reasons. In addition the NRA recognises the importance of protecting the existing aquatic environment and heritage features associated with them. Thus the NRA objects to the development of floodplains.

Over the next 5 years, the NRA will be conducting a national survey of flood risk areas (in accordance with Section 105 of the Water Resources Act 1991) to further assist local authorities in their consideration of planning proposals and the need for flood alleviation works.

ISSUE 25: DECLINE IN SALMON STOCKS, ESPECIALLY LARGE SPRING FISH

The River Wye is recognised as the premier salmon river in England and Wales. Rod catches have declined over the last 15 years with the decline in the number of large spring salmon caught being the most dramatic. It is considered that the level of stock of large spring salmon is now so low that it's existence and recovery as a fishery are at risk.

ISSUE 26: ILLEGAL FISHING FOR SALMON

The lower River Wye valley is a centre of illegal fishing activity. Several gangs of individuals use gill nets, set in the river at night, to catch salmon migrating up-river to spawn. Illegally taken salmon are sometimes sold to some local hotels, public houses, restaurants and fishmongers.

ISSUE 27: DECLINE IN BROWN TROUT STOCKS

Reported catches of brown trout have declined in the Wye catchment. There are some stretches that provide good fishing but some of these are supported by restocking programmes (put and take) by the fishery owners.

ISSUE 28: IMPROVE MONITORING OF FISH STOCKS

Monitoring of fish stocks is essential for the successful management of those stocks. There is a need to improve the monitoring of salmon, trout and coarse fish stocks in the Wye catchment.

ISSUE 29: MANAGEMENT OF EEL AND ELVER STOCKS

Reported catches have declined. Management of the elver fishery, based on the conclusions of recent research, may be required to protect eel stocks.

ISSUE 30: AVIAN PREDATORS OF FISH

Fish-eating birds, principally goodsander and cormorant, have increased in numbers on the Wye in recent years. There is widespread concern amongst fishery interests that these birds are having a significant impact on salmon, trout and, possibly, coarse fish stocks, although there is no evidence that serious damage to fish stocks is occurring. The NRA is seeking, through research, further evidence of the impact of fish-eating birds on fish stocks. In the meantime, judgement will be determined on a case by case basis.

ISSUE 31: DECLINE IN COARSE FISH STOCKS ON THE RIVER LUGG

Coarse fish stocks have declined in the lower River Lugg. Survey results indicate that fry survival is poor during periods of high river flows.

3.1.4 CROSS-FUNCTIONAL ISSUES

ISSUE 32: IMPACT OF RECREATIONAL USERS ON THE WILDLIFE CONSERVATION OF THE RIVER AND CONFLICT BETWEEN DIFFERENT RECREATIONAL USER GROUPS

The lower Wye is used by many people participating in a variety of activities. The river is a designated Site of Special Scientific Interest (SSSI) and an Area of Oustanding Natural Beauty (AONB). There is widespread concern about the impact of recreational use on the wildlife and landscape of the river corridor and the conflict between river users.

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

The issues and options facing the lower Wye described in the previous section are shown in summary tables in the following pages. These are intended to provide quick reference to the issues and options that have to be addressed as well as the means of resolving these problems.

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 faciilitate improvements to the water environment for the benefit of all users. Their implementation may require the co-operation of many bodies and individuals. The final action plan will provide more detailed budget and timetable information.

These should not be taken as a definitive list, nor should the proposed solutions be taken to be the only ones available. We hope that interested parties will debate these issues and pass their comments to the NRA for consideration when preparing the final version of the plan.

ISSUE No: 1	**WATER QUALITY FAILURES IN THE WORM BROOK, FROME AND LUGG CATCHMENTS DUE TO AGRICULTURAL ACTIVITIES**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Targeted catchment control work in sub-catchments. Identify farms for remedial waste management works to comply with COPRA 1991.	NRA/Farm owners Products	Will achieve improvements in long term..	Cost to farmers unknown. Costs to NRA of pollution prevention work.
2. Propose interim water quality (WQ) targets of Fisheries Ecosystem (FE) Class 3 and FE5 affected stretches.	NRA	Maintain existing water quality. Zero cost.	Will not achieve FE2 and FE4 target in short term.
3. Investigate impact of low flow on achievement of quality targets.	NRA	Quantification of problem. Prevents unnecessary expenditure by farmers.	May not be able to achieve long term Water Quality target.

ISSUE No: 2	**POOR BIOLOGICAL QUALITY IN THE UPPER AND MIDDLE REACHES OF THE RIVER FROME**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Investigate the continued use of pesticides in the catchment, develop a comprehensive monitoring programme and develop an action plan for WQ improvements.	NRA	Quantification and identification of sources and uses of pesticides in the catchment.	Cost unknown. Resource implications.
2. Improved methods of pesticide handling/ storage and application	Farm Owners Local Authorities	Improvement of water quality.	Cost unknown.
3. Investigate catchment for point source and diffuse farm pollution and develop an action plan for WQ improvements.	NRA/Farm owners	Improvement of water quality.	Cost and resource implications

ISSUE No: 3	WATER QUALITY FAILURE IN THE STRETFORD BROOK BELOW WEOBLEY SEWAGE TREATMENT WORKS		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Improvements to Weobley STW to meet environmentally protective consent. Due for completion by May 1994.	Dŵr Cymru	Achievement of FE target.	Costs £420K

ISSUE No: 4	WATER QUALITY FAILURE IN THE YAZOR BROOK BELOW BURGHILL SEWAGE TREATMENT WORKS		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Continued operational improvements to Burghill STW.	Dŵr Cymru	Improvement in Yazor Brook water quality.	Costs unknown.
2. Abandon Burghill STW and pump sewage to Hereford City STWs.	Dŵr Cymru	Remove pollution load from Yazor and hence improve quality.	Costs unknown. Extra load on Hereford STWs and sewerage system.
3. Propose interim target of FE4.	NRA	Maintain water quality. Allow Dŵr Cymru time to assess alternative schemes.	Not achieving target in short term. Restricts downstream uses.

ISSUE No: 5	**WATER QUALITY FAILURE IN THE COLDSTONE BROOK BELOW KINGSTONE AND MADLEY SEWAGE TREATMENT WORKS**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Continued operational improvements at Kingstone and Madley STW.	Dŵr Cymru	Improvement in brook quality.	Costs to DCC. Brook may not achieve long term quality.
2. Retain in Dŵr Cymru's Capital Programme (AMP2).	Dŵr Cymru/NRA	Improvement in water quality.	Capital costs Dŵr Cymru.
3. Consider alternative point of discharge into higher dilution stream.	NRA/Dŵr Cymru	Improvement in Coldstone Brook quality	Costs unknown.. Practicality of effluent pipeline length.
4. Re-assess long term FE2 target of Coldstone Brook to FE3 or FE4.	NRA	Maintain existing water quality. Minimise unnecessary expense by Dŵr Cymru.	Not achieving FE2 target. Possible impact on downstream uses.

ISSUE No: 6	**POOR BIOLOGICAL QUALITY OF VALLEY BROOK BELOW COLEFORD TOWN**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Remove foul connections to Valley Brook from Market Square, Coleford and connect to foul sewer.	Forest of Dean District Council	Improved WQ in brook.	
2. Improve performance of Newland Street Combined Sewer Overflow (CSO) and remove non-foul flow from Smithkline Beecham.	Forest of Dean District Council	Improved overflow operation and minimise discharges to brook.	
3. Improve foul sewer at Mill End to prevent surcharging.	Forest of Dean District Council /Dŵr Cymru	Improved WQ in brook.	Cost unknown.

ISSUE No: 7	**SEWAGE LITTER IN RUDHALL BROOK FROM HOMMS ROAD PUMPING STATION, ROSS**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Improvements to storm sewage overflow.	Dŵr Cymru/ District Council	Removal of nuisance caused by sewage debris in stream.	Cost unknown.

ISSUE No: 8	**LOCALISED POLLUTION OF RIVER FROME FROM BROMYARD PUMPING STATION**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Upgrade pumping station to provide additional capacity and storage and provide for storm sewage treatment capacity at Bromyard STW if necessary.	Dŵr Cymru	Remove threat of pollution in River Frome.	Cost unknown. Impact on performance of Bromyard STW unknown.
2. Consider priority of other CSOs in Dŵr Cymru capital programme.	Dŵr Cymru/NRA	Remove threat of pollution in River Frome.	Cost unknown.

ISSUE No: 9	**SEWAGE LITTER IN WYE ESTUARY DUE TO CRUDE SEWAGE DISCHARGES FROM CHEPSTOW TOWN**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Interception of foul discharges and take to single point for treatment to Urban Wastewater Treatment Directive requirements.	Dŵr Cymru	Improvement in Estuary water and aesthetic quality.	Costs unknown. Will not be achieved until post 2000.

ISSUE No.10	**BLUE GREEN ALGAL BLOOMS AT HARTLETON AND BODENHAM LAKES WITH POSSIBILITY OF EUTROPHICATION**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Development of action plan during 1994/95 together with programme of catchment inspection	NRA	Quantification of problem and identification of problem sites.	Cost of implementation action plan. Resource implications.
2. Improvement in farm effluent storage/disposal systems.	Farm owners	Improvement in water quality, reduction in nutrient inputs. Grant aid for farm pollution control work available from MAFF.	Cost to farmers unknown.

ISSUE No: 11	**PLANT AND ALGAL GROWTH IN THE RIVER WYE BELOW HEREFORD DUE TO NUTRIENT ENRICHMENT**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Designation of lower Wye as 'Sensitive Area' under the Urban Wastewater Treatment Directive - phosphorus removal at Hereford STWs and Leominster (Worcester Road) STW.	NRA/Dŵr Cymru	Possible reduction of weed and algal growth	Cost to Dŵr Cymru.
2. Physical removal of surface plant growth..	NRA/Fishery Owners/Other river users	Reduced plant cover and improved passage for craft.	Recurring cost. Impact on river ecology. Increase in rate of plant regrowth
3. Monitor water quality over the diurnal cycle during plant growth and decay periods.	NRA	Quantify extent of water quality impact. Minimise unnecessary cost.	Cost unknown. NRA resource implications.

ISSUE No: 12	**HIGH WATER LOSSES FROM THE PINSLEY AND GARREN CATCHMENTS.**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Identify if existing conditions create environmental problems and identify possible solutions.	NRA	Increased knowlege of the catchment. Will identify what further action needs to be taken.	Time delay whilst study is completed. Cost-effective solutions may not be apparent. Cost: £2,000.
2. Provide winter storage reservoirs for spray irrigators instead of summer abstraction.	MAFF/NRA Spray Irrigators	Less water loss during summer. Protection of the environment.	Cost: Unknown. Depends upon demand Not certain if conditions cause a problem.
3. Co-operatives between farmers to ensure existing winter storage is fully utilised.	NRA/FUW/NRA	Less demand on summer water level. Environmental protection improved.	May give only limited improvements. Not certain if present conditions cause a problem.
4. Augment Flow in watercourses.	NRA/Spray Irrigators	Allows abstraction when water required. Reduced summer demand on river. Increased flow in dry periods.	Several storage facilities required. Dependant upon availability of water resources. Cannot realistically supply to all sites.

ISSUE No: 13	**GROUNDWATER RESOURCES IN YAZOR GRAVELS AND CHEPSTOW LIMESTONE BLOCK NEED BETTER PROTECTION**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Detailed study of the Yazor Gravels and Chepstow Limestone Block.	NRA	Enables better protection of the aquifers and of local streams. Allows better determination of new licences for abstraction from the aquifers and associated surface waters.	Cost: £100,000 -£150,000
2. Draw up a policy regarding local abstraction regime in the Chepstow Limestone Block.	NRA	Allows better determination of new licences for abstraction from the Chepstow Limestone and associated surface waters. Prevents potential over-abstraction from the aquifer.	Cost: £20,000
3. Implement the NRA's Groundwater Protection Policy throughout the catchment.	NRA	Minimises the risk of derogation of groundwater sources and resources. Can be implemented along with 1 and 2.	Cost: £20,000 -£30,000

ISSUE No: 14	**OVER-ABSTRACTION OF LOCALISED RIVER STRETCHES AND SMALL WATERCOURSES**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Implementation of Regional Licensing Policy throughout the catchment.	NRA	Improved understanding of the balance of water resources. Widely accepted.	Takes time to implement. Not scientifically rigorous at all sites.
2. Undertake fundamental research into the flow requirements of river flora and fauna.	NRA	Partly in hand through NRA research programme. Will give a thorough assessment of the state of the catchment.	Unlikely to produce practically applicable results in the near future.
3. Apply the present method used for subcatchments to selected river stretches or to every river stretch.	NRA	Accepted method. More easily and rapidly applied than 1 or 2.	Not scientifically rigorous. The method gives an arbitrary measure of the state of the catchment.

ISSUE No: 15	**INSUFFICIENT INFORMATION ON RIVER FLOWS AND GROUNDWATER LEVELS TO PROTECT WATER RESOURCES AND THE ENVIRONMENT FULLY.**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Full upgrade of relevant Wye Gauging Stations. More sites on tributaries with many abstractions (e.g. the Garren Brook or Pinsley Brook).	NRA	More accurate flow measurements. Increased protection of environment. Better water management.	Cost: £300,000 - £500,000.
2. New stations to measure highly used streams - Garren Brook. Re-open gauging stations on lower Lugg and Pinsley Brook.	NRA	Better protection of local environment and water resource management.	Cost £100,000. Less accurate measurement than 1. for main Wye installations.
3. Programme of installing simple measuring posts where abstractions take from small watercourses.	NRA	Protects small watercourses. Can be done in conjunction with 1. and 2.	Cost £3,000. Less accurate and very localised information if not used with 1. and 2.
4. Increase monitoring of groundwater levels within the minor aquifers of the catchments (similar works programmed for upper Wye).	NRA	Protect local aquifers and associated surface waters from over abstraction. Gain better understanding of catchment water resources.	Cost £50,000 for lower Wye. Further £50,000 for the upper Wye.

OPTION No.16	**RESTRICTIONS ON ABSTRACTIONS CANNOT BE BASED ON THE ENVIRONMENTAL REQUIREMENTS OF RIVER PLAN AND ANIMAL LIFE**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Undertake research into flow requirements for river flora and fauna.	NRA	Already underway in NRA R&D Programme.	Unlikely to produce practically applicable results quickly.
2. Develop and implement licensing policy based on research to provide a Nationally consistent policy.	NRA and others as consultees	Can provide policy within 2 years.	Not as scientifically rigorous as 1. May not alter trigger level for Section 57 restrictions.
3. Undertake review of trigger levels.	NRA	Trigger level defensible.	Environmental benefits too difficult to quantify. Does not assist in setting of "Hands-off" flow conditions.
4. Do nothing.		No cost or effort	Trigger levels and "Hands-off" flow conditions may not protect the river or unduly penalise abstractors.

ISSUE No: 17	**GROUNDWATER ABSTRACTIONS FOR SPRAY IRRIGATION AFFECTING SURFACE WATER FLOWS**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Determine which spray irrigation abstractions from groundwater affect river flows directly and include in any restrictions.	NRA	Comply with legal requirements. Reduced demand on river during very low flows. Abstractors treated consistently.	Abstractors not previously affected, now restricted. May require some pumping tests.
2. Do nothing.		There are only a small number of abstractors who would not be covered.	Fail to comply with legal requirement. Demand on river in drought higher than necessary.

ISSUE No: 18	**IMPROVED LAND DRAINAGE AND LAND USE CHANGES IS ALLEGED TO HAVE REDUCED BASEFLOWS AND INCREASED RATES OF RUNOFF**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Investigate flow records to establish to what extent higher runoff rates and lower base flows occur.	NRA	Will understand causal mechanisms. Scope for ameliorative measures can be assessed.	

ISSUE No: 19	**DEGRADATION OF RIVERBANK HABITAT**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Seek to enhance the riverbank habitat when undertaking NRA flood defence works.	NRA	Improve the conservation resource	
2. Seek riverbank habitat improvements when considering applications for abstraction licences and land drainage consents and also when consulted on planning applications.	NRA	Improve the conservation resource.	
3. Encourage the creation of riparian buffer zones.	NRA/Landowners	Protection of riparian and aquatic resource.	Cost to NRA and Landowners.
4. Encourage sensitive bank management by angling interests.	NRA/Angling Interests	Improve the conservation resource.	Maintaining adequate access for angling.

ISSUE NO: .20	**NO STANDARDS OF SERVICE AGREED WITH CCW/EN FOR NRA OPERATIONS AFFECTING SITES OF SPECIAL SCIENTIFIC INTEREST**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Agree standards of service	EN/CCW/NRA	Protect SSSI. Ensures consistent approach.	

ISSUE No: 21	**PROTECTION OF THE HERITAGE RESOURCE**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Initiate procedures to identify unscheduled features when considering consent applications.	NRA /Conservation Agencies	Avoids damage to heritage features.	
2. Consider all NRA capital and maintenance activities to ensure no damage to heritage features.	NRA/Conservation Agencies	Avoids damage to heritage features.	
3. Seek opportunities to enhance sites of heritage interest in river corridors.	NRA/Conservation Agencies	Protects resource.	

ISSUE No: 22	**CONSERVATION OF RARE SPECIES**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Prepare conservation strategies for each rare species.	NRA/CCW/EN Voluntary Conservation Bodies	Monitor status of species. Specific needs determined.	
2. Restrict movement of non-native crayfish into the catchment.	NRA/MAFF/CCW/EN	Protection of native crayfish.	Restricts crayfish farming.

ISSUE No: 23	**TIDAL/FLUVIAL FLOODING IN SOME AREAS**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Monitor flooding.	NRA/LA	Maintains accurate database.	
2. Review options for flood defence improvements to standards of services.	NRA/LA	May lead to development of new schemes.	
3. Promote schemes as appropriate.	NRA/LA	Standards of service improved.	

ISSUE No: 24	**FLOODPLAIN AND RIVERSIDE DEVELOPMENT**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Restrict development on floodplain and riverside via planning consultation procedure.	NRA/LPAs	1. Management of flood risk to people and property. 2. Reduction in need for future flood protection. 3. Protects conservation interests.	
2. Production of Section 105 flood risk maps.	NRA/LPAs	1. Fulfils statutory duty 2. Allows LPAs to make better informed decisions.	Cost £100K
3. Use of statutory powers.	NRA	1. Better control of flood risk.	

ISSUE No: 25	**DECLINE IN SALMON STOCKS, ESPECIALLY LARGE SPRING FISH**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Review fishery byelaws to control exploitation and to allow greater escapement to spawn.	NRA/Fishery Owners	Increased stocks.	Loss of angling opportunity. Reduced rod catches.
2. Operate Glasbury Hatchery. Collect broodstock and restock fry into catchment to increase productivity.	NRA	Enhancement of stocks by utilising extra nursery areas.	
3. Investigate barriers to salmon migration and recommend a programme of fish pass construction.	NRA	Enhancement of stocks by utilising extra nursery areas.	Possible undesirable impact on indigenous fish fauna. Approx.cost £50K.
4. Conduct feasibility study of a breeding programme to enhance large spring salmon stocks.	NRA	Increased stocks.	
5. Carry out habitat improvements as recommended by 1993 Fisheries Survey.	NRA	Improved spawning and nursery areas to increase productivity.	Cost not yet determined.

ISSUE No: 26	**ILLEGAL FISHING FOR SALMON**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Maintain surveillance and anti-poaching patrols by Water Bailiffs.	NRA	Protection of stocks and detection of illegal activity.	
2. Control market in illegally caught salmon.	NRA	Reduce market in illegally caught salmon to discourage illegal fishing.	
3. Raise public awareness of illegal fishing and illegal trade in salmon by distributing information e.g. 'Buyer Beware' Leaflets.	NRA	Increased flow of information about illegal activity. Reduces illegal activity	

ISSUE No: 27	**DECLINE IN BROWN TROUT STOCKS**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Review fishery byelaws to control exploitation and to allow greater escapement to spawn.	NRA/Fishery Owner	Increased stocks due to greater escapement.	Loss of angling opportunity.
2. Act on recommendations in the Brown Trout Strategy including establishment of a database, identification of possible habitat degradation, research into restocking policies and the effects of predators on stocks.	NRA	Increased stocks of natural brown trout.	Restrictions on restocking.

ISSUE No: 28	**MONITORING OF FISH STOCKS**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Install acoustic fish counter to count ascending adult salmon and descending kelts, smolts and migrating shad.	NRA	To enable more accurate management of fish stocks.	Approx. cost of project £350K.
2. Assess juvenile salmon and trout stocks at 120 sites throughout the Wye catchment annually.	NRA	To enable more accurate management of fish stocks.	Restrictions on restocking.
3. Collect and analyse information on catches of coarse fish submitted by angling clubs.	NRA/Angling Clubs	To enable more accurate management of fish stocks.	

ISSUE No: 29	**MANAGEMENT OF EEL AND ELVER STOCKS**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Consider results and conclusions of NRA R&D Report including the need for regulation of the elver catch byelaw.	NRA	Increased stocks due to greater escapement of elvers.	Reduced fishing opportunity.

ISSUE No: 30	**AVIAN PREDATORS OF FISH**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Initiate an annual survey of goosander and cormorant to build on results of previous surveys.	NRA/Fishery Owners/ MAFF/WOAD	Information on numbers of birds essential for impact assessment.	Approx. cost £10K p.a.
2. Undertake R&D to assess impact of goosander and cormorant on fish stocks and consider possible control measures.	NRA/CCW/EN/ WOAD/MAFF	Protection of birds and fish stocks.	Practicality of controls

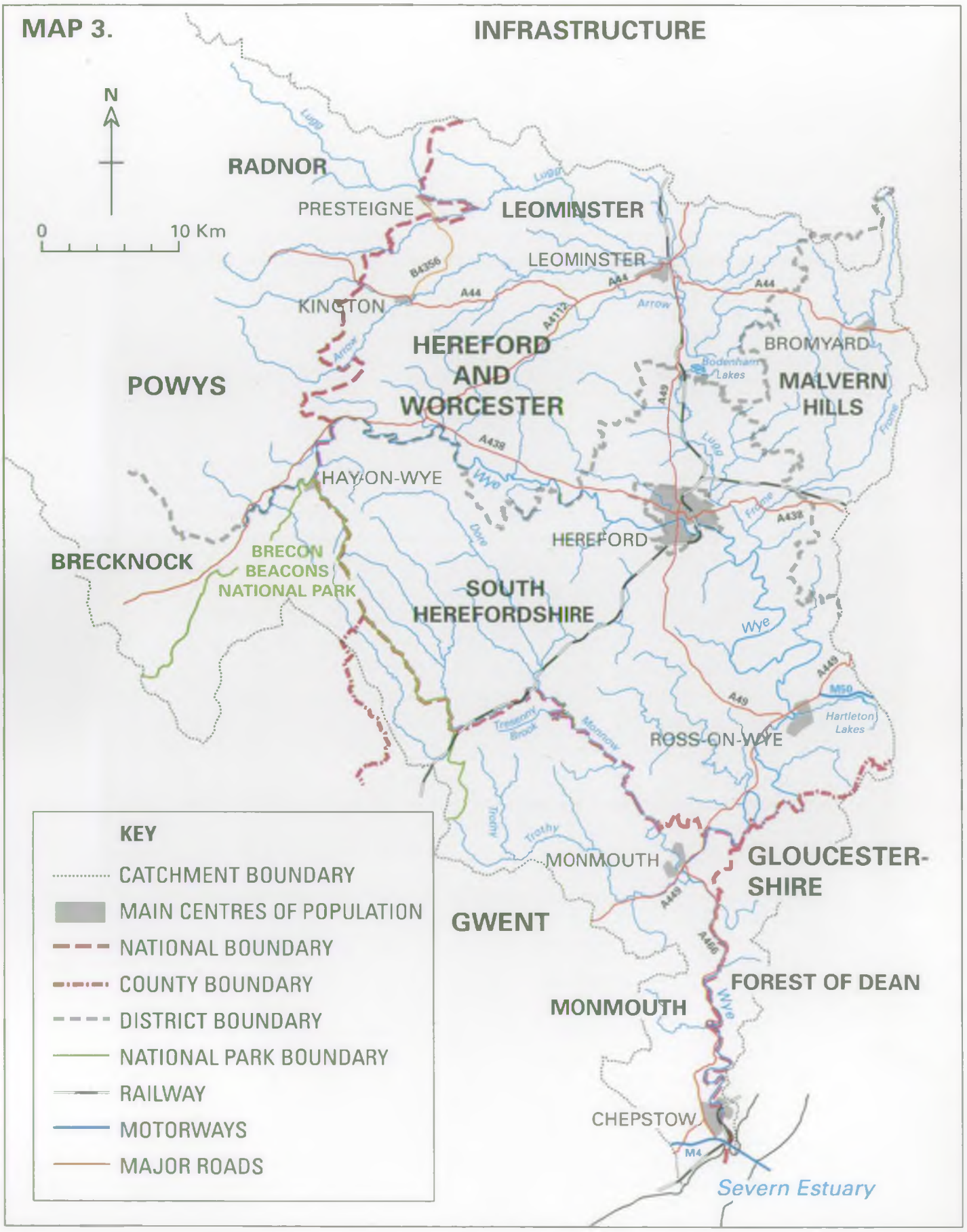
ISSUE No: 31	**DECLINE IN COARSE FISH STOCKS ON THE RIVER LUGG**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Monitor coarse fish stocks and carry out habitat improvement works to increase fish fry survival.	NRA/Fishery Owners.	Increased fish stocks.	Approx. cost £10K.

ISSUE No: 32	**IMPACT OF RECREATIONAL USERS ON THE WILDLIFE CONSERVATION OF THE RIVER AND CONFLICT BETWEEN DIFFERENT RECREATIONAL USER GROUPS**		
OPTIONS/ACTIONS	Responsibility	Advantages	Disadvantages
1. Consider feasibility of introduction of navigation byelaws and the adoption of navigation authority powers.	NRA	Better management of river use.	Cost of users if registration introduced.
2. Support the Wye Forum representing river users, owners and conservation interests.	NRA/Members of Wye Forum	Increased awareness of needs of different recreational groups and of conservations	
3. Improve the distribution of information about the river.	Members of Wye Management Advisory Group	Better management of recreation and improved environmental protection.	
4. Monitor levels and distribution of recreational use of river.	Wye Management Advisory Group	Better management of river use.	
5. Investigate impact of recreational uses on conservation.	NRA/CCW/EN	Improved environmental protection.	

PART II SUPPORTING INFORMATION

SECTION 4: THE USES OF THE LOWER WYE CATCHMENT

The following sections catalogue the legitimate Uses of the lower Wye catchment 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 objectives and targets. These are designed to protect both the environment and the requirements of other Uses. In Section 5 these 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 3.
INFRASTRUCTURE
N
0
10 Km
RADNOR
PRESTEIGNE
LEOMINSTER
LEOMINSTER
KINGTON
HEREFORD AND WORCESTER
POWYS
BROMYARD
MALVERN HILLS
HAY-ON-WYE
HEREFORD
BRECKNOCK
BRECON BEACONS NATIONAL PARK
SOUTH HEREFORDSHIRE
ROSS-ON-WYE
MONMOUTH
GLOUCESTER-SHIRE
GWENT
FOREST OF DEAN
MONMOUTH
CHEPSTOW
Severn Estuary
Lugg
Arrow
Wye
Dore
Frome
Bodenham Lakes
Hartleton Lakes
Trothy
Monnow
Trecenny Brook
B4356
A44
A4112
A438
A49
A4103
A466
M50
M4
KEY
CATCHMENT BOUNDARY
MAIN CENTRES OF POPULATION
NATIONAL BOUNDARY
COUNTY BOUNDARY
DISTRICT BOUNDARY
NATIONAL PARK BOUNDARY
RAILWAY
MOTORWAYS
MAJOR ROADS

4.1 DEVELOPMENT

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 in determining proposals.

The NRA has produced a series of Guidance notes for Local planning Authorities (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 majority of the catchment lies within the administrative County of Hereford and Worcester. The remainder lies within Powys, Gwent and Gloucestershire. Hereford is the only city in the catchment. The main towns are Chepstow, Monmouth, Ross-on-Wye, Bromyard, Leominster, Presteigne, Kington and Hay-on-Wye.

The area is predominantly rural with industrial development centred around the major towns. The Hereford and Worcester County Structure Plan (1986 - 2001) envisaged substantial housing development, over 13,000 houses in Hereford, Bromyard, Leominster

and Ross areas by 2001. The Gwent County Structure Plan (1991-2006) proposes housing development at Monmouth. It is envisaged that there will also be development pressure due to the Second Severn Crossing in the Caldicot and Chepstow areas of the catchment.

Objectives

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 should be incorporated into developments that are consistent with the Groundwater Protection Policy.

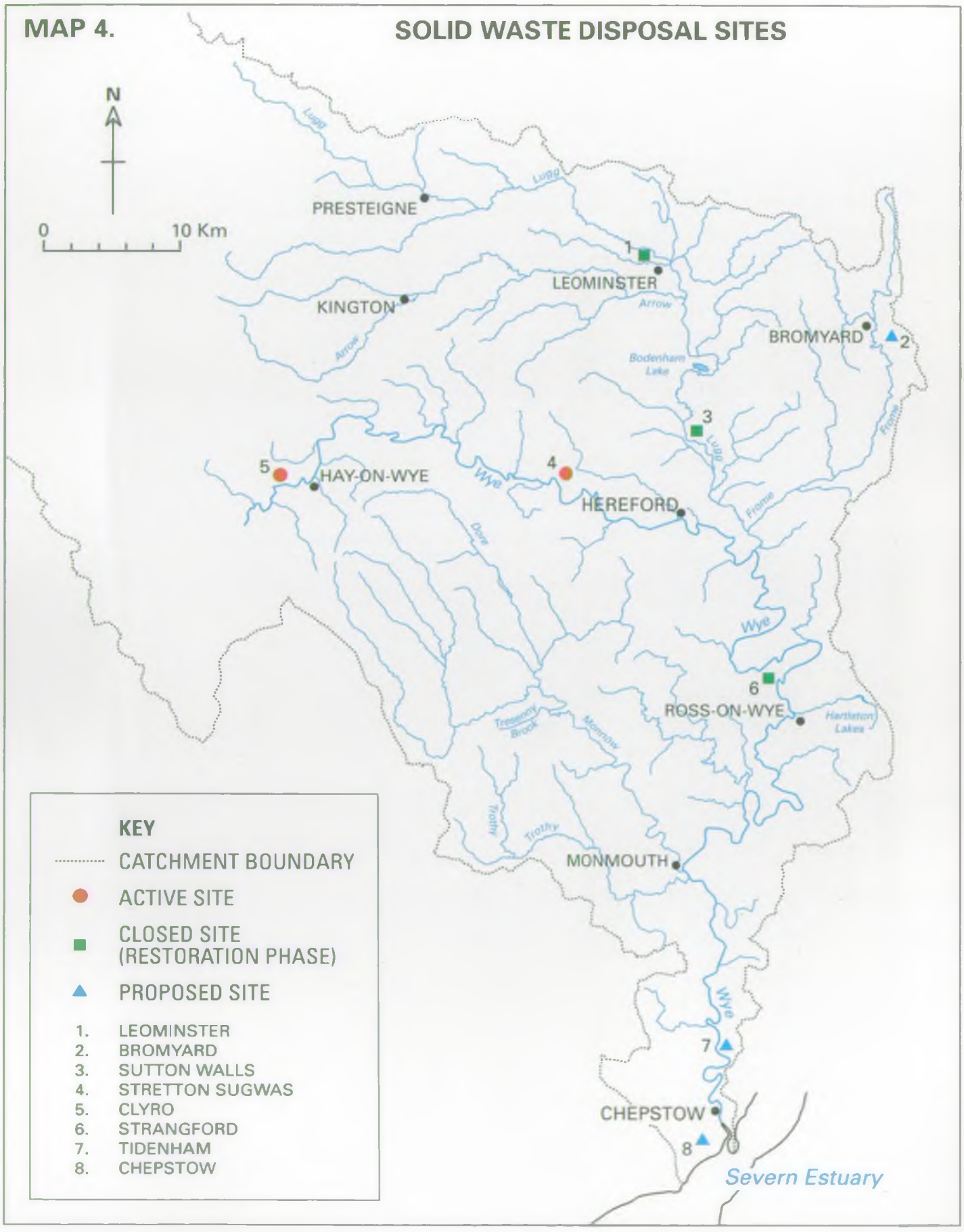
Water Quantity

- To protect surface and groundwaters from the adverse effects of development, including mineral extraction, landfill, afforestation, road construction 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.
- To ensure 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.
- Wildlife associated with the water environment should not suffer any detriment due to development, and wherever possible, development should enhance wildlife.

MAP 4. SOLID WASTE DISPOSAL SITES



4.2 SOLID WASTE DISPOSAL

General

The tipping 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 groundwaters. 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 Control of Pollution Act 1974 (eventually under the Environmental Protection Act 1993). The NRA is a statutory consultee on applications for landfill waste disposal licences.

Local Perspective

There are two Local Authority domestic landfill sites at Clyro and Stretton Sugwas. There are two other sites at Leominster and Strangford which are both closed, but still require leachate collection and disposal.

The NRA have been consulted over Waste Disposal Licences for disused quarries in Bromyard, Tidenham and Chepstow although full engineering details have yet to be agreed.

Objectives

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

Environmental Requirements

Water Quality

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

- Where appropriate waste disposal sites must comply with prohibition notices or discharge consent conditions. This will be enforced by the NRA.

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.

4.3 FLOOD WATER STORAGE AND FLOOD DEFENCES

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).

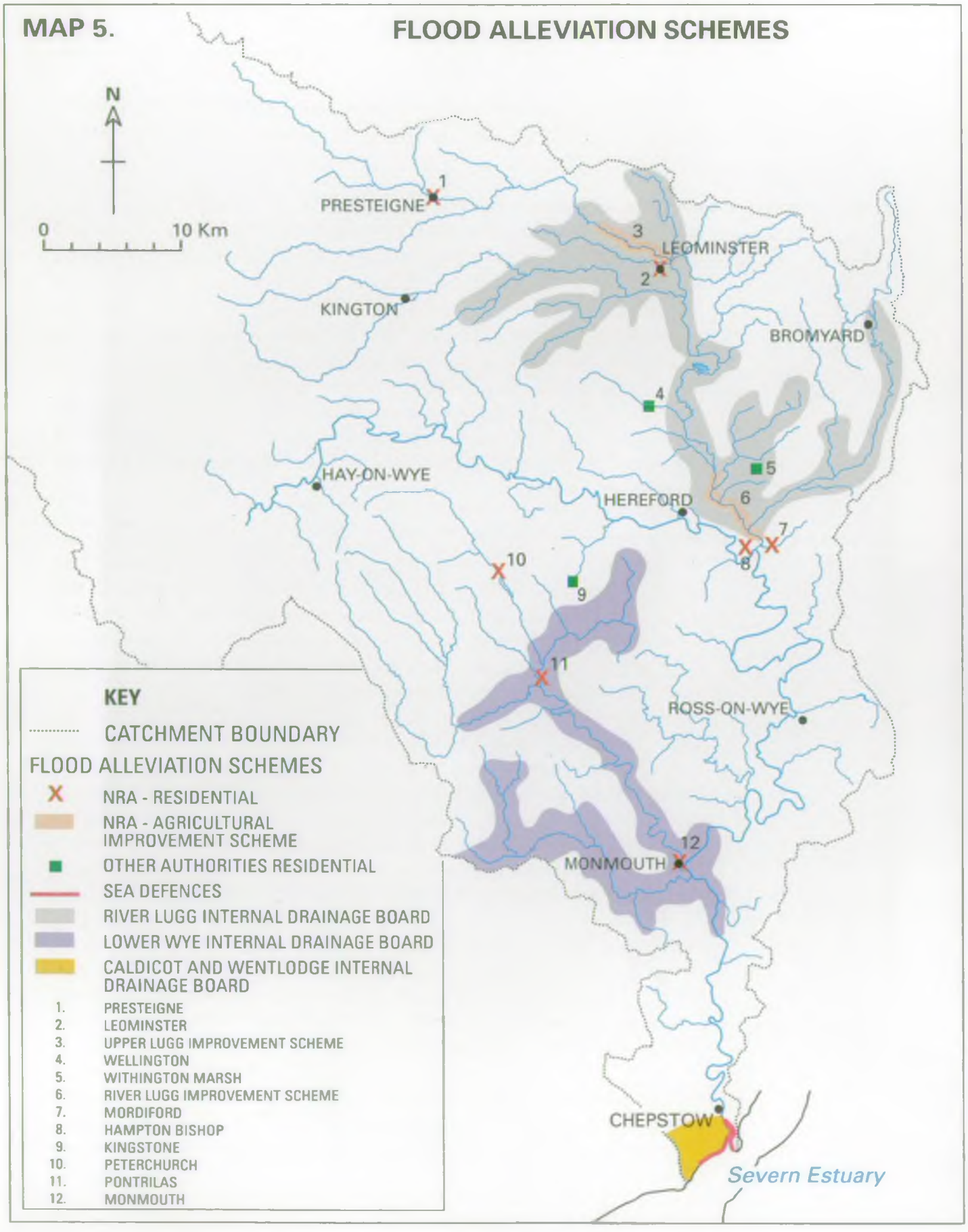
Areas of land next to rivers known as flood plain or washlands take the additional flow or naturally store water when the channel capacity is exceeded. Development on these areas over time has resulted in the need for protection works.

Protection against flooding is provided, where necessary and cost-effective, by the construction and maintenance of flood defences. The effectiveness of these flood defences is often measured in terms of the most severe flood against which protection is provided. The level of protection required depends on the land use; for example, urban areas are often provided with 1 in 100 year protection while, for agricultural areas, 1 in 5 year protection may be considered sufficient.

Under the Water Resources and Land Drainage Acts 1991 the NRA has general supervisory duties with respect to all matters relating to Flood Defence, and powers to consent culverting and the construction of obstructions in "ordinary watercourses" (i.e. not designated as "Main River"). Certain reaches of a river are designated formally as "Statutory Main Rivers" and on such Main Rivers the NRA has special powers to carry out flood defence works and to control the actions of others.

Any proposal that could interfere with the bed or bank or obstruct the flow in the Main River requires the formal consent of the NRA. If such works are not consented then the NRA can serve notice on the owner, requiring their removal. Failure to comply with this instruction may result in the NRA removing the works and recharging the cost to the owner.

On ordinary watercourses the Local Authority is a designated drainage authority and as such, has powers to carry out flood defence works (Land Drainage Act 1991). Works on some ordinary watercourses are administered by Internal Drainage Boards.


MAP 5.
FLOOD ALLEVIATION SCHEMES
N
0
10 Km
PRESTEIGNE
LEOMINSTER
KINGTON
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
CHEPSTOW
Severn Estuary
KEY
CATCHMENT BOUNDARY
FLOOD ALLEVIATION SCHEMES
NRA - RESIDENTIAL
NRA - AGRICULTURAL IMPROVEMENT SCHEME
OTHER AUTHORITIES RESIDENTIAL
SEA DEFENCES
RIVER LUGG INTERNAL DRAINAGE BOARD
LOWER WYE INTERNAL DRAINAGE BOARD
CALDICOT AND WENTLODGE INTERNAL DRAINAGE BOARD
1. PRESTEIGNE
2. LEOMINSTER
3. UPPER LUGG IMPROVEMENT SCHEME
4. WELLINGTON
5. WITHINGTON MARSH
6. RIVER LUGG IMPROVEMENT SCHEME
7. MORDIFORD
8. HAMPTON BISHOP
9. KINGSTONE
10. PETERCHURCH
11. PONTRILAS
12. MONMOUTH

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. For this reason consultations are carried out within and outside 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.

The NRA provides and operates a flood warning system on designated main rivers within the catchment. The Police pass the warnings to the general public.

Local Perspective

Flood alleviation schemes have been constructed at various locations in the catchment, as shown on Map 5. These are maintained on a regular basis to ensure their effectiveness. There are also major works which have been carried out to protect agricultural land from flooding in the Lugg Valley. The River Lugg and the lower Wye Internal Drainage Boards (Map 5) are areas within the Wye catchment where there are particular drainage problems and there is a consequent need to carry out a high standard of maintenance. As the Wye enters the Severn estuary a short length of the right bank lies within the remit of the Caldicot and Wentlooge internal Drainage Board.

Drainage of urban areas within the catchment is of particular concern. Runoff controls are required on many of the watercourses which receive these discharges e.g. Eign Brook in Hereford.

The NRA maintains sea defences from Thornwell to Black Rock at the mouth of the River Wye near Chepstow.

A flood warning scheme covers the River Wye between Hay-on-Wye and Monmouth, the River Monnow (mainly for Monmouth) and the River Lugg (mainly for Leominster).

Insecure and fallen trees or branches that impede flow are removed throughout the length of the main river system as part of a rolling 7-10 year programme of maintenance. This work is particularly important at urban locations e.g. Monmouth and Hereford, where flood washed debris collects on the piers of arched bridges and can cause flooding problems.

There are large areas of flood plain within the lower Wye catchment and development of these could lead to higher flood risk to the urban areas.

Of the small manual workforce carrying out regular maintenance in the Wye, the majority of work is executed in the lower Wye.

Objectives

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 water course 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 defence works.
- To provide adequate arrangements for flood warning.

4.4 FISHERIES ECOSYSTEM

General

The Fisheries Ecosystem Use addresses the whole water-based ecosystem, although fish are used as the key indicators of the general well-being of the river environment. Consequently, there are 6 water quality classes based upon the requirements of different fish species, Class 1 (high quality salmonid fishery) being the highest.

It is intended that the Fisheries Ecosystem Use will be the first Use to be included within the new Water Quality Objective (WQO) scheme being developed by the Department of the Environment (DoE). It is proposed that the standards supporting the WQO will be the same as those for the Fisheries Ecosystem targets identified in CMPs. These WQOs would then become statutory following public consultation and agreement by the Secretaries of State.

In setting the first WQOs based on Fisheries Ecosystem Classifications, the DoE will select, a small number of pilot catchments to test the procedures for implementing the scheme. The Cleddau catchment is among those catchments being considered for inclusion in the first batch, it is appropriate to consider the proposed water quality standards of the WQO scheme when planning the maintenance and improvements of the fisheries and general ecosystem of the river.

Local Perspective

There are twenty-nine species of fish in the catchment ranging from minnow to salmon and including pike, chub, dace, trout and stoneloach. Whilst major species are exploited for angling, all species have significant conservation importance.

Salmon

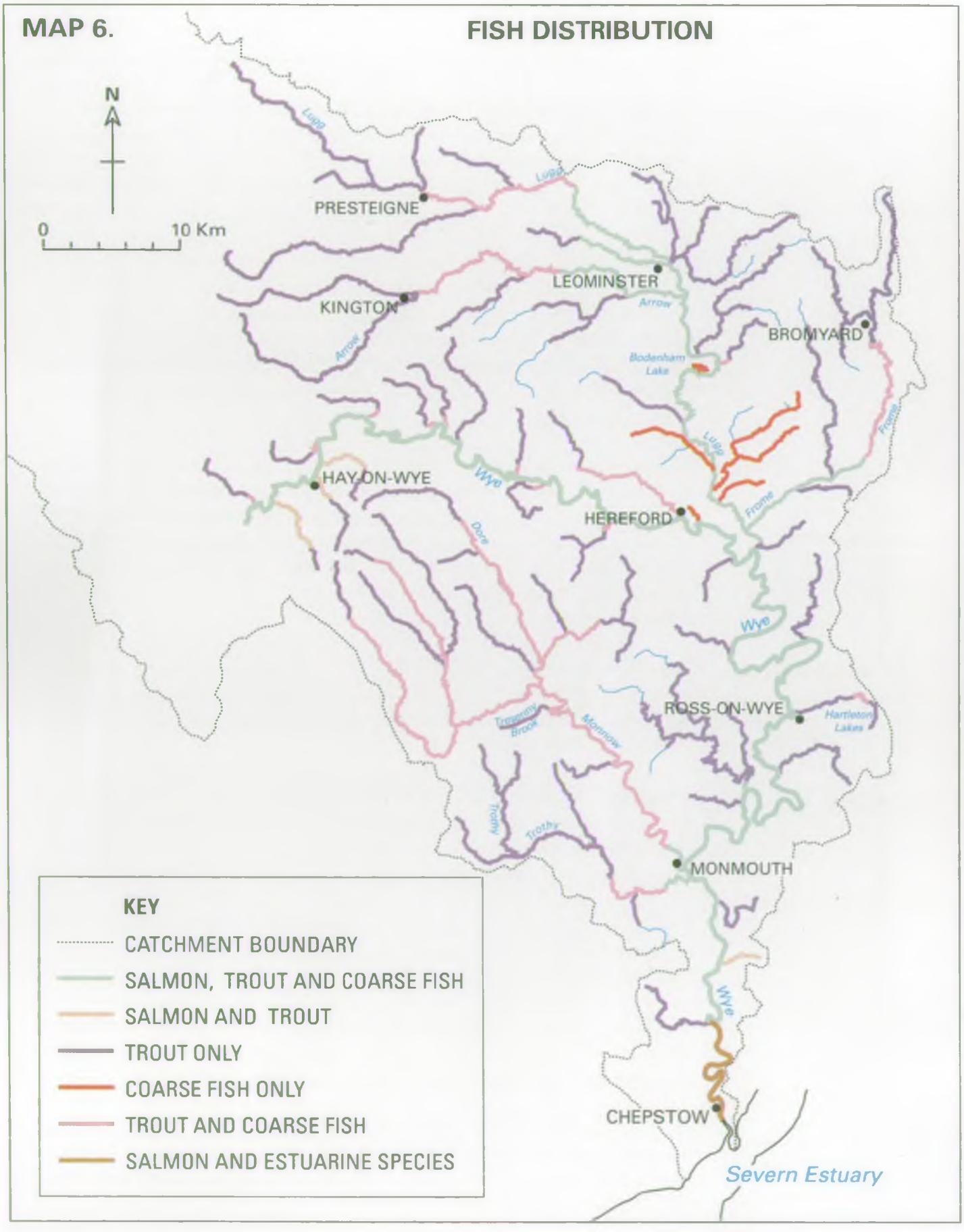
The lower Wye is the principal area for salmon fishing in the catchment. It is also an area where salmon spawn, but due to the difficulties of observing this, and in monitoring the resultant juveniles, its significance as an area for spawning is unknown.

The lower Wye unfortunately suffers from illegal salmon fishing, with organised gangs of individuals using gill nets to catch the salmon on their migration upstream to spawn.

The River Lugg sub-catchment is an important area for salmon spawning. Most of the other tributaries in the lower Wye catchment are either inaccessible to salmon or unsuitable as spawning areas.

Trout

Sea trout are rare. Catches of brown trout are generally considered low compared with the past. There is little restocking in the Wye but several fisheries on the rivers Lugg, Arrow and Monnow restock each year with


MAP 6.
FISH DISTRIBUTION
N
0
10 Km
PRESTEIGNE
KINGTON
LEOMINSTER
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
CHEPSTOW
Severn Estuary
Lugg
Arrow
Bodenham Lake
Frome
Wye
Dore
Trothy
Monnow
Trothy Brook
Harleston Lakes
KEY
CATCHMENT BOUNDARY
SALMON, TROUT AND COARSE FISH
SALMON AND TROUT
TROUT ONLY
COARSE FISH ONLY
TROUT AND COARSE FISH
SALMON AND ESTUARINE SPECIES

brown trout and some rainbow trout. There are a number of 'put and take' stillwater trout fisheries that principally stock with rainbow trout.

Coarse Fish *Coarse fish species are found throughout the lower Wye catchment in rivers and stillwaters. Species present include chub, dace, grayling, bream, roach, pike, eels, bleak, carp and tench. Barbel, illegally introduced in the late 1970s are spreading throughout the lower Wye and the lower River Lugg.*

Other Migratory Fish *Sea lamprey, twaite shad and possibly allis shad migrate into the Wye each May/July. Elvers enter the river in March, April and May and adult eels migrate to the sea principally during the autumn.*

Fish Distribution *The distribution of salmon, trout and coarse fish is shown on Map 6.*

Objectives 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.

To ensure a rich and varied range of in-river and bankside habitats and species dependent upon them, typical of a catchment of this type.

Environmental Requirements

Water Quality

Rivers: - Waters should comply with the formal and informal standards set for the Fishery Ecosystem Use for CMPs.

Stillwaters: - Until specific stillwater Water Quality Objectives are set, these waters should conform with the same standards used for the Fisheries Ecosystem Use, applied to rivers in CMPs.

Estuaries: - Coastal and estuarial waters should conform with the informal standards for the Protection of Aquatic Life.

Water Quantity - The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features - An appropriate diversity of natural instream and bankside habitats should be maintained to support the wildlife (including fish) typical of the river type.

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

wildlife associated with the river and its corridor.

- 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 or general ecosystem, and where possible should lead to enhanced diversity.

4.5 SPECIAL ECOSYSTEMS

General

Special ecosystems are regarded as those areas that are formally designated for their high conservation value. Such areas include National Parks, National Nature Reserves (NNRs). Sites of Special Scientific Interest (SSSIs) and Scheduled Ancient Monuments (SAMs).

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

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

Local Perspective

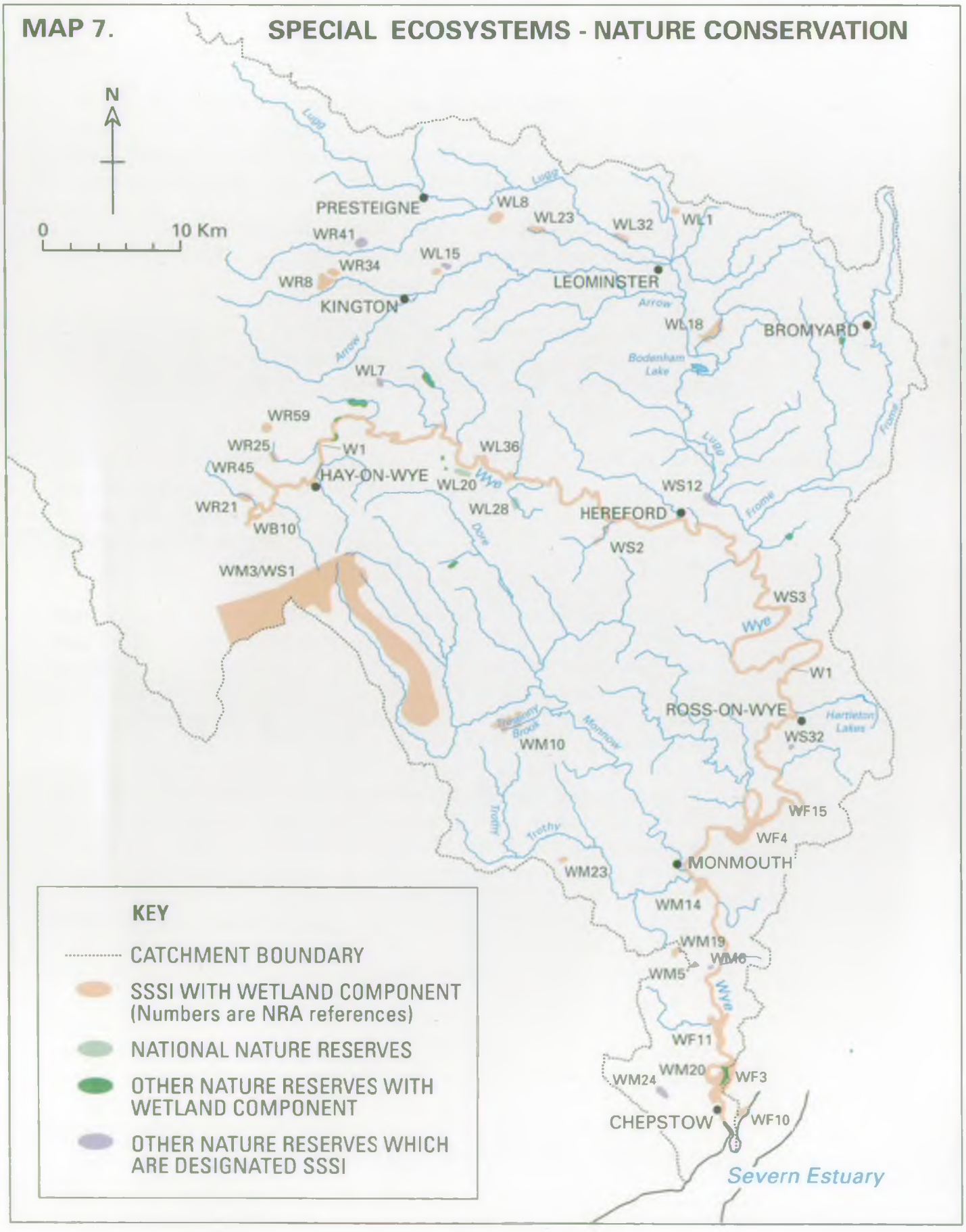
The whole of the River Wye is a designated SSSI. It is of national importance as an example of a major river which has a largely natural regime and which is relatively free from pollution. It supports a variety of aquatic animals and plants which reflect the range of different habitats available.

Map 7 only shows SSSIs with a major wetland component. These include Grade 1 sites (of National importance) namely Moccas Park (WL20) and Hill Hole Dingle (WL18). There are important ornithological sites at Shobdon Pools (WL23) and Flintsham Titley Pools (WL15). The River Lugg Meanders (WL32) are designated as an example of a river management scheme involving measures that work with, rather than against, natural fluvial processes. The Lugg Meadows (WS12) are one of the most important examples of "common meadows" in the UK. The River Lugg itself is currently proposed as a SSSI from its source to its confluence with the Wye. Several SSSIs are dependent on hydraulic continuity between the major aquifers e.g. Byton and Combe Moor (WL8).

Also shown are National Nature Reserves and County Wildlife Trust Reserves with a wetland component. There are a number of other SSSIs and nature reserves in the catchment that have no significant aquatic interest.

A small area on the western edge of the catchment lies within the Brecon Beacons National Park (Map 8).

The Wye Valley from Mordiford, just south of Hereford, to Chepstow is a designated Area of Outstanding Natural Beauty.


MAP 7.
SPECIAL ECOSYSTEMS - NATURE CONSERVATION
N
0
10 Km
PRESTEIGNE
WL8
WL23
WL32
WL1
WR41
WL15
WR34
WR8
KINGTON
LEOMINSTER
BROMYARD
WL18
Arrow
Bodenham Lake
WL7
WR59
WR25
W1
WL36
WR45
HAY-ON-WYE
WL20
Wye
WS12
WR21
WL28
HEREFORD
Frome
WB10
Dore
WS2
WM3/WS1
WS3
Wye
W1
ROSS-ON-WYE
Harleton Lakes
WS32
Pontshill Brook
Monnow
WM10
WF15
Trothy
WF4
MONMOUTH
WM23
WM14
WM19
WM6
WM5
Wye
WF11
WM20
WF3
WM24
CHEPSTOW
WF10
Severn Estuary
KEY
CATCHMENT BOUNDARY
SSSI WITH WETLAND COMPONENT
(Numbers are NRA references)
NATIONAL NATURE RESERVES
OTHER NATURE RESERVES WITH WETLAND COMPONENT
OTHER NATURE RESERVES WHICH ARE DESIGNATED SSSI

Of the large number of Scheduled Ancient Monuments found within the catchment, very few are associated directly with watercourses or located on floodplains, as shown on Map 8.

Objectives To protect the special conservation interest for which the water based sites were designated.

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.

- Meanwhile at sites where water quality is a key factor the most stringent alternative standards for water quality for a 'Conservation Use' (ie. Fisheries Ecosystem, Class 1) will be applied. Water quantity and physical feature standards will be addressed to the maintenance of existing conditions, unless otherwise specified.

4.6 CONSERVATION - ECOLOGY, LANDSCAPE AND HERITAGE

General

The protection of the aquatic ecosystem and designated sites for nature conservation are covered in the Fisheries Ecosystem and Special Ecosystems sections respectively. This section deals with the broader aspects of the conservation of wildlife, landscape and heritage features that extend beyond 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 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 or as 'listed buildings' but can be any feature of interest.

Local Perspective

The lower Wye valley is of great landscape value and is a designated Area of Outstanding Natural Beauty. Many of its tributaries are also of considerable scenic beauty, especially the valleys of the River Monnow and River Dore (Golden Valley).

The river supports a variety of plant communities, reflecting the various types of river bed, flow and water chemistry and some species of localised distribution.

The otter population is showing evidence of expansion, although it does not yet extend to all areas of the catchment. Mink is present in many areas and several bat species, including the rare Greater and Lesser Horseshoe bats, use the catchment.

The Wye catchment supports a range of bird species. These include sand martins, mallards, moorhens and kingfishers. Little ringed plovers have recently bred in the upper reaches of the lower Wye and goosanders and mergansers have bred in the area for some years. Cormorants are also increasingly seen on the lower Wye.

NRA biological monitoring has shown that the lower Wye and many of its tributaries support a high quality and varied range of insects and other small aquatic life, including the nationally rare mayfly species Potamanthus luteus, a scarce mayfly species Caenis pusilla and the freshwater pearl mussel Margaritifera margaritifera.

The headwaters of the Lugg catchment also support insects of national conservation status including the endangered caddis Hydropysche saxonica. the rare caseless caddis Hydropsyche fulvipes and the stratiomyid fly Oxycera pardalina.

The Wye is nationally important for the conservation of the native crayfish. One confirmed outbreak of "crayfish plague" occurred on the River Arrow in 1990 but there is no evidence of spread of the disease from this area.

The fish fauna include a wide range of species and the catchment supports populations of rare fish including shad and lampreys.

The Wye Project was set up in 1990 by a partnership of public bodies. The Project looked at the potential conflict between landscape, conservation, amenity and recreational use of the River Wye.

In addition to scheduled historic sites there are a large number of unprotected sites which may be as valuable and more vulnerable.

Objectives

To ensure that wildlife, landscape and heritage features of interest, including designated sites, are protected and, where appropriate accessible.

Environmental Requirements

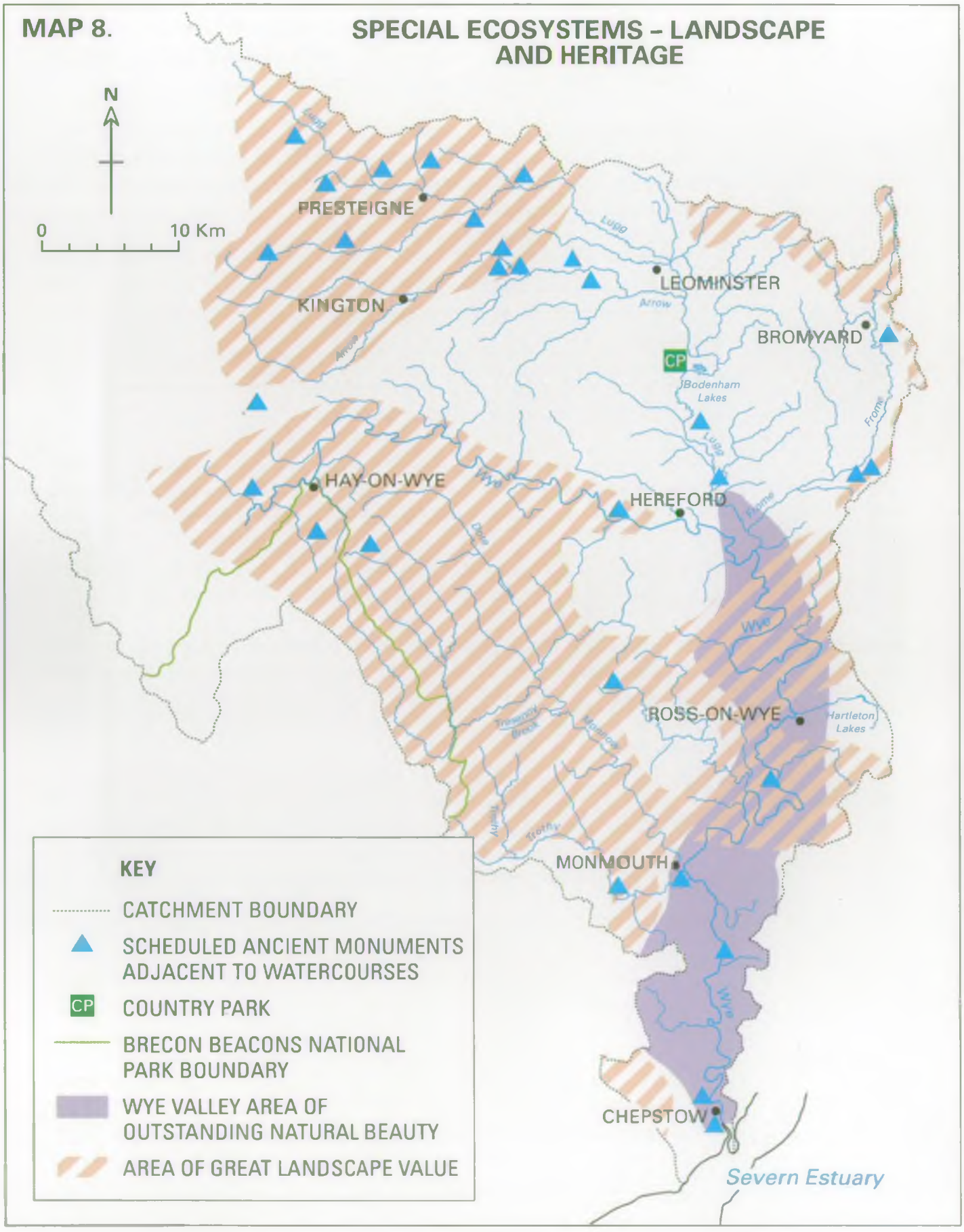
Water Quality

- It is unlikely that there could 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 Fisheries Ecosystem class, while estuarial and coastal waters should conform with standards for the Protection of Sensitive Aquatic Life.

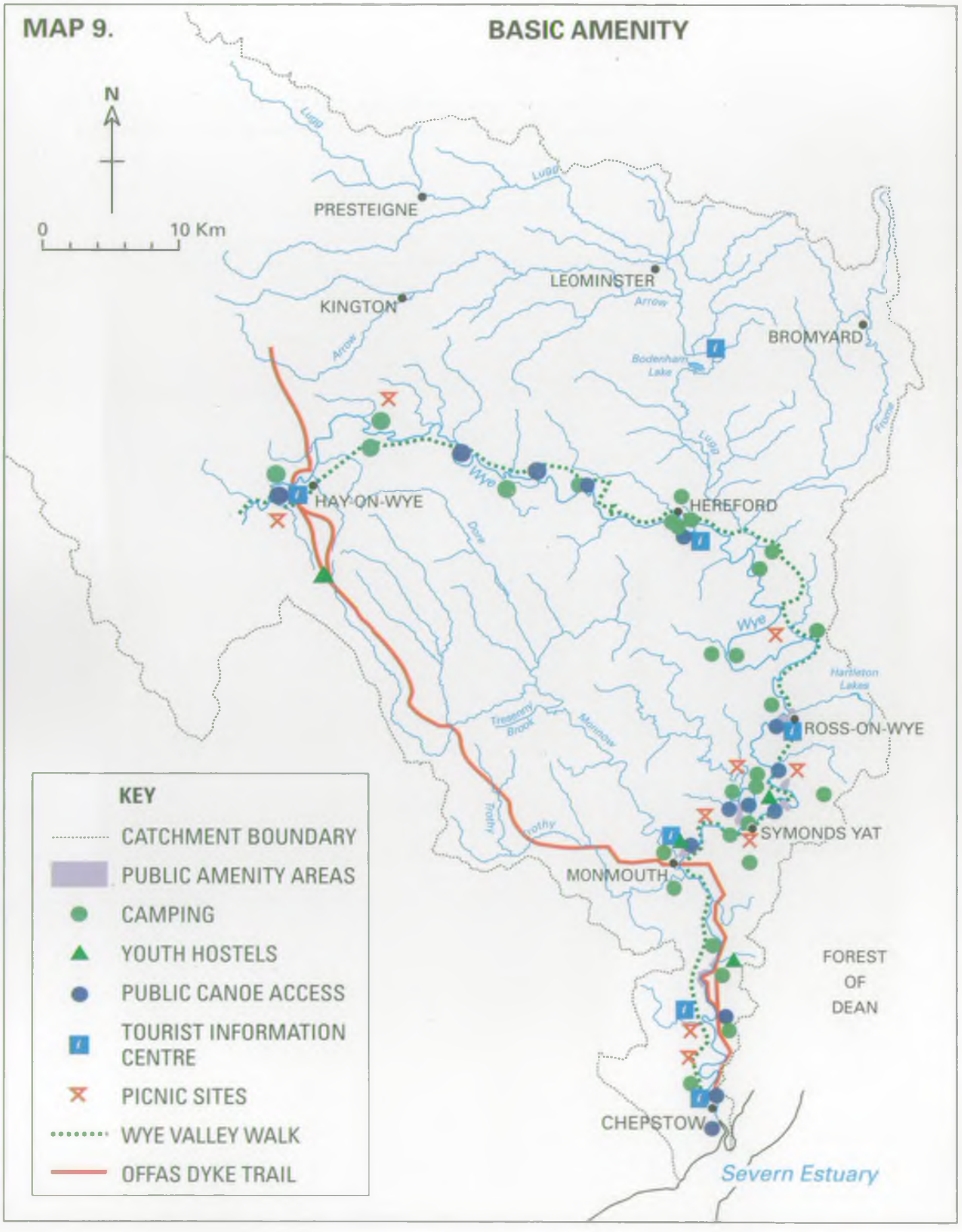
Water Quantity

- The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.


MAP 8.
SPECIAL ECOSYSTEMS – LANDSCAPE AND HERITAGE
N
0
10 Km
PRESTEIGNE
KINGTON
LEOMINSTER
BROMYARD
CP
Bodenham Lakes
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
Hartleton Lakes
MONMOUTH
CHEPSTOW
Severn Estuary
Lugg
Arrow
Frome
Wye
Dore
Trothy
Monnow
KEY
CATCHMENT BOUNDARY
SCHEDULED ANCIENT MONUMENTS ADJACENT TO WATERCOURSES
CP
COUNTRY PARK
BRECON BEACONS NATIONAL PARK BOUNDARY
WYE VALLEY AREA OF OUTSTANDING NATURAL BEAUTY
AREA OF GREAT LANDSCAPE VALUE

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.
- The diversity of natural in-stream features and river corridor plants and animals should be maintained and enhanced where desirable.


MAP 9.
BASIC AMENITY
N
0
10 Km
PRESTEIGNE
KINGTON
LEOMINSTER
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
SYMONDS YAT
MONMOUTH
CHEPSTOW
FOREST OF DEAN
Severn Estuary
Lugg
Arrow
Bodenham Lake
Wye
Dore
Frome
Hartleton Lakes
Trothy
Monnow
Treadam Brook
KEY
CATCHMENT BOUNDARY
PUBLIC AMENITY AREAS
CAMPING
YOUTH HOSTELS
PUBLIC CANOE ACCESS
TOURIST INFORMATION CENTRE
PICNIC SITES
WYE VALLEY WALK
OFFAS DYKE TRAIL

4.7 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

Many people live adjacent to watercourses and many more visit them for recreation.

The historic towns of Hereford, Ross-on-Wye and Monmouth are all situated on rivers. Many other towns in the catchment including Hay-on-Wye, Leominster, Kington, Bromyard and Chepstow also have rivers running through them.

The Wye Valley Walk and sections of Offa's Dyke Path give the public access to the Wye between Hereford and Chepstow and there are many picnic sites along the Wye.

The river corridor is therefore very valuable as a basic amenity so the visual appearance of these waters is highly important.

However, public access to the river corridor, particularly to the tributaries of the Wye, is limited. This problem is examined in the Wye Project.

Objectives

To maintain the watercourse so that the public enjoyment of bankside environment is not impaired.

To provide safe and easy access to the waterside without unreasonably constraining other Uses.

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 - The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

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.

4.8 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 Ecosystem 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

The River Wye is arguably the best salmon fishery in England and Wales. Fishing rights on the Wye and it's tributaries are all in private ownership.

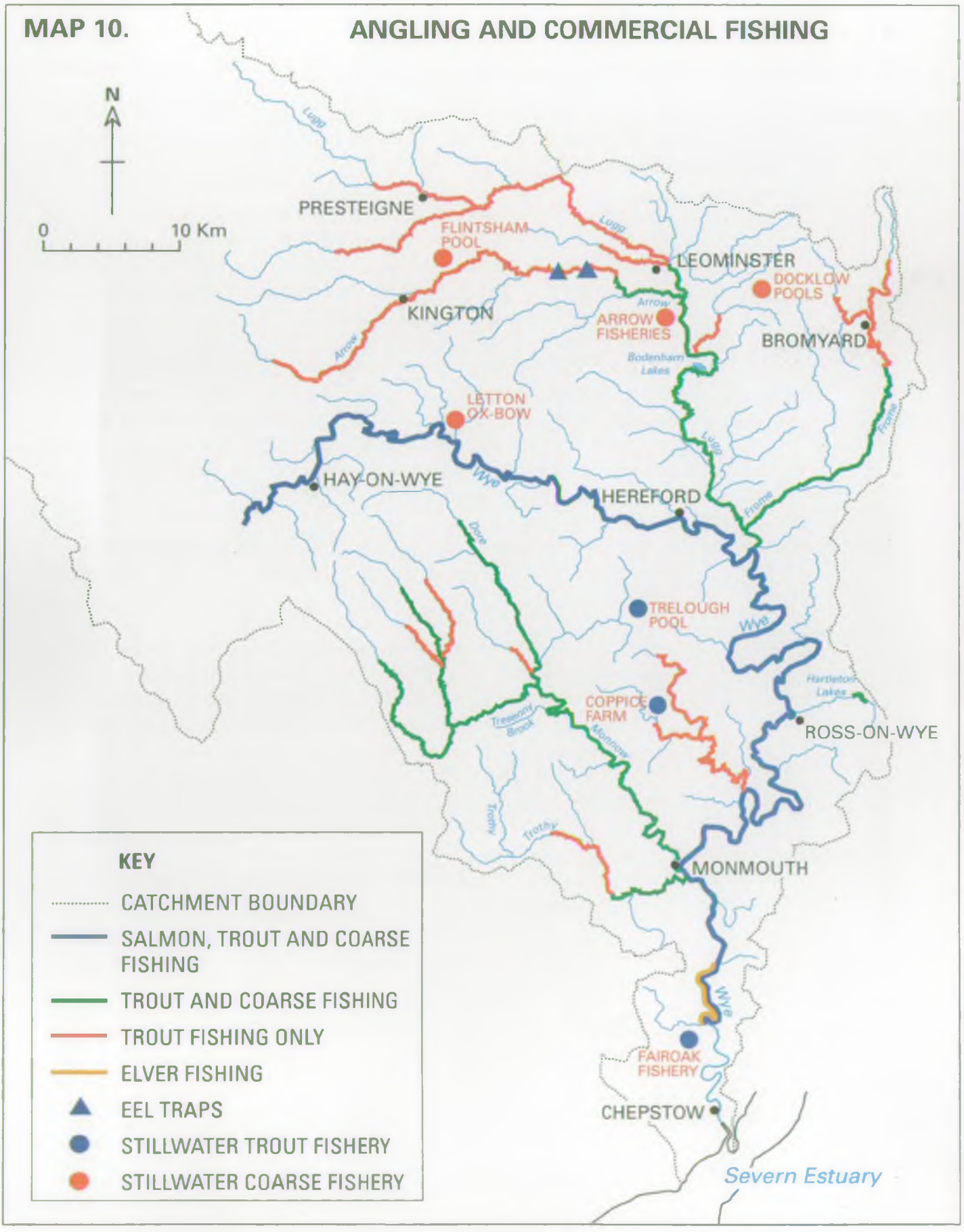
Angling for salmon occurs only on the main River Wye. Trout fishing occurs throughout the lower Wye catchment although the most popular fishing is on the rivers Lugg, Arrow and Monnow. Some river fisheries restock with hatchery reared trout. There are also a number of put and take stillwater trout fisheries in the lower Wye catchment.

Coarse fishing is centred on the lower Wye and the lower reaches of the Rivers Lugg and Monnow. The principal species are chub, pike, roach, bleak, dace, bream and grayling. Barbel numbers are increasing and becoming popular with coarse fishermen. Carp and tench are present in a number of stillwaters, particularly in the Leominster/Bromyard area.

These river and lake fisheries are popular with pleasure and match anglers.

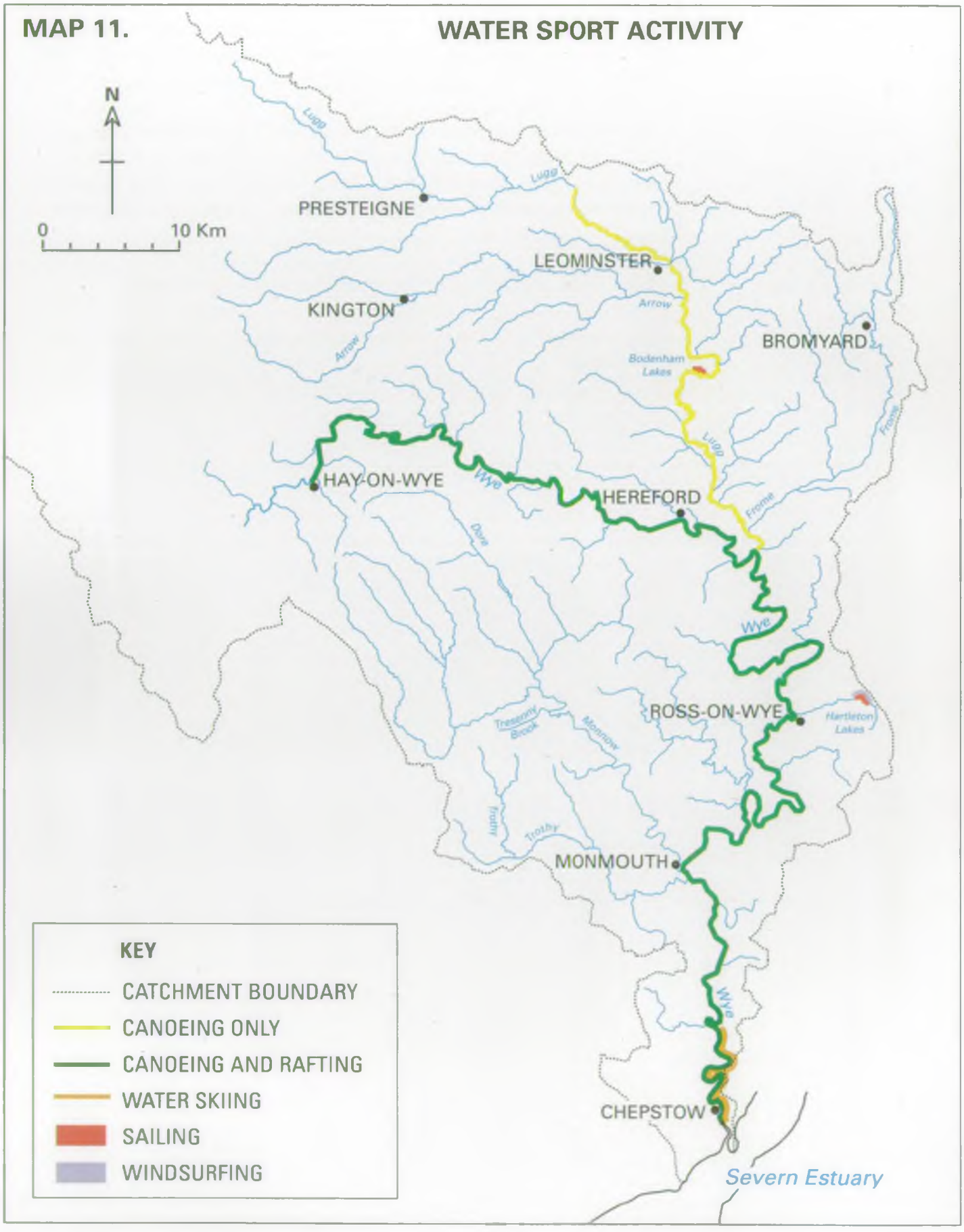
Objectives

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


MAP 10.
ANGLING AND COMMERCIAL FISHING
N
0
10 Km
PRESTEIGNE
FLINTSHAM POOL
KINGTON
LEOMINSTER
DOCKLOW POOLS
ARROW FISHERIES
BROMYARD
Bodenham Lakes
LETTON OX-BOW
HAY-ON-WYE
HEREFORD
TRELOUGH POOL
COPPICE FARM
Hartleton Lakes
ROSS-ON-WYE
MONMOUTH
FAIROAK FISHERY
CHEPSTOW
Severn Estuary
Lugg
Arrow
Wye
Dore
Frome
Trothy
Monnow
Trodiay
Treadam Brook
KEY
CATCHMENT BOUNDARY
SALMON, TROUT AND COARSE FISHING
TROUT AND COARSE FISHING
TROUT FISHING ONLY
ELVER FISHING
EEL TRAPS
STILLWATER TROUT FISHERY
STILLWATER COARSE FISHERY

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	-	The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.
Physical Features	-	Safe access to and from the waterside should be promoted.
	-	The waterside features required for angling should be maintained and developed.


MAP 11.
WATER SPORT ACTIVITY
N
0
10 Km
PRESTEIGNE
LEOMINSTER
KINGTON
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
CHEPSTOW
Severn Estuary
Lugg
Arrow
Bodenham Lakes
Frome
Wye
Dore
Trothy
Monnow
Tresenny Brook
Hartleton Lakes
KEY
CATCHMENT BOUNDARY
CANOEING ONLY
CANOEING AND RAFTING
WATER SKIING
SAILING
WINDSURFING

4.9 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), waters must have met several criteria that include: high numbers of bathers, first aid facilities, life guards and toilets. Identified waters are required to achieve the mandatory bacteriological 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

Most recreational activity in the catchment is concentrated on the River Wye and a number of lakes. Canoeists and rafters use the Wye from Hay to Chepstow and water-skiers use the tidal Wye especially around Chepstow. Sailors, sail-boarders and canoeists also use stillwaters such as Hartleton Lakes and Bodenham gravel pits.

There is some use of the River Wye by jet-skiers particularly at Monmouth, Symonds Yat and Huntsham Bridge.

The need for restrictions on the speed of powered craft has been recognised and is being addressed by the NRA in promoting a speed limit byelaw within the public navigation.

Local people often swim in rivers especially during hot summers.

Objectives 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 standards contained within the EC Bathing Waters Directive.

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 - The NRA is currently developing an abstraction licensing policy that will take account of the flow requirements of different uses in an objective and structured way. Meanwhile the NRA will seek to protect the range of flows that reflect as natural a regime as possible.

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

4.10 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.

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 bylaws 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 ad the NRAs concern is principally for the participants' enjoyment of the activity.

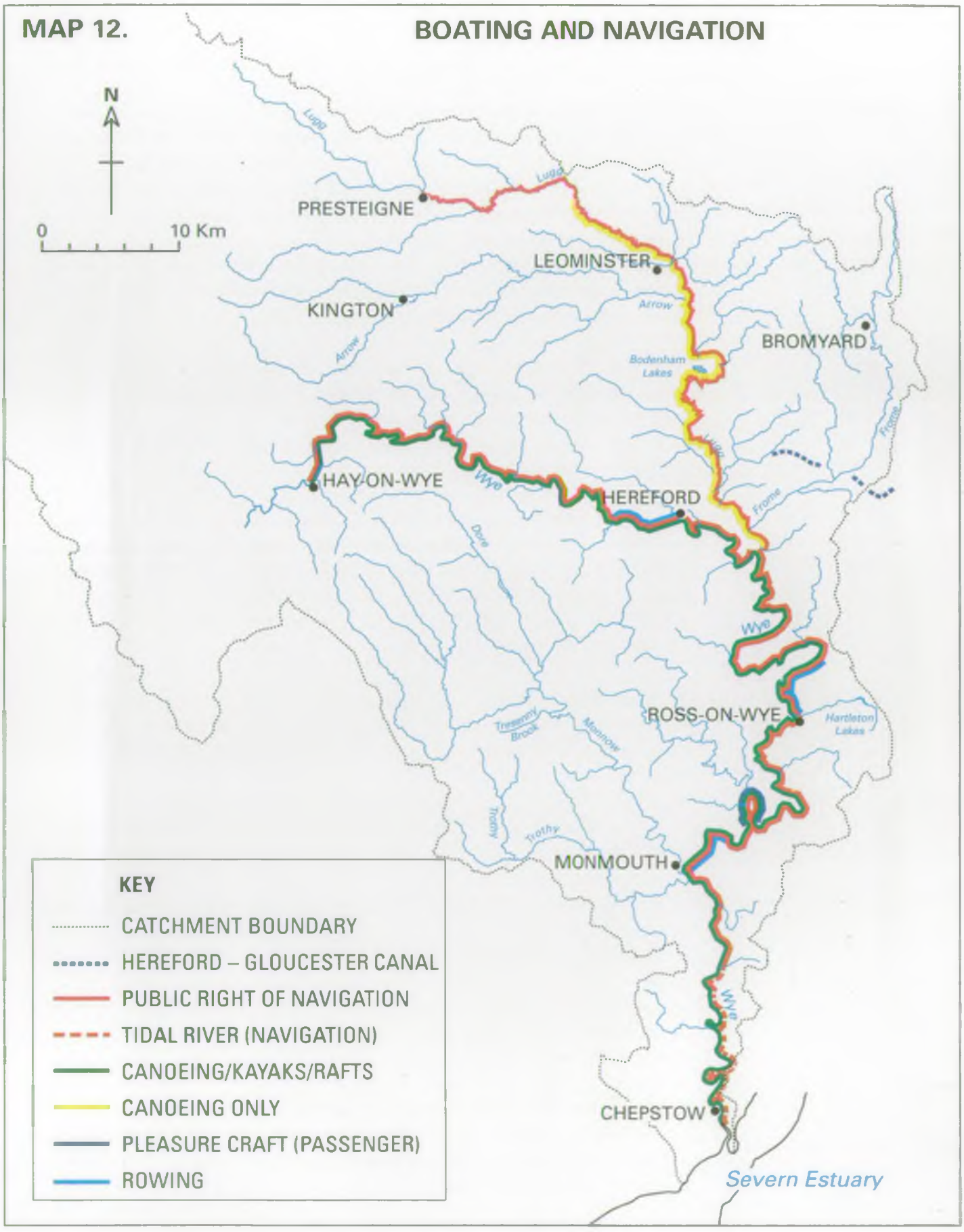
Local Perspective

The lower River Wye has been used for navigation for many centuries. Today, boating is almost entirely recreational, but in the past the Wye was an important commercial waterway used to transport the products of industry and agriculture.

The full extent of public rights of navigation on the Wye are not clear, but it is apparent that a public right to navigate exists between Hay and Chepstow, and on the River Lugg, as a result of Acts of Parliament passed in the 17th Century. However, anyone wishing to gain access to the river to exercise this right must do so at a public access point or with the permission of the riparian (river bank) owner.

All commercial navigation is linked to tourism with passenger carrying boats at Symonds Yat and canoe hire/adventure holiday enterprises at several locations.

The River Wye Restoration Trust has recently been formed with the objective of facilitating the wider use of the river for recreational navigation through the construction of weirs and locks. This would potentially conflict with the NRA's statutory responsibilities and the


MAP 12.
BOATING AND NAVIGATION
N
0
10 Km
PRESTEIGNE
LEOMINSTER
KINGTON
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
CHEPSTOW
Severn Estuary
Lugg
Arrow
Bodenham Lakes
Wye
Frome
Dore
Trothy
Monnow
Trelleck Brook
Hartleton Lakes
KEY
CATCHMENT BOUNDARY
HEREFORD – GLOUCESTER CANAL
PUBLIC RIGHT OF NAVIGATION
TIDAL RIVER (NAVIGATION)
CANOEING/KAYAKS/RAFTS
CANOEING ONLY
PLEASURE CRAFT (PASSENGER)
ROWING

Trust's Solicitors have been advised accordingly. The NRA is developing a suite of byelaws to regulate certain aspects of navigation and the recreation on this river and is exploring the additional powers that the status of navigation authority would provide, while considering the consequences of such an action.

For almost 160 km, the lower Wye offers boating on a natural river, free from artificial obstructions, flowing through countryside of great natural beauty. For the most part the predominant use is canoeing, by individuals, families, groups such as scouts and guides, and canoe clubs, who undertake short day trips or longer tours. Some white water opportunities are available at Symonds Yat, where slalom events are held. There are a number of commercial canoe hire firms and adventure holiday companies based on the Wye, offering canoe and Kayak trips.

There are three rowing clubs based on the Wye at Hereford, Ross and Monmouth. Important regattas are held at these sites every year.

Raft racing to raise money for charity has increased in popularity over the last 15 years. Races are held each year ranging from small "fun" races to large scale events such as the 160 km race from Hay to Chepstow that takes the 80 teams three days to complete.

A number of large passenger-carrying boats operate at Symonds Yat taking passengers on a 30 minute round-trip on the river.

The Wye Project considered the issues of navigation, amenity and conservation and the conflicts between users of the river and their impact on conservation.

There is very little boating use made of the tributaries of the lower Wye.

The route of the Hereford to Gloucester canal crosses the catchment from Ashperton to Hereford. There are only short lengths of canal which contain water and only one full restored section at Monkhide. The Herefordshire Gloucestershire Canal Trust carried out the restoration as part of their goal of restoring the whole canal.

Hartleton Lakes, near Ross-on-Wye, and the Bodenham gravel pits, just outside Hereford, provide opportunities for sailing, sail-boarding and canoe tuition for school and youth groups and holiday-makers.

Objectives

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

Environmental Requirements

Water Quality - The provisions for Aesthetic Criteria should be complied with.

Water Quantity - The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features - Where waters under the control of the NRA are used for navigation there shall be no obstruction to the passage of vessels.

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

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

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

4.11 COMMERCIAL FISHING FOR SALMON, TROUT, FRESHWATER FISH AND EELS

General

This use is principally concerned with the use of nets and other types of gear to catch migrating eels, salmon and trout or other freshwater fish. While fish can be caught commercially in freshwaters with rod and line this is still considered as angling and is covered by the rod licensing system. Migrating adult salmon and sea trout are the main quarry for commercial fisheries in Wales and these are restricted to coastal waters and estuaries. The number of these fisheries is closely controlled by Net Limitation Orders that are designed to maintain stocks. The NRA licences commercial salmonid fisheries within the terms of the Orders and enforces its provisions. In many places the fishing techniques allowed reflect local culture, and consequently in Wales there is a very wide variety of fishing methods employed. These range from coracles and nets to ranks of fixed traps.

The capture of eels and non-salmonid freshwater fish, other than by rod and line, is also licensed by the NRA. While there is no limit to the number of licenses that can be issued the NRA specifies certain methods that can be employed and may refuse to issue a licence for a location if it feels that fish stocks could not support the fishery or that the migration of salmon and trout could be impaired.

Local Perspective

Elver fishing is very popular on the tidal River Wye between Bigsweir and Tintern during the months of March, April and May. Traditionally the fishermen caught the elvers for their own consumption but in recent years most fishermen have sold their catch to dealers for export and UK consumption.

There are two eel traps on the River Arrow but they are only fished intermittently. Some lakes in the Lower Wye catchment support fyke netting for eels.

The commercial salmon fishery of the lower Wye is owned by the NRA. Prior to 1984, when the fishery ceased operation, drift nets were operated in the Severn Estuary off the mouth of the Wye and Stopnet boats fished in the river mainly in the Chepstow area. The fishery was closed on conservation and economic grounds although a limited lave net fishery operates in the Sudbrook area of the Severn Estuary.

Objectives

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

Environmental Requirements

Water Quality

- Since the well-being of fish is dealt with in the Fishery Ecosystem section the protection of the working environment of commercial fishermen will be considered here. Consequently, water quality will be required to comply with the standards for Aesthetic Criteria.

- The NRA is currently developing an abstraction licensing policy that will take account of the flow requirements of different uses in an objective and structured way. Meanwhile the NRA will seek to protect the range of flows that reflect as natural a regime as possible.

Physical Features

- To enforce the provisions of the Net Limitation Orders to ensure that stocks of salmon and sea trout are not endangered by commercial fishing.

- To licence and control commercial fishing for eels and non-salmonid freshwater fish to protect stocks.

- To minimise conflict between the requirements of different fisheries.

- Access points for commercial fisheries should be protected.

4.12 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 section. However, the highly polluting nature of agricultural waste normally precludes this option and the NRA's approach is aimed at control of source by minimising the volumes of effluent. 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 devlope 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.

Forestry

In certain circumstances, conversion of land to coniferous forest can have a range of adverse impacts on the water environment. These include:-

- Increased sediment load and runoff rate to rivers that can increase the flood defence maintenance requirement and may also destroy key conservation features.

- In sensitive area water quality can become too acid for fish and other wildlife to survive, as the dense tree canopy increases the effects of acid deposition - often referred to as 'Acid Rain'.

Consequently the NRA has worked closely with the Forestry Authority and others in the production of Forests and Water Guidelines that are designed to minimise the impact of forest management on the water environment. While forest development is outside the normal planning process some local authorities have decided to produce Indicative Forestry Strategies that will outline the future of managed forests in England and Wales. The NRA is an informal consultee on these strategies but is pressing for a more formal role in this and other aspects of forest planning.

Local Perspective

There are several thousand farms in the catchment ranging from sheep farming in the north and west to arable and dairy farming in the central and southern areas. The lowland parts of the Wye catchment have significant areas of fruit, potatoes and hop growing where the use of agrochemicals is widespread.

Pesticide monitoring programmes are in operation on the rivers Wye, Lugg, Frome and Monnow. The programmes are based on known pesticide usage with particular emphasis on certain chemicals at specified times of the year.

A programme of pollution prevention inspections and the completion of data questionnaires for high risk livestock farms has been implemented by the NRA.

None of the catchment is identified as being in a 'sensitive area' as defined in the NRA Forestry policy although there are some areas of managed forests. The forests most likely to have significant effects on the water environment are those on headwater catchments. These have been identified in the upper Wye catchment management plan. Streams here are highly important as salmonid nursery habitat and for a range of other fauna and flora.

Objectives

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

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.

- That 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

- River flows upstream of consented discharges should be maintained at least at the level used to determine the consent.

- 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.

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.

- That 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.

4.13 FISH FARMING

General

Fish farming has especially close links with the water environment and requires large volumes of clean water that are later discharged as effluent. Consequently, there is a large potential for adverse environmental impact. Thus all fish farms must be registered with the Ministry of Agriculture, Fisheries and Food (Welsh Office in Wales) and the NRA issues consents for freshwater fish farms to both abstract water and discharge effluent (marine farms may require a consent to discharge, depending upon circumstances). Careful management of fish farms is required by all involved to control the impact and the NRA is particularly concerned to prevent the spread of disease, alien species or strains of fish to wild stocks and to maintain free passage for upstream and downstream migrating wild fish.

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

There are four fish farms in the lower Wye catchment (see Map 16). The Whitebrook fishery on the Honddu and the South Wales Fishery on the Arrow are both used for restocking purposes. The Boultibrook fish farm on the upper Lugg and St Briavels fish farm on the Mork brook supply trout for the table.

Objectives

To control fish farming activity to protect wild fish stocks and other uses of the water environment.

Environmental Requirements

Water Quality

- That the conditions stated in the discharge consent are complied with. This will be enforced by the NRA..
- No deterioration in the quality of water above discharges, beyond that assumed when setting the consent for an authorised discharge.

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 - That suitable provision should be made to prevent the escape of stock to the wild and the trapping of wild stock within the farm. Where appropriate this will be enforced by the NRA. Similarly provision should be made to prevent the spread of diseases and alien species.

MAP 13. LICENSING SUB-CATCHMENTS

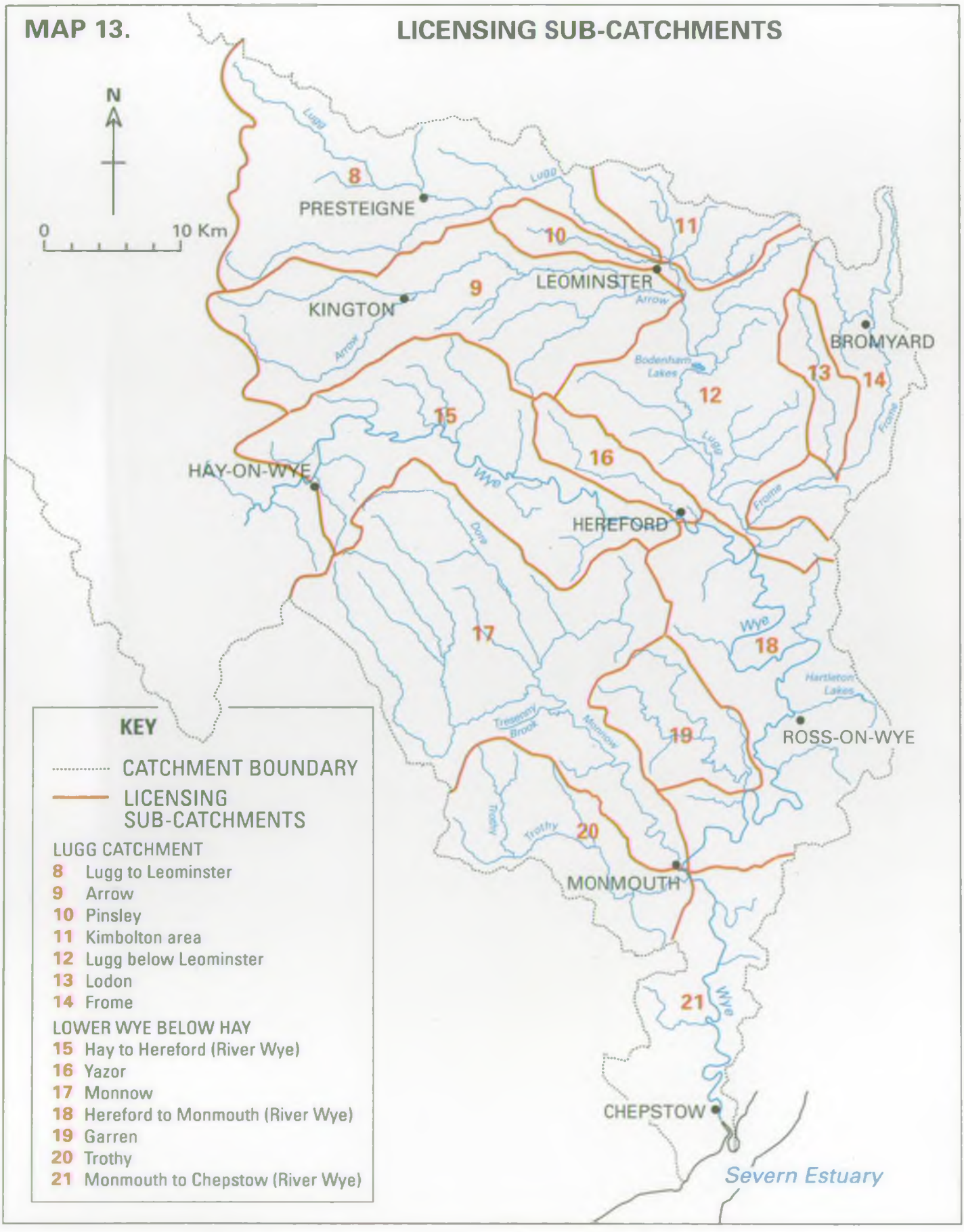
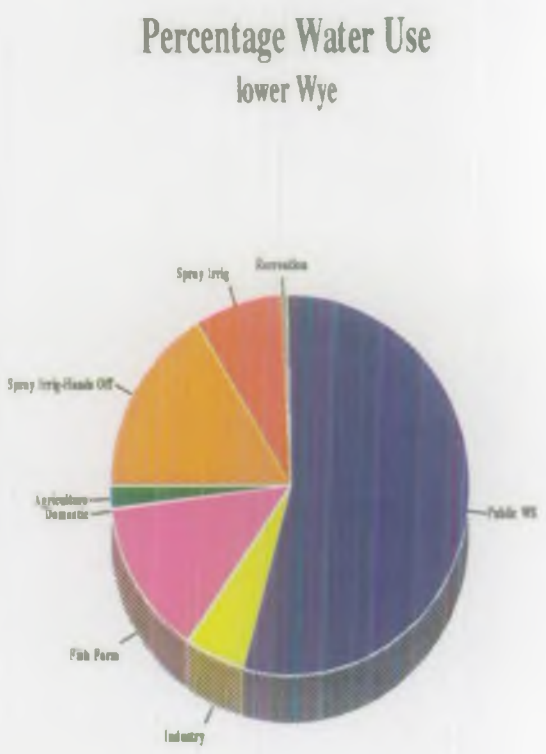
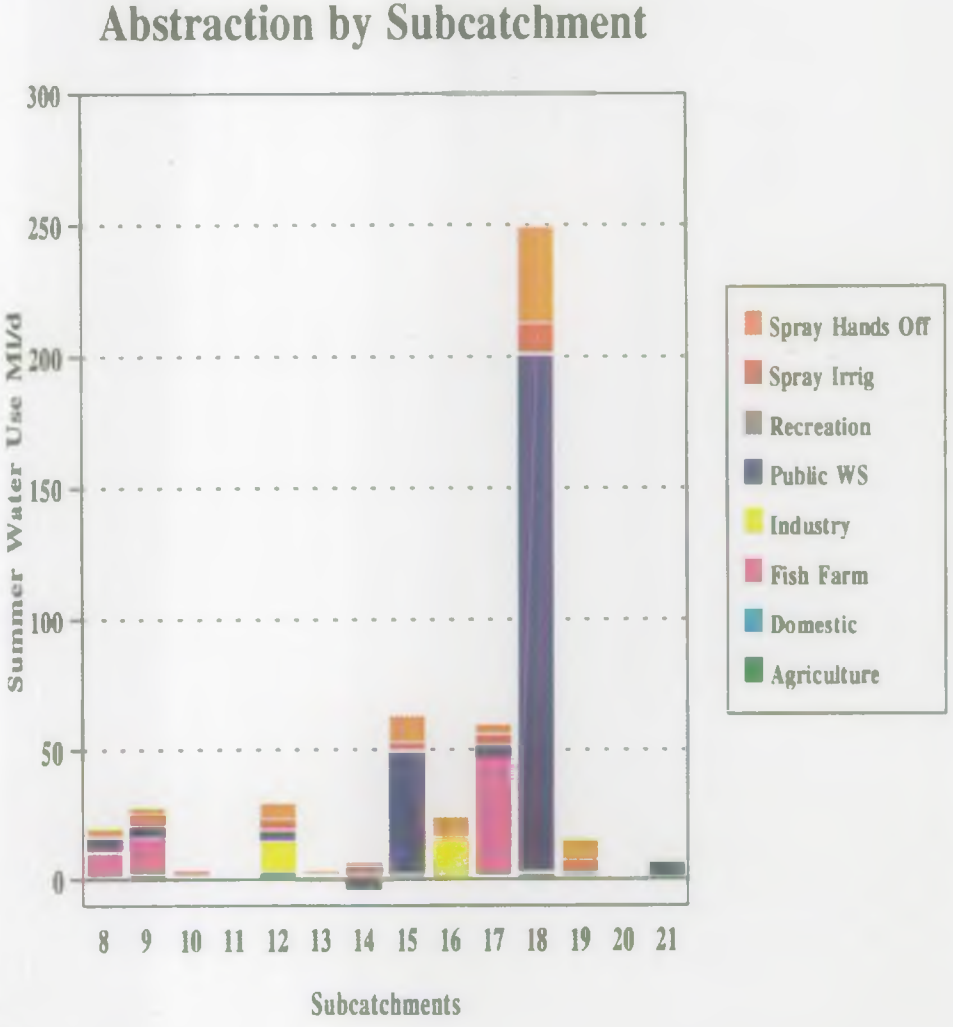


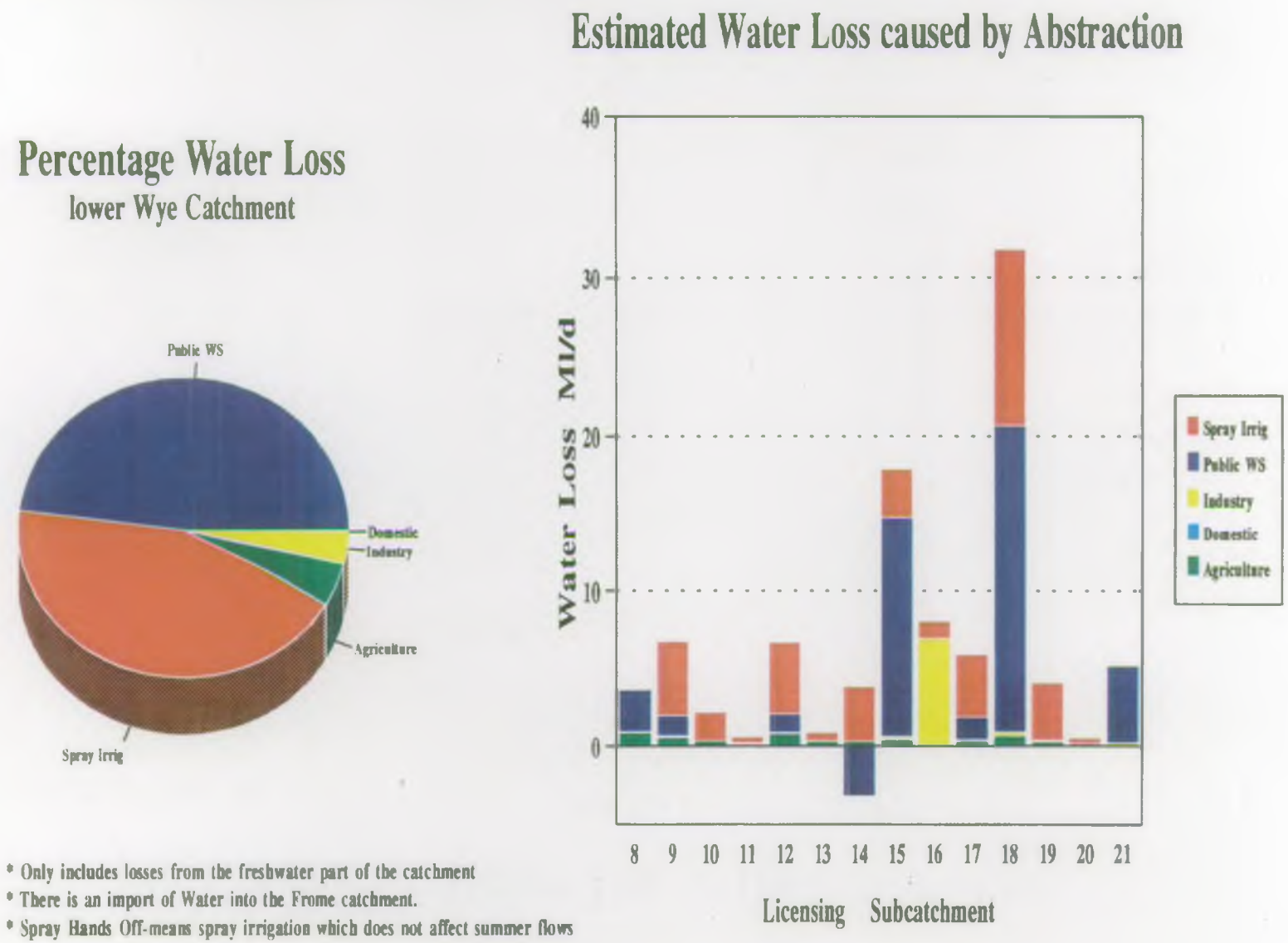
Fig 1. Summer Water Use in the lower Wye





* Only includes abstractions affecting freshwater part of the catchment.
* There is an import of water into subcatchment 14
* Spray Hands Off-means spray irrigation does not affect summer flows

Fig 2. Estimated Summer Water Loss caused by Abstraction



* Only includes losses from the freshwater part of the catchment
* There is an import of Water into the Frome catchment.
* Spray Hands Off-means spray irrigation which does not affect summer flows

4.14 ABSTRACTION FOR DRINKING WATER (POTABLE) SUPPLY

General

Almost all abstractions for public water supply, or for private supplies to more than one dwelling, are authorised by licences granted under the Water Resources Act 1991. Exemptions from the requirement for a licence include most types of supplies to a single household, and all abstractions, regardless of use, from groundwater in large areas of North and West Wales.

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.

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 forms the basis for the NRA's activities in this area.

All abstraction licences specify volumes that the licence holder may take, but not exceed, and many contain conditions that restrict the impact of the abstraction on the environment and other abstractors. The exemptions 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.

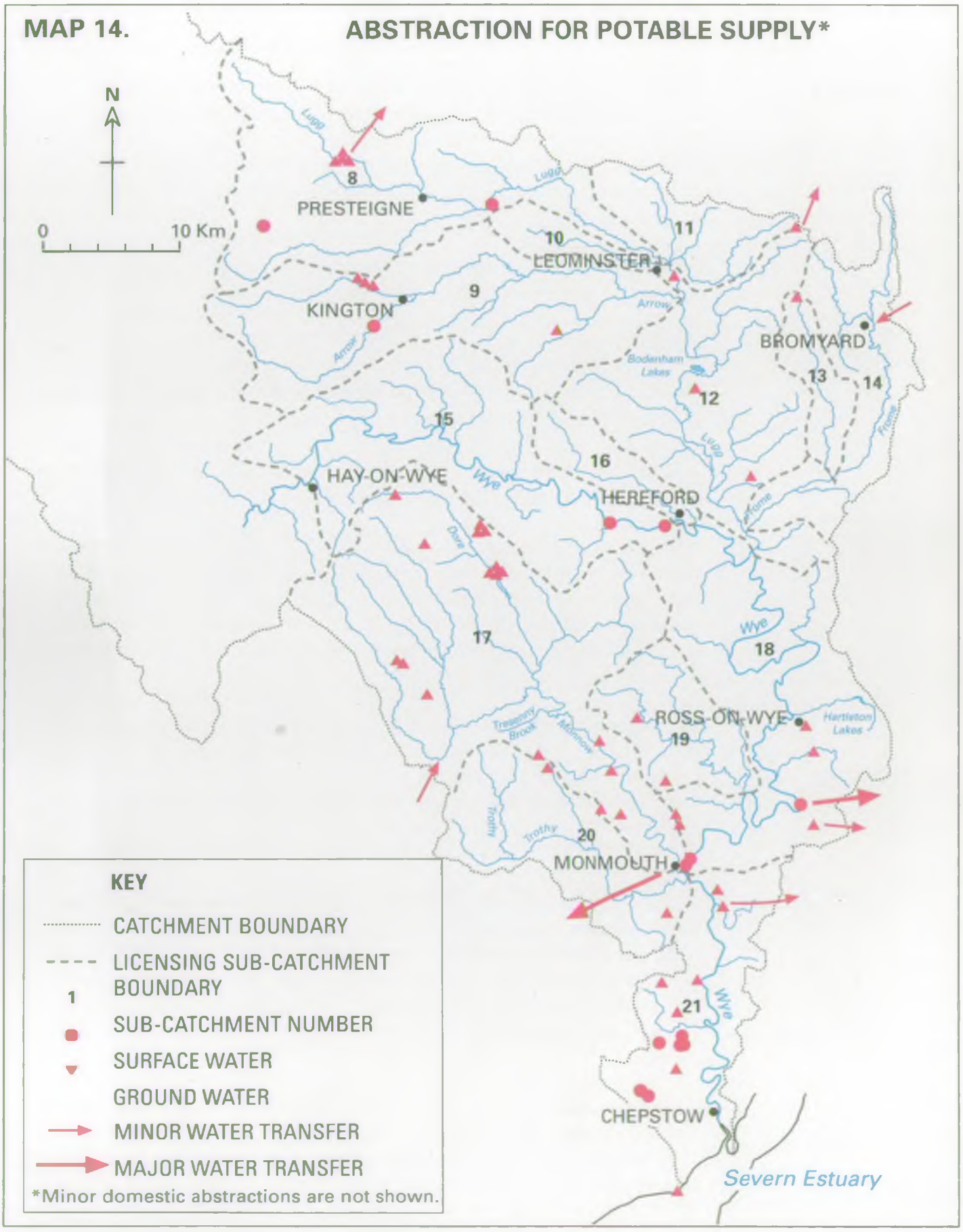
In considering applications for new licences, the NRA must ensure that no derogation of existing abstractors occurs, and that the aquatic environment is properly safeguarded. The NRA does not guarantee that the authorised volume will be available at all times, nor that the water will be fit for the purpose for which it will be used.

Local Perspective

Potable water is suitable for drinking, though it is also used for the full range of public water needs. The water is either supplied by the water undertakers, Dŵr Cymru and Severn Trent Water, or from small domestic supplies for private use on isolated properties. The abstractions by the water undertakers are shown on Map 14. The minor domestic supplies are spread throughout the lower Wye and are too numerous to show on the map.

The water undertakers are the largest abstractors in the lower Wye, taking 282 Ml/d - over half of all licensed abstraction in the catchment. However, this does not mean that public water abstractions are the largest users of water in each subcatchment (See Fig.1). The figures do

MAP 14. ABSTRACTION FOR POTABLE SUPPLY*



not include the water taken directly from the Elan reservoirs which is dealt within the upper Wye Catchment Management Plan.

Three of the four largest abstractions in the catchment take from the Wye at Monmouth (136 Ml/d), Lydbrook (45 Ml/d) and Hereford (45 Ml/d) for public water supply. The Hereford abstraction supports the City, and although Lydbrook water is partly used to supply Ross-on-Wye, most of the water taken from there and from the Wye at Monmouth is exported from the catchment. These are dealt with in greater detail in Section 4.15 on Water Transfer.

Despite the large quantities of water taken, there is little adverse impact on the river from these abstractions: Most of the water taken at Hereford and Ross is returned as treated sewage effluent a short way downstream, and although none of the water exported at Lydbrook/Monmouth is returned to the river, these abstractions are supported by the Elan reservoirs when flows are low. A release is made from the reservoir which flows down the river and is taken out at Lydbrook or Monmouth. This operation provides more water to the river between Elan and Lydbrook/Monmouth than would be present naturally.

The remaining public water supply abstractions are small-medium sized. These support local population centres and are mostly from local aquifers or springs. One such abstraction is from the Great Spring in Sudbrook, which takes 11 Ml/d from a fissure in the Chepstow limestone aquifer. This provides water to the Sudbrook locale and may have some localised impact on the water resource in conjunction with other users of the Great Spring.

The minor domestic abstractions are generally used to supply isolated farmhouses which cannot be reached by water mains. These are very small abstractions, almost all from groundwater sources, and account for very little of the water used in the catchment.

Public water supply is the major source of water loss from the catchment despite returning a high proportion of the water used and measures, such as the use of reservoir water when water cannot be returned to the rivers. The estimated loss is around 45 Ml/d, half of all the estimated daily water loss for all uses during summer conditions. This water loss is, however, often from larger rivers which can sustain it, and is not an important source of loss from every subcatchment (see Fig.2.).

After use, the private domestic water is usually dispersed to ground via soakaways, so most of the small amounts of water abstracted eventually reach the river system. Domestic abstraction therefore causes little water loss from the catchment.

Demand for both domestic water use and public water supply is not

expected to rise significantly over the next decade.

Objectives

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 in a river as possible and discharges to be made as close to the point of abstraction as is practicable.

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

Environmental Requirements

Water Quality - The quality of water at licensed surface and groundwater abstractions should meet the standards set out in EC Surface Water Directive (75/440/EEC) and the standards for Aesthetic Criteria.

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 - Abstraction and associated activities must not lead to an unacceptable reduction in or alteration to the physical habitats required by other uses.

4.15 ABSTRACTION FOR WATER TRANSFER

General

Abstractions from reservoirs and boreholes may be used directly, or may be transferred elsewhere, within or outside, the catchment. Transfers clearly represent a nett loss to the immediate area and so their impact is generally mitigated by the release of regulation or compensation water during periods of low flow. All transfers are subject to abstraction licences.

Local Perspective

The transfers of water are for public water supply and are dealt with in Section 4.14 and Map 14. The two major transfers are from the River Wye at Monmouth and Lydbrook. The Monmouth transfer supplies up to 136 Ml/d of water to Newport, Llanwern and Cardiff, whilst Lydbrook transfers 36 Ml/d to the Severn catchment.

These transfers are responsible for a large quantity (200 Ml/d) of water taken from the lower Wye catchment, but in times of low flow, much of the absraction is suported by releases from reservoirs, and therefore do not have a significant adverse effect on summer low flow. An estimated water loss of 18 Ml/d results from water transfer during the summer low flows, all of which is treated as public water supply loss in Fig. 2. This is not a major loss from the River Wye, although the effects of smaller transfers on minor sources have not yet been investigated.

The smaller transfers of water are at a local scale, near the catchment boundary. Medium-sized abstractions at Lydbrook (4.6 Ml/d), Newland (4.5 Ml/d), Pilleth (1.5 Ml/d) and Brokleton (0.08 Ml/d) are used to supply villages in the neighbouring Teme catchment, representing a minor loss to the lower Wye as none of the water is returned. This loss is partly compensated for by transfers of water into the lower Wye, from the Teme to Bromyard (4.6 Ml/d) and from the Usk to the Monnow (0.2 Ml/d). There is also some re-distribution of water within the lower Wye catchment. This is localised and has little impact on the river flow regimes. Only rarely is water transferred between the licensing subcatchments.

The NRA will shortly be completing a Regional Water Resources strategy to identify the future requirements for water in the Welsh Region and how these can be met. It is anticipated that major increases in the current transfers of water will not be needed.

The NRA has published a Water Resources development strategy for England and Wales. It suggests that further development of the Elan Valley in the upper Wye might provide additional supplies to parts of

England. This could involve increased regulation of the River Wye with subsequent transfer to the rivers Severn and Thames. However, the need for such a development is many years away, and only then if demand increases substantially, and if it would not cause an adverse environmental impact.

Objectives

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 in a river as possible and discharges to be made as close to the point of abstraction as is practicable.

Environmental Requirements

Water Quality

- Water transfer should not adversely affect water quality in either the donor or receiving catchment.

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 must not be altered in a way that might preclude water transfer at suitable locations.

- Water transfer should not lead to alterations of the physical habitat to a degree that might affect other uses, in either the donor or receiving catchment.

4.16 ABSTRACTION FOR AGRICULTURAL SUPPLY

General

All abstractions for agricultural purposes, apart from some small (less than 20 cubic metres per day) general agricultural Uses from surface waters, require an abstraction licence. This Use deals with abstraction from groundwaters and surface waters for agricultural use. This includes general stock watering, use around the farm and crop spraying, as well as for spray irrigation and fish farming purposes.

All abstraction licences specify volume that the licence holder may take, but not exceed, and may contain conditions that restrict the impact of the abstraction on 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 no derogation of existing abstractors occurs, and that the aqutic environment is properly safeguarded. The NRA does not guarantee that the authorised volume will be available at all times, nor that the water will be fit for the purpose for which it will be used.

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 when flows are lowest and no water is returned to the river after use. The NRA encourages winter abstraction into storage and would not usually apply restricitons to winter abstracted water. The winter abstraction charges are only one- tenth of those for summer abstraction.

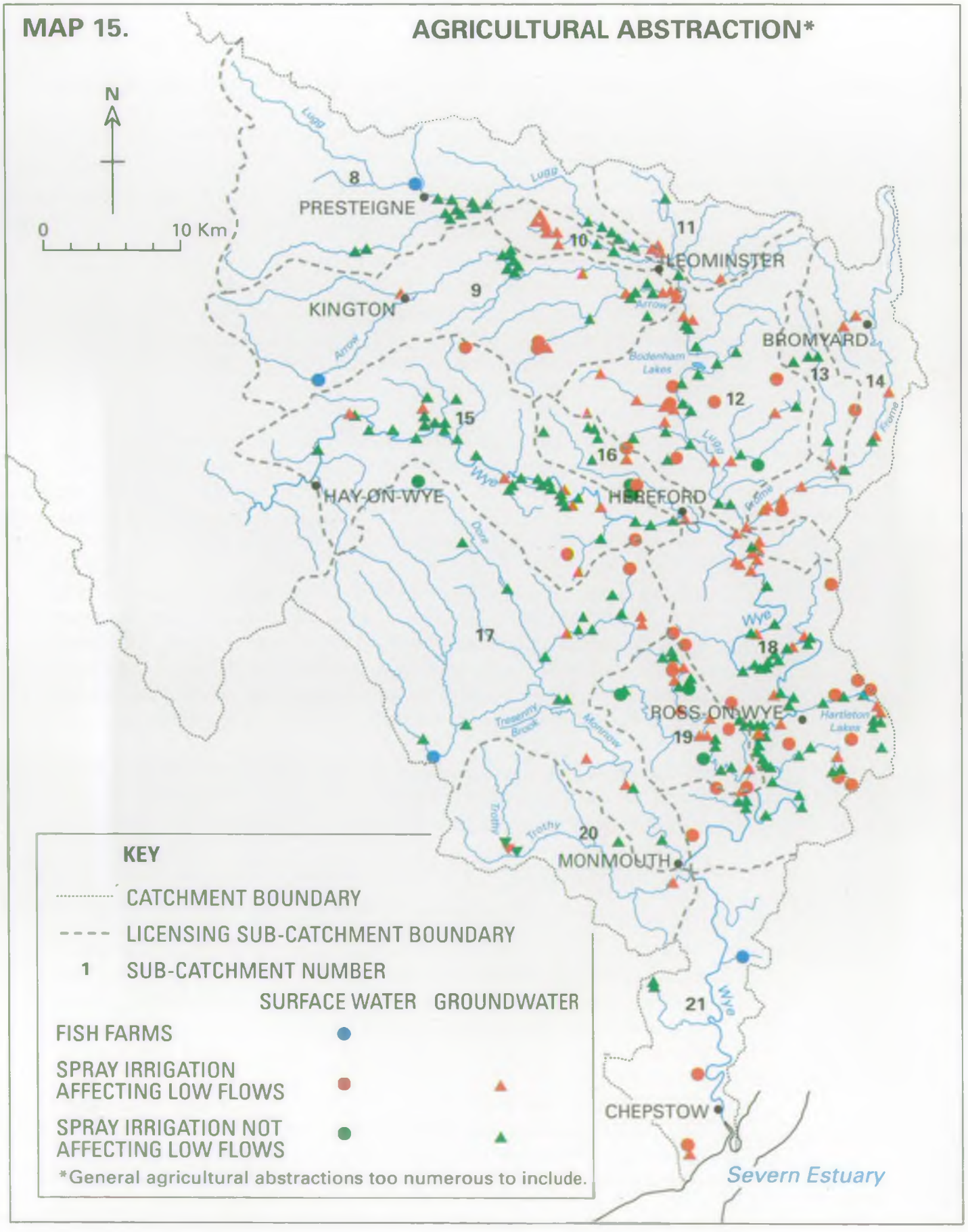
Fish farming can severely affect a watercourse by diverting a large proportion of the flow through the farm, leaving the river reduced in flow. The requirement for an adequate residual flow can restrict the viability of a fish farm.

Local Perspective

General Agriculture

Agriculture is the predominant land use in the lower Wye. The 1120 abstractions for general agricultural and stock watering purposes account for nearly three-quarters of all licenses in the catchment. These abstractions account for a quarter of all licenses in the Welsh Region of the NRA.

Typically, these abstractions are very small volumes (averaging less than 0.01 Ml/d) of water abstracted from a well or borehole near the farmhouse. Virtually all of the abstractions are from groundwater or spring sources and they are well distributed throughout the catchment


MAP 15.
AGRICULTURAL ABSTRACTION*
N
0
10 Km
PRESTEIGNE
KINGTON
LEOMINSTER
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
CHEPSTOW
Severn Estuary
Lugg
Arrow
Wye
Dore
Frome
Monnow
Trothy
Bodenham Lakes
Hartleton Lakes
Treworry Brook
8
9
10
11
12
13
14
15
16
17
18
19
20
21
KEY
CATHMENT BOUNDARY
LICENSING SUB-CATCHMENT BOUNDARY
1 SUB-CATCHMENT NUMBER
SURFACE WATER
GROUNDWATER
FISH FARMS
SPRAY IRRIGATION AFFECTING LOW FLOWS
SPRAY IRRIGATION NOT AFFECTING LOW FLOWS
*General agricultural abstractions too numerous to include.

area. They are too numerous to show on Map 15. As the abstractions are small, general agricultural abstractions represent only 2% of the water that is licensed for abstraction in the catchment. Furthermore, because the water use is spread throughout the year, and much of the water is returned to the river system, general agricultural use represents an even smaller proportion of the summer water loss from the catchment.

Water use for general agriculture is expected to rise slightly over the next decade.

Spray Irrigation

In addition to the general agricultural abstractions described above, intensive arable farming often requires spray irrigation to water crops during the dry summer months. There are nearly 250 spray irrigation licences, 80% of which are from surface sources. The abstractions for spray irrigation are shown on Map 15.

The pattern of summer water consumption (the water lost from the catchment during the summer low flow period) is complicated by restrictions upon spray irrigation licences. Some "licences of right" permit water to be taken at any time. The NRA is encouraging farmers to store winter water for summer use, or has imposed hands-off flow conditions to limit water use in dry periods. On Map 15, the spray irrigation licences which impact upon low flows are differentiated from those that do not. Only the unrestricted summer licences are used in calculating the water loss (Fig.2).

During the summer, 39 Ml/d of water can be abstracted for spray irrigation regardless of the flow in the rivers. Significantly, none of the water used in spray irrigation returns to the rivers. It is all lost, so this use is responsible for nearly half of the water loss from the lower Wye. In some places, water loss from spray irrigation is responsible for a much greater proportion of the total water loss (over 80% in the Garren and Pinsley).

There is the potential for demand for spray irrigation water to almost double over the next decade. This demand can only be met if sufficient resources are available at the right time of year.

Fish Farming

There are four fish farms which abstract water from rivers. These are shown on Map 15 and further described in Section 4.13. The abstractions for fish farming are large, they total 68 Ml/d and the largest abstracts 45 Ml/d. Typically, however, a fish farm is akin to an off-stream series of ponds to which water is diverted and then returned to the river. Therefore, although fish farms account for a tenth of licensed daily use in the catchment, the impact upon the river is restricted to the river reach between the water intake and discharge from the farm. As there are large volumes of water used, care must be taken to avoid local adverse environmental impacts.

The increase in water use for fish farming is difficult to predict, but it is not expected to rise markedly.

Objectives

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 abstraction licences. The NRA will encourage abstractions to be made as far downstream in a river as possible and discharges to be made as close to the point of abstraction as is practicable.

To protect the quality 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.

Environmental Requirements

Water Quality - The quality of water at licensed surface and groundwater abstractions should meet the standards set out in EC Surface Waters Directive (75/440/EEC) and the standards for Aesthetic Criteria.

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 - Abstraction and associated activities must not lead to an unacceptable reduction in al alteration to the physical habitats requires by other uses.

4.17 ABSTRACTION FOR INDUSTRIAL SUPPLY

General

All abstractions used for industrial or commercial purposes must be authorised by a licence granted under the Water Resources Act 1991.

All abstraction licences specify volumes that the licence holder may taken, but not exceed, and many contain conditions that restrict the impact of the abstraction on 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 no derogation of existing abstractors occurs, and that the aquatic environment is properly safeguarded. The NRA does not guarantee that the authorised volume will be available at all times, nor that the water will be fit for the purpose for which it will be used.

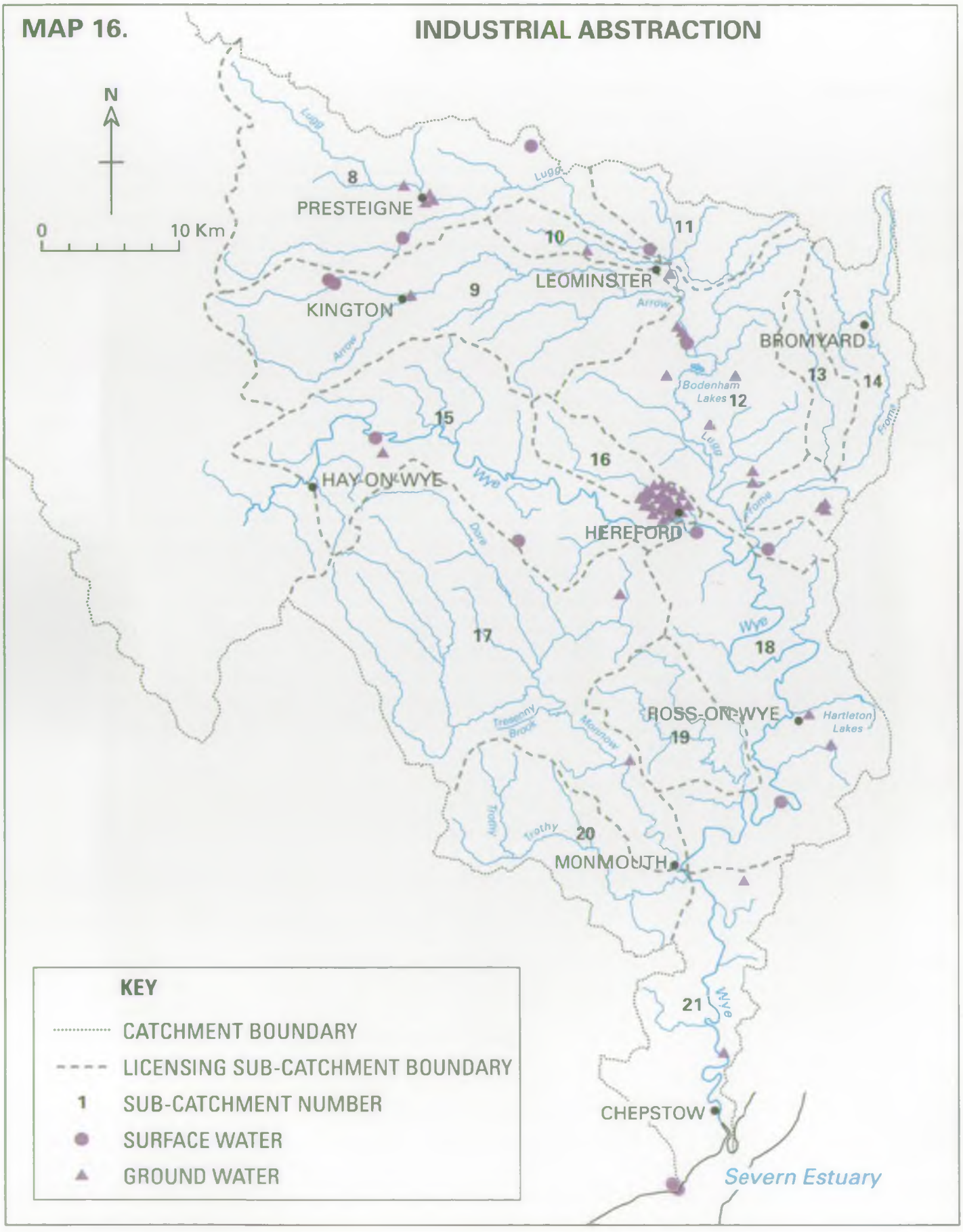
Local Perspective

The catchment is not an industrialised one. There are 47 industrial abstractions (Map 16), which vary widely in size. The industrial water users are found throughout the catchment, with a notable abstraction of 7.2 Ml/d from the River Lugg near Leominster. However, Hereford has the only concentration of industry. Here, 14 Ml/d can be abstracted for industrial use, nearly all of it by H.P.Bulmer Ltd. and Sun Valley Ltd.. All Hereford industrial abstractions use water from the Yazor Gravels aquifer. After use, most of the water is treated and returned to the River Wye. Thus there is a small water loss (1.3 Ml/d) from the Wye catchment as a whole, but a relatively large one (7 Ml/d) from the Yazor Gravels aquifer. This may affect surface water flows.

The largest industrial abstractions, of 26 Ml/d, supplies a paper mill at Sudbrook. It is on the coast and takes groundwater from the rail tunnel under the Severn Estuary. It is not thought to affect the River Wye, but it may, in conjunction with a large public water abstraction, affect local water levels in the aquifer and associated surface streams.

Disregarding the coastal abstractions which do not affect the river system, only 28 Ml/d is licensed for industrial use throughout the catchment. This represents 5% of all abstractions within the lower Wye. The water loss caused by these abstractions is 3.5 Ml/d. This represents 4% of the total water loss.

The amount of water lost from the catchment varies with the industrial process. Therefore, determining the water loss is done on a site by site basis. In many cases, all the water is returned to the river at the site, so


MAP 16.
INDUSTRIAL ABSTRACTION
N
0
10 Km
PRESTEIGNE
KINGTON
LEOMINSTER
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
CHEPSTOW
Severn Estuary
Bodenham Lakes
Hartleton Lakes
Lugg
Arrow
Wye
Dore
Frome
Trothy
Monnow
Trecenny Brook
8
9
10
11
12
13
14
15
16
17
18
19
20
21
KEY
CATCHMENT BOUNDARY
LICENSING SUB-CATCHMENT BOUNDARY
1 SUB-CATCHMENT NUMBER
SURFACE WATER
GROUND WATER

the only loss of flow is between the intake and outlet points. At other sites, water is lost to the atmosphere. Elsewhere, water is not of suitable quality to return to the river directly and is first treated at a sewage treatment works before discharge to the river. In this case, there may be little nett water loss from the subcatchment, but there may still be a substantial length of river which would be affected to some degree by the abstraction.

Use of water for industrial purposes is not expected to rise, and may decrease over the next decade.

Objectives

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 abstration licences. The NRA will encourage abstractions to be made as far downstream in a river as possible and discharges to be made as close to the point of abstraction as is practicable.

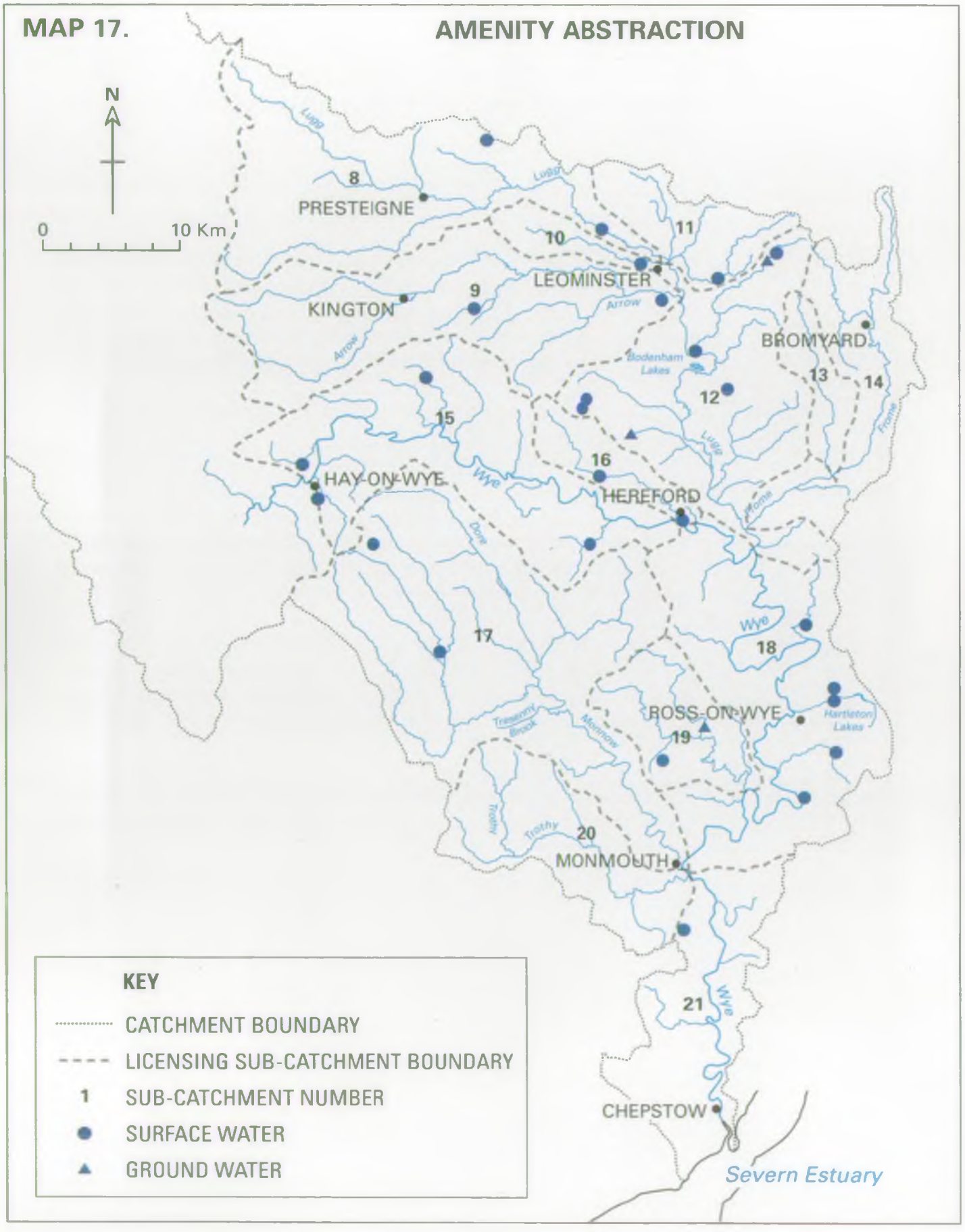
To protect the quality of groundwaters by implementing the NRA's Groundwater Protection Policy.

Environmental Requirements

Water Quality - For industrial abstractions the standards for Aesthetic Criteria will be met and there should be no deterioration in water quality compared to when the abstraction licence was granted.

Water Quality - The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features - Abstraction and associated activites must not lead to an unacceptable reduction in or alteration to the physical habitats required by other uses.


MAP 17.
AMENITY ABSTRACTION
N
0
10 Km
PRESTEIGNE
KINGTON
LEOMINSTER
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
CHEPSTOW
Severn Estuary
Lugg
Arrow
Wye
Dore
Frome
Monnow
Trothy
Bodenham Lakes
Hartleton Lakes
Treworry Brook
8
9
10
11
12
13
14
15
16
17
18
19
20
21
KEY
CATCHMENT BOUNDARY
LICENSING SUB-CATCHMENT BOUNDARY
1 SUB-CATCHMENT NUMBER
SURFACE WATER
GROUND WATER

4.18 ABSTRACTION FOR AMENITY SUPPLY

General

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

Many amenity ponds are constructed in floodplain areas and consequently pose a problem to any other floodplain development. The NRA will seek to ensure that such developments and associated works do not affect the natural river environment.

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

Local Perspective

Abstractions and impoundments for amenity purposes are scattered throughout the catchment (Map 17). Usually, they are used for fishing and conservation lakes, and the water requirement is small. They do not amount to a significant proportion of the daily water use of the catchment, and all the water used in the ponds is returned to the river system. The impoundments which dam some small watercourses to create a pond do so without the need to abstract water at all, so at all but a very local scale this use has no impact upon low flows.

Demand for amenity uses is difficult to forecast. It is expected to rise, but water loss from this use is likely to remain very low.

Objectives

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 abstraction licences. The NRA will encourage abstractions to be made as far downstream in a river as possible and discharges to be made as close to the point of abstraction as is practicable.

Environmental Requirements

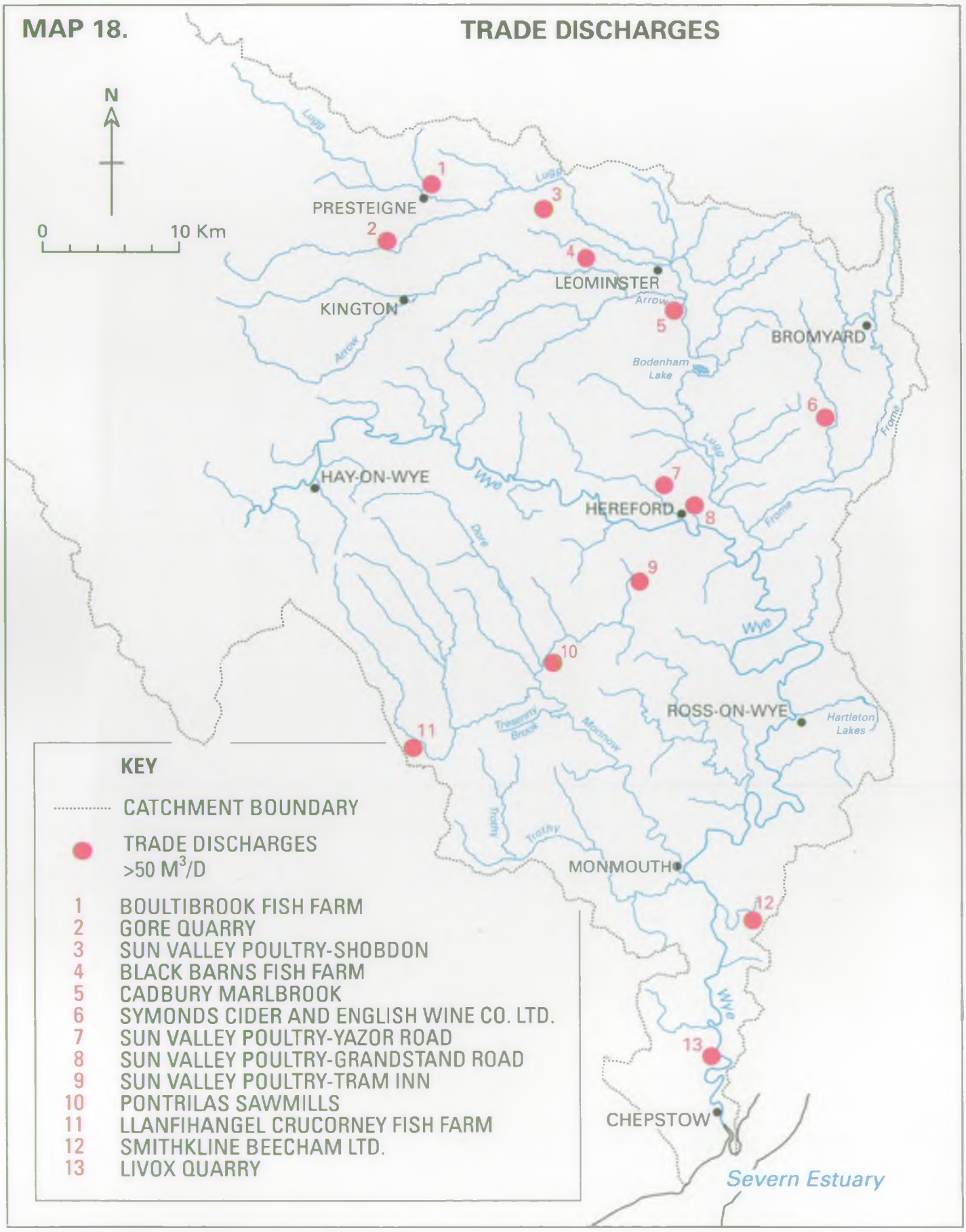
Water Quality

- While the developer must ensure that the intended source of water is fit for the proposed use(s) all waters should comply with the standards of Aesthetic Criteria.

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 - There should be no alteration of the river channel or flood plain that would reduce its fishery and conversation value or increase flood risk.


MAP 18.
TRADE DISCHARGES
N
0
10 Km
PRESTEIGNE
KINGTON
LEOMINSTER
BROMYARD
HAY-ON-WYE
HEREFORD
ROSS-ON-WYE
MONMOUTH
CHEPSTOW
Severn Estuary
Lugg
Arrow
Bodenham Lake
Frome
Wye
Dore
Trothy
Hartleton Lakes
KEY
CATCHMENT BOUNDARY
TRADE DISCHARGES >50 M3/D
1 BOULTIBROOK FISH FARM
2 GORE QUARRY
3 SUN VALLEY POULTRY-SHOBDON
4 BLACK BARNS FISH FARM
5 CADBURY MARLBROOK
6 SYMONDS CIDER AND ENGLISH WINE CO. LTD.
7 SUN VALLEY POULTRY-YAZOR ROAD
8 SUN VALLEY POULTRY-GRANDSTAND ROAD
9 SUN VALLEY POULTRY-TRAM INN
10 PONTRILAS SAWMILLS
11 LLANFIHANGEL CRUCORNEY FISH FARM
12 SMITHKLINE BEECHAM LTD.
13 LIVOX QUARRY

4.19 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 authorisation issued is consistent with protecting the Uses of the receiving water and also the broader commitment to the reduction of dangerous materials in the environment. Where pollution prevention measures are stated by HMIP these must also be consistent with 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 4.21.

Local Perspective

There are few industrial discharges to rivers in the catchment. The most significant are Cadbury at Marlbrook (5.5 Ml/d to River Lugg) and Symonds Cider at Stoke Lacy (0.18 Ml/d to River Loden).

Whitebrook Fishery at Llanfihangel Crucorney abstracts 45 Ml/d of water ad discharges it to the River Honddu.

Other trade discharges are problems of site drainage where surface water may become contaminated by processes or spillages on site. Normally these do not pose significant water quality problems.

Objectives

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

Environmental Requirements

Water Quality

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

- There should be no 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.

- The Authority will develop and implement a Regional licensing Policy, which will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features

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

4.20 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 a 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 runoff 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. It 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.

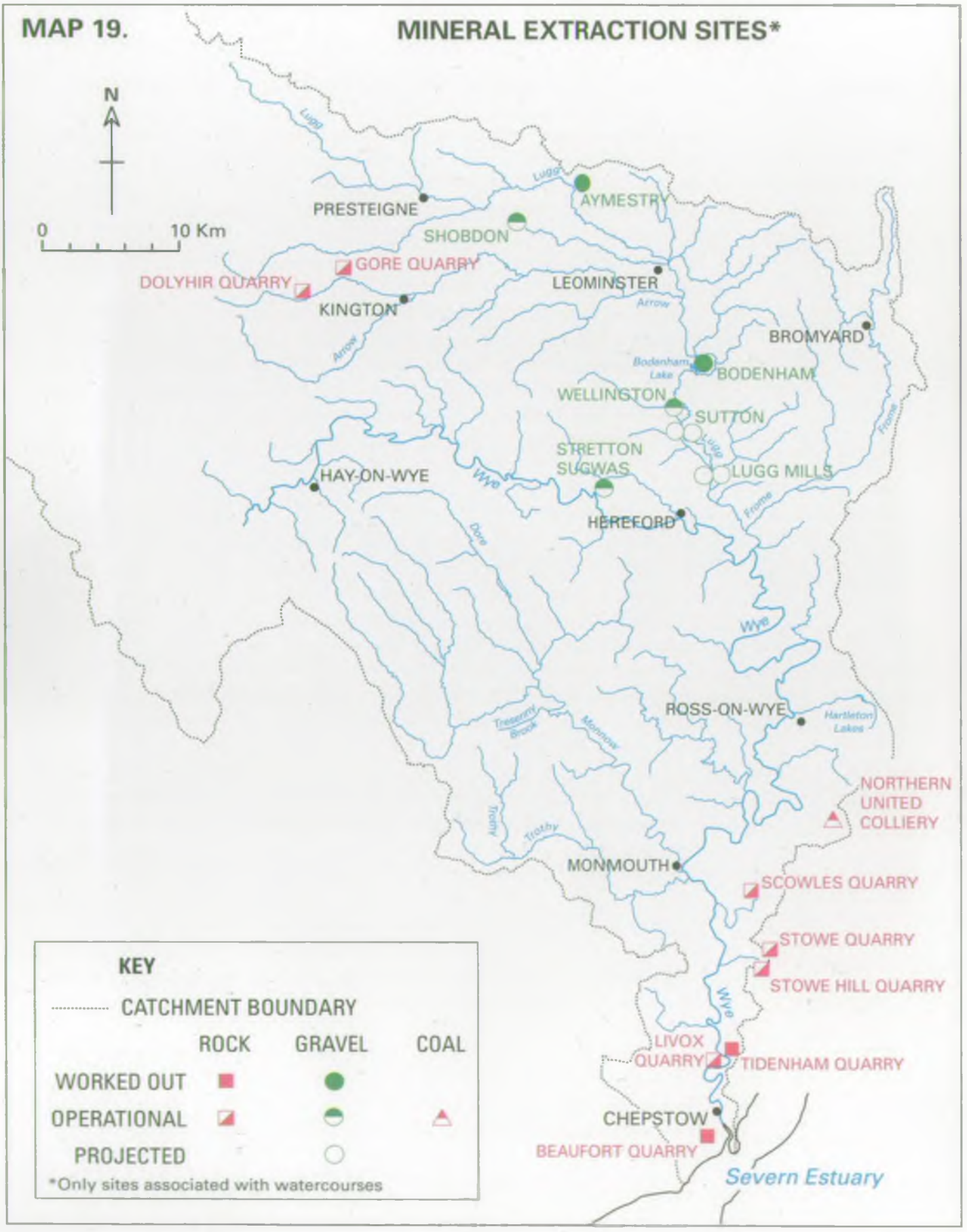
In some areas land reclamation schemes may cause renewed problems as toxic metals are exposed or fine solids run off into watercourses. Consequently such discharges are licensed and monitored by the NRA.

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

Mineral extraction within the catchment includes quarrying for rock and excavation for sand and gravel and to a minor extent for coal. The sites are shown on Map 19. The impact on the quality of surface waters is controlled by means of discharge consents. At Dolyhir Quarry the Cynon brook has been culverted to minimise pollution.

At Stretton Sugwas and Wellington the discharge consents permit the discharge of groundwater from the site by pumping from lagoons. The Wellington site is situated in the floodplain of the River Lugg and the flood embankments associated with this site are subject to land drainage consent.


MAP 19.
MINERAL EXTRACTION SITES*
N
0
10 Km
Lugg
PRESTEIGNE
AYMESTRY
SHOBDON
GORE QUARRY
DOLYHIR QUARRY
KINGTON
LEOMINSTER
Arrow
BROMYARD
Bodenham Lake
BODENHAM
WELLINGTON
SUTTON
STRETTON SUGWAS
LUGG MILLS
Frome
HAY-ON-WYE
Wye
HEREFORD
Dore
ROSS-ON-WYE
Hartleton Lakes
Trecenny Brook
Monnow
NORTHERN UNITED COLLIERY
Trothy
MONMOUTH
SCOWLES QUARRY
STOWE QUARRY
STOWE HILL QUARRY
LIVOX QUARRY
TIDENHAM QUARRY
CHEPSTOW
BEAUFORT QUARRY
Severn Estuary
KEY
CATCHMENT BOUNDARY
ROCK
GRAVEL
COAL
WORKED OUT
OPERATIONAL
PROJECTED
*Only sites associated with watercourses

At the Northern United Colliery site at Hawkwell in the Forest of Dean, a coal recovery scheme is proposed and a discharge consent will control the dscharge of contaminated surface water from the site.

The proposed sites at Sutton and Lugg Mills are situated in the River Lugg floodplain and will require land drainage and discharge consent, and an abstraction licence.

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

Environmental Requirements

Water Quality

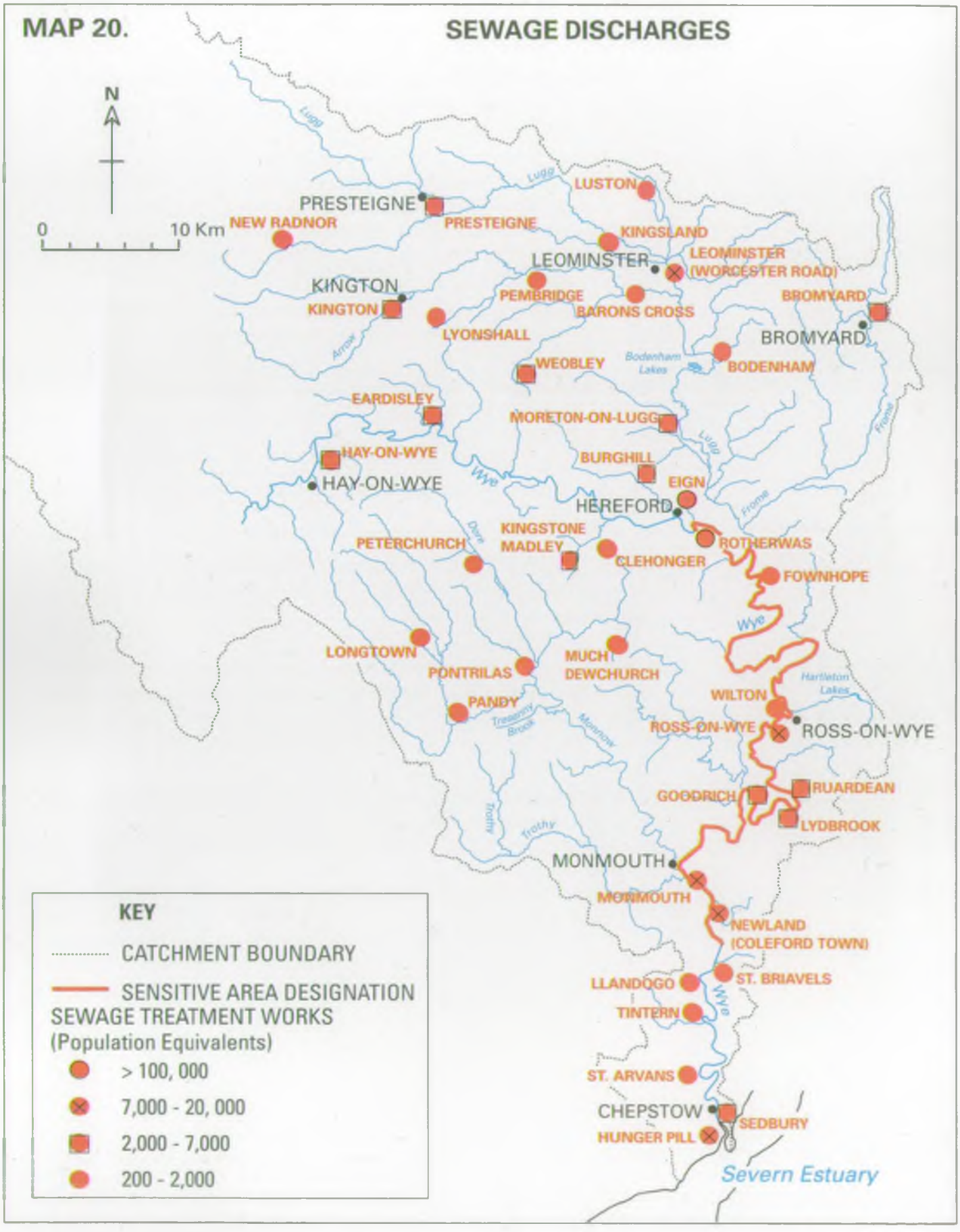
- All consented discharges must comply with the conditions stated within the consent. This will be enforced by the NRA.
- There should be no deterioration in water quality above a consented discharge, from that assumed when the discharge consent was calculated.
- Measures must be taken to prevent diffuse pollution that may arise from rainfall runoff.

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.


MAP 20.
SEWAGE DISCHARGES
N
0
10 Km
PRESTEIGNE
NEW RADNOR
PRESTEIGNE
LUSTON
KINGSLAND
LEOMINSTER
LEOMINSTER (WORCESTER ROAD)
KINGTON
KINGTON
PEMBRIDGE
BARONS CROSS
BROMYARD
BROMYARD
LYONSHALL
WEOBLEY
Bodenham Lakes
BODENHAM
EARDISLEY
MORETON-ON-LUGG
HAY-ON-WYE
HAY-ON-WYE
BURGHILL
EIGN
HEREFORD
KINGSTONE
MADLEY
PETERCHURCH
CLEHONGER
ROTHERWAS
FOWNHOPE
LONGTOWN
PONTRILAS
MUCH DEWCHURCH
PANDY
Hartleton Lakes
WILTON
ROSS-ON-WYE
ROSS-ON-WYE
GOODRICH
RUARDEAN
LYDBROOK
MONMOUTH
MONMOUTH
NEWLAND (COLEFORD TOWN)
LLANDOGO
ST. BRIAVELS
TINTERN
ST. ARVANS
CHEPSTOW
SEDBURY
HUNGER PILL
Severn Estuary
Lugg
Arrow
Wye
Dore
Frome
Trothy
Monnow
Treadam Brook
KEY
CATCHMENT BOUNDARY
SENSITIVE AREA DESIGNATION
SEWAGE TREATMENT WORKS
(Population Equivalents)
> 100, 000
7,000 - 20, 000
2,000 - 7,000
200 - 2,000

4.21 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. They are designed to only operate 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.

Coastal discharges are also generally owned by Dŵr Cymru although 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 has regard to the terms of the EC Urban Wastewater Treatment Directive and other statutory obligations and covers the period 1995-2015. Consequently, 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.

Increasing quantities of sewage sludge are being disposed of by surface spreading onto, or injection into, farmland. This is a direct result of implementation of a commitment by the U.K. Government to cease sewage sludge dumping at sea by 1998. A waste disposal licence is not required for land spreading provided the sludge application is beneficial to the land. The contractor is expected to provide details of the sludge application to the Local Authority under provisions in the Sludge (Use in Agriculture) Regulations 1989. It is considered essential that sludge disposal to land is performed by competent operators if surface and groundwater pollution is to be avoided.

Local Perspective

The majority of consented discharges are from Dŵr Cymru sewage treatment works.

The most significant inputs are shown in the following table:-

Name/Location of STW	*Population Equivalent*	*Receiving Watercourse*
Hereford (Rotherwas & Eign)	*125,000*	*River Wye*
Newland (Coleford)	*19,000*	*River Wye*
Monmouth	*10,200*	*River Wye*
Leominster (Worcester Road)	*9,600*	*River Lugg*
Ross-on-Wye	*7,300*	*River Wye*
Burghill	*6,000*	*Yazor Brook*
Bromyard	*3,000*	*River Frome*

There are 100 sewage treatment works with discharges of more than 10 m^3/d, of which 41 are greater than 50 m^3/d. These are shown on Map 20. There are many smaller discharges from sewage treatment works to watercourses and numerous septic tanks which mostly discharge to the ground.

The total sewage effluent discharge to the freshwater part of the catchment is 47.6 Ml/d. This represents 4.7% of the dry weather flow of the river (1012 Ml/d measured at Redbrook).

The Wye estuary receives sewage discharges of varying types: fully treated sewage effluent discharges from Sedbury (0.6 Ml/d), Llandogo (0.18 Ml/d) and Tintern (0.98 Ml/d); screened sewage from Hunger Pill outfall (5.0 Ml/d) (part of Chepstow Town and surrounding villages) and some crude sewage discharges from Chepstow Town.

The River Wye from Hereford to it's tidal limit has been designated as a eutrophic sensitive area under the Urban Waste Water Treatment Directive and the STWs at Hereford (Rotherwas and Eign) and Leominster (Worcester Road) have been targeted for nutrient reduction.

All of the urban areas mentioned above have sewerage systems of which combined sewer overflows are a necessary part.

Objectives

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

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.

- The Authority will develop and implement a Regional licensing Policy, which will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

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.

SECTION 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.

5.1 WATER QUALITY TARGETS

General

There are two aspects of water quality assessment; the first relates to the classification of waters according to a graded system, the second to the measurement of achievement of specific targets. The first aspect has, for many years, involved using the former National Water Council (NWC) system where water quality classes range from excellent to very poor. In future this will be superseded by the General Quality Assessment Scheme currently under development within the NRA. The new system will also include biological and fisheries elements and will provide an overall snapshot view of river water quality across the country.

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 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 EC Directive for Bathing Water, Freshwater Fisheries, Dangerous Substances and Urban Wastewater Treatment and are constructed to give a complete coverage of water chemistry. The targets set represent the most stringent water quality requirement and reflect the visionary concept of Catchment Plans.

WQOs

In recognition of the benefits of this use-related approach to water quality management and assessment, the NRA has recommended a system to the Department of the Environment, which in line with the provisions of the Water Resources Act 1991, can give Water Quality Objectives (WQOs) a statutory basis. If the system is approved these Water Quality Objectives will be ultimately introduced to all catchments via the Catchment Planning programme.

Groundwater Targets

The NRA has produced a "Policy and Practice for the Protection of Groundwater" (PPPG) which provides advice on the management and protecion of groundwater on a sustainable basis. The Welsh Region is implementing this national policy which will effectively manage the groundwater protection in the area of the lower Wye catchment. This new policy deals with the concept of vulnerability and risk to groundwater from a range of human activities. It considers protection around the point of abstraction and protection for the area which drains to the abstraction point. The degree of protection afforded to the aquifer is zoned according to the travel time of pollutants to a source.

Particular human activities considered in the Groundwater Protection Policy are:

Discharges to to Underground Strata:

The NRA has powers under the Water Resources Act 1991 to control discharges of sewage and trade effluents to underground strata. It will seek to prevent any discharge into underground strata, either directly or via sub-surface soakaways, which may lead to pollution of groundwaters.

Disposal of Sludges and Slurry to Land:

The NRA is committed to limiting the disposal of wastes from agriculture, industry and sewage treatment in Source Protection Areas. Aside from EC legislation, there are no statutory controls governing sludge disposal, so protection is being achieved through co-operation with disposal contractors in their use of the land.

Physical Disturbance of Aquifers:

This involves work such as mining and construction, where excavation takes place within an aquifer, thus affecting the groundwater flows. The NRA can influence the proposals through its role as a Planning consultee and, where appropriate, through its own licences and consents.

Contaminated Land/Waste Disposal:

Land can become contaminated by present or historical use for landfill or industry. The NRA will seek to prevent contaminated land affecting groundwater quality through its position as statutory consultee in the planning process and by encouraging effective remedial measures where necessary.

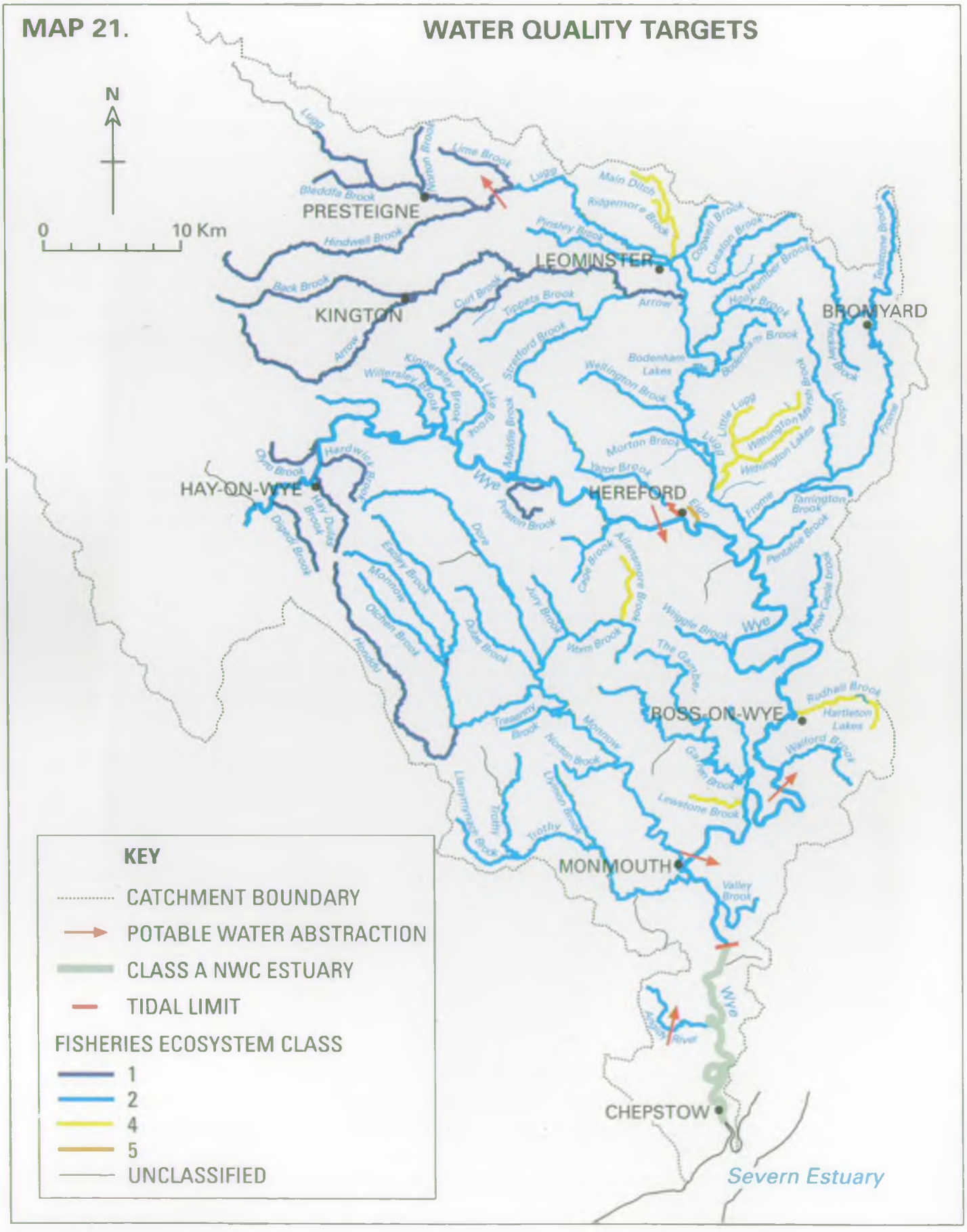
Diffuse Pollution:

Diffuse pollution results from inputs over a wide area rather than from a single source. Control can be achieve through land management. There are limited opportunities for the NRA to influence this other than by the creation of 'Water Protection Zones' and 'Nitrate Sensitive Areas'.

CATCHMENT TARGETS

Groundwater

Groundwater is important throughout the catchment in sustaining public, private and industrial abstractions together with providing a contribution to flow in surface water systems. A major groundwater resource is the Carboniferous Limestone in the Chepstow area, together with the Devonian (Old Red Sandstone) which outcops over much of the lower catchment. Superficial deposits of sands and gravels associated with the



KEY

- CATCHMENT BOUNDARY
- POTABLE WATER ABSTRACTION
- CLASS A NWC ESTUARY
- TIDAL LIMIT

FISHERIES ECOSYSTEM CLASS

- 1
- 2
- 4
- 5
- UNCLASSIFIED

Yazor Brook and River Lugg also provide areas where groundwater is extensively utilised.

The protection of these resources is effectively undertaken by the implementation of the Policy and Practice for the Protection of Groundwater.

Due to the rural nature of the lower Wye catchment, contaminated land issues are less prominent than in other catchments.

Surface Water

The River Wye Catchment is an important salmon and trout fishery and the Fisheries Ecosystem (FE) targets reflect this use. The main rivers and larger tributaries in the catchment therefore have a FE class 1 or 2 target providing a water quality suitable for supporting salmonid fish. The Little Lugg, Withington Brook, Ridgemoor Brook, Main Ditch, Rudhall, Allensmore and Lewstone Brooks all have a FE class 4 target due to their geographical location and topography, low summer flows and resultant variability of water quality. The target for the Eign Brook and the lowest culverted stretch of the Yazor Brook has been set at FE class 5 because of the low natural flows, the urbanised nature of their catchment and the inaccessibility to fish in some reaches.

These FE water quality targets are illustrated on Map 21.

In addition to the FE targets there are also water quality targets at specific points in the catchment where water is abstracted for potable supply. The water quality target at Monmouth, Lydbrook and Broomy Hill on the Wye, Byton on the Lugg and Rogerstone Grange on the Angiddy Brook is that contained in EC Directive 75/440/EEC for waters receiving normal physical chemical and disinfection treatment before being put into potable supply.

In addition, many of the river stretches in the catchment have been designated as salmonid fisheries under the EC Freshwater Fish Directive 78/659/EC. These strethces are the River Wye from tidal limit to Hay,River Lugg from mordiford to Presteigne, River Arrow from Leominster to Kington, River Monnow from monmouth to it's confluence with the Olchon Brook, River Trothy from Monmouth to Llantilio Crossenny and the Garren Brook to its confluence with the Gamber. The water quality has to comply with criteria set down in the Directive.

The target for the Wye Estuary and it's tidal reach is NWC Class A, which is the highest estuary quality and is suitable for the passage of migratory fish.

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 abstraction 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 enviroment, 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 is analysing information on water use and is preparing a Regional Water Resources Strategy. It will be reviewing forecasts of future demand to try and anticipate needs for water resources developments and consider ways to meeting those future demands.

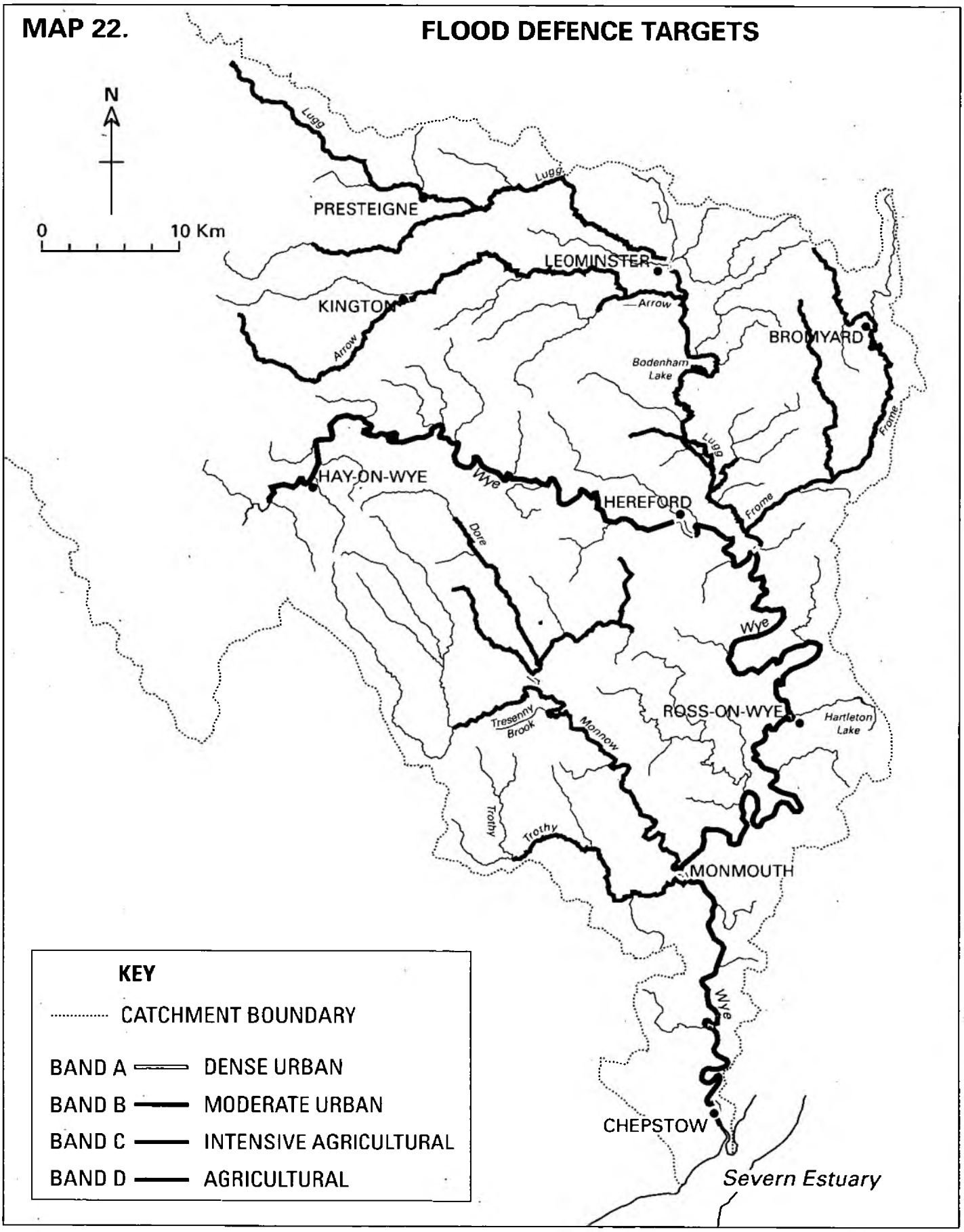
Local Perspective

Until it is possible to make a detailed assessment of the environmental needs of the river or to implement Regional Licensing Policy, the NRA intends to protect the natural 95-percentile flows of the rivers (Q95). In an average year, river flows would be less than the Q95 for only 18 days. These target flows apply when considering new abstractions from surface or groundwater.

Groundwater abstractions are included because, although the volume of groundwater use is limited, abstraction from it can reduce surface water flows. The extent to which this occurs in the catchment is unknown at present, and it is difficult to put restrictions upon a licence based upon groundwater levels. Therefore, it is preferable to base the water quality targets for groundwater upon the desired surface water flow.

As well as protecting ground and surface waters from over abstraction, the NRA intends to prevent the disruption of groundwater flows by the physical disturbance of aquifers. The flow of water underground is important in maintaining groundwater levels, which may support

abstractions or environmental features. Construction, mining or other excavations can interrupt this flow, with potential impacts upon abstractions or the environment. The NRA can influence development proposals through it's role as a planning consultee and, where appropriate, through the NRA's licences and consents. This target has been included in the NRA's "Policy and Practice for the Protection of Groundwater" (PPPG).


MAP 22.
FLOOD DEFENCE TARGETS
N
0
10 Km
Lugg
PRESTEIGNE
LEOMINSTER
KINGTON
Arrow
BROMYARD
Bodenham Lake
Frome
HAY-ON-WYE
Wye
HEREFORD
Dore
ROSS-ON-WYE
Hartleton Lake
Tresenny Brook
Monnow
Trothy
MONMOUTH
CHEPSTOW
Severn Estuary
KEY
CATCHMENT BOUNDARY
BAND A DENSE URBAN
BAND B MODERATE URBAN
BAND C INTENSIVE AGRICULTURAL
BAND D AGRICULTURAL

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.

FLOOD DEFENCE TARGETS

A system has been developed by the NRA which determines the typical standard of service which should be provided to satisfy the Flood Defence requirements of a particular land use. There are a series of five land use bands which define different levels of land use intensity and hence potential damage. A sixth band is included to be ascribed where no known floodplain exists or is attributable. The land use bands for the lower Wye catchment are shown on Map 22.

The target standard of service for the provision of flood alleviation schemes is set from the calculation of optimum benefit cost ratios determined when considering the alternative solutions to the problem.

Flood Warning

Where flood warning systems are in operation the NRA target is to provide that the warning is received at least 2 hours before the flood event occurs.

The NRA flood warning system aims to provide:

* *a 24 hour monitoring service which receives forecasts of adverse weather and heavy rainfall, and warning of high river levels in order to detect and*

forecast possible main river fluvial and tidal flooding;

* *warnings to the police, for dissemination to local authorities, other bodies and the general public. The current accepted practice for the dissemination of flood warnings is for the NRA to issue warnings to the policy who in turn alert local authorities prior to warning people at risk.*

DEVELOPMENT TARGETS

With regard to development the following targets are used:

* *No increase in flood risk as a result of development.*

* *No new development in an area where the existing level of of service is considered below the standard required for the type of development proposed.*

* *Provision of suitable access for maintenance of the river channel.*

* *No detriment to the water environment due to development.*

* *Adequate pollution prevention methods that are consistent with Groundwater Protection Policy should be incorporated into developments.*

CONSERVATION TARGETS

The NRA is currently developing a national River Habitat Survey methodology and an Otter Conservation Strategy which will assist in setting targets for conservation. Until such detailed targets are set, the following general targets apply:-

* *Protection of natural river channels, corridors and wetlands for the benefit of wildlife (including fish) and landscape by:*

  - *undertaking river works in a manner that has regard to and, where appropriate, increases the conservation value;*

  - *encouraging the creation of a riparian buffer zone;*

  - *responding to NRA consent applications and development proposals.*

* *Protection of historical and archaeological features associated with the water environment and those features contributing to local heritage.*

* *Promotion and support of initiatives for the maintenance and enhancement of wetlands, wet meadows, bankside and instream habitats.*

* *Control of the spread of Japanese knotweed.*

* *Agree a level of service with the Countryside Council for Wales and English Nature for NRA actions that impact upon SSSIs.*

* *Maintain and enhance populations of rare and endangered plants and animals (including fish) associated with the river or wetlands.*

FISHING AND ANGLING TARGETS

Specific fisheries targets have not been set. The aim is to maintain, improve and develop fisheries and the following general targets apply:-

* *With respect to salmon and trout fisheries, to sustain the level of exploitation by the rod fishery, whilst conserving stocks.*

* *Identify trends in stock abundance for juvenile stocks of fish and make comparisons with "expected" abundances based upon habitat characteristics.*

* *Maintain an abundance of juvenile salmon and brown trout and freshwater fish and eels which is related, where possible, to the carrying capacity of the catchment based upon habitat characteristics.*

* *Control illegal fishing and target the market in illegally caught salmon.*

* *Ensure, where appropriate, access for salmon and trout to all suitable spawning and nursery areas.*

* *Maintain the integrity and genetic diversity of salmon and trout populations.*

* *Maintain a monitoring programme which quantifies fish stock abundance and stream carrying capacity based upon habitat characteristic assessment.*

* *Control the introduction of fish through the Section 30 restocking consent procedure.*

* *Protection of natural river channels (see Conservation Targets).*

  - *Suitable habitat for salmonid breeding with an adequate distribution of potential redd sites and nursery areas.*

  - *Unimpeded access for migratory salmonids through the estuary and up river to all potential spawning reaches (where appropriate), with adequate holding pools throughout the catchment.*

- *Effective fish screens on all abstractions and discharges (where necessary) to protect wild fish stocks and prevent escapement from fish farms.*

- *Suitable habitat for freshwater fish breeding with an adequate distribution of nursery areas.*

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

* *Implement the recommendations of the Shad Conservation Strategy, as they apply to the River Wye.*

RECREATION AND BOATING TARGETS

Targets for the recreational uses of waters have not been set and requirements for these uses rely on subjective assessment by trained staff.

In the absence of specific targets, the following general targets apply:

* *Increase public and user awareness of the needs of different user groups and the conservation value of river corridors.*

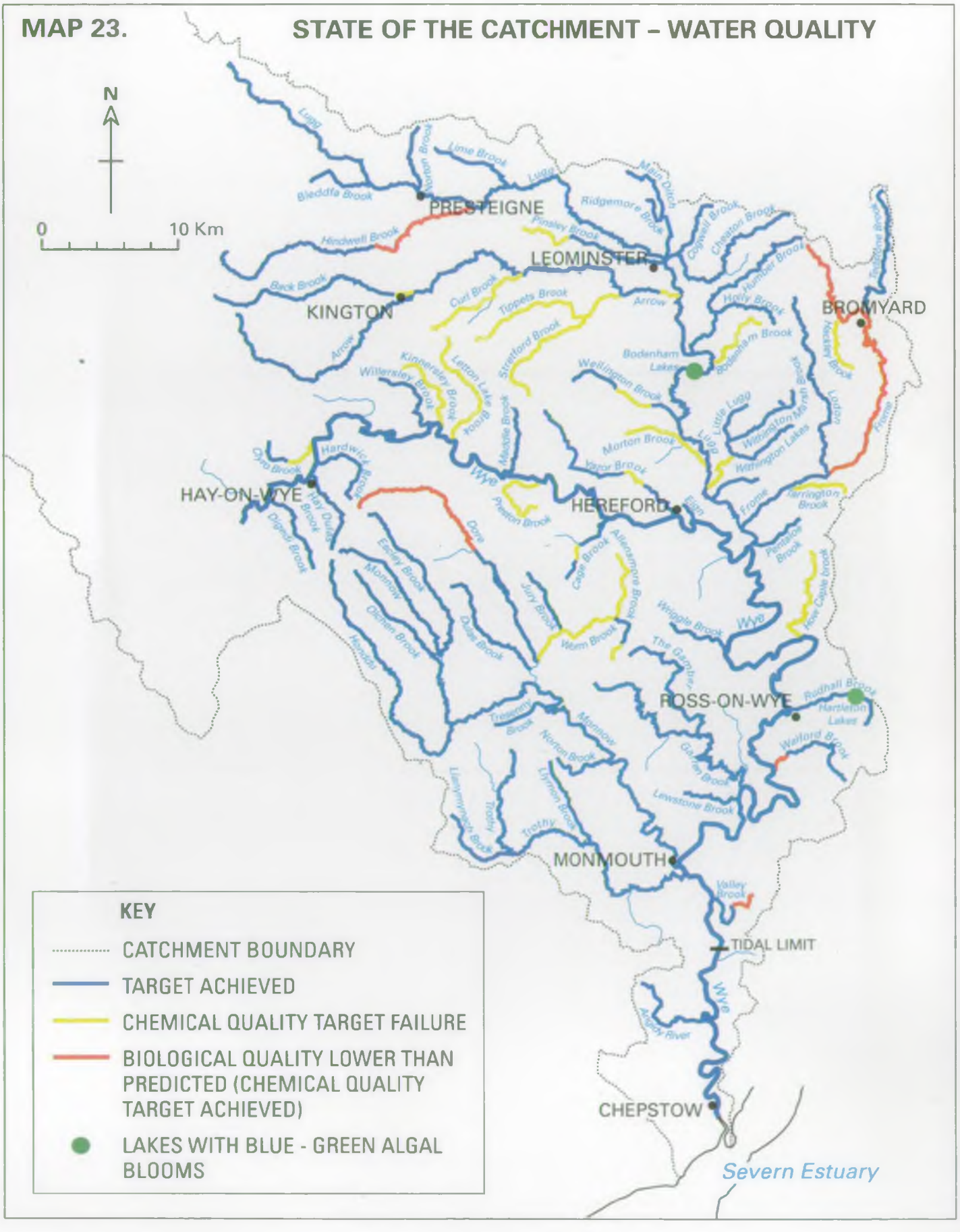
* *Support, where appropriate, opportunities for public access to the River Wye for boating and other recreational activities.*

* *Maintain and enhance the features that provide the natural character of boating and recreation along the river.*

SECTION 6.0 THE STATE OF THE CATCHMENT

The following section examines the ability of the catchment to support the Uses identified in Section 4, by assessing compliance with the targets set out in Section 5. In this manner the key Issues in the catchment are identified. **The Issues and potential solutions are discussed in detail in Section 3 in Part 1 of this Consultation Plan.**

MAP 23. STATE OF THE CATCHMENT – WATER QUALITY



KEY

- CATCHMENT BOUNDARY
- TARGET ACHIEVED
- CHEMICAL QUALITY TARGET FAILURE
- BIOLOGICAL QUALITY LOWER THAN PREDICTED (CHEMICAL QUALITY TARGET ACHIEVED)
- LAKES WITH BLUE - GREEN ALGAL BLOOMS

6.1 WATER QUALITY

General

The current state of the water quality of the lower Wye catchment has been assessed against the Use-related targets set in Section 4. 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 headwaters 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 sampling.

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. 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 section illustrates the results of this analysis and it is stressed that all the catchment passes its identified targets, unless it is specifically stated otherwise.

Local Perspective

Groundwater

There is a perceived problem of elevated nitrate levels in groundwaters at three locations within the lower Wye. Currently these public potable groundwater sources are being considered by the Government as potential Nitrate Vulnerable Zones within the terms of the EC Nitrate Directive. The NRA has provided technical advice to the Government on this matter.

Surface Water

Map 23 identifies that most of the rivers in the catchment pass the water quality targets set (Map 21). Nevertheless, there remain some stretches where water quality fails to meet the Fisheries Ecosystem classification targets.

The failures to meet the Fisheries Ecosystem standards are due to the exceedance or non-achievement of specified limits for either dissolved oxygen (DO), biochemical oxygen demand (BOD) or ammonia. In some of these cases the water quality fails to meet a combination of two or more of these standards.

There are a number of stretches where water quality fails to meet its standard but where new or improved sewage treatment and disposal systems have been introduced during 1993 and where subsequent reassessment of water quality is anticipated to show compliance with the FE targets. These stretches are:

a) *Upper stretch of the Worm Brook where the new Much Dewchurch STW is fully operational.*

b) *Bottom stretch of the River Arrow where improvements to Leominster (Worcester Road) STW and the sewerage system were completed. The final effluent from the STW is now discharged to the River Lugg where greater dilution is available.*

c) *Walford Brook where two small STWs have been abandoned and the sewage from the village is now pumped to Ross-on-Wye STW.*

There are a number of stretches where water quality fails to meet its standards but where there are no known point sources of pollution. These are stretches on the Kinnersley, Preston, Tippetts, Back, Hindwell, Pinsley, Curl and Clyro Brooks as well as on Letton Lakes and the River Dore. Further investigations and reassessment of the chemical and biological quality and the quantity of flow in these watercourses is required. The other, more significant failures are discussed in the Issues Section of this plan.

In addition the NRA also undertakes a programme of biological monitoring and a National classification system, currently under development, will allow rapid comparison between chemical and biological quality for a given river. Map 23 also identifies those stretches of river where biological quality is lower than that suggested by the chemical quality. This indicates either intermittent pollution or the effect of a chemical that is not routinely measured.

Biological and aesthetic assessments have also been carried out as part of the criteria for priority ranking of the STWs within the Dŵr Cymru Asset Management Programme (AMP2). This list identifies works where capital expenditure for improvements is necessary, such as at Weobley and Hereford, or where re-assessment is necessary to confirm the position on this list of Norton, Burghill, Kingstone & Madley, Presteigne, Kington, Luston & Yarpole, Ross-on-Wye and Tarington STWs.

It should be noted that the stretches of rivers formally designated under (a) the EC Freshwater Fish Directive (78/659 EEC) and (b) the EC Directive for Surface Waters Suitable for Abstraction for Public Supply (75/440/EEC) all comply with their water quality targets.

6.2 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 longterm 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 carefully considered the available surface and ground water resources within the Wye catchment and their degree of utilisation. The following Sections and Figures 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.

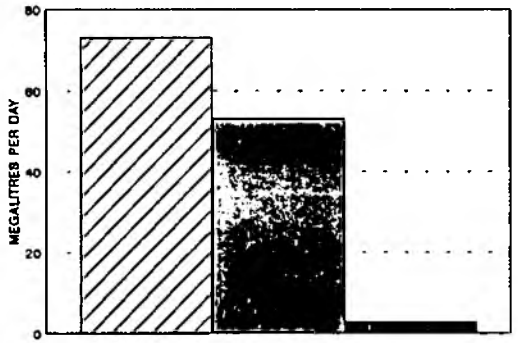
Local Perspective

A definitive state of the catchment cannot be fully assessed until a licensing policy is implemented or the ecological need for the river flow has been determined. However, the condition of the catchment's water resources has been assessed through the proportion of the available water which is used and not returned to the river. This has been calculated by comparing the amount of water lost because of abstraction with the typical river flow during a dry summer (the Q95). In assessing the water loss, abstractors are assumed to take water continually at the full licensed rate, and all groundwater abstractions were taken to have a direct effect upon surface flows. Thus, the results present a 'worst case' scenario.

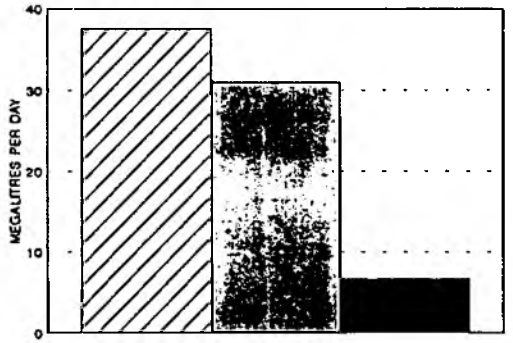
The size of the lower Wye catchment prevents this comparison being made at each local stretch of river, and it has been applied to the licensing subcatchments instead. In some subcatchments, the river receives flow from other subcatchments upstream. Thus, in calculating the remaining available water, the water loss from each upstream subcatchment is considered. Notably, subcatchments 15, 18 and 21 receive the upper Wye waters, so the loss of 9.5 Ml/d from the upper Wye has been included. This is a relatively minor quantity, a detailed explanation of which is given in the upper Wye Catchment Management Plan Consultation Document (July 1993).

Fig 3a Water Resource Usage
Sub Catchments 8 to 14

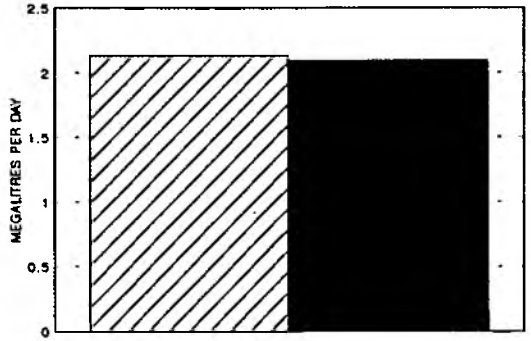
Lugg to Leominster
Subcatchment 8



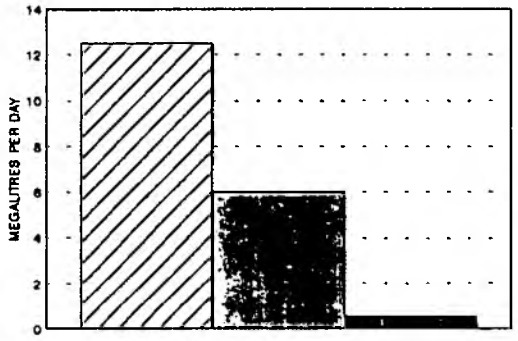
Arrow
Subcatchment 9



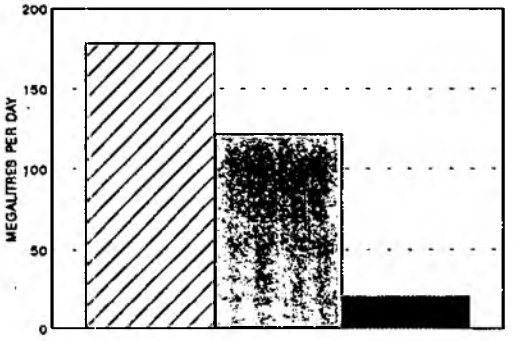
Pinsley
Subcatchment 10



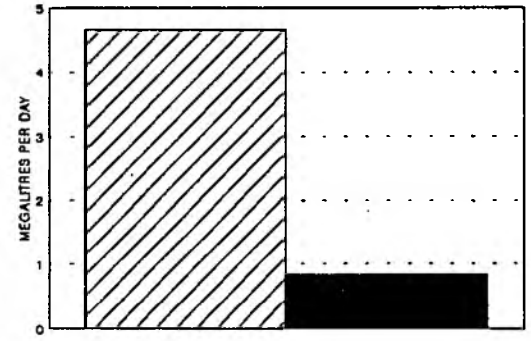
Kimbolton Area
Subcatchment 11



Lugg below Leominster
Subcatchment 12



Lodon
Subcatchment 13



Frome
Subcatchment 14

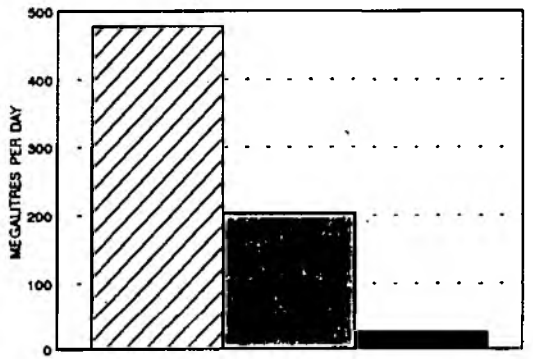
Natural Q95
(Typical Dry Summer Flow)

Estimated 1984 Lowest Flow
(if Available)

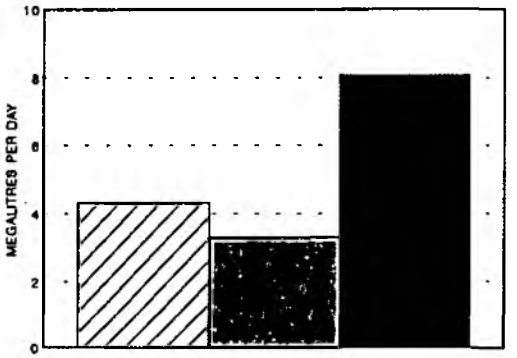
Estimated Summer Water Loss
from Abstraction

Fig 3b Water Resource Usage
Sub Catchments 15 to 21

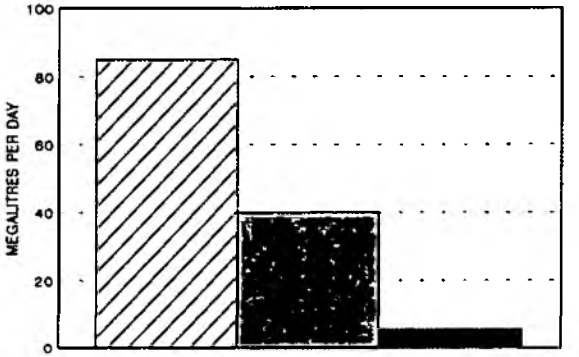
Wye Hay to Hereford
Subcatchment 15



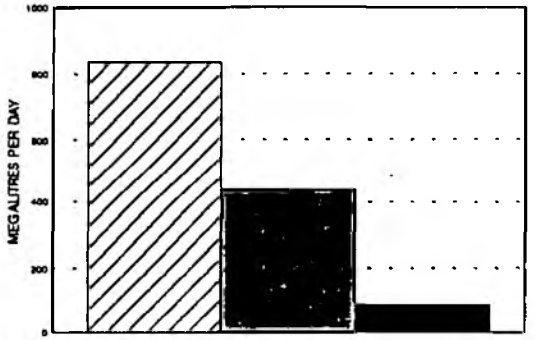
Yazor
Subcatchment 16



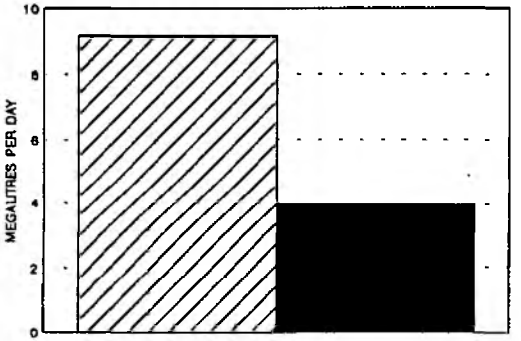
Monnow
Subcatchment 17



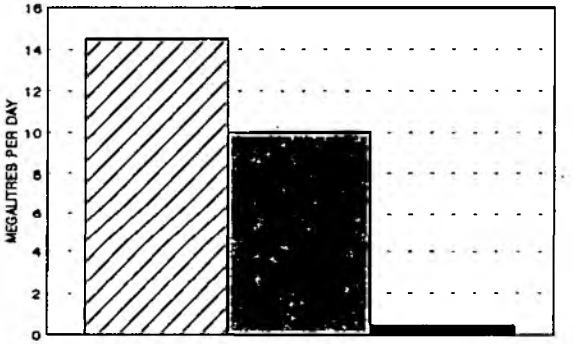
Wye Hereford to Monmouth
Subcatchment 18



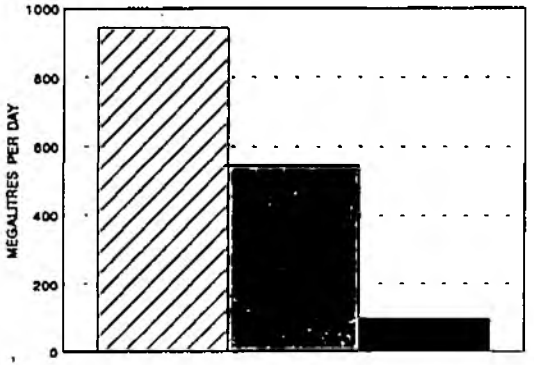
Garren
Subcatchment 19

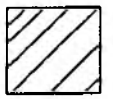


Trothy
Subcatchment 20



Wye Monmouth to Tidal Limit
Subcatchment 21





Natural Q95
(Typical Dry Summer Flow)

Estimated 1984 Lowest Flow
(if Available)

Estimated Summer Water Loss
from Abstraction

Figure 3 suggests that throughout most of the catchment, the available summer water resource is sufficient to meet the present demand of water users. In all but three subcatchments the water loss is only a small proportion (less than 20%) of the Q95. It is also substantially less than the lowest river flows measured in the 1984 "drought". The use of hands-off flow conditions and the encouragement of winter storage on farms has been successful in reducing summer water loss. This policy will continue to be applied to new licences where necessary. It is not known how much water must be left in the rivers to sustain the aquatic ecology. However, in the absence of more detailed knowledge, the above comparison does suggest that many of the rivers still have a healthy quantity of water flowing in them.

It must be remembered that the analysis does not investigate individual stretches of river. It is possible that, even though the subcatchment may have sufficient water resources, some river stretches within it may suffer much higher levels of water loss. An assessment of individual river stretches is required to gain a better knowledge of the state of the catchment. Naturally, this applies most to the subcatchments in which a higher percentage of available water is lost and also to the Kinnersley, Preston, Tippetts, Back and Letton Lake Brooks where there are unexplained failures of water quality which may indicate a lack of flow in the watercourses.

The three subcatchments in which the available summer water resource does not appear to easily accommodate the potential water loss are the Yazor, Pinsley and Garren subcatchments. It is unlikely that all the existing abstractors would take their full water allocation at once. However, the possible environmental impacts of the present level of abstraction in these subcatchments requires further investigation.

In the Pinsley and Yazor subcatchments the water in the streams is associated with that in the local aquifers - the Aymestry and Yazor Gravels respectively. In the Pinsley subcatchment, most of the abstraction is from the Pinsley Brook, and is not thought to greatly affect the aquifer resource. Indeed, the aquifer helps sustain flows in the Pinsley during dry periods reducing any impacts from abstraction. In the Yazor subcatchment, nearly all of the abstraction is from water stored within the aquifer. The location and timing of the interaction between the surface streams and the aquifer is vital in determining the effect of the groundwater abstraction upon the surface streams. The large abstractions may not necessarily affect the surface watercourses, and the NRA is currently investigating the aquifer to gain a fuller knowledge of the impact of the groundwater abstraction.

In addition to the abstractions from the main Wye catchment, there is a coastal zone which forms part of subcatchment 21. Consideration of this zone requires a different analysis from that of the main Wye catchment shown in Figure 3.

The coastal area consists of the tidal reaches of the Wye and several small brooks which do not contribute their flow to the main river. It also includes the Sudbrook Great Spring, an important fissure aquifer within the Chepstow Limestone Block. As with the Yazor Gravels, the Sudbrook Great Spring supports major abstractions, including a paper mill abstraction of 26 Ml/d and a public water supply abstraction of 11 Ml/d. Recent studies have identified the need to quantify the water resource and gain a better understanding of the interaction of the aquifer with the surface watercourses. The condition of the surface streams needs to be assessed as part of a local scale investigation specific to the aquifer.

6.3 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 also be 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 defence has been assessed by studying the flood history over the past 30 years and the known distribution of flooding.

The following sections illustrate the current state of the catchment and identify areas where there are felt to be deficiencies.

Local Perspective

Flood Defence

Flood alleviation schemes which have been constructed at Monmouth, Pontrilas, Peterchurch, Hampton Bishop, Leominster and Eardisland are regularly maintained to ensure satisfactory performance. Often lengths of main rivers are subject to periodic maintenance, which will be related to the appropriate standard of service based on the targets set by the Land Use Banding System.

The communities of Chepstow, Tintern, Brockweir, Lydbrook, Hereford, Ross-on-Wye, Skenfrith, Ewyas Harold, Eardisland and Kington are still subject to flooding. For a variety of reasons including cost, environmental consideration and general practicability, it has not been possible to undertake works to alleviate the problems. However, the situation is kept under review.

Throughout the Wye catchment flooding occurs from "ordinary" watercourses which are kept under review by the local authorities.

As with all catchments there are pressures to develop the floodplain and the Wye has particularly large floodplains as compared to other catchments.

Flood Warning

The NRA continually refines the flood warning procedures to ensure effective operation of its flood warning schemes.

Conservation

The lower Wye catchment is largely rural in character and is of considerable natural beauty. The River Wye and it's banks is designated a SSSI and the River Lugg is proposed as an SSSI from its headwaters to

the confluence with the Wye. Overall, therefore, the principal river corridors are of considerable nature conservation interest. Surveys of smaller watercourses have also indicated that they are of botanical interest. However, in some reaches there is evidence of degradation of the riverbank habitat.

Although there are several SSSIs and a number of rare and endangered species within the catchment, there are no agreed standards of service for NRA operations that may affect SSSIs and no guidelines for the management of such species.

The Wye is nationally important for the conservation of native crayfish, which are threatened by crayfish plague carried by the non-native, farmed signal crayfish.

The catchment contains a small number of scheduled Ancient Monuments and a large number of sites which are not formally notified and which are recorded in a manner which makes them less easily accessible to the NRA. Current procedures are therefore less effective in protecting these unscheduled sites.

Fisheries and Angling

Illegal Fishing

Illegal fishing by organised gangs using nets to catch salmon is a problem throughout the year in the lower Wye. There is also a trade in the illegally caught fish to hotels, restaurants, fishmongers and others.

Angling

The salmon rod catch has been below the long-term average on the Wye for the last 5 years. Catches of large, spring run fish have declined most notably. Possible causes of the decline in salmon stocks include changes in land use (e.g. agriculture and afforestation), acidification (in the upper Wye catchment), exploitation at sea and changes in sea temperature.

Brown trout stocks are variable with some river stretches supporting trout fishing whilst others are restocked by the fishery interests to improve angling. Overall, trout stocks have been subject to decline for many years. Possible causes of this include land use changes, predation and angling pressure.

The lower Wye and the lower Lugg are important coarse fisheries. Coarse fish catches are very variable year on year. However, there has been a marked decline in angling catches in the lower Lugg in recent years. This is thought to be due to a lack of suitable cover or refuge areas for coarse fish fry during periods of high river flows.

Reported catches of eels and elvers have declined in recent years and this may indicate a decline in stocks in the Wye.

Obstructions

There are no obstructions to the passage of salmon up the Wye. However, most of the River Monnow is inaccessible because of a weir at Osbaston, near Monmouth. Fish passes on the River Lugg enable salmon to migrate as far upstream as Aymestry (Lugg) and Eardisland on the River Arrow.

Monitoring

There is a three-pronged approach to collecting information on salmon and trout stocks. The distribution and abundance of juvenile fish has been assessed annually since 1985 using electro-fishing techniques at fixed sites. Information about adult salmon is collected through rod catch returns submitted by fishery owners and by the reading of salmon scales submitted by anglers. During the salmon spawning seasons NRA fisheries staff undertake redd counts.

Coarse fish stocks are monitored by surveys of anglers' catches, especially data from angling matches, and by electrofishing. Angling clubs have been slow to co-operate in providing catch data and electrofishing has proved rather inefficient in a river the size of the Lugg.

Recreation and Navigation

The lower Wye is used by a variety of boating interests including canoeists, rowers, rafters, jet-skiers, water-skiers and passenger cruisers.

There are some public launching sites with limited facilities such as steps or a slipway. The three rowing clubs have clubhouses and launching steps. Excessive growth of water crowfoot especially at Monmouth, can cause difficulties for rowing boats during regattas.

The Wye Valley Walk and other footpaths provide public access to river banks and there are some picnic sites.

The Wye Project examined the issues and made recommendations for public access to the river corridor, the use of the public right of navigation, the conflicts between users of the river and the impact of these users on conservation. The project identified a number of areas where the provision of facilities and control of river users could be improved.

APPENDIX 1: GLOSSARY OF TERMS AND UNITS USED

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'.

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.

AMMONIA

A chemical which is often found in water as the result of the discharge of sewage effluents. It is widely used 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 logs, wetland and so on.

AQUIFER

Most rocks contain holes, cracks and fissures. When these are interconnected they can store and allow water to pass through them. These rocks are known as 'aquifers' and the water contained within them as 'groundwater'.

BASE FLOWS

When rain falls onto the catchment, some water is absorbed by the soil instead of flowing directly to the river. The water reaches the river by slowly seeping through cracks and pores in the soil and rock. This is termed the 'base flow' and provides the flow in a river during a long dry spell.

BOD

An abbreviation for Biochemical Oxygen Demand. This is an estimate of the rate at which biological and chemical processes use up the available oxygen.

CATCHMENT

The area of land drainage to a defined point.

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.

CONSENT

A Discharge Consent is a statutory document issued by the NRA to indicate any limits and conditions on the discharge of an effluent to a river, lake, groundwater, estuary or coastal water.

Also a different statutory document issued by the NRA, known as a Land Drainage Consent, this authorises works to the beds or banks of a river which have been approved by the NRA.

COGAP

Short for Code of Good Agricultural Practice for the Protection of Water.

COPRA 1991

Short for Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991.

CUMECS

Short for cubic metres per second (m^3/sec).

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.

DISSOLVED OXYGEN

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

DRY WEATHER FLOW (DWF)

For sewage works, this is calculated by adding estimates of the domestic sewage discharge (which is the population multiplied by the per capital consumption) plus any industrial discharges plus infiltration in to the sewer.

For the river, the Dry Weather Flow is taken to be what is know as the 95-percentile flow (or Q95) which means the river is higher than Q95 for 95% percent of the time.

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.

EUTROPHIC/EUTROPHICATION

Terms which describe water which is rich in nutrients or the process of enrichment. At worse, such waters are sometimes beset with unsightly growths of algae.

FAUNA

Animal Life.

FLORA

Plant life.

GAME FISH

Salmonid fish, i.e. trout and salmon.

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.

HANDS-OFF FLOW (HOF)

This condition is often included in an abstraction licence which says that the abstraction must stop when the flow in the river drops below a certain flow (or level). This is known as the hands-off flow, because below this flow, the abstractor must keep his 'hands off ' the river.

LEACHATE

Liquid emanating from solid matter.

m^3/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.

MAIN RIVER

Also known as 'Statutory Main River'. It is a legal definition which defines particular rivers and streams which are defined on special maps. On the 'Main River', the NRA has powers to construct and maintain defences and to control the actions of others through byelaws and the issue of Consent. Any proposal that could interfere with the bed or banks or affect the flow of the river requires formal consent from the NRA.

Ml/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.

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'.

Q95

The 95-percentile flow is the flow which on average is exceeded for 95% of the time. It generally occurs in the summer, and can be regarded as a typical flow in a dry summer. It is not a drought flow.

RAW WATER

This is water in it's original state which has not yet undergone any treatment that may be needed for public water standards to be met.

REACH

A length of a river.

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'.

RIVER CORRIDOR

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

SALMONID FISH

Game fish, e.g. trout and salmon.

SSSI

Short for 'Site of Special Scientific Interest'.

STILLWATERS

Ponds, lakes and reservoirs which may or may not be fed by a river or stream.

SURFACE WATERS

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

TARGET CLASS

The quality class which a water should achieve by a specified date. The target may be expressed in terms of chemical or biological quality. Some rivers may already be within their Target Class, others will require improvement.

TILL

Till is a deposit of clay, sand and boulders which has been left on the land surface by the glaciers of the last ice age.

UNDERGROUND STRATA

Mainly a legal term used to signify geology under the surface soil layer. If groundwater exists, or if water is being discharged to the ground, the geology underneath the soil layer is known in the various Act of Parliament as 'underground strata'.

WETLAND

Wet areas of a river catchment where the plants, birds and insects and so on that live there are dependent on that 'wetness' for their survival.

95-PERCENTILE FLOW

See Q95 above.

95-PERCENTILE STANDARD

A level of water quality, usually a concentration, which must be achieved for at least 95 percent of the time.