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Environment Agency
Asiantaeth yr Amgylchedd

Water for life and livelihoods

River Basin Management Plan
Severn River Basin District

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The Environment Agency website holds the river basin management plans for England and Wales, and a range of other information about the environment, river basin management planning and the Water Framework Directive. www.environment-agency.gov.uk/wfd

You can search maps for information related to this plan by using 'What's In Your Backyard'. http://www.environment-agency.gov.uk/maps.

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This plan at a glance

This plan is about the pressures facing the water environment in the Severn River Basin District, and the actions that will address them. It has been prepared under the Water Framework Directive, and is the first of a series of six-year planning cycles.

By 2015, 17 per cent of surface waters (rivers, lakes, estuaries) in this river basin district are going to improve for at least one biological, chemical or physical element, measured as part of an assessment of status according to the Water Framework Directive. This includes an improvement of over **1860km** of river, in relation to fish, phosphate, specific pollutants and other elements.

34 per cent of surface waters will be at good or better ecological status/potential and 65 per cent of groundwater bodies will be at good status by 2015. In combination 35 per cent of all water bodies will be at good or better status by 2015. The Environment Agency wants to go further and achieve an additional two per cent improvement to surface waters across England and Wales by 2015.

The biological parts of how the water environment is assessed – the plant and animal communities – are key indicators. **At least 38 per cent of assessed surface waters will be at good or better biological status by 2015.**

The Severn River Basin District has a very special environment - from the uplands of Wales, down through the valleys and rolling hills, to the lowlands. It includes Areas of Outstanding Natural Beauty, a National Park and other features of national and international importance. Water supports these landscapes and their wildlife and it is vital to the livelihoods of those who live and work here. There has been great progress in protecting these natural assets and cleaning up many of the water environment problems that people have created in the past. However, a range of challenges still remain.

The key issues include:

- diffuse pollution from agriculture and other rural activities;
- point source pollution from water industry sewage works;
- physical modification of water bodies; and
- diffuse pollution from urban sources.

At present, because of these pressures, and the higher environmental standards required by the Water Framework Directive, only 29 per cent of surface waters are currently classified as good or better ecological status. 37 per cent of assessed surface water bodies are at good biological status now, although we expect this to change to 32 per cent when we have assessed all water bodies.

In order to meet these targets, it is important for everyone to play their part now and in the future. River basin management is an opportunity for this generation – for people and organisations to work together to improve the quality of every aspect of the water environment – to create an environment we are all proud of and can enjoy.

1 About this plan

This plan focuses on the protection, improvement and sustainable use of the water environment. Many organisations and individuals help to protect and improve the water environment for the benefit of people and wildlife. River basin management is the approach the Environment Agency is using to ensure our combined efforts achieve the improvement needed in the Severn River Basin District.

River basin management is a continuous process of planning and delivery. The Water Framework Directive introduces a formal series of 6 year cycles. The first cycle will end in 2015 when, following further planning and consultation, this plan will be updated and reissued.

The Severn River Basin District Liaison Panel has been central to helping us manage this process. The panel includes representatives of businesses, planning authorities, environmental organisations, consumers, navigation, fishing and recreation bodies and central, regional and local government, all with key roles to play in implementing this plan.

The Environment Agency has also worked extensively with local stakeholders to identify the actions needed to address the main pressures on the water environment.

This plan has been prepared under the Water Framework Directive, which requires all countries throughout the European Union to manage the water environment to consistent standards. Each country has to:

- prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- aim to achieve at least good status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027;
- meet the requirements of Water Framework Directive Protected Areas;
- promote sustainable use of water as a natural resource;
- conserve habitats and species that depend directly on water;
- progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants;
- contribute to mitigating the effects of floods and droughts.

The plan describes the river basin district, and the pressures that the water environment faces. It shows what this means for the current state of the water environment, and what actions will be taken to address the pressures. It sets out what improvements are possible by 2015 and how the actions will make a difference to the local environment – the catchments, the estuaries and the groundwater.

Looking towards implementation, the plan highlights the programme of investigations to be undertaken. This will identify more actions, particularly those associated with diffuse pollution, for delivery during the first cycle. New national measures, made available by government, will also lead to additional improvements. At local level, the Environment Agency will be working closely with a wide variety of organisations and individuals, not only to deliver the commitments contained in the plan, but wherever possible to expand upon them for the benefit of the water environment.

Strategic Environmental Assessment

A Strategic Environmental Assessment of the draft plan was completed to review the effects of the proposals on the wider environment. The assessment enabled us to make sure that this plan represents the most sustainable way of managing the water environment.
The Post Adoption Statement and accompanying Statement of Environmental Particulars is available at www.environment-agency.gov.uk/wfd.

Habitats Regulations Assessment

A Habitats Regulations Assessment of this plan has been carried out to consider whether it is likely to have a significant effect on any Natura 2000 sites. The assessment was undertaken by the Environment Agency, in consultation with Natural England and the Countryside Council for Wales.

The assessment concluded that the River Basin Management Plan is unlikely to have any significant negative effects on any Natura 2000 sites. The Plan itself does not require further assessment under the Habitats Regulations. This conclusion is reliant on the fact that before any measures in the Plan are implemented they must be subject to the requirements of the Habitats Regulations. Any plans, project or permissions required to implement the measures must undergo an appropriate assessment if they are likely to have a significant effect.
A copy of the Habitats Regulations Assessment of this plan is available at www.environment-agency.gov.uk/wfd .

Impact Assessment

An impact assessment of this plan has been completed. It looks at the costs of a reference case, which includes existing actions and new actions required by existing obligations, and the incremental costs and benefits of implementing the additional new actions required by this plan. The impact assessment also provides a forward look to the costs and benefits of potential action in future cycles (2015 to 2021 and 2021 to 2027).
A copy of the impact assessment is available at www.environment-agency.gov.uk/wfd.

2 About the Severn River Basin District

The Severn River Basin District is home to over 5.3 million people and covers an area of 21,590km^2, with about one third of the district in Wales. The River Severn is the longest river in Britain and flows into the Severn Estuary. As well as the River Severn and its main tributaries the district includes the rivers of South East Wales, including the Wye, Usk and Taff, and those of the counties of Avon and Somerset that drain into the Severn Estuary. Figure 1 shows the river basin district.

The district has several major urban centres, including Bristol, Cardiff and Coventry. However, much of the river basin district is rural in character, particularly within the Welsh Borders. About 80% of the land is managed for agriculture and forestry. The key economic sectors in the district are business services, wholesale and distribution, public administration and health. Transport equipment and metals manufacturing are also important industrial sectors.

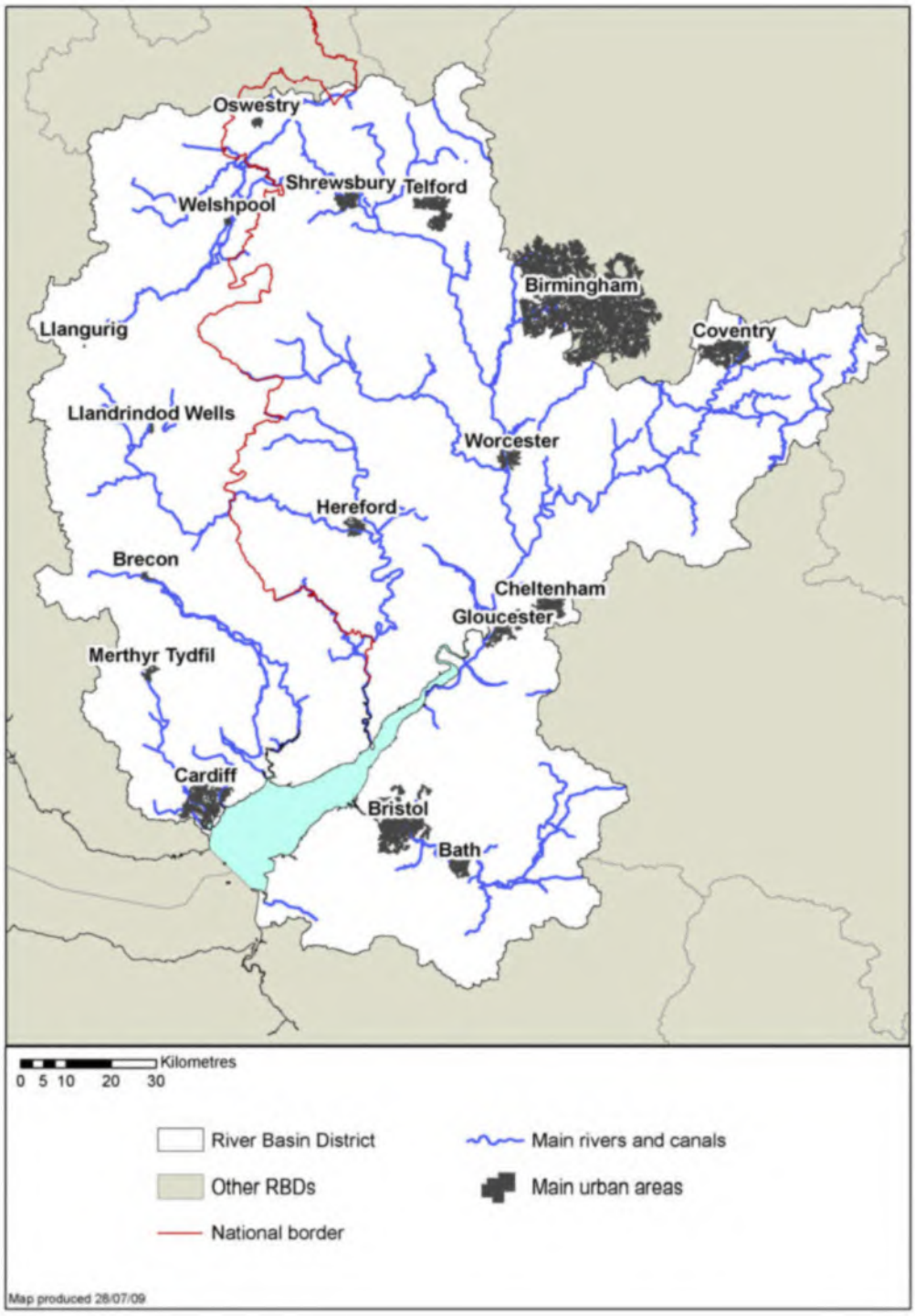
The river basin district contains important habitat and wildlife areas, including 28 Special Areas of Conservation and five Special Protection Areas with features that depend on water. The Severn Estuary and its surrounding area are afforded a very high level of protection under European wildlife law for its bird populations, habitats and migratory fish species. The area surrounding the estuary is also designated as a wetland of national and international importance.

Past and present activities within the river basin district put pressures on the water environment. Rural land management is a source of diffuse pollution from nutrients, sediments and pesticides. Sewage treatment works and other intermittent discharges from the sewerage network also increase nutrient levels whilst these and other point sources increase the pressure from ammonia and dangerous substances. Run-off and drainage from urban areas can contain a range of pollutants whilst historic mining activity has left a legacy of metal and other pollution.

Abstractions from rivers and groundwaters for public water supply and to a lesser extent for industry and agriculture impact on river flows and groundwater levels. Many rivers and lakes have been subject to some form of physical modification which has had negative impacts on habitats and wildlife.

A great deal is already being done to protect and improve the water environment. However, it will take more time, effort and resources to deal with the pressures that have significantly altered and damaged the environment over the last few hundred years. The natural environment of the Severn River Basin District is an attraction for the people who live and work there plus the many tourists who visit – this increases the pressure.

Figure 1 **Map of the Severn River Basin District**



Pressures on the water environment

There are a number of major challenges.

High population densities and transport networks put pressure on the water environment. **Discharges from sewage works can impact on water quality** or the enjoyment of it, and water companies will implement a major programme of work to address this issue.

Government has identified a need for new homes in England and Wales. In response to this, the recent relevant housing growth estimates[1] envisage 420,000 new dwellings and

associated infrastructure to be built by 2026. Managed well, this **growth and regeneration will be an opportunity** to make improvements to the water environment in a way that enhances people's quality of life.

The way land is managed has given rise to complex pollution issues. This **diffuse pollution is a major pressure** on the water environment. It comes from both urban and rural areas. In rural areas, further improvements are needed to farming practices, to protect water quality and allow wildlife to thrive.

Rivers and estuaries have been highly modified and engineered to facilitate development, flood and coastal risk management or navigation. **Physical modification** needs to be addressed in order to achieve more natural functioning of wetland ecosystems, and protect fish and their habitats into the future.

There are also **concerns over maintaining the water resources** available for people and the environment. This river basin district relies on groundwater for the majority of its public water supply – yet the aquifers also need to provide flow for rivers and wetlands. It is therefore essential to safeguard supplies and the environment by protecting groundwater from pollution, and managing the water resource.

Natural forces such as sea level rise, coupled with climate change, can pose a threat to people, property and coastal habitats.

All these challenges relate to a range of specific pressures that need to be dealt with in this river basin district. The most significant of these are:

- **abstraction and other artificial flow regulation** – problems related to taking water from rivers, lakes and groundwater;
- **non-native species** - invasive non-native species are plants and animals that have deliberately or accidentally been introduced outside their natural range, and by spreading quickly threaten native wildlife and can cause economic damage;
- **nitrate** – a nutrient found in fertilisers used in agriculture, and in sewage effluent;
- **pesticides** – chemical and biological products used to kill or control pests;
- **phosphate** – a nutrient in sewage and fertiliser, which can cause too much algae to grow in rivers when in excess quantities;
- **physical modification** – changes to the structure of water bodies, such as for flood defence;
- **sediment** – undissolved particles floating on top or suspended within water, for example those caused by increased rates of soil erosion from land based activities. Sedimentation can smother river life and spread pollutants from the land into the water environment;
- **urban and transport pollution** – a range of pollutants related to urban areas and the transport network.

[1] Comprising draft figures from West Midlands and South West Regional Spatial Strategies and Wales Spatial Plan: West Midlands - around 195,000; South West – around 196,000; Wales – 200,000 – 240,000 across Wales with 22% total growth in SE Wales and 18% growth in Mid Wales (figures will be adjusted when confirmed)

3 Water bodies and how they are classified

In the context of the Water Framework Directive, the water environment includes rivers, lakes, estuaries, groundwater and coastal waters out to one nautical mile. For the purposes of river basin management, these waters are divided into units called water bodies, as summarised in Table 1. In addition, this plan aims to protect wetlands that depend on groundwater.

Table 1 **Water body numbers in the Severn River Basin District**

	Water body types					
	Rivers and canals*	Lakes and reservoirs**	Estuaries (transitional)	Coastal	Groundwater	**Total**
Natural water bodies	619	13	1	0	40	**673**
Artificial water bodies	78	13	0	0	-	**91**
Heavily modified water bodies	94	49	5	0	-	**148**
Total	**791**	**75**	**6**	**0**	**40**	**912**

* The rivers and canals category also includes surface water transfers (SWTs). The total length of river covered by the Directive in this river basin district is 7512 kilometres.
** The lake and reservoir category includes 4 ditches that are Sites of Special Scientific Interest.

The Water Framework Directive sets a target of aiming to achieve at least 'good status' in all water bodies by 2015. However, provided that certain conditions are satisfied, in some cases the achievement of good status may be delayed until 2021 or 2027.

Surface waters

For surface waters, good status is a statement of 'overall status', and has an ecological and a chemical component. Good ecological status is measured on the scale high, good, moderate, poor and bad. Chemical status is measured as good or fail.

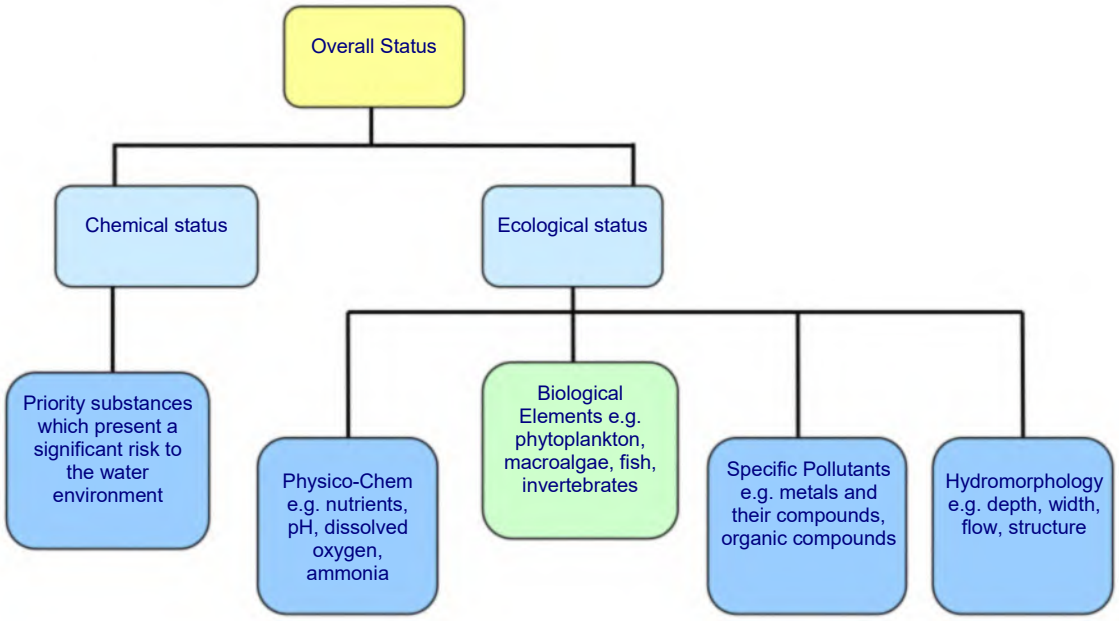
Good ecological status applies to natural water bodies, and is defined as a slight variation from undisturbed natural conditions. Figure 2 below shows how status is determined for surface waters. Each component has several different elements. These are measured against specific standards and targets developed by the Water Framework Directive UK Technical Advisory Group (UKTAG) and the European Union.

To understand the underlying reasons for water body status it is helpful to break down the results. Ecological status could be driven by the presence of a single chemical substance slightly exceeding the required standard. As well as ecological status this plan highlights the results of biological assessments (referred to as biological status) as these are the main indicators of environmental health for surface waters.

Monitoring and components of overall status

The monitoring programme for river basin management is based on a far wider range of assessments than were carried out in the past. A range of elements are measured in each water body, and a classification is produced based on a 'one out, all out' principle. This uses the poorest individual element result to set the overall classification.

Figure 2 **The components of overall status for surface water bodies**



The classification of water bodies will improve as new monitoring data are collected and better methods of assessment are developed. Future monitoring will help show where environmental objectives are already being met and where more needs to be done to improve the water environment. Monitoring will also take account of the spread of invasive non-native species.

The Water Framework Directive recognises the key role that water resources and habitats play in supporting healthy aquatic ecosystems. It requires that water bodies are managed to protect or improve hydromorphological conditions. Hydromorphology is a term that covers the flow of water in a water body and its physical form. The term encompasses both hydrological and geomorphological characteristics that help support a healthy ecology in rivers, lakes, estuaries and coastal waters.

Artificial and heavily modified waters

Some surface water bodies are designated as ‘artificial’ or ‘heavily modified’. This is because they may have been created or modified for a particular use such as water supply, flood protection, navigation or urban infrastructure.

By definition, artificial and heavily modified water bodies are not able to achieve natural conditions. Instead the classification and objectives for these water bodies, and the biology they represent, are measured against ‘ecological potential’ rather than status.

For an artificial or heavily modified water body to achieve good ecological potential, the chemistry of the water body must be good. In addition, there must be no structural or physical changes that could impact upon biology other than those that are essential to maintain the valid uses of the water body. All non essential modifications have had to be removed or changed so that there is potential for biology to be as close as possible to that of a similar natural water body. Often though, the biology will still be impacted and biological status of the water body may be less than good.

Ecological potential is also measured on the scale high, good, moderate, poor and bad. The chemical status of these water bodies is measured in the same way as natural water bodies.

Groundwater

For groundwater, good status has a quantitative and a chemical component. Together these provide a single final classification: good or poor status.

A ground water body will be classified as having poor quantitative status in the following circumstances; where low ground water levels are responsible for an adverse impact on rivers and wetlands normally reliant on ground water; where abstraction of ground water has lead to saline intrusion; where it is possible that the amount of groundwater abstracted will not be replaced each year by rainfall.

Poor chemical status occurs if there is widespread diffuse pollution within the groundwater body, the quality of the groundwater is having an adverse impact on wetlands or surface waters, where there is saline intrusion due to over abstraction, or the quality of water used for potable supply is deteriorating significantly. There are other objectives for groundwater quality in addition to meeting good status. These are the requirements to prevent or limit the input of pollutants to groundwater and to implement measures to reverse significant and sustained rising trends in pollutants in groundwater.

Protected areas

Some areas require special protection under European legislation.

The Water Framework Directive brings together the planning processes of a range of other European Directives. These Directives, listed in table 4, establish protected areas to manage water, nutrients, chemicals, economically significant species, and wildlife – and have been brought in line with the planning timescales of the Water Framework Directive. Meeting their requirements will also help achieve Water Framework Directive objectives.

Table 2 **Other Directives and their Water Framework Directive protected areas**

Directive	Protected area	Number of protected areas
Bathing Waters	Recreational waters	4
Birds	Natura 2000 sites (water dependent special protection areas)	5
Drinking Water	Drinking water protected areas	124
Freshwater Fish	Waters for the protection of economically significant aquatic species	906
Shellfish Waters	Waters for the protection of economically significant aquatic species	0
Habitats	Natura 2000 sites (water dependent special areas of conservation)	28
Nitrates	Nitrate Vulnerable Zones	44% land area of RBD
Urban Waste Water Treatment	Sensitive areas	25

Achieving the objectives of these protected areas is a priority for action in this plan. Annex D sets out their objectives and the actions required for Natura 2000 sites and the new Drinking Water Protected Areas required under the Directive. Annex C describes the actions required for all protected areas. In addition, there are two new daughter Directives (Groundwater and Environmental Quality Standards) that will be used to implement specific parts of the Water Framework Directive.

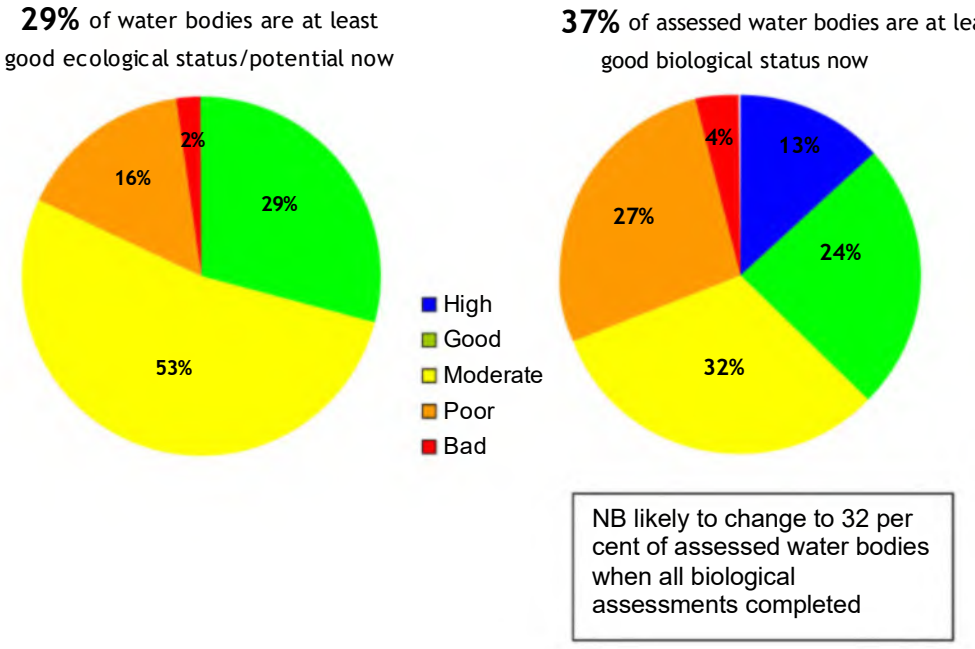
4 The state of the water environment now

The current status classification is the baseline from which improvements and the 'no deterioration in status' objective of the Water Framework Directive is measured. The current status classification has been updated since the draft plan. It is different to that presented in the draft plan because:

- the quality of assessments has been improved by refining classification methods;
- the accuracy of individual assessment tools has improved, especially for fish;
- a number of water bodies that were identified as potentially being heavily modified have not been designated as such in this plan because monitoring shows that they currently achieve good status;
- improvements from the water companies' Periodic Review 2004 have now been factored in;
- additional rivers and lakes have been classified that were previously unassessed.

29 per cent of surface waters are at good or better ecological status. 37 per cent of assessed surface waters are at good or better biological status now. This is shown in Figure 3.

Figure 3 **Ecological status/potential and biological status of surface water bodies now**



Statistics for both good ecological status or potential and biological status are influenced by the relative number of artificial and heavily modified waters and their classification. In the Severn River Basin District, 35 per cent of 239 artificial and heavily modified water bodies are currently classified as at good ecological potential, compared to 27 per cent of 633 natural surface water bodies having good ecological status. As discussed in the previous section the higher percentage of poor and bad water bodies assessed for biological status compared to ecological status/potential reflects the fact that even where all mitigation measures are in place to allow an artificial/heavily modified water body to be classified as good, the use of the water body may mean that biology is still impacted. As biological monitoring continues it is likely that the percentage of water bodies at good or better biological status will change from 37 to 32 per cent. This is explained further in the section on Biological status and monitoring.

For groundwater bodies, currently 75 per cent are at good quantitative status. 78 per cent are at good chemical status.

Reasons for not achieving good status or potential

This section takes a closer look at rivers. The majority of management actions in the first river basin management cycle will be applied to river water. Reasons for not achieving good status or potential in other surface waters are being developed. The first course of action for lakes, coasts and estuaries is to develop a better understanding of the issues.

To identify what needs to be done to improve the environment, the reasons for not achieving good status need to be understood. The main reasons most frequently identified by Environment Agency staff using monitoring data and their knowledge and who have experience of individual water bodies are shown in Table 3. Each relates to one or more pressures, which in turn impact on elements of the classification.

The reasons for failure include diffuse source pollution from agriculture, point source discharges from water industry sewage works and a range of reasons due to physical modifications. The actions in this plan will increase the number of waters achieving good status or potential, for example through changes to land management practices and significant investment in improving discharges from sewage works. Even if good status is not completely achieved, they will also lead to improvements to the key elements impacted.

Table 3 **Main reasons (where known) for not achieving good ecological status or potential**

Reason for failure	Key elements impacted
Diffuse source agricultural	ammonia (phys-chem), dissolved inorganic nitrogen, dissolved oxygen, fish, invertebrates, macrophytes, phosphate, phytobenthos, phytoplankton, total phosphorus
Point source water industry sewage works	ammonia, phosphate, dissolved oxygen
Physical modification barriers to fish migration	fish
Physical modification urbanisation	fish, invertebrates, mitigation measures assessment
Physical modification land drainage	dissolved oxygen, fish, mitigation measures assessment
Physical modification flood protection	fish, invertebrates, mitigation measures assessment
Physical modification water storage and supply (including for power generation)	fish, mitigation measures assessment
Diffuse source mixed urban run-off	dissolved oxygen, invertebrates, phosphate, benzo (ghi) perelyene and indeno (123-cd) pyrene.

It is important to note that because classification involves a wider range of elements than previous monitoring schemes, and many of the key pressures are complex and occur in combination, we often do not know the reason for a failure. For many water bodies either the reasons for failure are unknown, or it is uncertain whether there is a failure or whether pressures really are causing an impact. In these cases we will need to investigate, as discussed on page 35.

For groundwater quality, the main reasons for poor status are high or rising nitrate concentrations, with some failures for pesticides and other chemicals. The main reason for poor quantitative status in groundwater is that abstraction levels – mainly for drinking water –

exceed the rate at which aquifers recharge. Unsustainable abstraction from groundwater is an important issue for the river basin district. The majority of the 25 per cent of groundwater bodies at poor quantitative status are the principal aquifers used for drinking water. The plan identifies a range of actions to prevent deterioration and improve groundwater elements, as well as investigations to improve the confidence in groundwater classification.

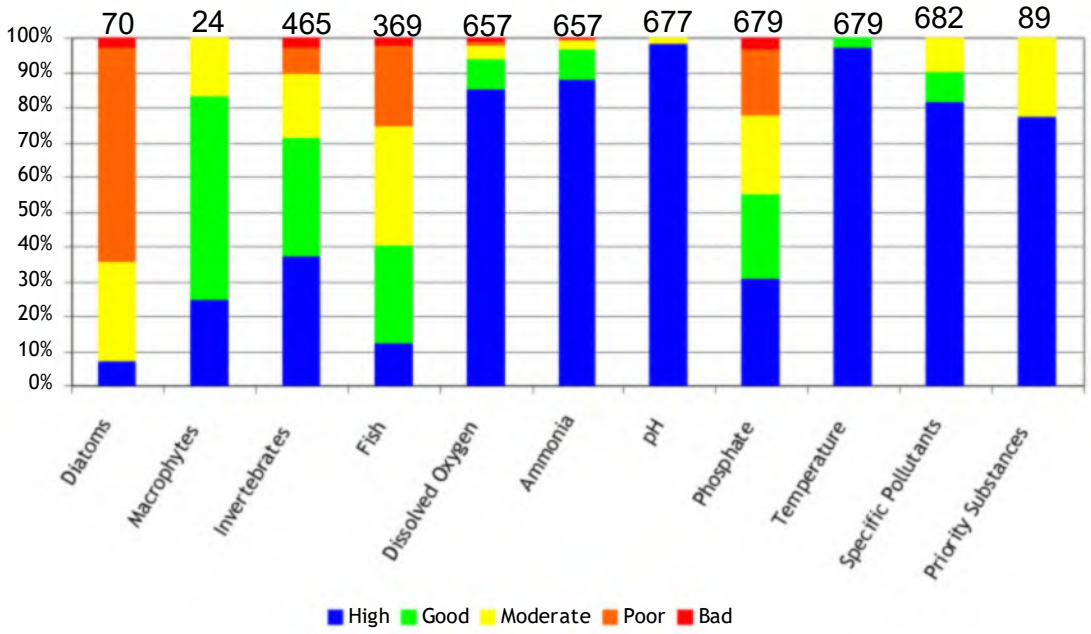
Reduced flow due to unsustainable abstraction was also identified as a reason for not achieving good status in some rivers, lakes and estuaries. The worst affected water bodies are being investigated and remedied through the Environment Agency's Restoring Sustainable Abstraction Programme. Through Catchment Abstraction Management Strategies we will manage resources in a consistent way, balancing the needs of water users with those of the environment.

Classification of individual elements

For rivers, which comprise the majority of water bodies in the river basin district, the main elements indicating that good ecological status or potential is not being achieved are fish, phosphate and invertebrates. This is shown in Figure 4.

Figure 4 **Proportion of assessed river water bodies in each status class, by element**

(numbers above bars indicate total number of water bodies assessed for each element)



The results for macrophytes (aquatic plants) and diatoms (microscopic algae) are from relatively fewer water body assessments based on a new (2007) risk based monitoring programme. However, as would be expected, the results for these elements confirm the presence of pressures on biology in many of the assessed water bodies.

Excessive sediment is a possible cause for biology not being good in a number of water bodies. At present however, standards are not available to assess the impact of sedimentation. The Environment Agency will be developing techniques for this as one of the actions in this plan.

Biological status and monitoring

New monitoring programmes for the Water Framework Directive since 2007 focus on locations where the Environment Agency suspects there may be a problem caused by pressures on the water environment. The Environment Agency does not yet have biological assessments for all relevant water bodies. In this river basin district 68 per cent of surface water bodies have an assessment for at least one biological element. The number of water bodies covered by biological monitoring is set to increase over the next three years. As new information becomes available it is likely that some water bodies currently labelled as good biological status will be shown to have a lower quality.

For instance, from the chemical monitoring the Environment Agency performs it is now clear that there is a link between high levels of phosphate in surface waters and biological failures in the main river type (lowland alkaline rivers). The assessment of reasons for failure that we have started to undertake shows that across England and Wales 22 per cent of river water bodies are failing to achieve good status/potential because of excessive levels of phosphate. In this river basin district phosphate results show that it is likely that the percentage of water bodies at good or better biological status will change from 37 to 32 per cent when additional water bodies are assessed for diatoms and/or macrophytes. This same analysis points to discharges from sewage treatment works and releases from agriculture being responsible for the majority of this. Rather than wait for the results of more biological assessments, we need to ensure corrective action is started in the first plan cycle.

Through Ofwat's determination of the water industry periodic review of investment, the water industry will continue their investment programme targeted at addressing their contribution to phosphate pollution. It is important that agriculture also makes a contribution in the first cycle improvements.

The Environment Agency is now working with the main farming groups to understand better the main ways in which phosphate from land enters and is transported in water bodies. Farming groups have agreed to use this information to encourage individual farmers to take action to reduce their contribution to water pollution. We will trial this new approach in the Anglian River Basin District and through the Campaign for Farmed Environment. We will also look at what the advice and incentives available through agri-environment schemes and the England Catchment Sensitive Farming Delivery Initiative and Glas Tir, in Wales, can do to reduce phosphate pollution of water and wetlands.

In parallel with this approach, the Environment Agency will continue to develop work on regulatory measures, such as piloting Water Protection Zones (WPZs) in England, so that if voluntary approaches are shown not to work in a particular area, or where higher environmental standards are needed in for example protected areas, we are ready and able to ensure progress is made before 2015. The work to identify the ways in which phosphate enters water bodies and the means of reducing this will inform the measures that might be applied in WPZs. WPZs will only be effective if the means of control have been clearly identified.

5 Actions to improve the water environment by 2015

The following gives an overview of the key contributions from sectors and organisations that the Environment Agency will work with to implement this plan.

These actions are summarised versions of the full programme of actions that can be found in Annex C.

The lead organisation for each action is given in brackets. Note that many actions will involve more than one sector and need to be implemented in partnership. Actions in Annex C are therefore duplicated across the relevant sectors. Sectors are encouraged to put further actions forward during the implementation of this plan.

After the action tables there are sections on:

All sectors

All sectors must comply with the range of existing regulations, codes of practice and controls on the use of certain substances.

Investigations will be carried out by the Environment Agency and partner organisations where appropriate, to establish the extent and source of pressures and to identify any further actions that are technically feasible and not disproportionately costly. These actions will be carried out during this or future management cycles.

Investigations and actions will also be carried out in drinking water protected areas (where necessary focused in safeguard zones) to reduce the risk of deterioration in raw water quality and therefore reduce the need for additional treatment to meet drinking water standards.

A small number of candidate Water Protection Zones (WPZs) will be promoted in England in the first plan cycle, where there is clear evidence that voluntary mechanisms such as the England Catchment Sensitive Farming Delivery Initiative and Pollution Prevention Campaigns are not sufficient by themselves to achieve the required environmental objectives. The candidate Water Protection Zones will be used to establish the usefulness of the concept, but as we have said earlier in describing the results of the biological monitoring, this in turn relies on a clear understanding of the practices causing problems and the techniques to avoid them.

Agriculture and rural land management

This sector has a big role in looking after and improving the quality of the rural environment. About eighty per cent of the land is managed for agriculture and forestry in the Severn River Basin District.

A combination of incentive, advisory and regulatory measures have been in place for a number of years to help farmers and other land managers protect the environment. For instance, the Code of Good Agricultural Practice, Soil and Water Guidelines; agri-environment schemes are available on both sides of the border (Environmental Stewardship, Tir Gofal) and incentives are available from Forestry Commission and Forestry Commission Wales for woodland management and planting. Wise stewardship of resources such as soil, nutrients, water and energy helps to cut costs while maintaining or improving the productivity of land and livestock.

Nevertheless, the way in which land is managed is still having a negative impact on natural resources and further action is needed to address diffuse pollution and other key pressures in rural areas. Government will consider the introduction of further restrictions of activities and restrictions on chemicals where there is evidence that voluntary actions failed to deliver.

Example actions
Continue Cross-Compliance – to help farmers comply with a range of Directives to reduce pollution from agriculture at farms receiving subsidies (all land managers). • Across the river basin district
Encourage uptake of **Voluntary Initiative best practice on pesticide use** by land managers within the agricultural and amenity sectors (Voluntary Initiative, Environment Agency) • Across the river basin district
Maintain a nationally funded advice-led partnership under the England **Catchment Sensitive Farming** Delivery Initiative (Natural England, Environment Agency) to reduce diffuse water pollution from agriculture in priority areas. • North Somerset Moors, West Midlands Meres and Mosses, Rivers Wye, Lugg, Teme, Tern (and Roden), and Leadon
Maintain and fund Environment Agency Wales **Catchment Initiatives** to reduce diffuse water pollution in priority areas • Wye, Usk and Cain catchments
Establish and enforce **Nitrate Vulnerable Zones** in catchments at high risk from nitrate pollution (Environment Agency) to reduce the amount of nitrate and other pollutants entering water from farmland. • Across the river basin district
Form **Strategic Partnerships** with the England Catchment Sensitive Farming Delivery Initiative and other advice led partnership work (Natural England, Environment Agency, Severn Trent Water) to provide further funding to reduce diffuse water pollution from agriculture. • Upper Avon (including River Leam)
Work with Natural England to target **Catchment Sensitive Farming type activities and agri-environment schemes** (Natural England, Environment Agency) to ensure adoption of best farming practice and reduce diffuse pollution from agriculture. • Priority water bodies as specified in Annex C
Designate and enforce **Water Protection Zones** and apply appropriate measures to control high risk activities (Environment Agency, Department for the Environment, Food and Rural Affairs (Defra). The Zones will provide a regulatory tool to control diffuse pollution to water or physical pressures in high risk areas where existing mechanisms will not meet Water Framework Directive objectives. • Initially around eight Zones in locations to be decided across England. Candidate pilot in River Lugg
Develop a detailed 5-year Catchment Action Plan for Water Safeguard Zones including proactive implementation of the **Metaldehyde Steering Group** 'Get Pelletwise' measures • Warwickshire Avon, Shropshire Middle Severn, Severn Uplands, Worcestershire Middle Severn
Encourage farmers and industry to **build storage reservoirs** to support or replace summer irrigation (Environment Agency) • Across the river basin district

Example actions
Provide **guidance and training in irrigation best practice** including auditing, benchmarking and scheduling (UK Irrigation Association, Environment Agency) • Across the river basin district
Provide **co-ordinated advice to farmers** on complying with agricultural and environmental regulations through the Green Futures initiative (West Midlands Rural Hubs and partners) • West Midlands
Reduce local impacts of acidification by continuing a long term programme of lime dosing and investigations (Environment Agency) • Severn Uplands
Reduce physical modification pressure by encouraging better application of guidelines for managing drainage channels with biodiversity in mind and educating as to best practice (Internal Drainage Boards, Environment Agency) • Across the river basin district
Reduce diffuse pollution and overland flood flows by undertaking woodland planting, including **wet and dry woodland**, and hedgerow restoration work (Forestry Commission, Forestry Commission Wales) • Across the river basin district
Reduce the impact from sheep dip by education and working with farmers to encourage best practice in use of sheep dip and other pesticides (Environment Agency) • Wye, Usk, Severn Uplands

Angling and conservation

The angling and conservation sector has a large role to play in delivering local 'on the ground' improvements to the water environment as well as working to establish new mechanisms. It engages communities and individuals, building on their skills and experience and actively involves them in making these improvements. Angling is a popular past time that can provide local intelligence on environmental quality.

Many environmental organisations can influence environmental quality through the land they own or manage. Riparian owners have specific responsibility for the management of their watercourses so their support, involvement and investment in implementing the actions is crucial.

Example actions
Living Landscapes Projects to create wetlands, improve and restore river habitat, remove barriers to fish migration and control and eradicate invasive species (Wildlife Trusts) • Across the river basin district
Develop **angling participation** initiatives (South East Wales Rivers Trust) • South East Valleys
Develop and deliver a programme of **improvements to weirs** which are the most significant physical barriers to fish passage (Environment Agency) • Across the river basin district
Control and eradication of Giant Hogweed and the identification and treatment of Japanese Knotweed and Himalayan Balsam (Wye and Usk Foundation) • Wye and Usk catchments
Mitigate the spread and impact of non-native invasive crayfish through the **South West White Clawed Crayfish Conservation Project** (Bristol Zoo Gardens) • Bristol Avon and North Somerset Streams
Investigate feasibility of **re-aligning flood defences** at Slimbridge on the Severn Estuary to create inter-tidal and freshwater habitat (Environment Agency) • Severn Estuary

Central government

Government will continue to influence the development of European legislation to help bring forward initiatives that protect and improve the water environment, and those that are

technically feasible and not disproportionately costly. Defra and the Welsh Assembly Government are considering further policy options to help improve ambition in achieving objectives in this first plan cycle. These include controls on phosphate in detergents, tackling mis-connections, general binding rules, code of practice on septic tanks and options to increase the use of sustainable drainage systems to reduce risks of flooding and pollution of surface waters during periods of high rainfall.

The Environment Agency, Forestry Commission, Countryside Council for Wales, Natural England and the Marine and Fisheries Agency (to become the Marine Management Organisation), (the Welsh Assembly Government will assume Responsibilities under the Marine and Coastal Access Act when implemented) are the key government agencies for this plan. The agencies will work together on relevant actions.

Example actions
Enhanced capital allowance scheme is a government incentive giving tax relief for the purchase of water efficient plant and machinery to businesses who pay income or corporation tax. See www.eca-water.gov.uk (Defra/Government) • England
Establish **National Invasive Non-Native Species Forums** to plan prioritise and coordinate action • England and Wales
Promote Code for Sustainable Homes and **Building Research Establishment Environmental Assessment Method (BREEAM)** standards in national planning policy in Wales (Local Authorities, Welsh Assembly Government) • Wye, Usk, South East Valleys
Adopt the Maintenance Dredging Protocol (Defra, Ports and Harbour Authorities) to ensure no deterioration, identify appropriate mitigation, contribute to achieving good status or potential, and maintain the integrity of the European site network • Relevant Natura 2000 sites across the river basin district in England
Increase the amount of **floodplain woodland** by better targeting of Grant Schemes and through partnership projects (Forestry Commission), which will help manage flood water and address diffuse pollution and water temperature. • Across the river basin district

Environment Agency

The Environment Agency is the Government's lead agency for implementing the Water Framework Directive. We will continue to monitor, provide advice and manage improvements to the water environment. We regulate discharges to and abstraction from the water environment by issuing and enforcing environmental permits and licences. Where necessary we take enforcement action against those who act illegally and damage or put at risk the water environment. We also have responsibility to make sure there is enough water to meet the needs of industry, agriculture and wider society in the future.

We will work closely with all sectors to learn from them, build on existing knowledge and to develop a shared commitment to implementing environmental improvements.

Example actions
Continue and develop a **monitoring programme**, to maintain our understanding of the state of the water environment (Environment Agency). • Across the river basin district
Run local **pollution prevention campaigns** (Environment Agency) to raise awareness of the need for responsible handling and disposal of chemicals, oil and other pollutants. • Specified water bodies identified at risk, such as safeguard zones
Action to **reduce the physical impacts of flood risk management** activities in artificial or heavily modified water bodies (Environment Agency). • Waters specified in Annex B
Undertake investigations to better understand problems in water bodies where extended deadlines have been put in place and identify actions to resolve them where possible (Environment Agency) • Across the river basin district

Example actions
Conduct investigations at sites identified under the **Restoring Sustainable Abstraction** programme (Environment Agency) • Across the river basin district
Improve detection of pollution incidents using **River Fly partnerships** (Environment Agency) • South East Valleys, Wye

Industry, manufacturing and other business

The Severn river basin district is home to a diverse range of businesses and the activities of these businesses can directly or indirectly affect the water environment.

Most relevant actions in this plan are already underway or are part of the existing regulatory system. However, some actions are new, and will help reduce nutrients such as phosphate and will help meet tighter standards on ammonia and 40 other priority substances and pollutants in the river basin district. Where appropriate, industry will participate in pollution prevention campaigns and in investigations to establish the extent and source of pressures to define any further actions required for this and future plan cycles.

Example actions
Comply with regulations such as Environmental Permitting, Environmental Damage and Groundwater, to limit environmental damage and help prevent land contamination, pollution and deterioration of waters. • England and Wales
Voluntary **pollution prevention and remediation** of existing land contamination, to bring land back into beneficial use and remove potential sources of groundwater contamination. • Sites contributing to potential environmental quality standard failure
Run **pollution prevention advice and campaigns** to provide targeted advice and enforcement (Environment Agency) to reduce contaminants being released to groundwater from industrial estates, petrol stations and other sources. • High risk areas such as safeguard zones
Promote **reduction in water use** for specific sectors, including water efficiency plans that incorporate water reuse, recycling, rainwater harvesting and clean and dirty water separation (Environment Agency) • Across the river basin district
Reduce illegal eel and elver fishing in estuaries, rivers and still waters (Environment Agency) • Across the river basin district
Implementation of **sustainable drainage** Code of Practice. Comply with published advice for operators of sustainable drainage systems (Industry leads) • Across the river basin district

Local and regional government

Local and regional government have a major role in implementing this plan. The sector has a far reaching influence on businesses, local communities and leisure and tourism sectors.

In England and Wales duties and powers in relation to planning, waste and minerals, regeneration, highways, transportation, emergency planning, countryside management and other activities are undertaken by various organisations – Town, District and County Councils, Welsh Assembly Government, Regional Assemblies.

Many of the actions identified in the plan form part of this sector's normal work. The Environment Agency and others will work with Local Authorities to ensure that all relevant actions are identified, prioritised, resourced and implemented.

Example actions
Include **strong water efficiency policies** in Spatial Strategies and Local Development Plans/Frameworks (Local Authorities, Regional Assemblies, Welsh Assembly Government) • Across the river basin district

Ensure that **planning policies and spatial planning documents** take into account the objectives of the Severn River Basin Management Plan, including Local Development Documents and Sustainable Community Strategies (Local Authorities). • Across the river basin district
Action to **reduce the physical impacts of urban development** in artificial or heavily modified waters, to help waters reach good ecological potential (Local Authorities). • Waters specified in Annex C
Implement **surface water management plans**, increasing resilience to surface water flooding and ensuring water quality is considered on a catchment basis (Environment Agency, Local Authorities). • Across the river basin district
Promote the use of **sustainable drainage** in new urban and rural development where appropriate, and retrofit in priority areas including highways where possible (Environment Agency). • Across the river basin district
Ensure the need for appropriate **Water Cycle Studies** are included in regional and local plans particularly in growth or high risk areas (Local authorities) • Across the river basin district

Mining and quarrying

This sector has active operations in this river basin district. Past activity has left a legacy from historic mining and now, working with partners, the Environment Agency has an established Strategy for investigation and remediation of these sites.

Example actions
Investigate emissions from working sites and appraise options of **best practice controls** at mines and quarries to ensure environmental quality standards are met (Operators). • Sites contributing to potential environmental quality standard failure
Implementation of **best practice controls and remediation** at prioritised abandoned coal and metal mines (Coal Authority) • Water bodies specified in Annex C
Assess **mineral restoration schemes** for potential for delivering Water Framework Directive benefits (Local Authorities, Environment Agency, Environmental NGOs) • Across the river basin district
Develop and deliver **pollution prevention advice** to landowners and users on abandoned metal mines and coal mines (Environment Agency) • Wye, Usk, South East Valleys, Severn Uplands
Co-ordinate research and develop sustainable and integrated remediation options for: a) use of heat from minewater, b) alternate uses for ochre, and c) co-treatment of minewater and sewage (Coal Authority) • Across the river basin district

Navigation

Ports, harbours and marinas are essential for economic prosperity. Many navigation and port authorities have already done a great deal to help improve ecology and water quality and some harbours are home to internationally important wildlife. Careful planning will be needed to ensure that waters remain navigable whilst at the same time water quality is protected and improved.

Proposals to build new ports or expand existing ones need to take sustainable water management goals into account. Physical changes are permitted to waters for navigation but only if certain conditions are met.

Many of the rivers in the Severn river basin district are also popular with tourists and recreational boaters. We want to encourage recreation in the river basin district, whilst taking action to minimise any environmental impacts.

Example actions
Ban TBT use on ship hulls unless there is a coating to prevent leaching of underlying TBT anti-foulants, to prevent or limit pollution in marine waters (Marine and Fisheries Agency, Welsh Assembly Government, others). • England and Wales
Develop a dredging and disposal framework (Ports sector), which will provide guidance to all those undertaking or permitting navigation dredging and dredged material disposal activities to assist in achieving the statutory objectives of the Water Framework Directive and related Environmental Quality Standards Directive (2008/105/EEC). • England and Wales
Work with British Waterways on the issue of delayed salmon migration caused by navigation weirs and development of plans to **improve fish passage** as part of the maintenance regime (Environment Agency) • Worcestershire Middle Severn and Severn Vale catchments
Develop a programme of **awareness raising** and **information boards** on invasive non-native species (British Waterways) • Canals across the river basin district
Get on Board, a multi partnership campaign to protect and improve the Floating Harbour environment in Bristol (Bristol City Council) • Bristol Avon and North Somerset Streams

Urban and transport

Development and regeneration is a major opportunity to improve the water environment. However, when poorly planned or designed, urban and transport infrastructure can adversely impact on water quality or water resources. The Environment Agency and others want to work with the urban and transport sector to achieve an urban water environment rich in wildlife that local communities can benefit from and enjoy.

A good quality water environment has the potential to help economic regeneration and to enhance the economic and social amenity value of developments, and improve the quality of life in cities, towns and villages.

Spatial planning and design for urban development and infrastructure should aim to reduce surface water run off; protect and restore habitats; improve the quality of rivers, coastal waters, and groundwater, and thus protect drinking water supplies and bathing areas. The release of toxic pollutants that harm the water environment also need to be reduced.

Example actions
Encourage uptake of **Voluntary Initiative best practice on pesticide use** by land managers within the agricultural and amenity sectors (Voluntary Initiative, Environment Agency) • Across the river basin district
Action to **reduce the physical impacts of urban development** in artificial or heavily modified water bodies, to help waters reach good ecological potential (Local Authorities). • Waters specified in Annex C
Designate and enforce **Water Protection Zones** and apply appropriate measures to control high risk activities (Environment Agency, Defra). The Zones will provide a regulatory tool to control diffuse pollution in water or physical pressures in high risk areas where existing mechanisms will not meet Water Framework Directive objectives. • Initially around eight Zones in locations to be decided across England.
Reduce diffuse pollution by developing examples and promoting **best practice use** of sustainable drainage (Local Authorities) • Across the river basin district
Implement **Network Rail Pesticide protocol** to minimise the risk of pollution (Network Rail) • Across the river basin district
National Fire Service Protocol to minimise the risk of pollution during fire emergencies (National Fire Service) • Across the river basin district

Example actions
Implement the **Environment Agency and Highways Agency Memorandum of Understanding** and associated initiatives to minimise the risk of pollution (Highways Agency, Environment Agency) • Across the river basin district in England
Improve detection of pollution incidents by using **River Fly partnerships** to have more frequent monitoring of river macro invertebrates (Environment Agency, Environmental NGOs) • Wye, Usk, South East Valleys

Water industry

Water companies are major partners in the management and protection of the water environment. The Environment Agency works with companies, consumers and government to ensure that the sector's environmental work is planned and implemented in a way that is affordable for the public.

Improvement of continuous and intermittent sewage effluent discharges and of water resources management will be carried out as part of the ongoing water industry asset management programme.

The companies' programme of work under the periodic review of water industry investment in 2009 will make a large contribution to meeting the objectives in this plan. This includes carrying out investigations, and specific improvement schemes to address water quality or water resources.

In addition, specific actions will be carried out in drinking water protected areas to help safeguard drinking water supplies.

Example actions
Reduce leakage through active leakage control and customer supply pipe repair policies to help ensure sufficient water for people and wildlife (water companies). • Across the river basin district
Complete the **current round of water company asset investment** to deliver water quality improvements and reduce the impact of abstraction (water companies). • Rivers, coasts, estuaries and groundwater bodies across the river basin district
Improvements to water company assets under the next round of company investment (Asset Management Programme – AMP5), to deliver water quality improvements and continue to reduce the impact of abstraction under a range of environmental Directives (water companies). • Rivers, estuaries and groundwater bodies across the river basin district
Investigations under the next round of company investment (AMP5) to **quantify the risk from chemicals** at a number of sewage treatment works (water companies) • Water bodies specified in Annex C
Investigations under the next round of company investment (AMP5) to determine **cost effective action to manage abstraction** to support good ecological status (water companies) • Water bodies specified in Annex C
Co-ordinated education and awareness on water efficiency and re-use to promote the value of water for example **schools based education and awareness campaigns** (water companies) • Across the river basin district
Reduction in demand for water through **promotion of free household meters** (water companies) • Across the river basin district
Partnerships to identify **intermittent polluting discharges** from industrial premises in the South East Valleys catchment in Wales (Environment Agency, Dwr Cymru) • South East Valleys

Individuals and communities

Everyone can help protect and improve the water environment. Actions people can take include the following.

To save water

in houses or offices

- Turn off the tap when brushing teeth, and take short showers rather than baths.
- Wash fruit and vegetables in a bowl rather than under the running tap - and use the remainder on plants.
- Install a 'hippo' or 'save-a-flush' in toilet cisterns.
- Run dishwashers or washing machines with a full load on an economy setting, and boil the minimum amount of water needed in kettles or saucepans.
- Purchase low energy and low water use appliances.
- Hand wash cars.
- Ask water companies to fit a meter. This can reduce household water consumption.
- Install a low-flush toilet, put flow regulators on taps and showers, and install waterless urinals at work.
- Consider installing grey-water recycling systems in homes or workplaces. This can save one third of domestic mains water usage.

in gardens

- Choose plants that tolerate dry conditions. To help lawns through dry periods, do not cut them too short.
- To save water in gardens, collect rain in a water-butt, water at the beginning or end of the day, mulch plants, and use watering cans where possible instead of sprinklers or hosepipes.
- Fix dripping taps, and lag pipes to avoid them bursting in freezing weather.

To prevent pollution

- Use kitchen, bathroom and car cleaning products that do not harm the environment, such as phosphate-free laundry detergents, and use as little as possible. This helps prevent pollution.
- Take waste oil and chemicals such as white spirit to a municipal recycling facility: do not pour them down the sink or outside drains.
- Check that household appliances are connected to the foul sewer, not the surface water drain.
- Ensure septic tanks or private sewage treatment plants are well maintained and working effectively.
- Ensure household oil storage is in good condition, with an up-to-date inspection record.
- Report pollution or fly-tipping to the Environment Agency on 0800 807060.

To protect water dependent wildlife

- Put cotton buds and other litter in the bin, not down the toilet. It may end up in the sea where it can harm wildlife.
- Eat fish from sustainable sources, caught using fishing methods that do not cause damage to marine wildlife and habitats.
- Eliminate invasive non-native species from gardens, disposing of them responsibly.
- Adopt-a-beach to help keep beaches clean of litter than can harm wildlife and cause pollution.
- Join a river group to spot pollution, invasive non-native species, and take part in practical tasks.

Actions to protect drinking water

Drinking water supplied to households by water companies is of high quality and complies with strict standards enforced by the Drinking Water Inspectorate. Where water is abstracted from a water body for human consumption, the water body is designated as a Drinking Water Protected Area (DrWPA) – additional objectives apply and where necessary, additional action is put in place to protect the quality of the raw water abstracted.
Where we are reasonably confident that the DrWPA objective is at high risk of not being complied with, a Safeguard Zone has been identified. In the Safeguard Zone additional actions will take place. These may include voluntary agreements, pollution prevention campaigns and targeted enforcement action of existing legislation. Additional monitoring is taking place to assess whether those DrWPAs currently not assessed at high risk, need a Safeguard Zone and additional action taken.

In parallel with this approach, the Environment Agency will continue to develop work on regulatory measures, such as piloting Water Protection Zones in England. If voluntary approaches are shown not to work in a Safeguard Zone, we are ready and able to ensure progress is made before 2015.

The costs of action in this plan

Overall the Environment Agency estimates that the cost for implementing the actions in the Severn River Basin Management Plan will be £77 million annually. A significant proportion of this cost relates to existing measures. The existing measures are mainly required to fulfil the requirements of earlier EC Directives and are defined as the Reference Case in the Impact Assessment

There are additional new measures in the plan which we estimate to cost £8 million with a benefit of £31 million**.** In addition, investigations will be carried out that will help to identify the additional measures necessary in future planning cycles. The new measures are defined as the Policy Option in the Impact Assessment.

Further information on the approach used to assess the costs and benefits is contained in the Impact Assessment.

Taking action in a changing climate

The UK's Climate Projections (UKCP09) show that this region is likely to experience hotter drier summers, warmer wetter winters and rising sea levels. This is likely to have a significant effect on environmental conditions and will increase the impact of human activity on the water environment. Table 4 shows the likely effects of climate change on known pressures and the risk they pose on the water environment in the River Basin District.

It is essential that the actions in this plan take account of the likely effects of climate change. What is done now must not make it harder to deal with problems in the future.

Most actions in this plan will remain valid as the climate changes. Others can be adapted to accommodate climate change.

Table 4 **Qualitative assessment of increased risk from climate change by 2050 and beyond**

Pressure	Increased risk
Abstraction and other artificial flow regulation	Very high
Nutrients (nitrate and phosphate)	High
Sediment	High
Physical modification	Medium
Biological (invasive non-native species)	Medium
Microbiology (including faecal indicator organisms)	Medium
Organic pollution (sanitary determinands)	Medium
Salinity	Medium
Biological (fisheries management)	Low/Medium
Acidification	Low for freshwater Medium/High for marine
Priority hazardous substances, priority substance and specific pollutants, such as pesticides	Low
Temperature of point source discharges	Low

It is important to assess the carbon implications of the plans to avoid, adding unnecessary carbon dioxide burdens that could increase the problem of climate change.

The carbon costs associated with actions in the water industry Periodic Review 2009 (PR09) have been quantified. This is where the most significant carbon impacts will occur as the actions will require additional water treatment, construction of new works or upgrades to existing sites.

The approximate operational carbon implications (this does not include scheme construction carbon implications) of PR09 measures in England and Wales is approximately 4,722,000 tonnes per year at the start of the PR09 cycle (2009-10) and 4,564,200 tonnes per year at the end of the PR09 cycle (2014-2015). These figures are from the water company plans and result from schemes to satisfy a number of existing drivers such as Urban Waste Water Directive and Bathing Waters Directive as well as the Water Framework Directive. Specific figures for water companies can be found in water company plans.

There is no additional operational carbon component driven by the additional requirement to meet good status under the Water Framework Directive.

The majority of other actions are likely to have low impact as they are investigations, partnerships or encouraging best practice management. The potential impact of these can be assessed as the work is progressed.

No organisation has sole responsibility for ensuring that society adapts successfully to the effects of climate change on the water environment. Most will be achieved by working together and in partnership. This River Basin Management process provides an excellent framework to help focus and co-ordinate activities. In particular it will allow action to be taken on existing pressures at sites that are at risk and where appropriate restore the natural characteristics of catchments to protect water quality, maintain water resources and reduce the risks of floods and droughts, thus building resilience to the further impacts of climate change.

Working with other plans and programmes

A wide range of planning processes help ensure more sustainable management of the water environment. They are briefly described here.

Development planning

Development planning plays a key role in sustainable development and the Environment Agency will continue to work closely with planning authorities. We aim to ensure that planners understand the objectives of the Water Framework Directive and are able to translate them into planning policy.

There are many planning processes and provisions involved. They include:

- National legislation;
- Welsh Assembly Government Planning Policy and associated guidance;
- Regional Spatial Strategies, including Wales Spatial Plan;
- Local Development documents;
- local guidance (e.g. Supplementary Planning Documents);
- delivering the planning application process.

In the Severn River Basin District, there are already spatial plans which set out proposed levels of growth and development up to 2026: West Midlands and South West Regional Spatial Strategies and the Wales Spatial Plan. The proposed Strategic Development Areas target growth at larger settlements, for instance, Coventry, Worcester, Gloucester, Newport, Bristol and Bath.

Good development planning needs to consider a number of issues relevant to this plan, including housing locations, sewage treatment options, initiatives to reduce flow to sewage works, water efficiency measures and the reduction of nutrients from diffuse pollution. The Environment Agency and others will continue to work to help clarify the way forwards.

Flood risk and coastal erosion planning

There is a separate planning process for flood and coastal erosion risk management introduced by the new European Floods Directive (Directive 2007/60/EC on the assessment and management of flood risks). This requires that the environmental objectives of the Water Framework Directive are taken into account in flood and coastal erosion plans. Implementation of the Floods Directive in England and Wales will be co-ordinated with the Water Framework Directive. The delivery plans and timescales for the two directives will be closely aligned.

Catchment Flood Management Plans (prepared by the Environment Agency) and Shoreline Management Plans (prepared by local coastal authorities and the Environment Agency) set out long term policies for flood risk management. The delivery of the policies from these long term plans will help to achieve the objectives of this and subsequent River Basin Management Plans.

The Environment Agency plans its flood and coastal risk management capital investment through the ‘Medium Term Plan’, which is a rolling five-year investment plan. Using this, we have identified flood and coastal risk management activities that will deliver one or more restoration or mitigation measures included in this plan. Although these activities will be carried out for flood risk management purposes, they will be carried out in such a way to ensure any impacts are minimised and that the ecology is protected. Activities will not lower water body status unless fully justified under Article 4.7 of the Water Framework Directive.

Marine Planning

The Marine Strategy Framework Directive is closely linked with the Water Framework Directive and their application overlap in estuaries and coasts. The Environment Agency is

working with Defra, Welsh Assembly Government and others to ensure that the implementation of both Directives is fully integrated.

Managing new physical modifications

In specific circumstances the Water Framework Directive provides a defence for when, as a result of a new physical modification, good ecological status or potential cannot be achieved or where deterioration in status occurs. This is covered under Article 4.7 of the Directive.

Although protecting the water environment is a priority, some new modifications may provide important benefits to human health, human safety and/or sustainable development.

Such benefits can include:

• public water supply;

• flood defence/alleviation;

• hydropower generation;

• navigation.

It is often impossible to undertake such activities without causing deterioration of status to the water body. The benefits that such developments can bring need to be balanced against the social and economic benefits gained by maintaining the status of the water environment in England and Wales.

A feasibility study is underway for a Tidal Power Scheme across the Severn Estuary. Because there are no firm proposals in place it has not been possible to take account of any potential effects of the scheme on the waters of the Severn River Basin District. We will revisit this should firm proposals be put forward in future.

The Environment Agency has developed a process for applying the tests and justifications required for such new modifications (Article 4.7) and will work with stakeholders to ensure these provisions are met during the first cycle of river basin management.

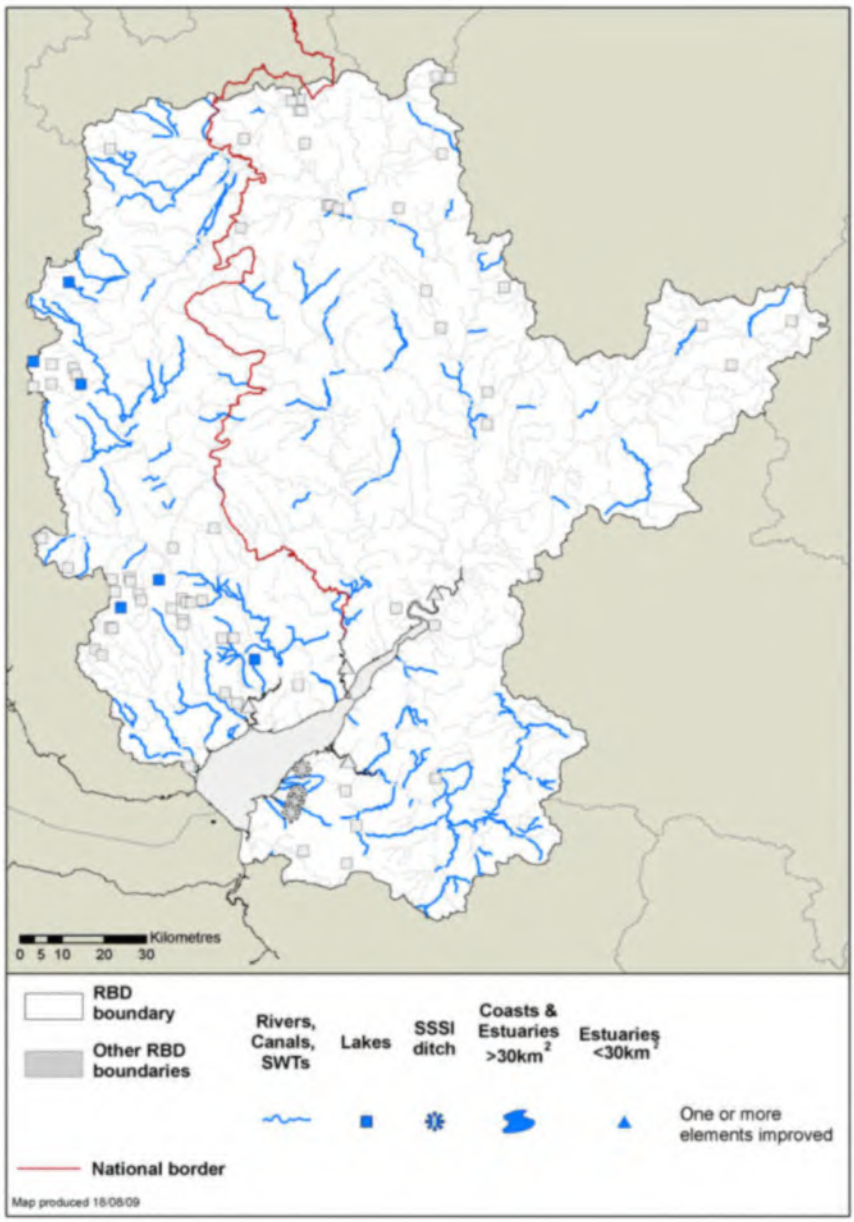
Other planning processes

The Environment Agency is also working to align planning processes in other areas. These include water resources and water quality, agriculture and rural development and natural heritage. Annex J provides further information about other planning processes.

6 The state of the water environment in 2015

One of the objectives of the Water Framework Directive is to aim to achieve good status in water bodies by 2015. However, for 65 per cent of water bodies this target cannot be met by this date. Greater improvement in status is limited by the current understanding of pressures on the water environment, their sources, and the action required to tackle them.

Figure 5 **Surface water bodies showing an improvement for one or more elements by 2015**



By 2015, 17 per cent of surface waters – 152 water bodies – will show an improvement by 2015 for one or more of the elements measured. This translates to 1860 kilometres of river or canal improved, and is illustrated in figure 5.

Figures 6 and 7 show what ecological and biological status will be in 2015 compared to now. By 2015, 34 per cent will be in at least good ecological status/potential and 43 per cent of assessed surface waters will be in at least good biological status. A map showing predicted status for surface water bodies in 2015 is provided in figure 9. Figures 10 and 11 show the predicted quantitative status and chemical status for groundwater in 2015.

Figure 6 **Ecological status/potential of surface water bodies now and in 2015**

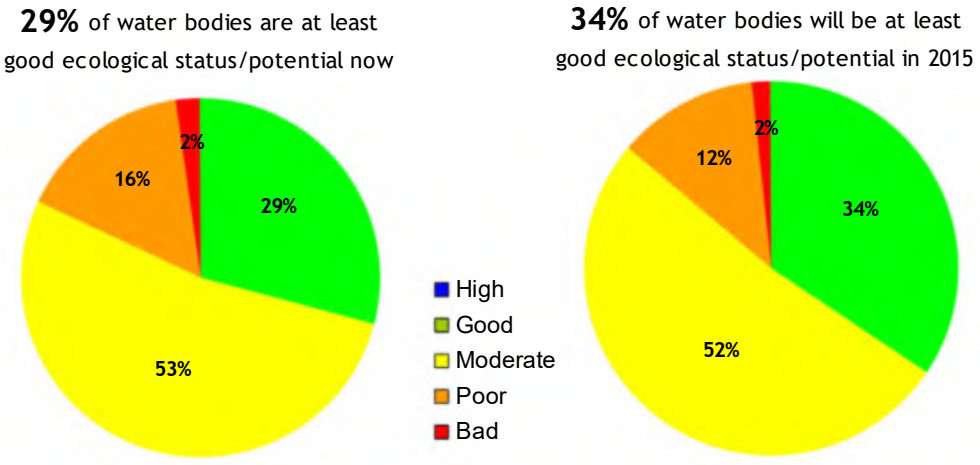
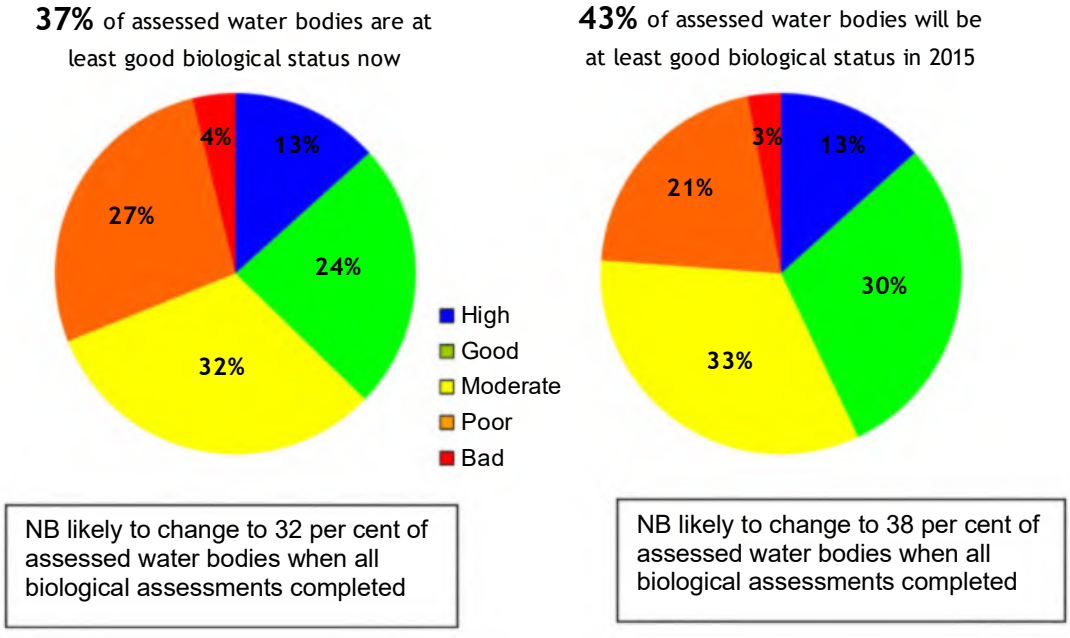


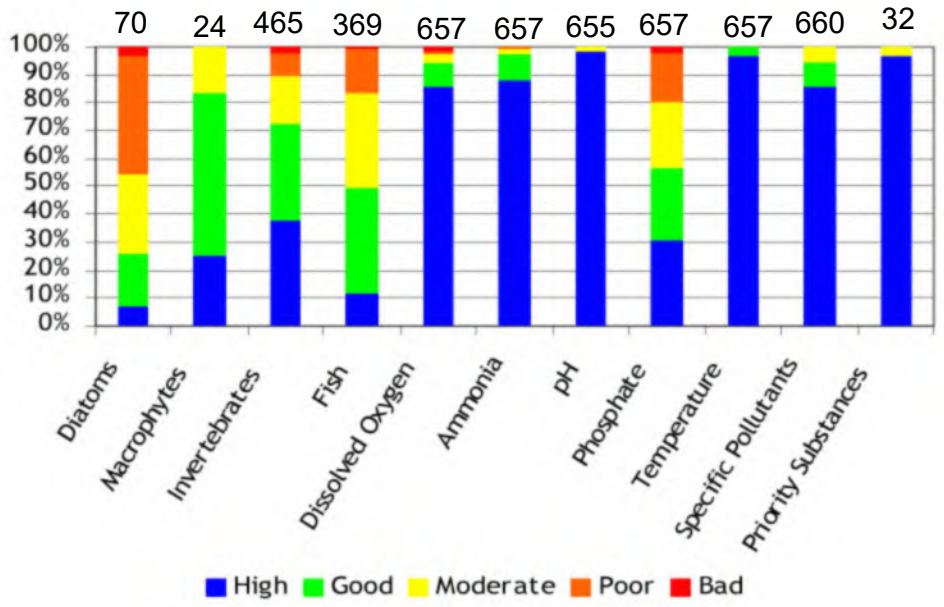
Figure 7 **Biological status of surface water bodies now and in 2015**



For the 239 artificial and heavily modified water bodies, 37 per cent will be in at least good ecological potential in 2015, compared to 33 per cent of 633 natural surface water bodies being at least at good ecological status.

Figure 8 **Predicted proportion of river water bodies in each status class, by element, for 2015**

(numbers above bars indicate total number of water bodies assessed for each element)

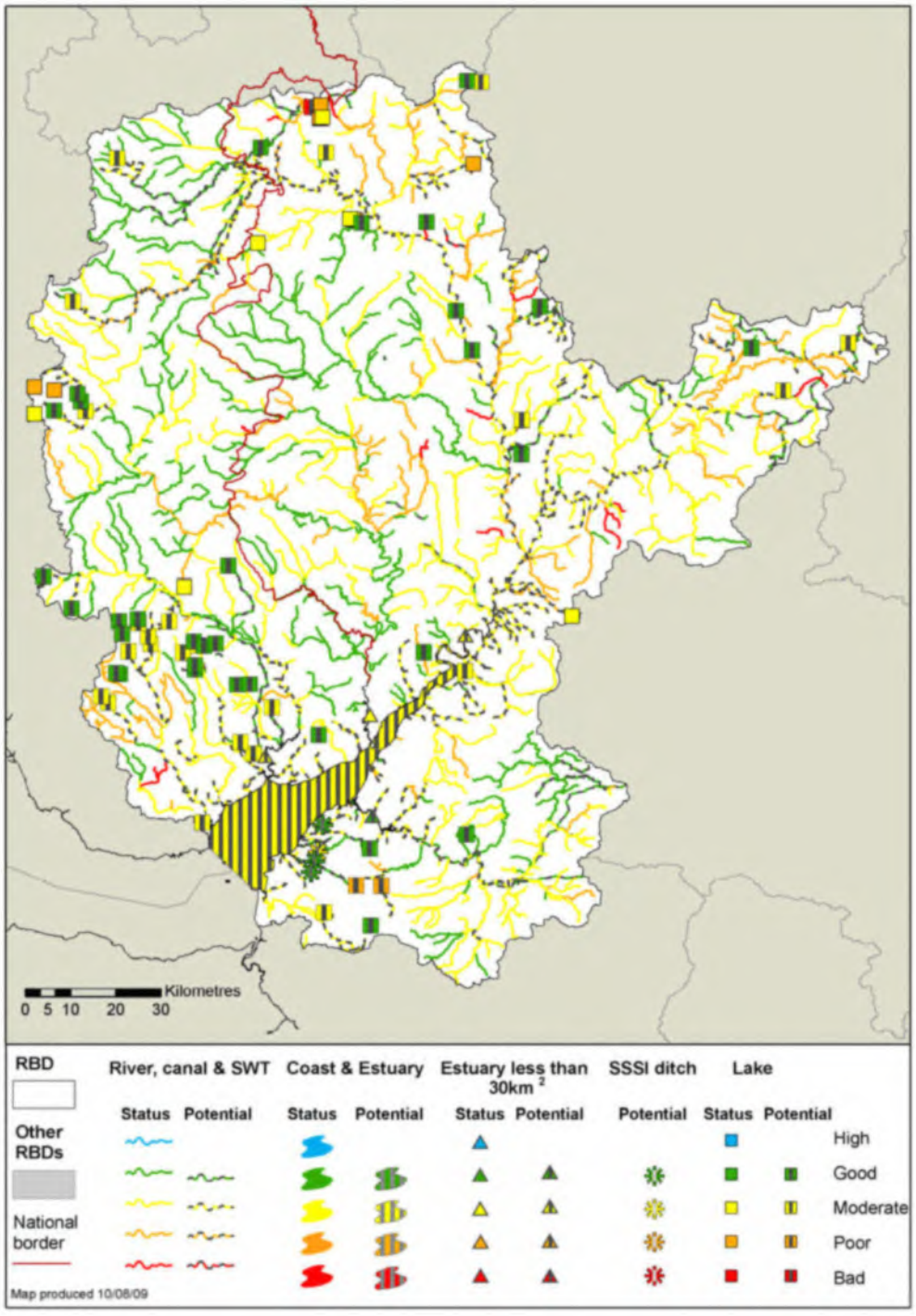


For many estuaries, coasts and lakes it is unlikely that an improvement in the number of water bodies at 'good' status/potential can be achieved by 2015. The biological tools and monitoring data needed to classify these types of water bodies have only recently been developed. There is limited knowledge about the pressures that affect many of these water bodies and how their biology responds to changes in these pressures. It has therefore not been possible to identify many additional cost effective and proportionate measures. In many cases though there will be improvements to some key elements as the result of actions in this plan and there will be investigations to help find technically feasible actions that are not disproportionately costly. The Environment Agency wants these waters to achieve good overall status or potential by 2021 or 2027.

There will be no deterioration in groundwater status by 2015, but improvement will take place over longer timescales. Figures 10 and 11 show the predicted quantitative and chemical status of groundwater in 2015.

Looking at overall status, the combination of ecological status and chemical status, 34 per cent of surface water bodies are expected to meet good or better overall status by 2015.

Figure 9 **Predicted status and potential for surface water bodies in 2015**



Investigations – improving outcomes for 2015

In many cases we, the Environment Agency are not able to identify appropriate actions for water bodies that are currently not achieving good ecological status. Sometimes this is because the cause of the problem and its sources are not yet known. Sometimes this will involve gaining corroborative evidence of biological problems to justify expenditure where there is low confidence of failure of chemical standards. In other cases the most appropriate solution to the problem needs to be researched. Investigations into these types of issues will be an important measure during the first cycle.

Where possible, investigations will take place before 2013 so that the results are known in time for the formal review of this plan by 2015. The Environment Agency has identified a significant number of surface water bodies that require investigations in this plan. A proportion of these will lead to actions that should be straightforward to put in place before 2015. The outcome of our detailed planning work is that we have confidence that 34 per cent of surface waters will be in good or better ecological status or potential by 2015. This is our formal target for this plan.

Across England and Wales we have a formal target of achieving 31 per cent of surface waters in good or better ecological status or potential by 2015. Improvement to the water environment has to be managed as a continuum, not in isolated six year cycles. Nationally we are already confident that 17 per cent of surface waters will be improved by for at least one element by 2015. We are also confident that a proportion of investigations will lead to action that we can put in place before 2015. To ensure we capture these additional opportunities, we will be ensuring that the Severn River Basin District makes its contribution to a goal of achieving up to 33 per cent of surface waters across England and Wales at good or better status or potential by 2015.

Figure 10 **Predicted quantitative status for groundwater in 2015**

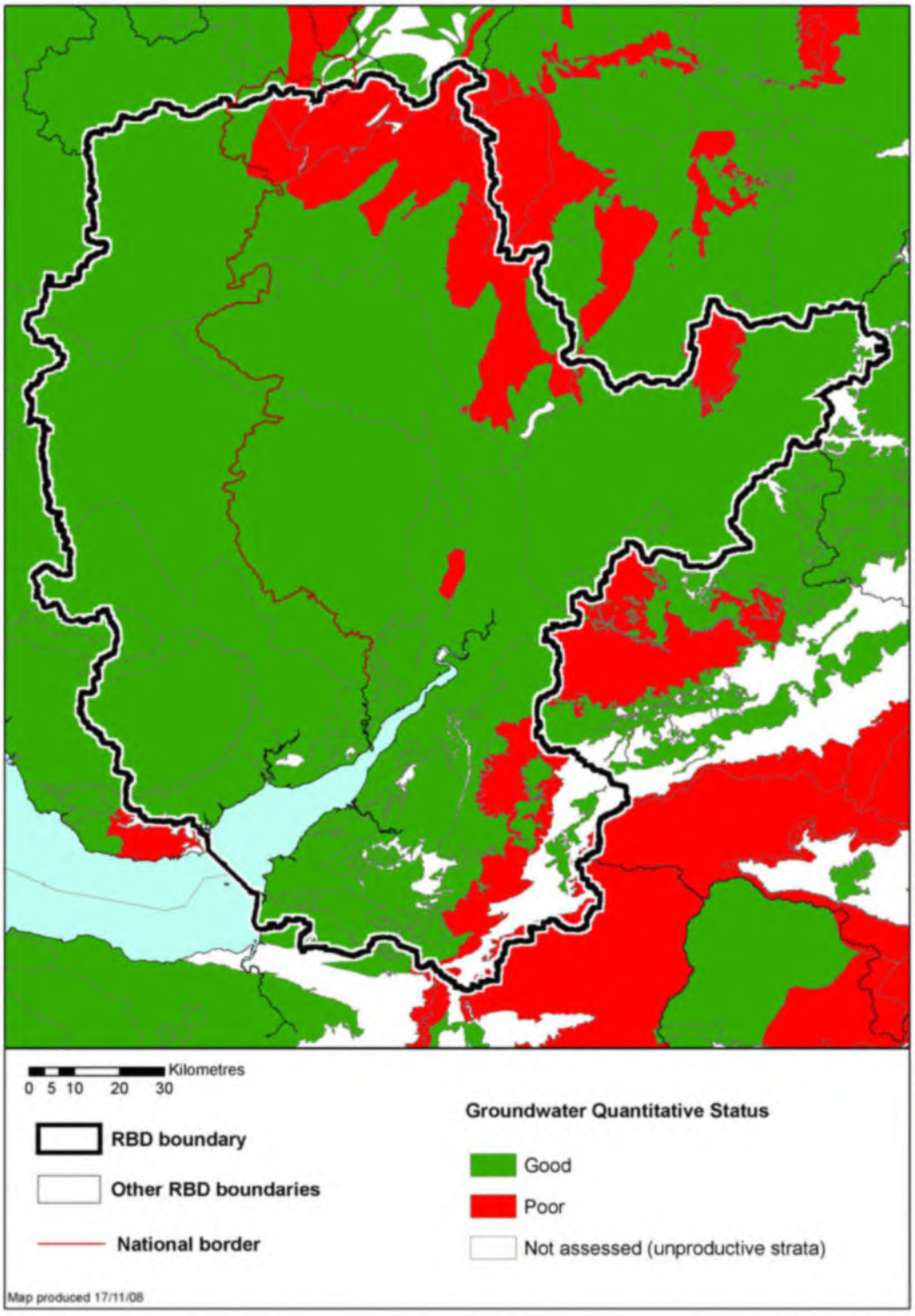
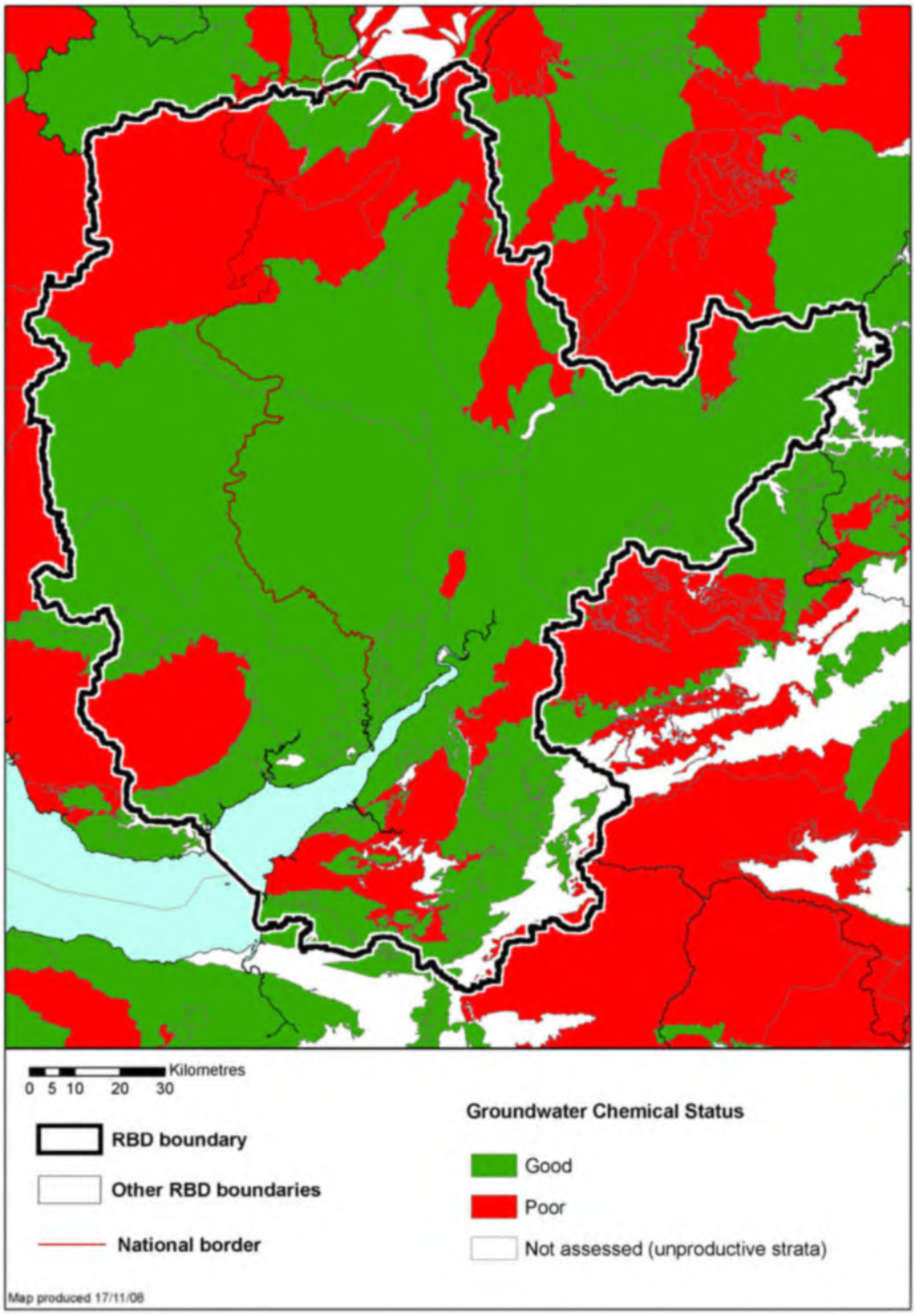


Figure11 **Predicted chemical status for groundwater in 2015**



7 Targets for subsequent cycles

There are three river basin management cycles: 2009-2015, 2015-2021 and 2021-2027. Achieving good status in all water bodies by 2027 is a significant challenge.

The information gained from investigations during the first cycle will help to accelerate improvement to known issues using both traditional and novel techniques in both second and third cycles. New issues will arise though.

This plan sets out where good status cannot be achieved by 2015. This relates to 67 per cent of rivers, 53 per cent of lakes, 83 per cent of estuaries, and 35 per cent of groundwater.

In these cases an alternative objective of good status or potential by 2021 or 2027 is set (see Annex E).

Over the period to 2027, the pressures on the water environment will change, particularly because of climate change. It is not known in detail how the water environment will respond to this.

The population in the river basin district will continue to increase, with further urbanisation. Agriculture will respond to the changing climate both here and abroad, market conditions, financial incentives and regulatory pressures. Technology and other solutions to address the pressures will improve, but the rate at which some new solutions can be introduced will depend on the economic climate.

The Environment Agency believes that achieving good status in all water bodies by 2027 will not be possible using only current technologies. Even achieving 75 per cent good status will require marked changes in land use and water infrastructure, such as a major programme to separate foul and surface water sewers across most of the river basin district. By current standards, such changes are extremely unlikely to be economically or socially acceptable.

For some waters therefore, achieving good status by 2027 could be not technically feasible or disproportionately costly.

The Environment Agency wants to work with others to find and implement additional actions to improve the environment, with the aspiration of achieving good status in at least 60 per cent of waters by 2021 and in as many waters as possible by 2027.

The water environment now and objectives for 2015 are described further in the section ‘Severn River Basin District catchments in 2015’. A summary of the key statistics for the Severn River Basin District is provided in the table on page 62.

8 Severn River Basin District catchments

This section summarises information about the status of waters in the different parts of the Severn River Basin District, their objectives and some of the actions for them.

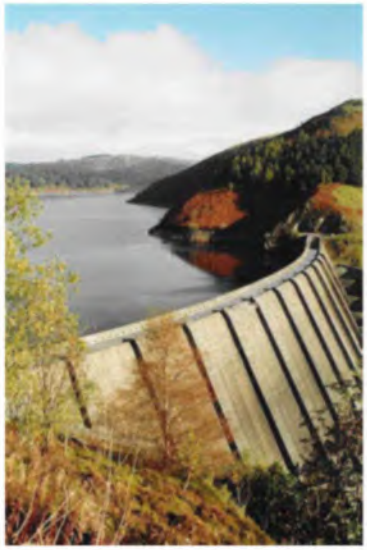
Figure 12 **Map of the catchments in the Severn River Basin District**

Rivers and lakes are grouped by catchment. There are 10 catchments, presented here.

- Severn Uplands
- Shropshire Middle Severn
- Worcestershire Middle Severn
- Teme
- Severn Vale
- Warwickshire Avon
- Wye
- Usk
- South East Valleys
- Bristol Avon and North Somerset Streams

There are separate sections for estuaries, and groundwater.

Severn Uplands catchment



The Severn Uplands area is predominantly rural in character with the main towns being Oswestry, Llanidloes, Welshpool and Newtown. The catchment includes the Clywedog and Vyrnwy reservoirs in the west and the rivers Severn and Vyrnwy as well as a collection of many small tributaries. The conservation value of the catchment is high with a large number of designated sites.

The tributaries support a diverse range of ecology associated with good water quality. However, the headwaters of many streams along the western uplands are impacted by acid runoff or drainage from abandoned metal mines. Sheep dip and sediment run-off cause ecological impacts in several rivers such as the Tanat, Vyrnwy and Cain.

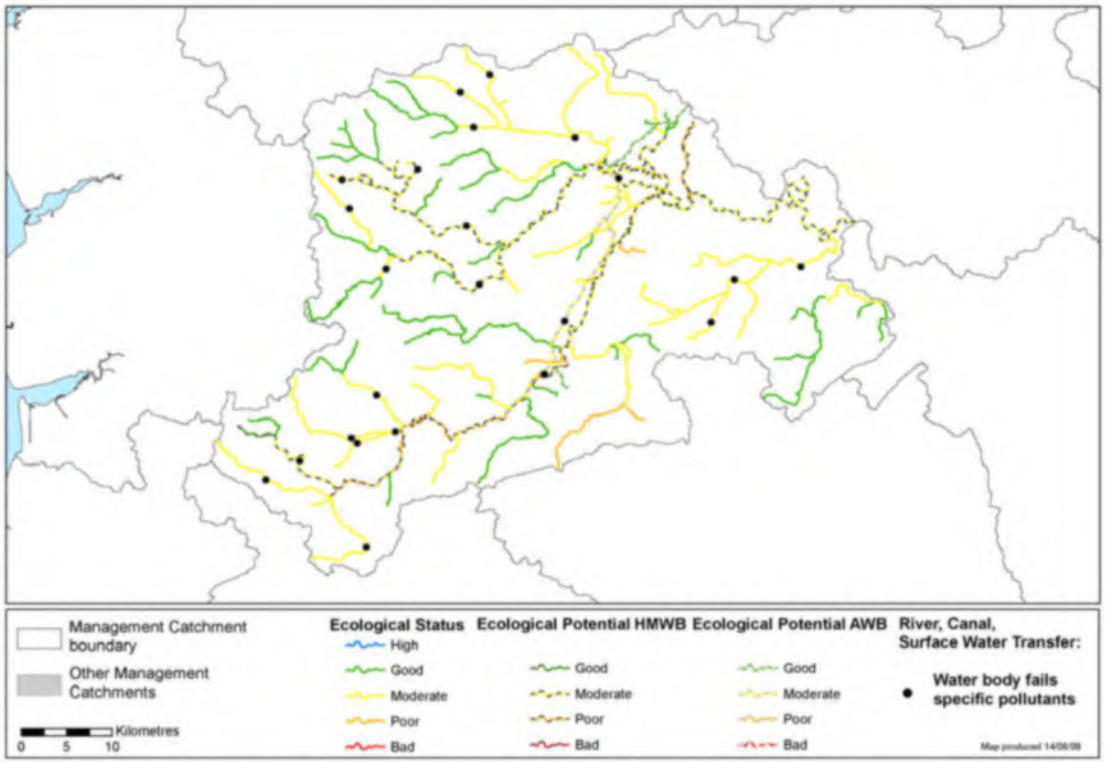
The fish communities are dominated by brown trout and migratory Atlantic salmon and the tributaries of the Severn provide important spawning grounds for both species. The distribution of salmon is limited by the presence of obstacles such as waterfalls.

There are 93 river water bodies and 4 lakes in the catchment. 45 per cent of rivers currently achieve good ecological status. 52 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, 20 per cent of surface waters in the Severn Uplands catchment will improve for at least one ecological element of good status.

Key statistics at a glance – Severn Uplands catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	44%	57%
% assessed at good or high biological status (58 water bodies assessed)	50%	53%
% assessed at good chemical status (4 water bodies assessed)	50%	50%
% at good status overall (chemical and ecological)	44%	57%
% improving for one or more element in rivers		19%

Figure 13 **Map showing the current status of waters in the Severn Uplands catchment**



As a result of these improvements there will be an increase of 13 per cent of river and lake water bodies achieving good ecological status by 2015, to 57 per cent.

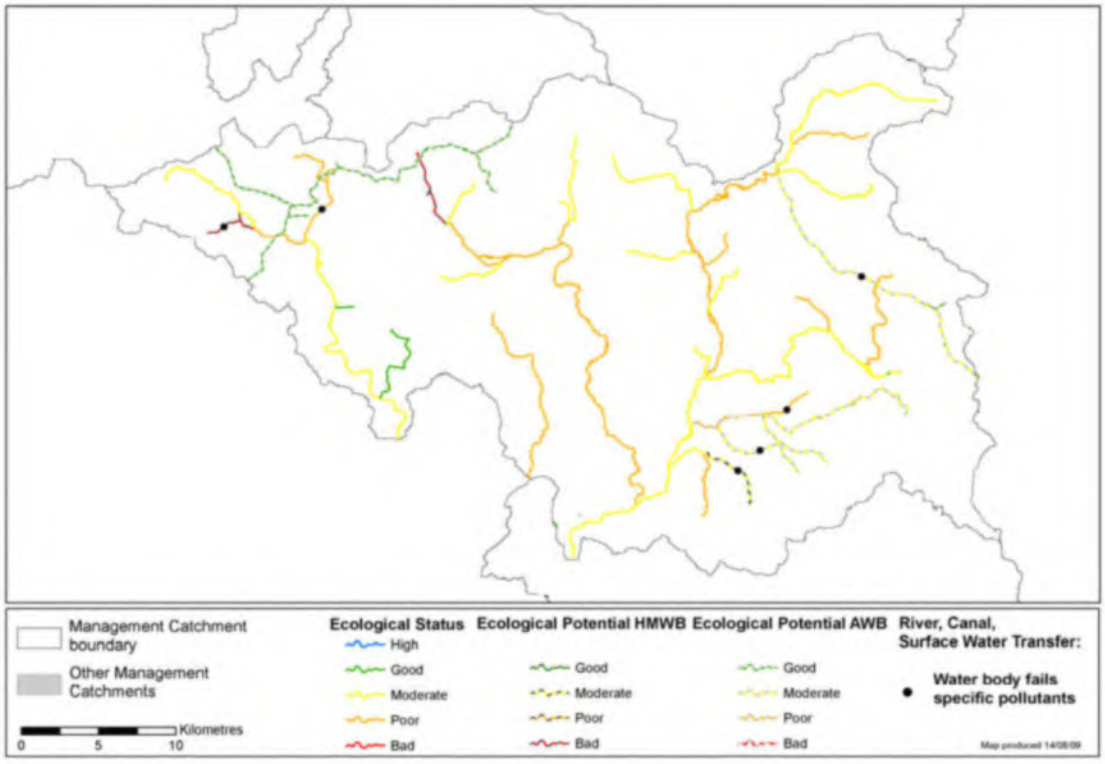
Some key actions for this catchment

- planned improvements to discharges from several sewage treatment works;
- initiatives to provide advice to farmers including the England Catchment Sensitive Farming Delivery Initiative and Environment Agency Wales Catchment Initiatives;
- investigate control and remediation of discharges from abandoned metal mines;
- programme of lime dosing to reduce the effects of acidification in the upper Severn Catchment;
- Wildlife Trust projects such as the Severn Vyrnwy Initiative to improve wetland habitat and flood plain connectivity.

Shropshire Middle Severn catchment

The Shropshire Middle Severn catchment is largely rural with a few towns such as Shrewsbury, Newport, Market Drayton and part of Telford, although there is significant pressure for urban development. The catchment includes the River Severn and its tributaries. The area is ecologically rich and includes a large number of designated sites, most of which come under the Midlands Meres and Mosses Ramsar Site. There are also several water related Special Areas of Conservation (SAC) in this area.

Figure 14 **Map showing the current status of waters in the Shropshire Middle Severn catchment**



Key statistics at a glance – Shropshire Middle Severn catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	6%	6%
% assessed at good or high biological status (32 water bodies assessed)	14%	17%
% assessed at good chemical status (7 water bodies assessed)	86%	86%
% at good status overall (chemical and ecological)	6%	6%
% improving for one or more element in rivers		5%

Abstraction for public supply and irrigation for agriculture can have a major impact on water resources. Several rivers are over abstracted or over licensed at low flows, for example the Coley Brook and rivers Perry and Tern. As part of the Environment Agency's Restoring Sustainable Abstraction programme and the water company's Asset Management Plan there are a number of sites being investigated to assess the impacts of abstraction on the environment.

The rivers Tern and Roden suffer from excessive plant and algal growth due to high levels of nutrients from sewage works effluent, other industries and farming.

There are 41 river water bodies and 8 lakes in the catchment. 5 per cent of rivers currently achieve good ecological status. 16 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, 4 per cent of surface waters in the Shropshire Middle Severn Catchment will improve for at least one ecological element of good status. Despite these improvements, the percentage of water bodies achieving good ecological status will remain the same.

Some key actions for this catchment

- initiatives to provide advice to farmers under the England Catchment Sensitive Farming Delivery Initiative;
- removal of nutrients at several sewage treatment works to reduce problems of excessive plant and algal growth in the river Tern;
- investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme;
- guidance and training in irrigation best practice, including benchmarking and scheduling;
- actions to reduce the impact from pesticides including metaldehyde (slug pellets).

Worcestershire Middle Severn catchment

The Worcestershire Middle Severn catchment is predominantly rural, but contains significant urban areas including parts of Telford, Wolverhampton, Dudley, Kidderminster and Worcester. As well as the River Severn itself, the main watercourses are the rivers Worfe, Stour and Salwarpe which are subject to unsustainable levels of abstraction at low flows. The area has many water dependent sites protected for their biodiversity and designated Sites of Special Scientific Interest. There are also a number of Special Areas of Conservation.

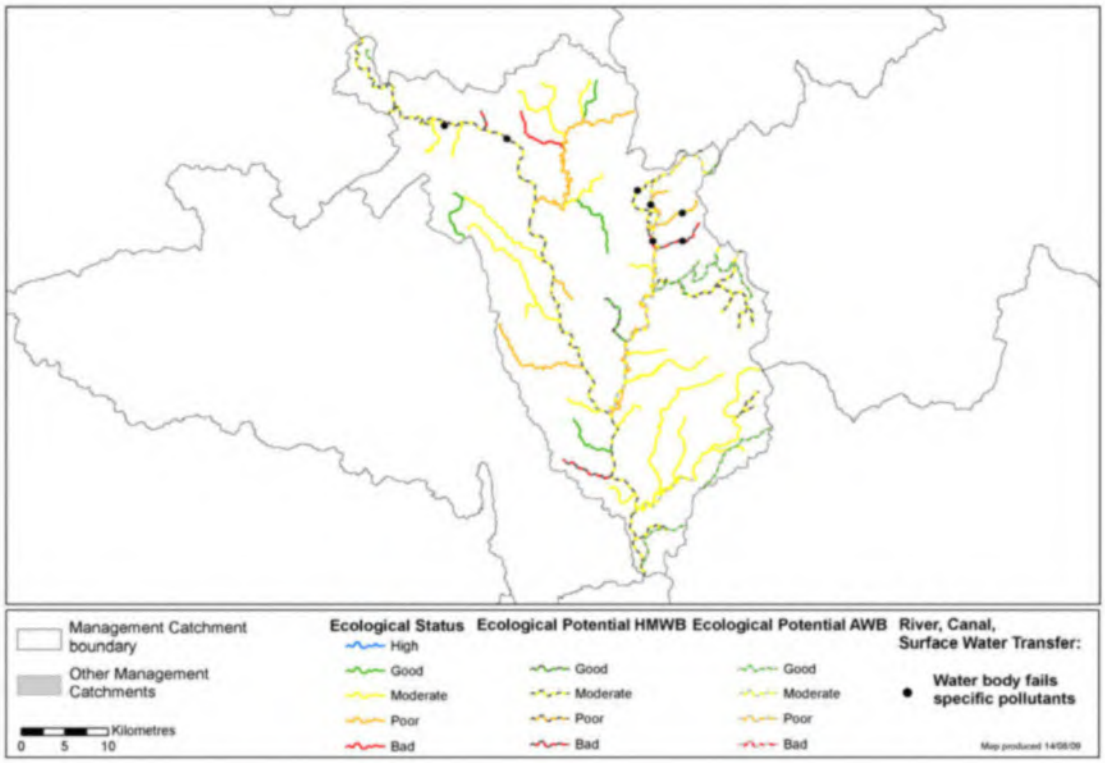
There are 47 river water bodies and 10 lakes in the catchment. 13 per cent of rivers currently achieve good ecological status. 28 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, 12 per cent of surface waters in the Worcestershire Middle Severn Catchment will improve for at least one ecological element of good status. Despite these

improvements, the percentage of water bodies achieving good ecological status will remain the same.

Key statistics at a glance – Worcestershire Middle Severn catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	21%	21%
% assessed at good or high biological status (40 water bodies assessed)	26%	29%
% assessed at good chemical status (10 water bodies assessed)	90%	90%
% at good status overall (chemical and ecological)	21%	21%
% improving for one or more element in rivers		15%

Figure 15 **Map showing the current status of waters in the Worcestershire Middle Severn catchment**



Some key actions for this catchment

- improvement to discharges at a number of sewage treatment works;
- investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme;
- projects on Wildlife Trust owned reserves to improve wetland and riparian habitat;
- Wildlife Trust's 'Access to Nature' community involvement programme to improve habitat and raise awareness of Black Country rivers;

- Green Futures initiative to provide co-ordinated advice to farmers on complying with agricultural and environmental regulations across the West Midlands.

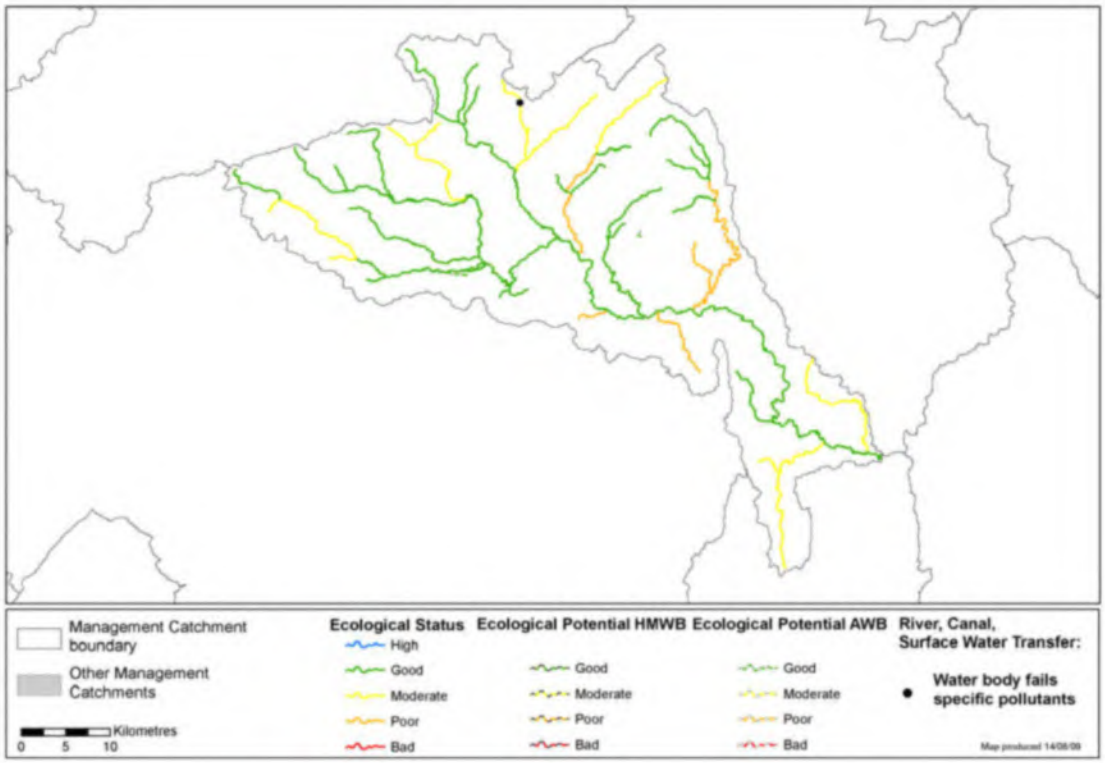
Teme catchment

The River Teme is a rural river which passes through the market towns of Knighton, Ludlow and Tenbury Wells before joining the River Severn south of Worcester. Major tributaries include the rivers Clun, Onny, Corve and Rea. The whole of the River Teme is classed as a Site of Special Scientific Interest and parts of the River Clun are classed as a Special Area of Conservation.

Brown trout and migratory Atlantic salmon are found throughout the majority of the Teme catchment and its tributaries provide extensive spawning grounds for both species. The presence of obstacles such as weirs limits the distribution of salmon within the catchment.

Water quality in the lower reaches of the catchment is affected by diffuse pollution, mainly by nutrients and sediment. Whilst there is adequate supply of surface water in the catchment during the winter months, in the summer the Teme often experiences low flows. Abstraction mainly provides water for irrigation for agriculture, with increased use for trickle irrigation.

Figure 16 **Map showing the current status of waters in the Teme catchment**



Key statistics at a glance – Teme catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	60%	65%
% assessed at good or high biological status (32 water bodies assessed)	69%	75%
% assessed at good chemical status (2 water bodies assessed)	50%	50%
% at good status overall (chemical and ecological)	58%	63%
% improving for one or more element in rivers		19%

There are 48 river water bodies in the catchment. 60 per cent of rivers currently achieve good ecological status. 69 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, 19 per cent of rivers in the Teme Catchment will improve for at least one ecological element of good status. As a result of these improvements there will be an increase of 5 per cent of river water bodies achieving good ecological status by 2015, to 65 per cent.

Some key actions for this catchment

- improvements to discharges at several sewage treatment works;
- provision of advice to farmers under the England Catchment Sensitive Farming Delivery Initiative;
- investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme;

- actions to reduce the impact from pesticides including metaldehyde (slug pellets).

Severn Vale catchment

The Severn Vale area includes many of the small rivers and brooks that drain into the lower River Severn or directly into the Severn estuary. The land is variable with mixed urban, agricultural and forested areas. The main urban areas include Gloucester, Cheltenham, Ledbury and Stroud.

Arable land dominates the Leadon catchment, which suffers from poor water quality due to excessive quantities of silt and high levels of phosphate and nitrate. Extensive woodlands are present in the Forest of Dean, where there are also water quality problems associated with uncontrolled discharges from former mine workings. These are often acidic and contain metals and other harmful substances that can have significant ecological impacts.

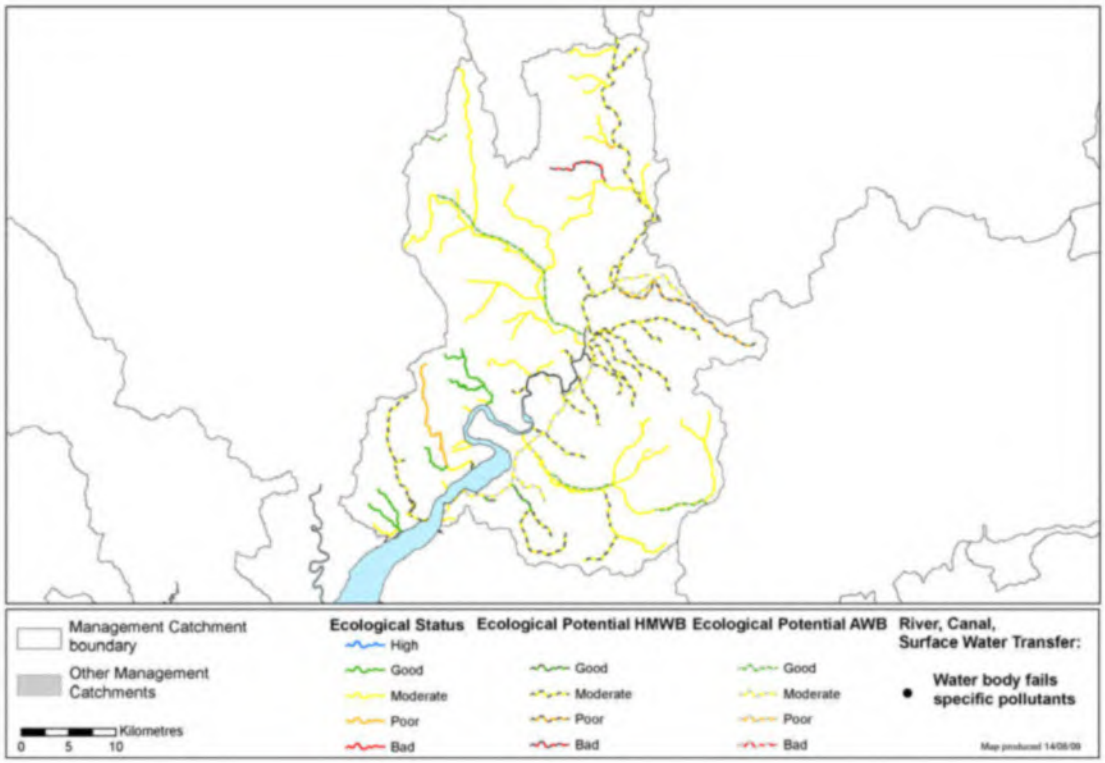
Abstraction within the catchment is mainly for public water supply and agriculture. Significant quantities are also used for power generation. The Cinderford and Glynch brooks are over abstracted and groundwater is used to enhance low flows in the Glynch Brook during summer months. Low flows are thought to be adversely affecting fish populations, particularly spawning and nursery areas, in some parts of the area. Further investigations will take place as part of the Restoring Sustainable Abstraction programme.

Key statistics at a glance – Severn Vale catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	7%	7%
% assessed at good or high biological status (50 water bodies assessed)	38%	38%
% assessed at good chemical status (16 water bodies assessed)	88%	88%
% at good status overall (chemical and ecological)	7%	7%
% improving for one or more element in rivers		0%

There are 64 river water bodies and 3 lakes in the catchment. 6 per cent of rivers currently achieve good ecological status. 38 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, however, no elements will improve in the first plan period.

Figure 17 **Map showing the current status of waters in the Severn Vale catchment**



Some key actions for this catchment

- investigating the sources of metals and other pollutants and various actions to improve the management of water resources;
- improvement to discharges at a number of sewage treatment works and investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme;
- provision of advice to farmers under the England Catchment Sensitive Farming Delivery Initiative;
- Salmon in Schools project to raise local awareness of the salmon lifecycle and habitat;
- improved fish passage on Blackpool Brook;
- pollution reduction campaigns on a local industrial estates;
- actions to reduce the impact from pesticides including metaldehyde (slug pellets).

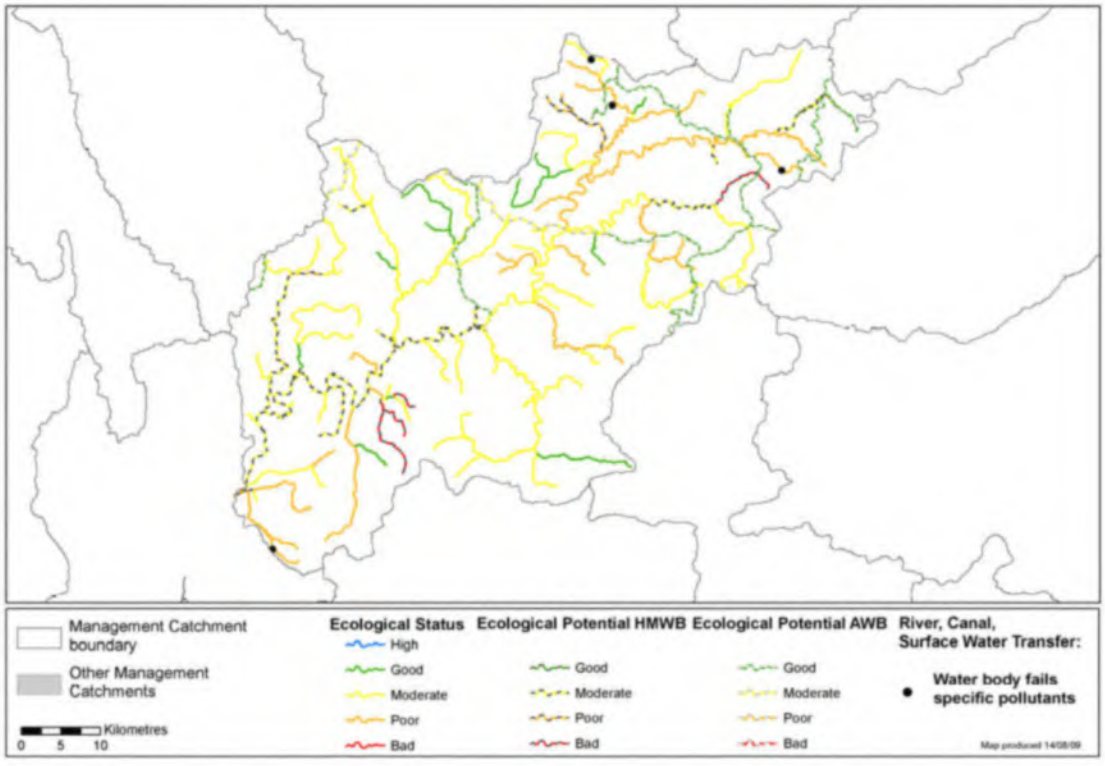
Warwickshire Avon catchment

The catchment includes the River Avon and its various tributaries. Coventry is the largest urban area in the catchment and other towns include Rugby, Leamington Spa, Warwick, Stratford-upon-Avon, Evesham, Redditch and Tewkesbury. Agriculture accounts for a high proportion of the land use including arable, livestock, horticulture and market gardening and fruit and vegetable production around Evesham. The catchment has a high value for wildlife and there are a large number of designated sites.

The River Avon is navigable and a major resource for recreational activities such as boating, canoeing, fishing and walking.

Water is abstracted primarily for public water supply, agriculture and industry. Water quality in the headwaters of the main tributaries is generally good. Elsewhere water quality problems are due to a mixture of the impact of sewage discharges, diffuse (urban and Agricultural) run off leading to nutrient enrichment and other pollution.

Figure 18 **Map showing the current status of waters in the Warwickshire Avon catchment**



Key statistics at a glance – Warwickshire Avon catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	11%	11%
% assessed at good or high biological status (75 water bodies assessed)	35%	40%
% assessed at good chemical status (16 water bodies assessed)	81%	88%
% at good status overall (chemical and ecological)	11%	11%
% improving for one or more element in rivers		9%

There are 91 river water bodies and 3 lakes in the catchment. 8 per cent of rivers currently achieve good ecological status. 35 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, 9 per cent of surface waters in the Warwickshire Avon Catchment will improve for at least one ecological element of good status. Despite these improvements, the percentage of water bodies achieving good ecological status will remain the same.

Some key actions for this catchment

- improvement to discharges at a number of sewage treatment works;
- investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme;
- guidance and training in irrigation best practice, including benchmarking and scheduling;
- pollution reduction campaigns on local industrial estates;
- encourage farmers and industry to build storage reservoirs to support or replace summer irrigation;
- Voluntary Initiative educational and advice programme to reduce the impact of agricultural chemical use including metaldehyde (slug pellets) in the River Leam catchment;
- Wildlife Trust projects to improve the ecological value of the rivers Avon, Stour and Sowe through partnerships with landowners, schools and the local community.

Impacts of abstraction on the environment are being investigated as part of the Restoring Sustainable Abstraction Programme and the licensing of trickle irrigation will control current unregulated abstraction.

Wye catchment

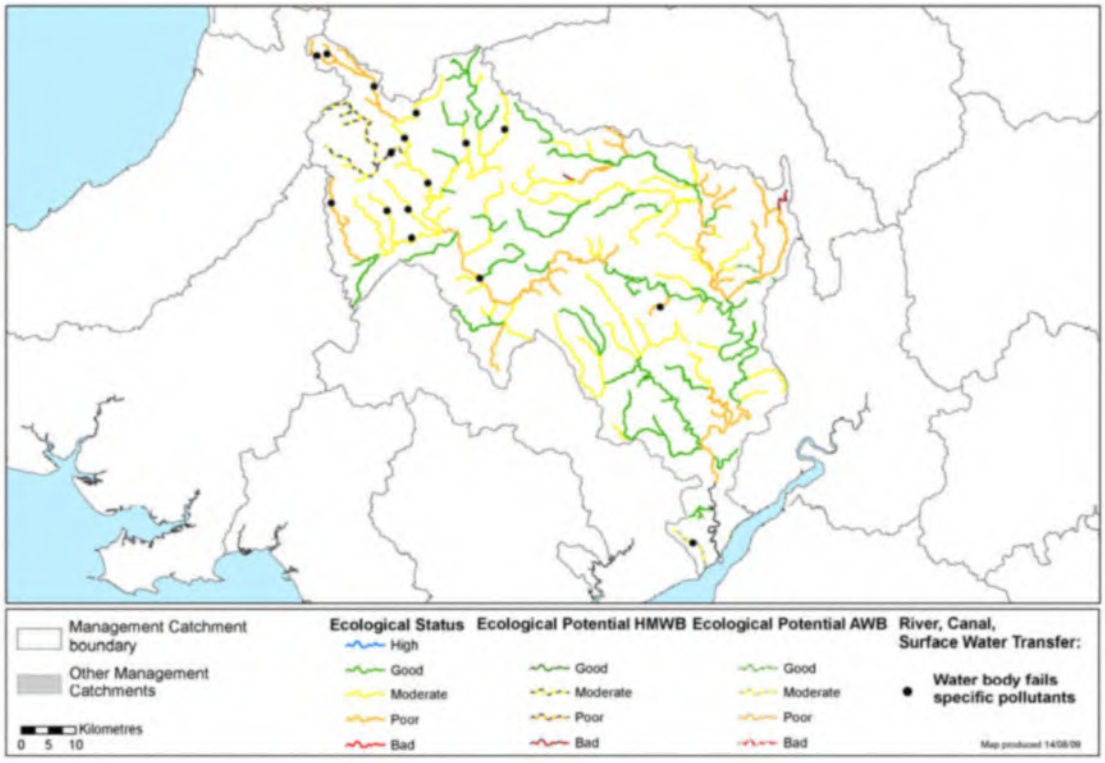
The River Wye drains a large catchment spanning the Welsh and English border and has many significant tributaries including the Elan, Irfon, Lynfi, Lugg and Monnow.

The main landuse is agriculture with livestock farming predominating in the north and west and more intensive arable farming in the south and east of the catchment. There is however some industry based around the major towns such as Monmouth and Chepstow.

The Wye catchment is rich in wildlife and habitats and this is recognised in the designation of the Wye and several tributaries as a riverine Special Area of Conservation. The area offers many opportunities for water based recreation and the Wye and Lugg are unusual in that there is a public right of navigation. The River Wye is a well-established and nationally

significant salmon and brown trout rod fishery and also a locally important coarse fish fishery. Elver fishing also takes place within the tidal reaches of the Wye. The Elan Valley system of reservoirs is vital in providing water for Birmingham, Gloucestershire and South Wales. The local economy is moderately dependent on businesses requiring water abstraction, primarily agricultural where trickle and spray irrigation is frequently used.

Figure 19 **Map showing the current status of waters in the Wye catchment**



Key statistics at a glance – Wye catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	35%	43%
% assessed at good or high biological status (115 water bodies assessed)	44%	52%
% assessed at good chemical status (10 water bodies assessed)	100%	100%
% at good status overall (chemical and ecological)	35%	43%
% improving for one or more element in rivers		23%

There are 136 river water bodies and 8 lakes in the catchment. 35 per cent of rivers currently achieve good ecological status. 45 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, 23 per cent of surface waters in the Wye Catchment will improve for at least one ecological element of good status. As a result of these improvements there will be an increase of 8 per cent of river and lake water bodies achieving good ecological status by 2015, to 43 per cent.

Some key actions for this catchment

- providing advice to farmers under both the England Catchment Sensitive Farming Delivery Initiative and the Environment Agency Wales Catchment Initiative;
- improvements to sewage treatment work discharges to reduce levels of ammonia and phosphate;
- improving in land management and reduction in sedimentation through the restoration of ancient ravine woodlands in the Wye Valley;
- Investigation into sources of siltation and impacts on survival of salmon in the rivers Arrow and Lugg;
- improving riparian habitat and improving access for fish on the rivers Arrow and Lugg;
- working with farmers at a local level to provide advice and encourage good practice in the use and disposal of sheep dip;
- improvement in land management and reduction in sedimentation through the restoration of ancient ravine woodlands in the Wye Valley;
- reducing local impacts of acidification through a programme of catchment liming;
- habitat improvements to reduce physical modification of watercourses and controlling non-native invasive weeds;
- investigating the ability of eels to migrate through the Rhynes (also known as Reens) system.

Usk Catchment

The River Usk rises in the Black Mountains and flows in a long narrow catchment through the towns of Brecon, Crickhowell, Abergavenny and Usk, before joining the Severn Estuary at Newport. Land use is mainly agricultural with hill farming predominating in the north west and mixed/arable farming in the south east. The ecological value of the catchment is recognised through the high level of designations including as a riverine Special Area of Conservation.

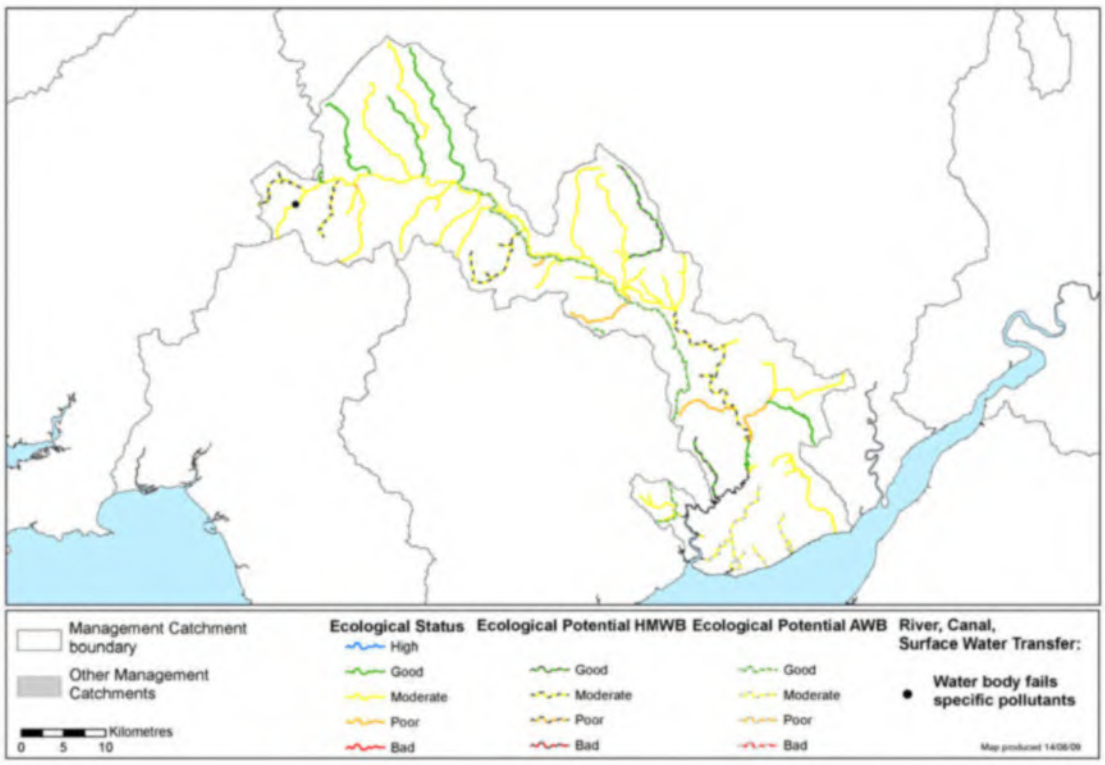
The headwaters of the Usk and some of those of its tributaries are impounded by the Usk, Crai, Talybont and Grwyne Fawr reservoirs. At Brecon some of the river's flow is diverted to feed the Monmouthshire and Brecon Canal and water from the lower River Usk is pumped to Llandegfedd water storage reservoir.

Key statistics at a glance – Usk catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	26%	41%
% assessed at good or high biological status (40 water bodies assessed)	33%	49%
% assessed at good chemical status (2 water bodies assessed)	50%	50%
% at good status overall (chemical and ecological)	26%	41%
% improving for one or more element in rivers		35%

There are 48 river water bodies and 10 lakes in the catchment. 19 per cent of rivers currently achieve good ecological status. 30 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, 33 per cent of surface waters in the Usk Catchment will improve for at least one ecological element of good status. As a result of these improvements there will be an increase of 15 per cent of river and lake water bodies achieving good ecological status by 2015, to 41 per cent.

Figure 20 **Map showing the current status of waters in the Usk catchment**



Some key actions for this catchment

- providing advice to farmers through the Environment Agency Wales Catchment Initiative;
- targeted action on sheep dip;
- habitat improvements to reduce physical modification of watercourses;
- investigating the ability of eels to migrate through the Rhynes (reens) system;
- reduce diffuse pollution and physical modification of rivers through practical action such as fencing and buffer strips;
- programme of eradication and control of Giant Hogweed, Japanese Knotweed and Himalayan Balsam.

South East Valleys catchment

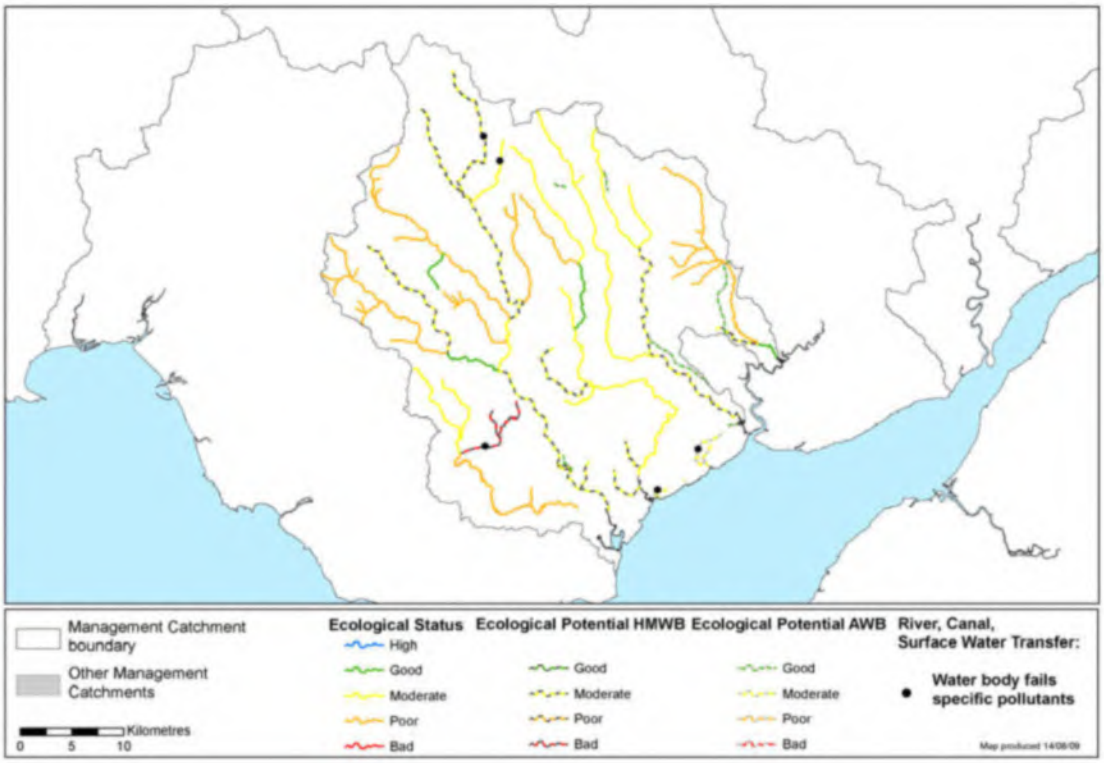
The main river catchments in the South East Valleys catchment are the rivers Ebbw, Sirhowy and Llywd which flow into the Usk Estuary and the rivers Rhymney, Taff and Ely which enter the Seven Estuary. Urban centres include Merthyr Tydfil, Caerphilly, Ebbw Vale and Cardiff.

The 'valleys' rivers are typically steep sided with mountainous upper valleys and extensively urbanised valley floors opening out into meandering lowland river valleys. They have a flashy flow regime and due to the underlying geology there is little water storage or base flow and in very dry summers some smaller tributaries can dry up. Most abstraction is for public water supply and commercial and industrial use.

Many of the river catchments have recovered from historical degradation caused by the iron, coal and other industries and their run-off to the rivers. Historical industrial development and towns tend to lie close to the banks of the rivers resulting in extensive physical modification and loss of riparian habitats. Improvements in water quality have allowed the return of salmon and sea trout with some tributaries providing spawning and nursery areas.

Overflows from abandoned mine workings can cause water quality problems, but they do benefit river flows in the summer months. Rivers are vulnerable to diffuse and intermittent point source pollution from urban and industrial development.

Figure 21 **Map showing the current status of waters in the South East Valleys catchment**



Key statistics at a glance – South East Valleys catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	25%	31%
% assessed at good or high biological status (37 water bodies assessed)	26%	38%
% assessed at good chemical status (13 water bodies assessed)	62%	62%
% at good status overall (chemical and ecological)	24%	29%
% improving for one or more element in rivers		23%

There are 40 river water bodies and 19 lakes in the catchment. 13 per cent of rivers currently achieve good ecological status. 22 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, 17 per cent of surface waters in the South East Valleys will improve for at least one ecological element of good status. As a result of these improvements there will be an increase of 6 per cent of river and lake water bodies achieving good ecological status by 2015, to 31 per cent.

Some key actions in this catchment

- improvements to sewage treatment works and addressing intermittent overflow discharges to reduce pollution by ammonia and other substances;
- targeted action on sheep dip;

- Rivers Trust work to promote local interest and improve river habitat, remove barriers to fish movement and eradicate non-native invasive species;
- River Flylife partnerships to improve detection of pollution and campaigns on local industrial estates;
- improving eel passage on the River Taff;
- investigate control and remediation of discharges from abandoned coal and metal mines.

Bristol Avon and North Somerset streams catchment

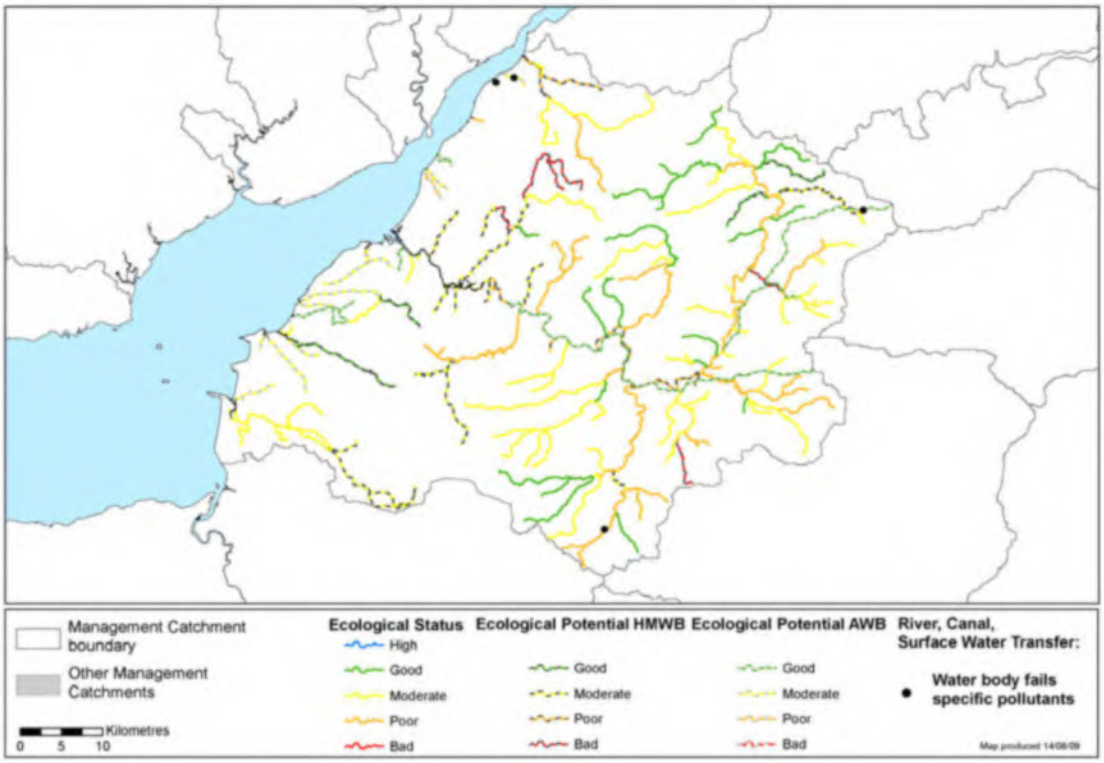
This is a largely rural catchment that includes some large urban areas such as Bristol and Bath. In the west it borders the Severn Estuary. The Axe and North Somerset Streams have long lowland sections interconnected in places by Rhynes (reens) and ditches. This complex artificial drainage system is managed by the Internal Drainage Boards.

The catchment supports a diverse range of wildlife and plant species and recreation is increasingly important, particularly where the rivers are readily accessible to the main population centres.

The Kennet and Avon Canal is a significant waterway in the upper part of the Bristol Avon. The lower Bristol Avon is navigable, via a system of locks, from the Severn Estuary to Bath. Several of the largest stone quarries in Europe are found in the Mendip Hills, with about 20 per cent of the country's hard rock production coming from this area. Substantial development is proposed in this catchment.

The major discharges in the catchment are from sewage treatment works and these can lead to signs of nutrient enrichment at times of low flows in the Axe and North Somerset Streams.

Figure 22 **Map showing the current status of waters in the Bristol Avon and North Somerset streams catchment**



Key statistics at a glance – Bristol Avon and North Somerset streams catchment

River and lake water bodies	Now	2015
% at good ecological status or potential	22%	27%
% assessed at good or high biological status (89 water bodies assessed)	30%	35%
% assessed at good chemical status (5 water bodies assessed)	40%	60%
% at good status overall (chemical and ecological)	22%	27%
% improving for one or more element in rivers		30%

There are 137 river water bodies and 6 lakes in the catchment. 21 per cent of rivers currently achieve good ecological status. 31 per cent of rivers assessed for biology are at least good biological status now. Local actions will address the key pressures in the catchment, 29 per cent of surface waters in the Bristol Avon and North Somerset Streams catchment will improve for at least one ecological element of good status.

As a result of these improvements there will be an increase of 5 per cent of river and lake water bodies achieving good ecological status by 2015, to 27 per cent.

Some key actions for this catchment

- ‘Get on Board’ a multi partnership campaign to protect and improve the Floating Harbour environment in Bristol;

- improvements to sewage treatment works and addressing urban intermittent discharges to reduce inputs of ammonia, phosphate and other pollutants;
- 'Operation Streamclean' a partnership project with Wessex Water to identify and correct sewerage misconnections at domestic properties;
- provision of advice to farmers including through the England Catchment Sensitive Farming Delivery Initiative;
- investigations to assess the impacts of abstraction on the environment under the Restoring Sustainable Abstraction programme;
- mitigating the spread and impact of non-native invasive crayfish through the South West White Clawed Crayfish Conservation Project;
- improving habitat and encouraging community action to tackle non-native invasive weeds through the Avon Frome Partnership and Bristol Invasive Weeds Forum.

Estuaries

The estuary water bodies in the Severn River Basin District include the main Severn Estuary (which has been split into three parts: upper, middle and lower) and the tidal reaches of the rivers Wye, Usk and Bristol Avon.

The estuaries include the important commercial ports of Avonmouth, Portbury, Cardiff, Newport and Sharpness. There are also a number of harbours and docks.

The Severn Estuary is internationally recognised for nature conservation being designated as a Special Protection Area, Ramsar site and Special Area of Conservation. The estuary is an important migratory route for salmon and internationally rare species such as shad. It supports traditional salmon fisheries and commercial elver fishing. With its very high tidal range the estuary also presents a challenge for coastal and flood protection.

The upper, middle and lower Severn and Usk estuarine water bodies have been designated as heavily modified water bodies due to modifications for flood protection. The Bristol Avon estuarine water body has been designated as heavily modified due to modifications for flood protection, navigation and quay line. Some actions have been identified to mitigate the impacts of these modifications on ecology.

Key statistics at a glance – estuaries

	Estuaries	
	Now	2015
% at good ecological status or potential	17%	17%
% assessed at good or high biological status (2 water bodies assessed)	50%	50%
% assessed at good chemical status (2 water bodies assessed)	100%	100%
% at good status overall (chemical and ecological)	17%	17%
% improving for one or more element in rivers		0%

There are 6 estuarine water bodies in the river basin district. 17 per cent currently achieve good ecological status while the others are at moderate potential. 50 per cent estuaries

assessed for biology are at least good biological status now. There will not be any improvement for estuarine water bodies during the first plan cycle to 2015.

Some key actions for estuaries

- investigation into feasibility of re-aligning flood defences at Slimbridge to create inter-tidal and freshwater habitat;
- sewage works discharges will be improved and urban diffuse pollution reduced to improve and protect bathing waters in the Severn Estuary;
- enforcement and controls will reduce illegal salmon, eel and elver fishing in the Severn Estuary;
- develop and implement a national guidance framework on dredging and disposal for those undertaking or permitting navigation dredging;
- action to reduce the pressure from physical modifications in the Severn Estuary such as setting back embankments, re-opening culverts and operational and structural changes to locks, sluices and weirs;
- appropriate water level management strategies in the system of Rhynes (reens) including timing and volume of water moved.

Groundwater

The main pressures on groundwater bodies are abstraction for drinking water supply and contamination with nitrates and to a lesser extent pesticides. In some parts of the river basin district abstractions from groundwater are used to support river flows.

Key statistics at a glance - groundwater

Groundwater	Now	2015
% at good quantitative status	75%	75%
% assessed at good chemical status (40 water bodies assessed)	78%	78%
% at good status overall	65%	65%

There are 40 groundwater bodies in the river basin district. 75 per cent are at good quantitative status and 78 per cent at good chemical status now. There will not be any improvement for groundwater bodies during the first plan cycle to 2015.

It takes time for clean recharge water to replenish the aquifers and because of this some groundwater bodies often take decades to recover from the effects of pollution. Concentration of pollutants can continue to rise for years after the pollution sources have been brought under control due to the time it takes for clean recharge water to reach the water table.

The main reason for poor quantitative status in groundwater is that abstraction levels – mainly for drinking water – exceed the rate at which aquifers recharge. Unsustainable abstraction from groundwater is an important issue for the river basin district. The majority of the 25 per cent of groundwater bodies at poor quantitative status are the principal aquifers used for drinking water and so are under the greatest abstraction pressure. The plan identifies a range of actions to prevent deterioration and improve groundwater elements, as well as investigations to improve the confidence in groundwater classification.

Unsustainable abstraction from groundwater bodies can lower groundwater levels and affect dependent river flows or wetlands, or can induce the intrusion of poorer quality water from the sea or from deeper aquifers. Reduced flow due to unsustainable abstraction was also identified as a reason for not achieving good ecological status or potential in some rivers, lakes and estuaries.

Some key actions in this river basin district

- Catchment Sensitive Farming or other advice led partnerships to address diffuse pollution;
- designation and enforcement of Nitrate Vulnerable Zones;
- pollution prevention activities to reduce diffuse pollution entering groundwater;
- controls on abstraction of water from groundwater bodies;
- investigations to better understand the impact of the major groundwater abstractions in the river basin district.

9 Next steps – implementing this plan

Diffuse pollution investigation and action

In developing the River Basin Management Plans approximately 8,500 investigations have been identified for England and Wales, including further monitoring. The vast majority of these will be undertaken by the Environment Agency and all of these will be completed by the end of 2012. The investigations will focus on resolving what is causing the problem and what the best method to tackle it is. As a result of the evidence they will provide, we will be able to take further action in the first cycle where practicable.

The remainder of the investigations – including over 100 water company catchment management investigations – will be carried out by co-deliverers across England and Wales during the course of the first delivery cycle. Working with the river basin district liaison panels, the Environment Agency will welcome the input of local data and knowledge from other parties to help drive action at catchment level.

We are confident the investigation programme will lead to actions enabling a further reduction in diffuse pollution and more environmental improvement before 2015. As we have said earlier, the Environment Agency is already committed to delivering, through its own work or through working with others, an additional two per cent improvement towards good status or potential by 2015 across England and Wales.

Additional national measures

In addition to commitments already provided, the UK Government and Welsh Assembly Government will continue to demonstrate their commitment and bring forward significant work starting with;

- banning phosphates in household laundry detergents;
- a new requirement contained within the Flood and Water Management Bill making the right to connect to surface water sewers contingent on Sustainable Drainage Systems (SuDS) being included in new developments. Local authorities will be responsible for adopting and maintaining SuDS that serve multiple properties and the highways authorities will maintain them in all adopted roads;
- general binding rules to tackle diffuse water pollution by targeting abuse of drainage systems, potentially including industrial estates, car washes and construction by 2012;
- transferring the responsibility for misconnections to water companies by 2012;
- the Water Protection Zones Statutory Instrument which will enter into force on 22 December 2009 and will be used to tackle diffuse pollution where voluntary measures are not sufficient;
- more funding for the Catchment Sensitive Farming Delivery Initiative in England from 2010 – a 50% increase in capital grant spend, and evaluation of the initiative to ensure it is achieving maximum effectiveness;
- better targeting of agri-environment schemes for water protection. In Wales, this includes aligning the forthcoming “Glastir” agri-environment scheme to contribute towards meeting Water Framework Directive requirements;
- supporting the farming industry in the Campaign for the Farmed Environment, which has reducing impacts on water quality as one of its priorities;
- encouraging farmers to use buffer strips to reduce diffuse pollution through guidance and advice provided under cross compliance;
- better understanding of the impact of sediment and measures to tackle it as a result of the additional funding announced in June 2009;
- further consideration of the impact of cross compliance and good agricultural and environmental conditions (GAEC) on water quality;
- implementation of the Sustainable Use of Pesticides Directive;

- Environmental Permitting Regulations guidance setting essential standards of location, operation and maintenance for septic tanks.

These and the other actions in the plans will lead towards a greater achievement of good status and improvement within class, with more than a quarter of the length of all rivers improving.

Implementing the plans at catchment level

The Environment Agency has found river basin liaison panels extremely valuable, and will continue to work with them throughout the plan delivery period. The panels will help to encourage river basin district-wide action through their sectors, monitor overall progress and prepare for the second cycle of River Basin Management Planning.

Given that implementation requires activity 'on the ground', it is essential that there is the maximum involvement and action from locally based organisations and people. Innovative ways of working together need to be identified that will deliver more for the environment than has been captured in this plan.

The Environment Agency will adopt a catchment-based approach to implementation that is efficient and cost-effective. This will support the liaison panels, complement existing networks and relationships, and enable better dialogue and more joined up approaches to action.

In some places there will be added value from adopting more detailed catchment plans to help deliver the River Basin Management Plan objectives during the planning cycles. The River Kennet is a case in point where we have set up a pilot group with a range of stakeholders. We will share the knowledge gained with the liaison panels, to help identify other catchments that could benefit from a similar approach.

Working with co-deliverers

This plan sets out in detail the actions required to improve the water environment. All organisations involved must play their part, record their progress and make the information available.

Where the work of a public body affects a river basin district, that body has a general duty to have regard to the River Basin Management Plan. Ministerial guidance states that the Environment Agency should:

- work with other public bodies to develop good links between river basin management planning and other relevant plans and strategies, especially those plans that have a statutory basis such as the Local Development Plans and Wales Spatial Plan;
- encourage public bodies to include Water Framework Directive considerations in their plans, policies, guidance, appraisal systems and casework decisions.

For some, the actions in this plan may be voluntary and for others they will be required under existing legislation. We want to work with you to make these actions happen, and identify new action to create a better place.

Reporting on progress

The Environment Agency will use its environmental monitoring programme and, where appropriate, information from other monitoring programmes, to review whether work on the ground is achieving the environmental objectives. We will update the classification status of water bodies accordingly and review progress annually. At the end of 2012 a formal interim report will be published. This will:

- describe progress in implementing the actions set out in this plan;

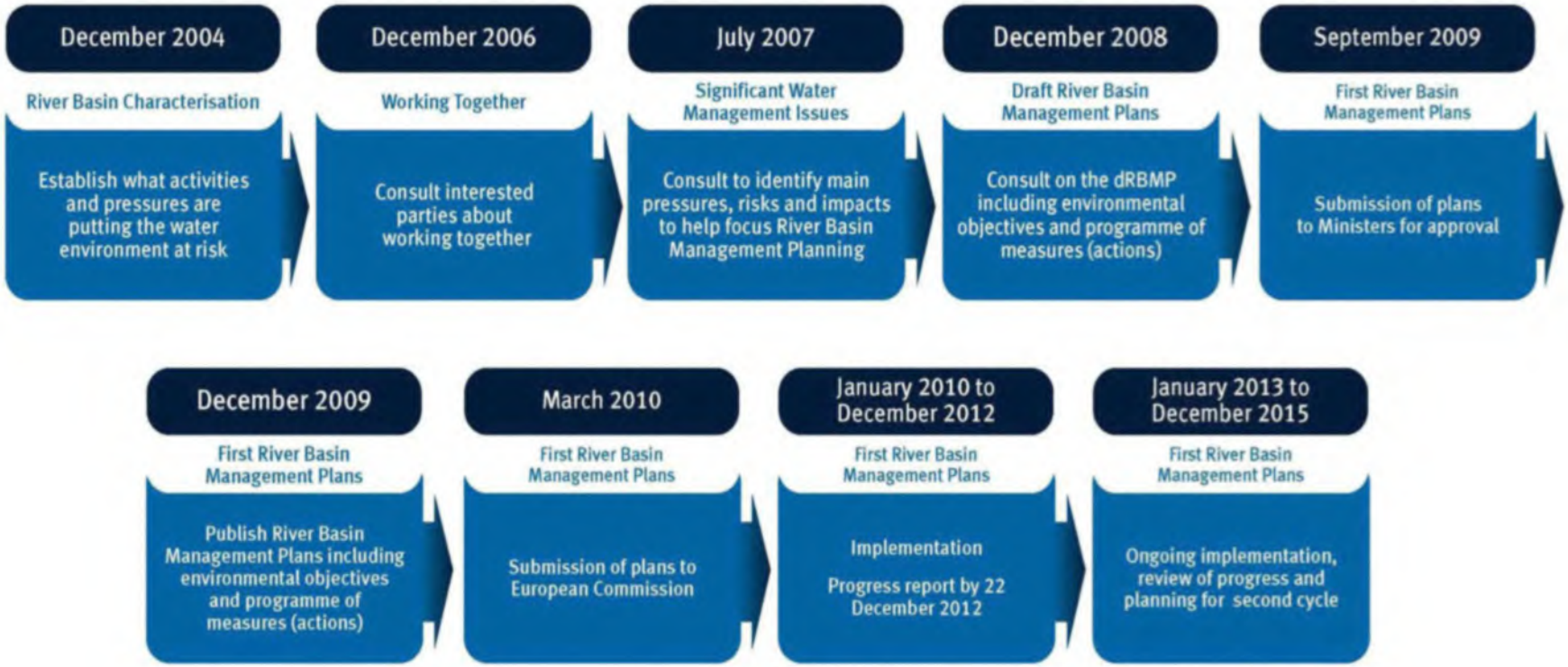
- set out any additional actions established since the publication of this plan;
- assess the progress made towards the achievement of the environmental objectives.

Preparations have already begun for the next cycle period 2015 to 2021 and for the subsequent cycle to 2027. If you have proposals for actions that can be included in these future cycles please contact us.

River basin management milestones

The plan builds on a number of other documents and milestones required by the Water Framework Directive. The work to date has ensured a strong evidence base, and a framework for dialogue with interested organisations and individuals. In terms of taking this plan forwards, it helps to understand the major milestones remaining. These future milestones are summarised in the figure below.

Figure 23 **River basin management planning milestones to date and to 2015**



10 Summary statistics for the Severn River Basin District

	Rivers *	Lakes **	Estuaries	Surface Waters Combined	Groundwater
% of water bodies with improvement in any status of any element by 2015	18	9	0	17	0
% of water bodies at good ecological status/potential or better now For groundwater: % of water bodies at good or better quantitative status now	27	47	17	29	75
% of natural water bodies at good ecological status or better now	27	0	0	27	75
% of artificial and heavily modified water bodies at good ecological potential or better now	28	56	20	35	N/A
% of water bodies at good ecological status/potential or better by 2015. For groundwater: % of water bodies at good or better quantitative status 2015	33	47	17	34	75
% of natural water bodies at good ecological status or better by 2015	34	0	0	33	75
% of artificial and heavily modified water bodies at good ecological potential or better by 2015	31	56	20	37	N/A
% of water bodies at good chemical status now	78	0	100	78	78
% of water bodies at good chemical status 2015	80	0	100	80	78
% of water bodies at good biological status or better now	38	28	50	37	N/A
% of water bodies at good biological status or better by 2015	44	28	50	43	N/A
% of water bodies with alternative objectives (good status 2021 or 2027)	67	53	83	66	35
% of water bodies deteriorated under Article 4.7	0	0	0	0	0

% of all water bodies (surface waters and groundwaters) at good status now	30
% of all water bodies (surface waters and groundwaters) at good status by 2015	35

* includes canals and surface water transfers
** includes reservoirs and ditches that are in Sites of Special Scientific Interest

11 Further information – the Annexes

Annex A **Current state of waters in the Severn River Basin District**
What the waters are like now. Information on our network of monitoring stations, the classification status of water bodies and the reference conditions for each of the water body types in the river basin district.

Annex B **Water body status objectives for the Severn River Basin District**
Information on water body status and objectives

Annex C **Actions to deliver objectives**
Details of the actions planned (programmes of measures) for each sector to manage the pressures on the water environment and achieve the objectives of this plan.

Annex D **Protected area objectives**
Details of the location of protected areas, the monitoring network, environmental objectives and the actions required to meet Natura 2000 sites and Drinking Water Protected Area objectives.

Annex E **Actions appraisal and justifying objectives**
Information about how we have set the water body objectives for this plan and how we selected the actions. It also includes justifications for alternative objectives that have been set.

Annex F **Mechanisms for action**
More detail about the mechanisms (i.e. policy, legal, financial tools) that are use to drive actions.

Annex G **Pressures and risks**
Information about the significant pressures and risks resulting from human activities on the status of surface water and groundwater.

Annex H **Adapting to climate change**
Information on how climate change may affect the pressures on the water environment and the ability to meet the objectives.

Annex I **Designating artificial and heavily modified water bodies**
Information about the criteria used to designate waters as artificial or heavily modified water bodies.

Annex J **Aligning other key processes to river basin management**
Aligning planning processes to deliver multiple benefits and sustainable outcomes

Annex K **Economic analysis of water use**
Information about the costs of water services within the river basin district

Annex L **Record of consultation and engagement**
Details of how we have worked with interested parties to develop this plan

Annex M **Competent authorities**
List of the competent authorities responsible for River Basin Management Planning.

Annex N **Glossary**
Explanation of technical terms and abbreviations.

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