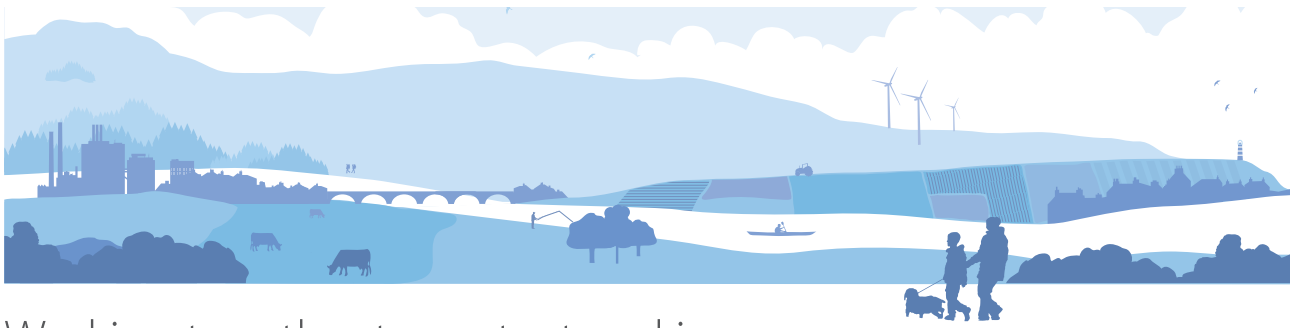
The river basin management plan for the Solway Tweed river basin district: 2015 update

21 December 2015



Working together to protect and improve our water environment

Supporting information

The river basin management plan consists of a number of different documents, maps and datasets. The maps and charts shown in this document are produced in the Scottish Environment Protection Agency's (SEPA) Water Environment Hub. In most cases, you can find more detail and view the mapping at a local scale using the online tool.

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The maps are based on the following sources:

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Incorporating information from others in river basin management planning

Some organisations have asked for the opportunity to share their environmental data to help improve river basin management and catchment planning. For example, sharing data and information to improve local evidence on the cause of a problem, such as the reason for not achieving good status, or a new response to a problem. Please contact your local catchment partnership (in England), or SEPA RBMP Co-ordinator (in Scotland) to learn more.

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1 A plan for the water environment

The area within the Solway Tweed river basin district is renowned for the environmental quality of its rivers, lakes, wetlands and seas. They are great natural assets; attracting visitors, contributing to the health and well-being of its people, supporting a rich diversity of wildlife and providing for the sustainable growth of its economy.

This plan is a route map for protecting and improving the water environment of the Solway Tweed river basin district (Figure 1). Many waters in the district are in a good or excellent condition. However, others are under significant pressure. The plan sets out the actions planned to reduce these pressures, and the improvements to the condition of the district's rivers, lakes, estuaries, coastal waters and groundwater that are expected to be achieved.

Figure 1 – the Solway Tweed river basin district.



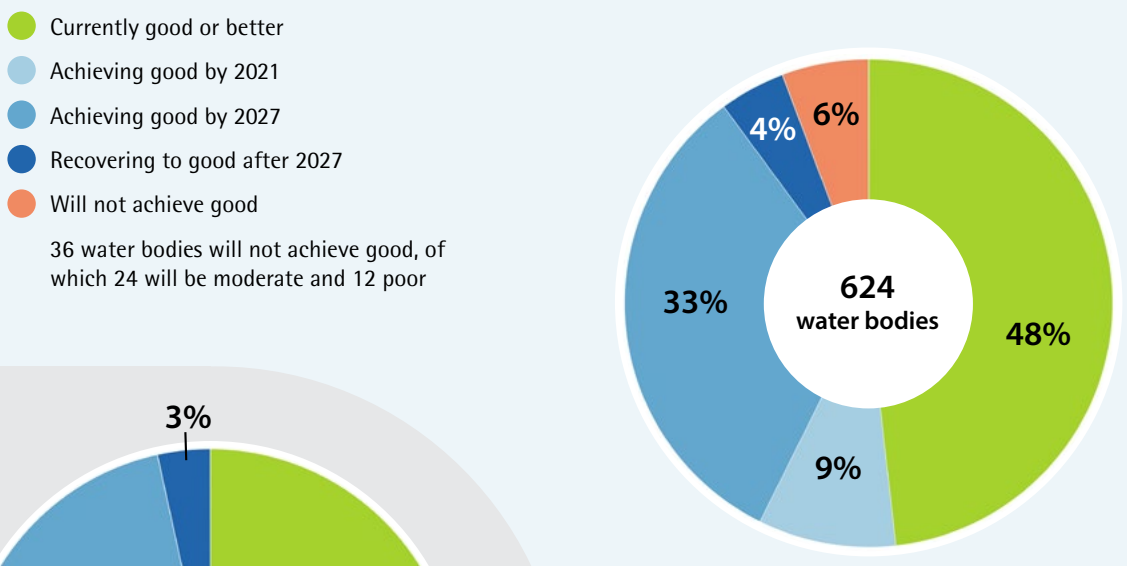
The plan builds on the first river basin management plan for the Solway Tweed river basin district[1], published in 2009. It sets revised objectives for the 12 year period from 2015 to the end of 2027 as described in Figure 2. This document provides an overview of objectives and the measures required to achieve them. Detailed information for each water body and protected area can be found in the Scottish Environment Protection Agency's (SEPA) Water Environment Hub.

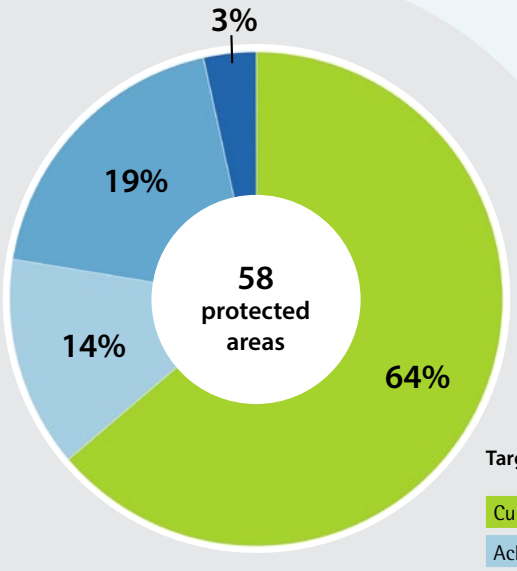
Achievement of these goals will require public bodies, businesses, land managers and voluntary groups and organisations, to work in partnership. Everyone has a role to play in protecting and improving the water environment.

Working together to secure the sustainable use of the water environment will help us maximise the benefits a healthy water environment can bring for people and businesses. It will also ensure we identify, and make use of, opportunities to contribute to realising wider goals by integrating with other plans and processes, as summarised in Figure 3.

1 www.sepa.org.uk/environment/water/river-basin-management-planning/publications#RBMPplan

Figure 2 - Improvement objectives for water bodies and protected areas for the period 2015 to 2027





Target	Genre	Number of protected areas
Currently good or better	Wildlife conservation areas	34
Achieving good by 2021	Wildlife conservation areas	3
Achieving good by 2027	Wildlife conservation areas	8
Recovering to good after 2027	Wildlife conservation areas	2
Currently good or better	Bathing waters	3
Achieving good by 2021	Bathing waters	4
Achieving good by 2027	Bathing waters	2
Achieving good by 2021	Shellfish waters	1
Achieving good by 2027	Shellfish waters	1

Figure 3 – Plans the river basin plan integrates with

Wider area	England	Scotland
Flooding and coastal erosion	Flood risk management plans[2] Flood and coastal risk management: long-term investment scenarios	National Flood Risk Assessment Flood Risk Management Strategies
Climate change adaptation	UK National Climate Adaptation Strategy and Adaptation Plan	
Water supply	Water resources management plans Drought management plans	Water scarcity plan Scottish Water plans and processes
Biodiversity	Biodiversity 2020: A strategy for England's wildlife and ecosystem services Natura 2000 site improvement plans	2020 Challenge for Scotland's Biodiversity - A Strategy for the conservation and enhancement of biodiversity in Scotland
Invasive non-native species (INNS)	The Invasive non-native species framework strategy for Great Britain	
Forestry		The Scotland Forestry Strategy
Sustainable land use		Getting the best from our land - A land use strategy for Scotland

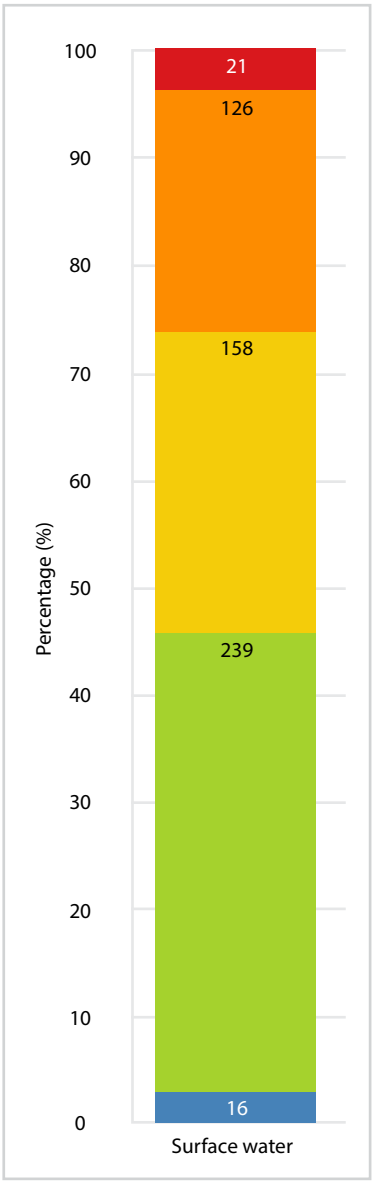
2 www.gov.uk/government/collections/flood-risk-management-plans-2015-to-2021

Current condition of the water environment

There are 624 river, lake, estuary, coastal and groundwater water bodies in the Solway Tweed river basin district, and 58 protected areas. Protected areas are areas designated as needing special protection because of their importance for bathing, growing and harvesting shellfish, or the conservation of wildlife of Europe-wide interest (see Appendix 1 for further information).

In 2014, 54% of the district's water bodies and 64% of these protected areas were assessed[3] as being in a good or better condition (Figures 4, 5 and 6)[4].

Figure 4 – Condition of surface water bodies in the Solway Tweed river basin district in 2014 (number of water bodies).



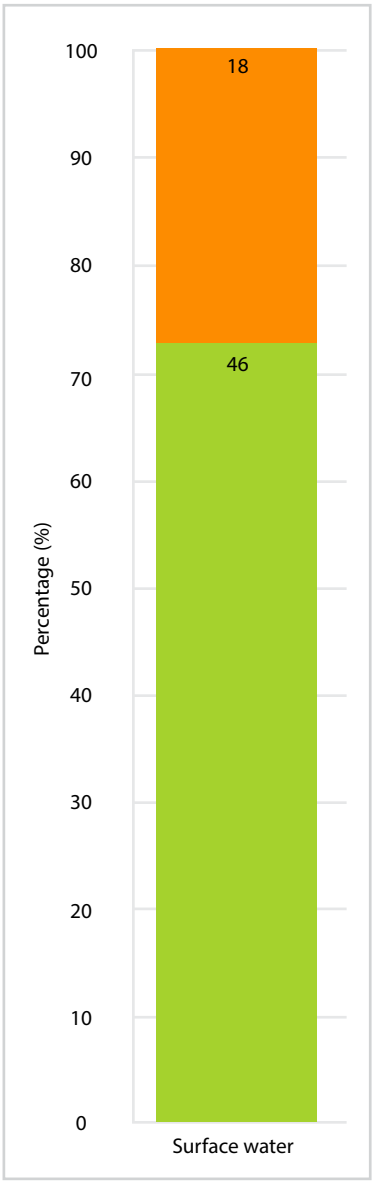
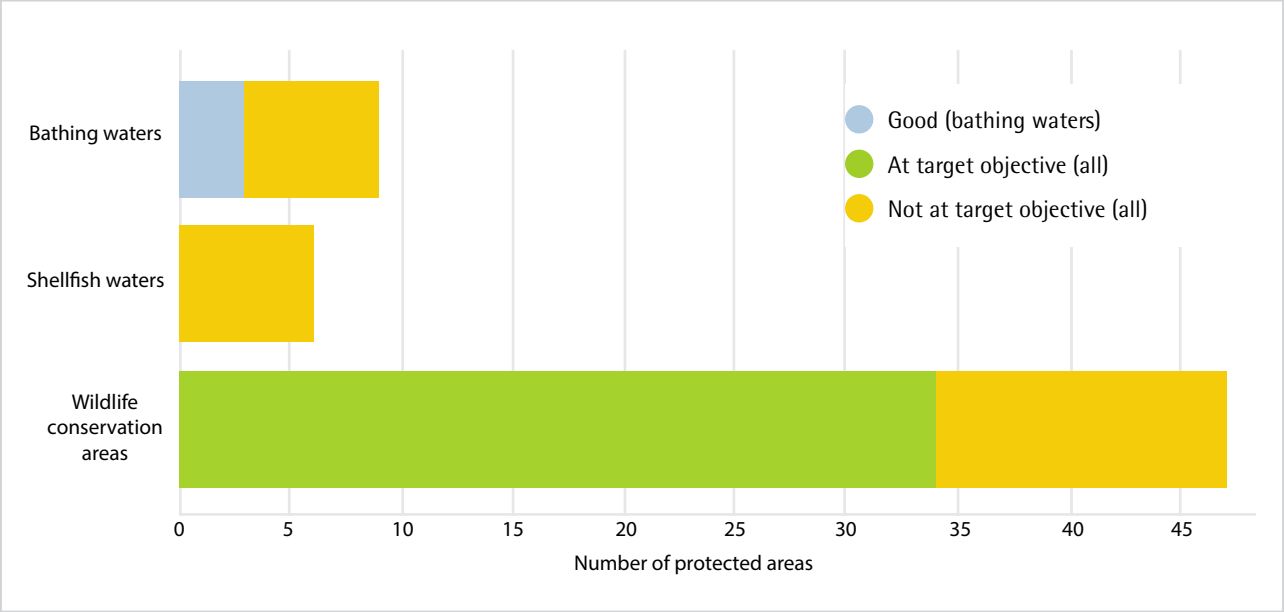


Figure 5 – Condition of groundwaters in the Solway Tweed river basin district in 2014 (number of water bodies).

3 Information on how the condition of water bodies is assessed is provided in Appendix 7 for England and Appendix 8.3 for Scotland.

4 The information included on bodies of surface water combines the agencies' assessment results for heavily modified and non-heavily modified surface water bodies. Information on heavily modified water bodies can be found in Appendix 7 for England and Appendix 8.1 for Scotland.

Figure 6 – Condition of protected areas for wildlife conservation, shellfish and bathing waters in the Solway Tweed river basin district.



Note to Figure 6

The district's 16 protected drinking water sources are not included in the figure. The objective for these areas is to prevent their deterioration. Six of these areas are currently at risk.

Areas designated as protected because of excess inputs of plant nutrients are also not shown. The objective for these is to put in place certain actions to reduce inputs and this has been done.

For wildlife conservation areas, 'at target' means that the characteristics of the water bodies on which an area's conservation goals depend are in at least a good condition. It does not indicate that the area's wildlife conservation goals are achieved: for a significant number of wildlife protected areas, the achievement of the latter is only partly dependent on the condition of the water environment. For some, the achievement of conservation objectives may require the condition of water bodies to be restored to a condition better than good. Where we find this is the case, we will review our targets for the areas concerned.

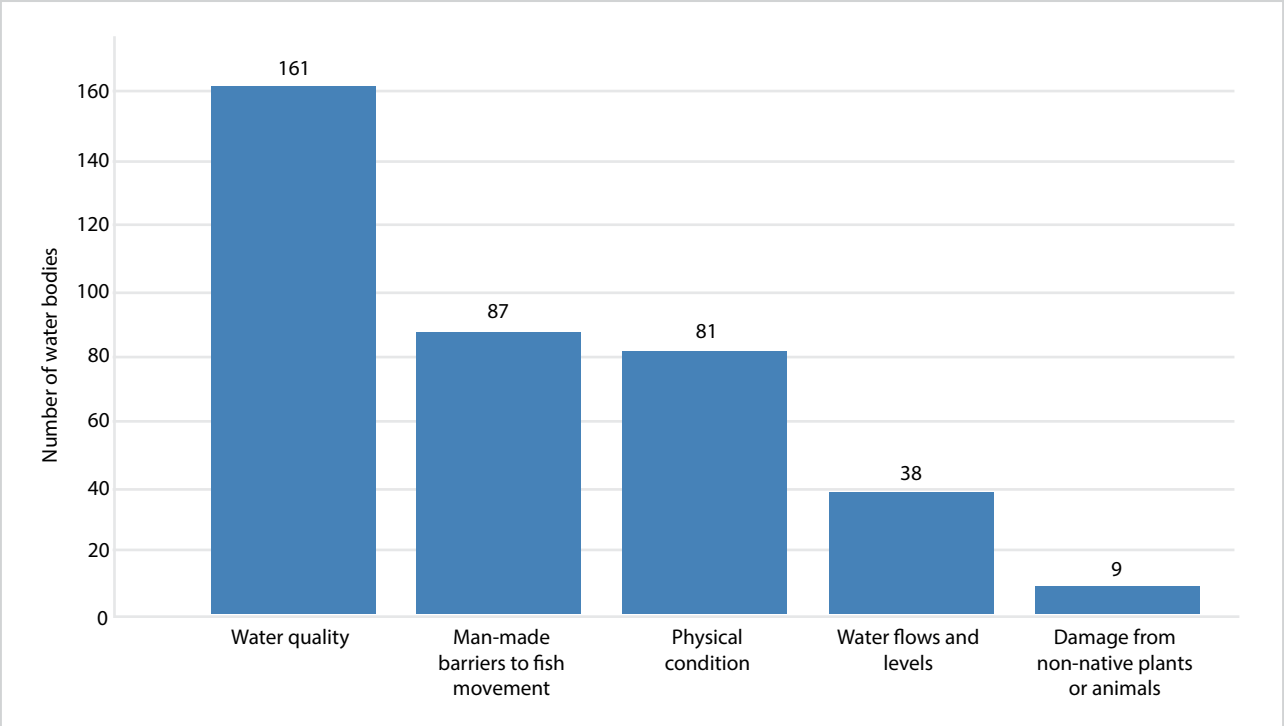
Pressures on the water environment

46% of water bodies and 36% of protected areas in the district are not in good condition. For rivers, lakes, estuaries and coastal waters, our main aim is to ensure good ecological quality. This requires:

- water quality to be good (i.e. unpolluted);
- the quality of the physical structure of beds, banks and shores to be good;
- removal of significant man-made impediments to the movement of migrating fish;
- water flows and levels to be good;
- protection from invasive non-native species (INNS).

Figure 7 summarises the number of water bodies where those conditions are not met – where the pressures on the water body are having a negative impact on its ecology.

Figure 7 – Causes of water bodies being in worse than good condition



Note to Figure 7

Some water bodies have multiple pressures and may feature in several columns.

Pressures affecting water quality, the physical condition of surface water bodies and barriers to fish movement are the most significant. The biggest impact is rural diffuse pollution, which accounts for 114 of the 161 affected water bodies.

These are also the pressures that pose some of the most significant management challenges[5] on a national scale.

The sections that follow describe the plan for tackling the pressures responsible for each of these impacts and the improvements to the condition of water bodies and protected areas that are expected to be achieved as a result.

5 Further details on these challenges can be found in the consultation, *Current condition and challenges for the future: Solway Tweed river basin district*, published in 2014.
www.sepa.org.uk/media/37232/current-condition_challenges-for-future_solway-tweed_public-consultation.pdf

Improving the condition of water bodies and protected areas

The two most widespread pressures on the water environment, rural diffuse pollution and modifications to the physical condition of water bodies, are both connected to land use. The majority of sources of rural diffuse pollution are the result of rural land uses. The majority of the most significant modifications to the physical condition of water bodies were made with the intention of facilitating urban or rural land uses. Reducing these pressures requires very different approaches to those used to tackle other pressures such as water abstraction and waste water and industrial discharges.

Measures required to address all the pressures on the water environment are generally very similar across the district. However, the way the measures are planned and delivered will align with each country's national approach.

Details of the full programme of measures for addressing all pressures on the water environment can be found in the online data tool, the Water Environment Hub.

Scotland's approach

Over the period 2009 to 2015, land managers, public bodies and voluntary organisations have worked together to develop and refine approaches to meeting the challenges posed by rural diffuse pollution and impacts on physical condition. However, this work now needs to be significantly expanded if it is to deliver the scale of improvement required.

For this second plan, the programme of measures in Scotland has been strengthened, increasing the focus and effort on reducing rural diffuse pollution and improving the physical condition of water bodies. The step changes that will be made to help tackle these, and the other major pressures on the water environment, are described in the sections below. They include:

- studies and investigations to help pin-point the sources of the problems;
- working with local communities and businesses to find solutions that maximise social and economic benefits;
- building action-focused partnerships, in particular with land managers, other businesses and voluntary organisations to lead and champion the work;
- communicating and sharing good practices, including among land managers;
- providing funding support for actions where appropriate.

More details can be found in Appendix 8.4 (Programme of measures).

Understanding of the condition of the water environment, the pressures on it and the benefits it provides have all improved since 2009. To take account of this in the second plan, objectives in the Scottish part of the district for 2021 and 2027 have been re-phased, prioritising actions between 2015 and 2021 that are expected to deliver the greatest benefits without incurring disproportionate cost. If on-going improvements in understanding of pressures and the costs and benefits of addressing them show it is appropriate to do so, further updates to the priorities for where and when action is taken will be made.

The details of action in the Scottish area of the district include everything currently planned to deliver water body and protected area improvements by 2021, 2027 and beyond that date where it is necessary and permitted ('extended recovery').

England's approach

Main programmes of measures for 2021 outcomes

The main programmes of measures that will improve the water environment of the Solway Tweed river basin district by 2021, grouped by funding sources, are:

- water company investment programme;
- Countryside Stewardship;
- Highways England's environment fund;
- flood risk management investment programme;
- catchment level government funded improvements;
- water resources sustainability measures.

The outcomes of these measures fall into two categories:

1. Measures that the predicted improvements in the status of water bodies by 2021 are based on - these figures are included in the objectives summary at the end of each section.
2. Measures that will happen by 2021 and achieve environmental outcomes, but there is not enough confidence (in location or scale of improvement) to predict specific outcomes. These figures are not included for 2021 in the objectives summary at the end of each section. Information on these additional environmental outcomes for 2021 is given below.

Details of each programme are included in the section discussing the relevant pressure.

Additional environmental outcomes for 2021

For some measures, although there is confidence that the measure will happen by 2021, there is not enough confidence about the location or the scale of improvement to be able to predict outcomes for specific elements in specific water bodies.

These additional 2021 outcomes, which are not included in the 2021 summary objectives under each pressure, are:

- habitat improvement schemes across the river basin district resulting in improvements to river ecology, delivered by projects run by Rivers Trusts and other bodies;
- reductions in nutrient levels from rural diffuse pollution arising from Countryside Stewardship;
- improvements to point source sewage discharges including Calthwaite, Dalston and Wigton wastewater treatment works.

The environmental objectives in this plan will drive additional improvement in the water environment by 2021. Opportunities include the periodic review of water company price limits in 2019, government spending reviews, major infrastructure projects and the routine review of environmental permits.

Forward look at measures beyond 2021

This section provides a summary of the measures that are envisaged as necessary for protected areas and water bodies to achieve their objectives for 2027 and beyond. It also describes opportunities that could enable additional measures to be implemented by 2021.

Measures to 2027

Figure 8 contains a summary of the types of measures that are envisaged to be necessary to address each significant water management issue up to 2027. This is not exhaustive and will inevitably change. Change can occur for a variety of reasons including, new evidence, changes in water body status, funding availability, government policy changes, development impacts and climate change. The measures in figure 8 are required in addition to the measures to address the significant water management issues described in each section on pressures.

The summary programmes of measures and environmental objective in this plan will be reviewed and updated in 2021. The Water Framework Directive (WFD) does not generally allow the timescale for the achievement of environmental objectives to be extended beyond 2027. Therefore, as part of the plan update in 2021, choices will have to be made about the appropriate use of less stringent objectives.

Figure 8 - Summary of types of measures envisaged as necessary to achieve objectives for each significant water management issue.

Types of measures envisaged in the river basin district	Main sectors involved in implementing the measures
Measures to address physical modification	
• Improvement to condition of channel/bed/banks/shoreline • Removal or easement of barriers to fish migration • Removal or modification of engineering structure	• Government (local government) • Rural land management
Measures to address pollution from waste water	
• Mitigate/remediate point source impacts on receptor	• Water industry
Measures to address changes to natural flow and level of water	
• Improvement to condition of channel/bed/banks/shoreline	• Government (local government)
Measures to address pollution from rural areas	
• Reduce diffuse pollution at source • Mitigate/remediate diffuse pollution impacts on receptor	• Government (central government) • Rural land management
Measures to manage pollution from minewaters	
• Mitigate/remediate point source impacts on receptor • Mitigate/remediate diffuse pollution impacts on receptor	• Government (central government)

The cost of programmes of measures provides a good indication of the scale and phasing of action. Figure 9 shows the current assessment of the potential costs of measures to achieve the water body and protected area objectives in this plan. The costs of measures are broadly allocated to the sectors whose activities cause the problem in line with the 'polluter pays principle'. Beyond the known funding to 2021, no decision has been made on where the costs will fall. In some cases, the sectors may not pay their own costs. Note figures are rounded to the nearest £10 million.

Figure 9 - Summary of estimated costs and phasing of action.

Sectors	Total cost of measures over 37 years (undiscounted) to achieve objectives (£m)	Phasing to 2021 (% of total cost envisaged to 2021)	Phasing post 2021 (% of total cost envisaged after 2021)
Government	30	<10%	>90%
Rural land management	630	<10%	>90%
Industry, services and infrastructure	4	<10%	>90%
Water industry	240	20-30%	70-80%

Note to Figure 9

The rural land management costs are based on a range due to different scenarios of cost allocation. The midpoint is presented here to be consistent with other costs.

Opportunities for additional measures

There will be greater certainty on the measures that will be required between 2021 and 2027 when this plan is updated in 2021. Before then, a number of strategic reviews and funding streams could enable additional measures to be confirmed / implemented before 2021. Some of these opportunities are described below.

External funding sources

The following funding sources could be used to implement measures:

- The LIFE Regulation, which was published on 20 December 2013, sets a budget for 2014 to 2020 of €3.4 billion for projects to invest in the environment and climate change. Calls for applications are annual, for priorities including nature, biodiversity, water, floods and drought.
- The Heritage Lottery Fund invests £375 million each year, a portion of this being available to environmental improvement projects through the 'Parks for People' (£100,000 - £5 million) and 'Landscape Partnerships' (£100,000 - £3 million) programmes. Calls for applications can be once or twice a year and are often a two stage process.
- The government has asked Local Enterprise Partnerships to prepare economic strategies to inform the allocation of domestic and European 'growth funds', for example, the Single Local Growth Fund and the European Structural and Investment Funds. The criteria for allocation of these funds include environmental protection and sustainable development, providing an opportunity for water infrastructure that supports efficient and sustainable use of water.

Review of Urban Waste Water Treatment Directive designations

The Urban Waste Water Treatment Directive aims to protect the water environment from the adverse effects of discharges of urban waste water and certain industrial discharges. It specifies minimum treatment requirements as well as more stringent tertiary treatment when needed to protect designated sensitive receiving waters.

Sensitive area designations are currently reviewed every four years. The latest review will be completed in December 2015. The Environment Agency would like to see a move towards six yearly cycles to align with the Water Framework Directive but this would require changes to legislation.

European Union (EU) Priority Substances Directive

The 2013 revisions to the Priority Substances Directive have been transposed into domestic legislation. To comply with the new requirements by 22 December 2018, the Environment Agency will submit a supplementary monitoring programme and a preliminary programme of measures to the European Commission, with the aim of achieving good

chemical status by 2027. The required measures will need to be considered in water company investment plans, as part of the 2019 Price Review and will be finalised in the 2021 update of the river basin management plans. All of the required measures will be made operational by 2024.

Preliminary investigations of chemicals with new European standards indicate that they could have a significant impact on good status in future. Sewage may be a significant source of some of these chemicals. While sewage treatment is generally effective at reducing inputs this may not always be sufficient. Some substances have restrictions or bans on usage but these may take many years to result in lower environmental concentrations. Additional treatment to tackle these chemicals is likely to be expensive and difficult to implement meaning that the best options for the future will need to be considered carefully.

Review of water company price limits

Ofwat[6] is expected to review the prices that water companies can charge their customers in 2019. As part of this process, water companies will need to update their business plans to include (amongst other things) additional environmental improvements agreed with their customers and the Environment Agency.

Common Agricultural Policy[7]

The current agreement for funding from the Common Agricultural Policy, including the basic payment scheme and rural development programme that encompasses Countryside Stewardship, ends in December 2020. Negotiations for continued funding for the period 2021 to 2027 have not yet begun.

Water resources management plans

Water companies will publish new plans in 2019. These plans set out how they will balance supply and demand for water over a 25 year period. The new plans will enable them to take account of expected changes in demand for water and in their available supply as a result of climate change and population growth, as well as any new measures needed to deliver environmental objectives.

Review of Nitrate Vulnerable Zones designations and action plans

Every four years, the UK is required to review the evidence in relation to the extent of nitrate vulnerable zones (NVZ). The effectiveness of the action programme introduced by the Regulations is looked at and changes implemented where required. NVZs are a means of reducing or preventing water pollution caused by nitrates from agricultural sources. The next review is underway and any changes are expected to be implemented in January 2017.

Additional measures to achieve protected area objectives

Measures have been developed for protected areas that are at risk of or do not currently meet their objectives. Figure 10 summarises the action planning process.

6 The Water Services Regulation Authority, www.ofwat.gov.uk

7 www.gov.uk/government/policies/common-agricultural-policy-reform

Figure 10 - Summary of measures for protected areas

Protected Area	Programme
Drinking water protected areas - surface water and groundwater	Safeguard zones have been defined for water sources in drinking water protected areas where extra treatment is likely to be required in the future. Safeguard zone action plans have been developed including measures needed to manage activities that may threaten raw water quality for surface waters and ground waters.
Economically significant species (shellfish waters)	Shellfish water action plans have been produced for all designated shellfish waters, which include measures aiming to observe relevant microbial shellfish flesh standards.
Recreational waters (bathing waters)	Bathing water profiles have been produced for all designated sites. They include details of the measures needed to achieve compliance with the revised standards that come into force in 2015. Further information is available on the measures for those bathing waters at risk of not achieving sufficient in 2015 in the bathing water action plans (continuing at risk).
Nutrient sensitive areas (Urban Waste Water Treatment Directive)	Measures have been identified to make sure that all relevant discharges from waste water treatment plants within the sensitive area have appropriate phosphorus or nitrogen emission standards.
Nutrient sensitive areas (nitrate vulnerable zones)	Nitrate vulnerable zones have been designated in areas where water quality is affected by nitrates from agricultural sources. Measures to reduce nitrate concentrations within nitrate vulnerable zones include establishing a voluntary code of good agricultural practice and developing action programmes to reduce agricultural nitrate losses.
Natura 2000: Water dependent Special Areas of Conservation (SACs) and Special Protection Areas for Wild Birds (SPAs)	Natural England has developed site improvement plans (SIPs) for water dependent sites. SIPs provide an overview of issues affecting the site condition; identify priority actions, timescales for implementation and potential funding sources. Natural England monitors, reviews and updates SIPs where appropriate.

Maintaining the quality of the water environment

As well as improving the condition of water bodies and protected areas that are not in a good condition, it is important that the current quality of all water bodies is maintained. Prevention of deterioration of the water environment, including drinking water sources, is a key purpose of this plan and a significant and constantly evolving challenge as pressures shift and change.

Regulating water uses

In order to prevent deterioration an effective system for checking that water uses are sustainable and that their risks are managed is needed. Accordingly, the measures put in place in both England and Scotland includes requirements for prior-authorisation of activities that could adversely affect the water environment. Programmes of monitoring and inspection by regulators, such as the Environment Agency and SEPA, then check and ensure these activities are carried out in accordance with the conditions of their authorisations.

Promoting sustainable use

Another important way the water environment is protected is by promoting and supporting sustainable water use. This includes:

- providing information and advice on how to avoid causing pollution;
- ensuring that public sector and private development plans are informed by information on where the water environment can accommodate additional pressures without adverse effects;
- rewarding and incentivising good practice;
- identifying risks posed from changing or expanding uses of the water environment, and working with the businesses concerned to find solutions and help them develop sustainably.

Minimising adverse impact from important developments

Adverse impacts from development are sometimes unavoidable. In these cases, it is necessary to balance protection of the water environment with achievement of other important goals - such as reducing flood risk, increasing renewable energy generation and ensuring adequate drinking water supplies. The regulators will continue to ensure developments that would adversely affect the water environment go ahead only where:

- their benefits outweigh those of protecting the water environment;
- all practical steps are taken to minimise adverse impacts.

To date, SEPA has allowed modifications to just one water body in order to allow sustainable development. There are no such developments in the English area of the district.

Maintaining good environmental practices

Good environmental practices, for example, in agricultural land management and in managing industrial estates to prevent pollutants entering surface water drains, play an important part in improving and then protecting the water environment. Public bodies, land managers and others will work to ensure that, once in place, good practices are maintained and that the next generation is ready and able to take them on.

Managing emerging risks

The condition of the water environment can be threatened by wider scale changes than those resulting from individual developments. These include:

- the spread of invasive non-native plants and animals;
- shifts in land uses or practices that increase diffuse pollution risks;
- changes in the use of chemicals and other materials;
- the introduction of diseases that can damage the health of aquatic wildlife.

The programme of measures established in this plan includes measures designed to manage a range of such potential risks. Managing risks posed by non-native invasive species present a particular challenge and further details of how we are attempting to do so can be found in the section on invasive species.

Spotting emerging risks early is the key to successfully avoiding damage to the water environment. This will be an important objective of the environmental monitoring and assessment programmes underpinning implementation of this plan. However, the scale of the task means that even when using state of the art environmental monitoring techniques, these programmes need to be supplemented with information from businesses, voluntary organisations and ordinary people. We will continue to promote and facilitate this important public role in helping protect the quality of the water environment.

Adapting to climate change

Periods of dry weather and periods of flooding already lead to increased risks to the water environment. Climate change will increasingly affect demands on water resources, the ability of the water environment to accommodate water uses, the pattern of land uses and the ability of non-native species to spread and become established. Improving our understanding of when and where we need to act to manage these effects will be an important part of our river basin planning work over the period to 2027.

Working together

The Environment Agency and SEPA are jointly responsible for producing and implementing the Solway Tweed river basin plan, on behalf of the UK and Scottish governments. The agencies work closely together, and both also rely on the work of other national and local bodies in their respective countries: all public bodies will take this plan and its objectives into account when doing anything that could affect the water environment. In addition, in Scotland, a number of responsible authorities have been identified to work alongside Scottish Ministers and SEPA to ensure a co-ordinated approach is maintained.

Partnership working at a catchment level is vital to the delivery of the plan's objectives, whether in England or Scotland and there is a long history of partnership working both across the district and across the border. The Tweed Forum continues to act as the support and implementation lead for river basin planning in the Tweed. In the Solway, the advisory group functions are taken up by the North Solway Group and catchment groups in England. All aim to bring together relevant stakeholders to ensure communication and co-ordinated approaches.

In Scotland, catchment level working with existing or new partnership groups will continue to have a role in the delivery of measures across Scotland during the second and third river basin planning cycles. For this river basin district, the Tweed Forum and North Solway AAG liaison will continue to be used to facilitate this process.

In England, catchment partnerships and the catchment based approach were established during the first cycle to inform the planning process and help with delivery of measures.

Working together in England: catchment partnerships and the catchment based approach

Taking a catchment based approach helps to bridge the gap between strategic management planning at river basin district level and activity at the local water body scale. The catchment based approach aims to encourage groups to work together more effectively to deal with environmental problems locally.

Catchment partnerships are groups of organisations with an interest in improving the environment in their local area and are led by a catchment host organisation. They inform the river basin management planning process and help implement measures by:

- providing local evidence;
- targeting and coordinating action;
- identifying and accessing funding for improvements in the catchment;
- incorporating river basin management planning into the wider environmental management of the catchment.

Some of the partnerships will produce their own catchment or local plans.

The partnerships work on a wide range of issues including, but not restricted to, the water environment and river basin management. Partnerships also include coastal and marine waters.

Figure 11 lists the partnerships in this river basin district. Some partnership groups are in the early stages of being set up, while others have been active for years.

Figure 11 – Partnerships in the English area of the district

Catchment	Partnership group host
Eden	Eden Rivers Trust
Waver and Wampool	West Cumbria Rivers Trust
Till and Tweed	The Tweed Forum

Working together in England: catchment level government funded improvements

As part of the commitment to the catchment based approach, Defra has made £10.1 million available during 2015 to 2016 for voluntary action to improve the water environment through the Catchment Partnership Action Fund (CPAF) and the Environment Agency's Environment Programme. In England, the Environment Agency will invest £4.64 million through its Environment Programme, with more than 50% of this being specifically for partner-led projects.

CPAF will invest £5.1 million in 2015 to 2016. £1.3 million of this supports the role of catchment hosts with the remainder going to projects carried out by voluntary groups. Of the CPAF and Environment Programme funding, at least £2 million will be used for dealing with urban pollution issues.

Across England, a wide variety of measures are funded at a catchment level. This includes advisory and action based schemes to reduce the impact of pollution from rural and urban areas along with habitat improvement measures to increase biodiversity.

Natural England will invest £2 million nationally on protected areas measures during 2015 to 2016. This will focus on safeguarding and where necessary improving the condition of Natura 2000 sites using measures such as river restoration, lake restoration, control of diffuse pollution, management of freshwater invasive species and habitat restoration on wetland sites.

The effectiveness of measures within this programme is variable. Measures such as removing barriers to fish migration are well established engineering solutions and are effective. However, there are some catchment and habitat improvement schemes that are less well established, including measures to reduce pesticide pollution or reconnect rivers to their floodplains. Some measures rely on behavioural change in agricultural practice, so may be less effective compared to engineering solutions.

Projects need to be resilient to a changing climate, performing under a variety of conditions and supporting the long term health of the catchment. When developing its investment programme, the Environment Agency considers the contribution each action will make to reduce climate change risks and works with partners to manage these risks and help catchments adapt.

Other catchment level government funded improvements address a range of pressures and will secure a variety of improvements to the environment, but are not linked to outcomes for 2021 because of insufficient confidence about the scale of improvement.

An example of these improvements in the Solway Tweed river basin district is the Cumbria river restoration strategy.

Cumbria river restoration strategy

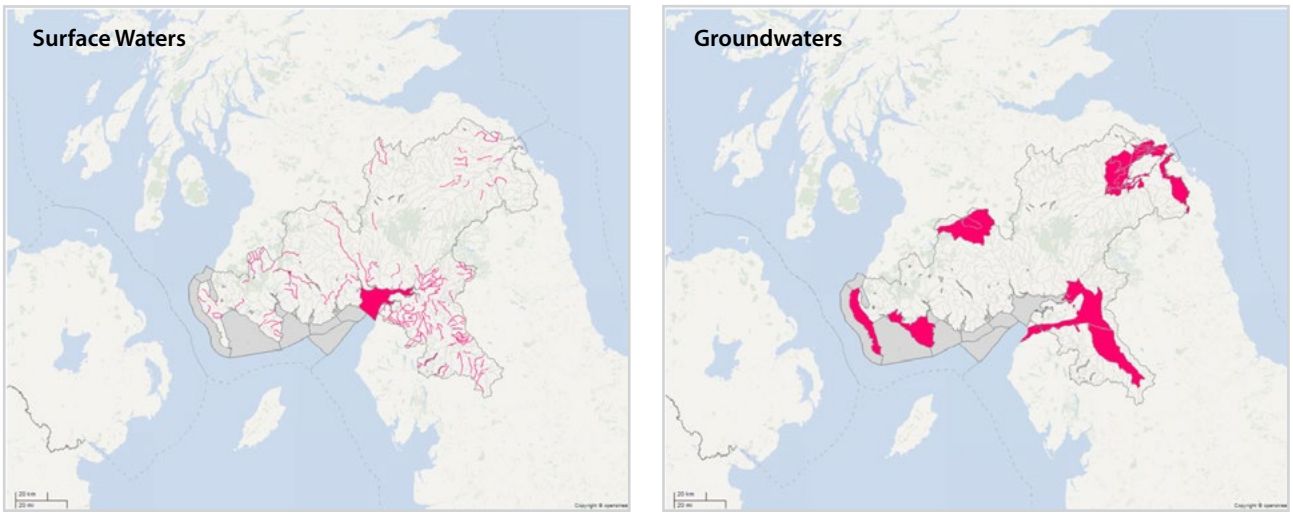
The strategy is a £1.1 million, six year plan of river restoration projects in Cumbria's rivers. Led by the Environment Agency and Natural England, it aims to help develop the skills of rivers trust officers by providing technical and project management support throughout the life of the strategy. The projects to enable the strategy will help re-connect the rivers to historic flood plains, improve habitat diversity, result in better fish spawning habitat and improve learning and understanding of this work among the farming and local community.

The CPAF is funding two projects in the Eden catchment, delivered by Eden Rivers Trust. The projects on Pow Beck and the River Petteril aim to deliver riparian habitat improvements and agricultural advice.

3 Water quality

Across the Solway Tweed district, water quality is at worse than good status in 161 water bodies (Figure 12).

Figure 12– Water bodies where water quality is worse than good



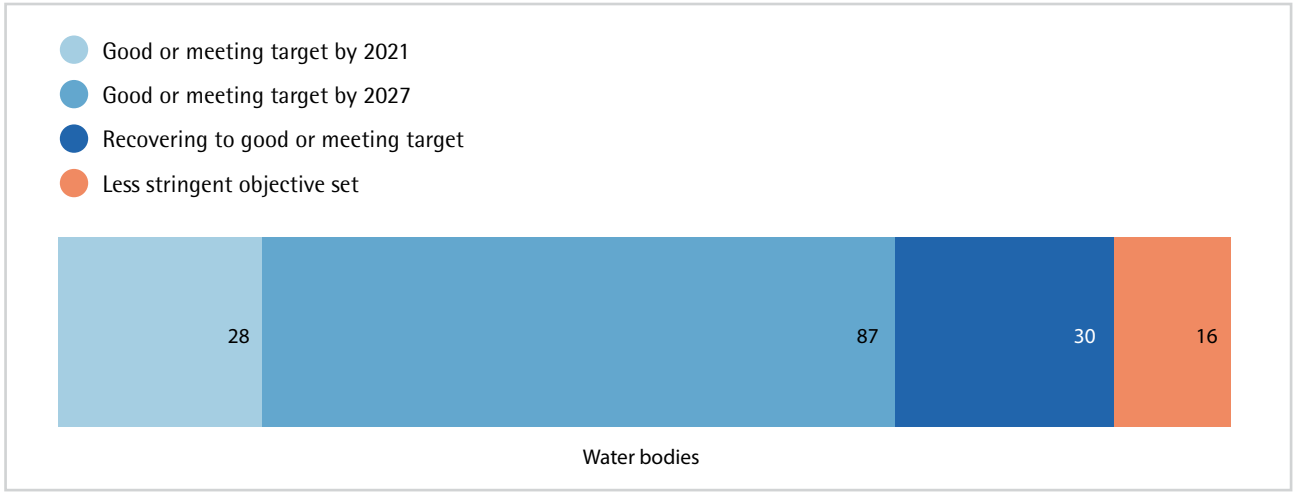
Improving water quality in these water bodies will bring a range of benefits, including helping to:

- support the expansion of businesses that depend on a high quality water environment, such as tourism, food and drink production, and fisheries;
- reduce the costs of public drinking water production and protecting the health of private water supply users;
- expand opportunities for a wide range of recreational activities, including by improving bathing waters;
- contribute to the regeneration of areas where a high quality water environment could be an important community amenity;
- improve the health and range of populations of wild plants and animals, including rare and endangered species.

Targets for improvement in overall water quality

The actions outlined in the following sections are expected to bring about improvements in water quality by the dates shown in Figure 13.

Figure 13 - Expected improvements in water quality in water bodies that are at worse than good status in 2015. Date given is when overall water quality is expected to reach good status, and affected water plants and animals have recovered.



Note to Figure 13

Reductions in the concentrations of pollutants and, in bodies of surface water, the recovery of water plant and animal communities from their effects can take time after the required action has been taken. Water bodies where recovery is expected to lag in this way are shown in the figure as recovering to good after 2027.

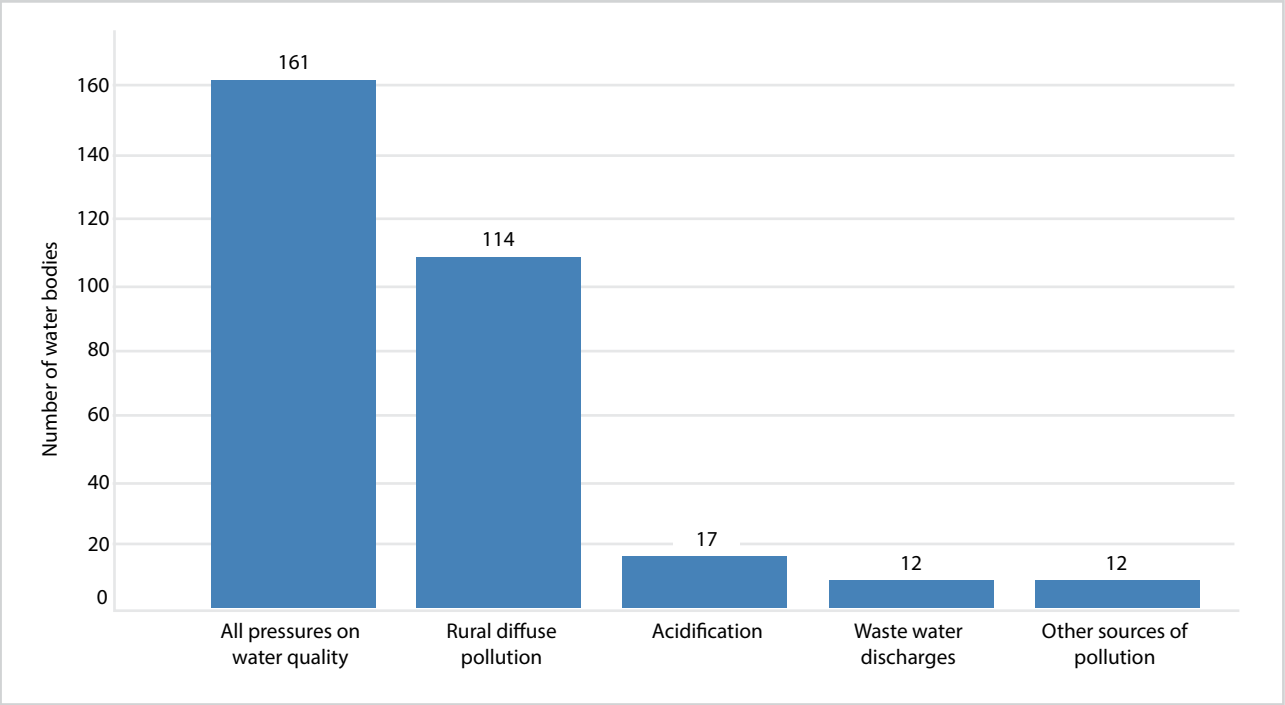
A proportion of the objectives for the Scottish area of the district have additional time allocated to ecological recovery; six years after measures are in place for rivers and 12 for lakes.

16 Scottish water bodies have been given a 'less stringent objective' than good status.

Pressures on water quality

As Figure 14 illustrates, rural diffuse pollution is by far the main pressure on water quality in the district.

Figure 14 – Number of water bodies with water quality pressures



Note to Figure 14

Some water bodies have multiple pressures and may feature in several columns.

The planned actions to address rural diffuse pollution and waste water discharges are outlined in the following sections. Other than those, acidification and pollution from historic mining and quarrying are the district's most significant water quality problem, with abandoned metal mines affecting Glenridding Beck (Greenside mines), Hilton Beck and the River Caldew.

Acidification

Seventeen river water bodies in the Scottish area of the district are affected by acidification. These are all in the Galloway region, in the Dee, Cree, Bladnoch and the Fleet catchments.

The amount of acid deposition, which is the primary cause of acidification in these water bodies, has substantially reduced as a result of controls on emissions of acidifying gases within the UK and internationally. Due to the very sensitive nature of the catchments affected, recovery is likely to be a long process. In twelve of the water bodies forestry is thought to be exacerbating the problem and delaying recovery. Measures to reduce the impact of forestry are ongoing.

One water body is predicted to recover by 2027, with the remainder in long term extended recovery – current predictions suggest improvement by around 2040 for most.

Rural diffuse pollution

A range of different sources can contribute to rural diffuse pollution. The main cause is typically when rainwater run-off from land picks up soil, bacteria and nutrients from livestock excreta, or fertilisers and pesticides.

The main sources in the district result from agricultural land uses but contributions from forestry activities and from rural septic tanks can be significant in some areas too.

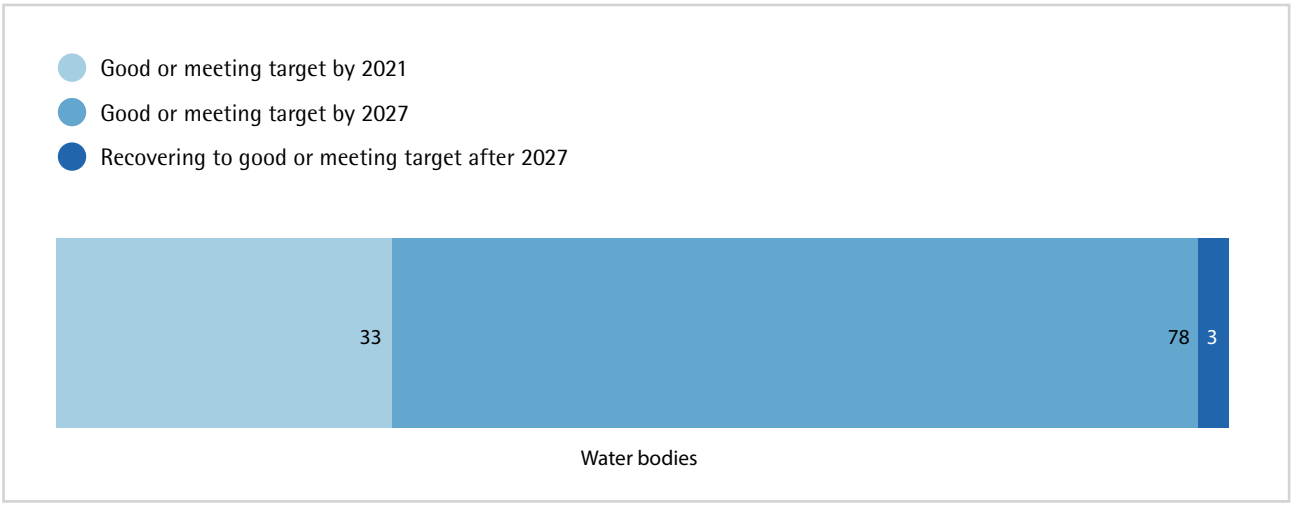
Scale of problem and targets for improvement

There are currently 114 water bodies affected by rural diffuse pollution in the district. Most of these water bodies are rivers but the figure includes six lakes, 11 ground water bodies and both the Solway and Tweed estuaries.

The objectives set for water quality improvements in these water bodies are shown in Figure 15.

The timescale for recovery from the effects of pollution will vary, typically being longer for lakes than rivers and longer still for groundwater. These delays are because it takes time for pollutants already in the environment to flush out of the system and, in the case of surface waters, for healthy populations of water plants and animals to re-establish.

Figure 15 - Expected improvements in water quality in water bodies affected by rural diffuse pollution. Date given is when the water body is expected to have recovered from pollution from rural diffuse sources.



Note to Figure 15

A proportion of the objectives for the Scottish area of the district have additional time allocated for ecological recovery; six years after measures are in place for rivers and 12 for lakes.

The improvements shown also factor in the effect of measures to reduce other sources of the pollutants concerned, such as waste water discharges.

It is not possible to predict precisely the effects of all measures to reduce diffuse sources of pollution. However, it is anticipated that, in combination with measures taken to address other sources of pollution, they will be sufficient to achieve good water quality in the affected water bodies in due course. Progress towards this target will be monitored, and the programme of measures will be updated if necessary.

Action to deliver improvements

Across the district there are established measures in place to address rural diffuse pollution that prevent deterioration and provide some improvements in water quality. Beyond this, both countries have specific national plans in place to provide larger scale improvements.

In both English and Scottish areas, regulators and operators use and apply relevant legislation. For example:

- Farmers who claim under the annual Basic Payment Scheme (formerly the Single Farm Payment) under the Common Agricultural Policy must meet Good Agricultural and Environmental Condition as a cross compliance requirement.
- In the district's Nitrate Vulnerable Zones each country has regulatory action programmes in place to reduce pollution of vulnerable ground waters and estuaries by agricultural nitrates.
- Local government uses planning conditions, legal agreements and enforcement powers to prevent or stop pollution from rural developments, roads and other rural infrastructure. It also considers the impact of pollution when preparing spatial plans, minerals and waste plans and making decisions on development management, new rural buildings and rural infrastructure.
- Both countries' agencies check and ensure compliance with a wide range of environmental legislation, including that controlling pollution.
- In Scotland, a series of General Binding Rules (GBRs) were introduced during the first cycle. The GBRs lay down minimum requirements for how a wide range of land management activities liable to cause pollution must be undertaken to help protect and improve water quality.

Also in both English and Scottish areas, actions to address impacts of specific sectors or in specific locations, will be carried out under existing or parallel programmes. These include:

- Forest managers and public bodies work to raise awareness of good practices for minimising pollution from forestry operations. They promote sustainable forestry and compliance with the UK Forestry Standard.
- Scottish Water leads a 'sustainable land management incentive scheme' in one catchment in the Solway (Winterhope) where drinking water is affected by rural diffuse pollution. Work includes catchment visits, advice and an incentive scheme to fund additional action by land managers.
- In Cumbria, United Utilities' Sustainable Catchment Management Programme (SCaMP), which has been developed in association with the RSPB, aims to apply an integrated approach to catchment management. This will help improve water quality, reduce colour and associated treatment costs and deliver wider improvements for the catchments.

It should also be noted that in Scotland work to address rural diffuse pollution is delivered through a combined set of measures that target both water bodies and protected areas.

Action in England

Of the 112 water bodies in the district where rural diffuse pollution was contributing to adverse effects on water quality in 2015, 66 lie in the English area of the district.

How the issue is managed

Regulators and operators use and apply relevant legislation and policy:

- Government and agencies (Environment Agency) check and ensure compliance against permits under the Environmental Permitting (England and Wales) Regulations 2010 and against requirements of a wide range of environmental legislation.
- Agricultural and rural land management (farm businesses) comply with permits issued under the Environmental Permitting (England and Wales) Regulations 2010. Permitted activities include some discharges to groundwater, spreading of waste to land for agricultural benefit, pig and poultry units over a certain size and safe recovery of agricultural waste.
- Agricultural and rural land management (farm businesses) comply with the action plan within the Nitrate Pollution Prevention Regulations 2015 in all nitrate vulnerable zones.
- Agricultural and rural land management (farm businesses) comply with the requirements of the Control of Pollution (Silage Slurry and Agricultural Fuel Oil) Regulations 2010 (SSAFO).
- Agricultural and rural land management (farm businesses) comply with the Water Resources Act 1991 requirement to "not knowingly permit polluting matter to be present at a place where it has or is likely to enter controlled waters".
- Government and agencies (Farming Advice Service) advise farmers on general requirements of cross compliance and regulations required under the WFD.
- Government and agencies (Environment Agency and Natural England) provide site-level advice on the specific requirements of regulations.
- Government and agencies (Natural England) provide advice on the specific requirements of regulation that relate to designated sites, and can prevent or stop potentially damaging activities.
- Government and agencies (Environment Agency and Natural England) provide advice and training to farmers in some priority catchments through an approach such as Catchment Sensitive Farming.
- Government and agencies (Environment Agency) reviews the effectiveness of measures within catchments, and where there is sufficient need, considers whether further action should be proposed.
- Government and agencies (Forestry Commission) comply with the UK Forestry Standard, the government's approach to sustainable forestry.
- Local government use planning conditions, legal agreements and enforcement powers under the Town and Country Planning Act 1990, to prevent or stop pollution from rural developments, roads and other rural infrastructure.
- Local government considers the impact of pollution when preparing spatial plans, minerals and waste plans and making decisions on development management, new rural buildings and rural infrastructure.

Operators, influencers and project undertakers take action:

- Agricultural and rural land management (farm businesses) meet cross compliance requirements of the Basic Payment scheme funded by the Common Agricultural Policy.
- Agricultural and rural land management (farm businesses) voluntarily participate in Countryside Stewardship and Countryside Productivity schemes to prevent deterioration, improve water quality and reduce flood risk.

- Agricultural industry manufacturing and other business participate in sector led approaches including farm assurance and the Campaign for the Farmed Environment schemes.
- Water industry and rural land management work together in drinking water safeguard zones to reduce the need for water treatment as a result of nutrients or pesticides to meet drinking water standards.
- Government and agencies (Forestry Commission and Environment Agency) use opportunity mapping to identify and promote locations where woodland creation can achieve multiple benefits for the environment.

The main programmes of measures that will improve the water environment affected by rural diffuse pollution, by 2021, are:

- Countryside Stewardship;
- catchment level government funded improvements.

Catchment level government funded improvements are described in detail on page 18.

Countryside Stewardship

Countryside Stewardship is a new scheme that is open to all eligible farmers, woodland owners, foresters and other land managers through a competitive application process. It is entirely voluntary and is part of a wider investment of £3.5 billion in England under the Common Agricultural Policy for 2016 to 2020. It will contribute £900 million of new funds to enhance the natural environment, particularly the diversity of wildlife and water quality. About £400 million of this new funding will be used to improve water quality and increase resilience against flooding.

By 2020, it is expected that 30% to 40% of rural England could be part of a Countryside Stewardship agreement. Countryside Stewardship supports the implementation of measures over and above legal requirements and good practice. It will address soil management and reduce the effect of nutrients, sediment and faecal bacteria pollution. This will reduce the impact of eutrophication and benefit bathing waters, shellfish beds and drinking water. This is achieved through measures categorised by the following groups:

- enhanced field management, including seasonal livestock exclusion, winter cover crops, buffer and riparian management strips next to watercourses and reduced nutrient applications from fertilisers;
- land use change, including woodland and wetland creation or converting arable land to grassland, which requires less fertiliser;
- water and woodland capital grants, including sediment traps, fencing of watercourses and tree planting;
- re-naturalising rivers and coast defences, including making space for water and coastal realignment.

Countryside Stewardship will support climate change resilience, for example, by planting trees next to rivers and streams, which reduces river temperature and avoids losses of salmonid fisheries. It will also reduce sedimentation of rivers, making rivers better able to store more flood water.

Individually these measures can be effective at a field scale but a number of land managers need to take up measures across the whole catchment for the measures to be really effective. As a result, improvements to the environment from Countryside Stewardship are not linked to specific improvements in water body element status by 2021. The uptake of measures is voluntary, with the first agreements commencing in 2016. The individual nature of catchments including soils, topography and rainfall make it difficult to quantify the benefits of these measures.

Countryside Stewardship is expected to achieve additional environmental outcomes for 2021. Preliminary research suggests that for nutrients and sediment it may provide elemental improvements of approximately 2% to 10% from the current position where supported with advice. In some discrete locations an improvement of up to 18% may be achieved, but the precise locations will depend on the level of uptake of measures by farmers and the supporting advice provided. Further research is planned that will help to evaluate the likely benefits of Countryside Stewardship for water.

It is not yet possible to describe the detail of schemes or exact location of investment, however improvements are anticipated within the river basin district.

Protected Areas

As part of Natural England's Site Improvement Plan (SIP) delivery, the River Eden Special Area of Conservation and the River Tweed Special Area of Conservation both have Diffuse Water Pollution from Agriculture plans in place.

Safeguard Zones are non-statutory areas identifying where measures and actions are targeted to meet drinking water protected area objectives. The Environment Agency develops Safeguard Zone Action Plans with water companies and local stakeholders to identify and implement measures and actions. There are three safeguard zones in the River Eden catchment.

Action in Scotland

During the period 2009 to 2015, SEPA and its partners developed the diffuse pollution priority catchment approach. This has involved the following:

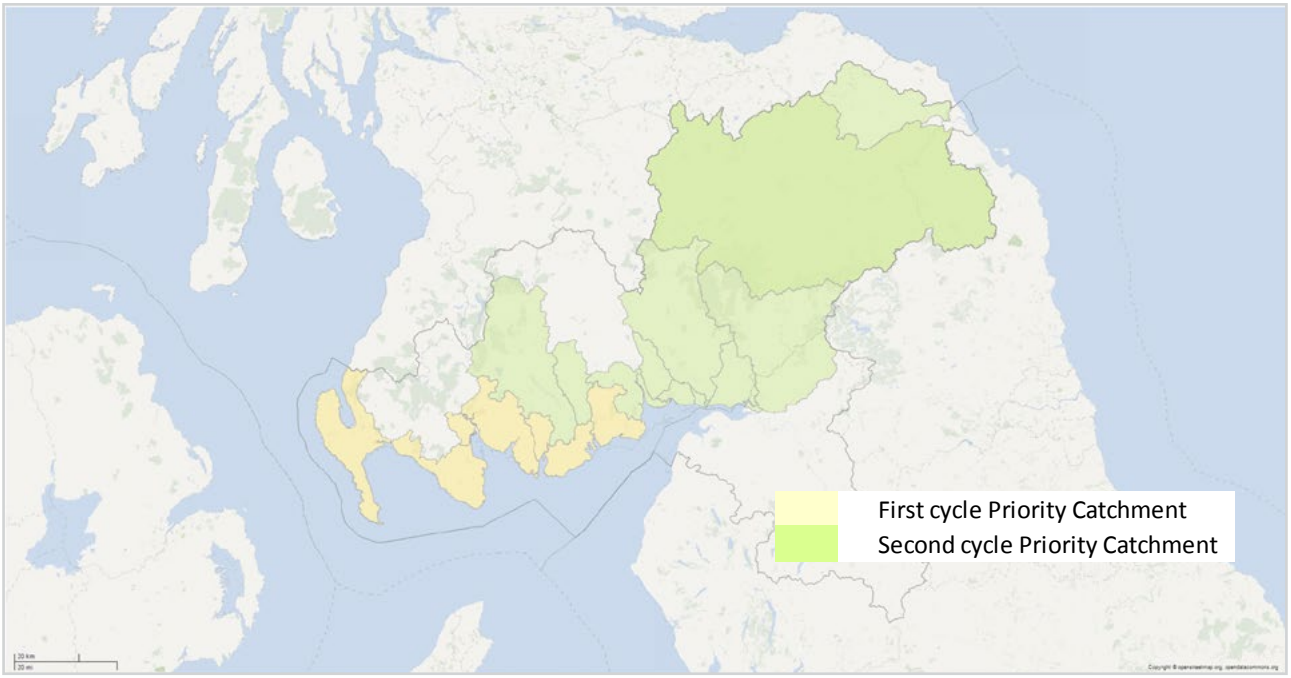
- General binding rules (GBRs) were introduced on how a wide range of land management activities liable to cause pollution must be undertaken to help protect and improve water quality.
- Land managers and public bodies worked together in 14 prioritised catchments across Scotland, two of which are in the Solway Tweed district, to bring land management practices in line with the requirements of the GBRs. The priority catchment approach was designed for large areas of land where the dominant land uses are intensive arable farming, livestock farming or forestry.
- More than 900km of rivers in the two priority catchments were walked to assess diffuse pollution sources, and across Scotland over 3000 farms visited. Of the farms where non-compliance with the GBRs was found, 85% have subsequently taken steps to reduce pollution risks, or are in the process of doing so. Public bodies are continuing to work with those farmers who have not yet started to improve their management practices to ensure they do.
- In some cases land managers are doing more than is required by the GBRs with the assistance of funding available under the Scottish Rural Development Programme.
- The approach is supported by the Diffuse Pollution Management Advisory Group, whose members represent a cross section of rural, environmental and wildlife conservation interests.
- Implementing targeted action programmes in one area (known as the Lower Nithsdale Nitrate Vulnerable Zone) to reduce pollution from agricultural nitrates.
- Partnership working to train staff and raise awareness of rural diffuse pollution prevention and the GBRs within Scotland's forestry industry, and use of the Forests and Water Guidelines to reduce and prevent rural diffuse pollution impacts from forestry.

Of the 114 water bodies in the district where rural diffuse pollution was contributing to adverse effects on water quality in 2015, 48 lie in the Scottish area of the district. Rural diffuse pollution is adversely affecting five Scottish protected areas: one Natura site, and four bathing waters.

Of these, 16 water bodies and two protected areas are in, or receive water from, the two priority catchments where land managers and public bodies have been working together during the 2009 to 2015 period. SEPA expects to see improvements in water quality in these water bodies and protected areas over the next few years. Land managers and public bodies will continue to work together in the catchments over the period 2015 to 2027 to further improve compliance with the GBRs and ensure good land use practices are maintained and strengthened where necessary.

A further 24 water bodies and three protected areas in, or receiving water from, 11 catchments are affected by land uses where the priority catchment approach is applicable. Between 2015 and 2021, land managers and public bodies will put in the concentrated effort required to help to drive and support the required improvements in land use management practices in these catchments.

Figure 16 - Rural diffuse pollution priority catchments.



Note to Figure 16

In the cross-border river catchments shown, the priority catchment approach will be applied in the Scottish area.

Across Scotland, there are a range of protected areas and some water bodies where diffuse pollution generally arises from less intensive land uses such as hill farming and sheep grazing, and from septic tank discharges. The area over which concentrated action to reduce pollution is needed is generally significantly smaller than for priority catchments. To differentiate these areas from the latter, they are identified as rural diffuse pollution focus areas. There are 72 in total.

Three focus areas lie in the Solway Tweed district, and are intended to improve or protect water quality in:

- a section of the River Tweed Special Area of Conservation (SAC), and one impacted water body that lies within the SAC;
- a loch which is receiving pollution from forestry;
- a drinking water protected area.

Over the period 2015 to 2021, SEPA will investigate and identify the main sources of pollution in each focus area. Land managers and public bodies will then work to identify what can be done and start to put in place the appropriate measures with the aim of making as much progress as possible in improving water quality by 2021. Across the country, this is a challenging programme of work because of:

- the large numbers of focus areas involved;
- the time and specialist expertise required in each focus area to work out the main sources of pollution and then develop practical solutions;
- the technical challenges of implementing those solutions in sometimes remote rural areas where access can be difficult.

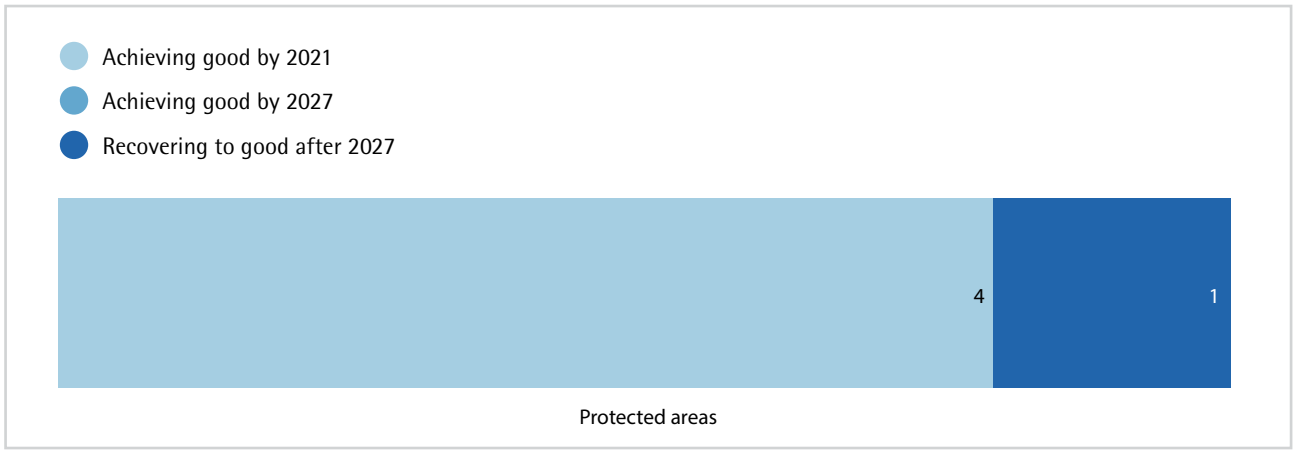
For these reasons, SEPA does not think it will be feasible to complete all the actions required before the end of 2021. All measures will be in place by 2027.

As well as significantly expanding priority catchment work and initiating work in focus areas, additional measures will be undertaken to address rural diffuse pollution. They are as follows:

- revising and strengthening the Scottish Rural Development Programme to help support land managers take action beyond the basic good practice required by the GBRs;
- increasing efforts on national awareness raising and education to help land managers across the district understand how they can reduce the risk of rural diffuse pollution.

The improvements predicted for water bodies as a result of these measures are included in figure 15 and for protected areas, in figure 17.

Figure 17 – Predicted improvements to protected areas in the Solway Tweed river basin district



Waste water discharges

Waste water, or sewage, can contain nutrients such as phosphorus and nitrates, toxic chemicals and other harmful substances, including viruses and bacteria. Nutrients can disturb the natural ecological balance of a water body and cause excessive growth of vegetation and algae, which may starve the water of oxygen. Other pollutants in waste water may be directly toxic to plants or animals. Humans can also be affected, for example, through bacteria and viruses in waste water affecting bathing or shellfish waters.

Scale of problem and targets for improvement

There are currently 12 water bodies affected by waste water discharges in the district. Most of these water bodies are rivers but the figure includes a lake, a groundwater and the Solway estuary.

All of the 12 affected water bodies have an objective of good status by 2027.

Action to deliver improvements

Action in England

Improvement works at three wastewater treatment works in the English area of the district are planned during the 2015 to 2021 period. However, achieving an improvement in status on the water bodies affected by their inputs is reliant on other sectors putting additional measures in place.

Water company investment programme

Ofwat, the economic regulator of the water sector reviews water industry investment plans every five years. As part of this process, known as the price review, the Environment Agency works with water companies, Ofwat and others to make sure that investment protects the water environment, increases resilience and secures long-term benefits for society and the economy. The Environment Agency sets out the environmental obligations, including work required to prevent deterioration and achieve protected area and water body status objectives.

Across England, water companies will be investing £3.5 billion in environmental improvements between 2015 and 2020, including approximately £70 million in this river basin district. Significant investment will go into addressing point source impacts from sewage treatment works and discharges from the sewer network. This will reduce pollutants such as ammonia and nutrients that disturb the natural ecological balance of water bodies and cause excessive growth of vegetation and algae.

Further investment will deal with abstraction and flow pressures. This includes reducing the amount of water that can be taken or measures to enhance habitats to compensate for damage caused by abstraction.

Habitat improvement schemes are planned to reduce the impact of physical modifications caused by water company operations and action is planned to deal with invasive non-native species on water company land. Further measures will ensure compliance with the Eels Regulations, which require water intakes to be screened to prevent eels and other fish from being drawn out of the river into drinking water treatment works.

Climate change adaptation and mitigation is an integral part of water company planning and is an essential part of assessing scheme options. This is particularly important for water resources planning, where water companies must plan up to 25 years in advance to make sure that there is enough water to meet future demands.

Most of the measures are well-established engineering solutions that are proven to be effective. Changes are secured through amendments to environmental permits. There are some catchment and habitat improvement schemes that are less well established, including measures to reduce pesticide pollution. Some of these schemes rely on voluntary behavioural change affecting agricultural practice. These can be less effective when compared to engineering solutions.

A 'fair share approach' is applied to the selection of measures, which assumes there is a proportional reduction in polluting load from each of the contributing sectors. For example, when identifying measures for phosphorus in a catchment, the amount coming from sewage treatment works and the amount from other sources, such as rural diffuse pollution was calculated. If the sewage works was responsible for 70% of the phosphorus load, then the measure

identified is to achieve 70% of the required phosphorus reduction. In this situation achieving an improvement in status is reliant on other sectors putting additional measures in place.

Water company investment will directly contribute to predicted improvements in status by 2021 for specific elements in specific water bodies. Measures to reduce the amount of water taken out of the environment for public water supply will make sure that there is enough water left in rivers and lakes to support good ecological status. This will be achieved through changes to water company abstraction licences.

Measures to reduce phosphate will secure additional outcomes for the environment, but are not linked to specific improvements in element status by 2021 because there is insufficient confidence about the scale of improvement as additional improvement is required from other sectors.

Action in Scotland

Some uncertainty remains about the scale of the contribution of waste water discharges to water quality impacts in the three affected water bodies in the Scottish part of the district. To resolve this and enable the development of the investment programme for the period, Scottish Water will work with SEPA to carry out studies in respect of these water bodies during the 2015 to 2021 period. Any work needed to address the discharges will then be carried out between 2021 and 2027.

4 Physical condition of the water environment

Modification to the physical conditions of the beds, banks and shores of rivers, lakes, estuaries and coastal waters can adversely affect the extent, quality or diversity of habitats for aquatic wildlife. Modifications have happened at many different times, with some dating back centuries. The vast majority of the more substantial modifications were made to protect or facilitate land uses.

Improving the physical condition of affected water bodies will provide a range of wider benefits, including:

- access to better quality landscapes and amenity for communities and businesses, with associated benefits for health, well-being and the economy;
- improved health and range of populations of wild plants and animals;
- contributions to flood risk management, especially when integrated into natural flood risk management schemes;
- improved bank-side vegetation helping reduce the risk of diffuse pollution.

The most common types of modifications responsible for impacts on the physical condition of affected water bodies are:

- straightening, deepening, narrowing and sometimes culverting of rivers and estuaries for land drainage, flood water conveyance, navigation, or to increase land area;
- reinforcement of, or the construction of, walls and embankments on, banks and shores to help control erosion of adjacent land or contain flood waters;
- removal or degradation of natural bank-side vegetation due to over-grazing, urbanisation or conversion of land for agriculture or forestry uses.

Although some of the modifications no longer serve the purposes that they were originally intended, many still provide important benefits, such as helping reduce the risk of flooding, helping drain farmland or enabling navigation. Achieving a good physical condition in water bodies subject to such modifications requires that their physical condition is improved to the extent possible without significant adverse impacts on those benefits. Where the best physical condition that can be achieved still means the water bodies are substantially modified, they will be identified as heavily modified water bodies (HMWB) (see Appendix 8.1 for further information). This is to indicate that their physical condition is as good as it can be, given the constraints.

Scale of problem and targets for improvement

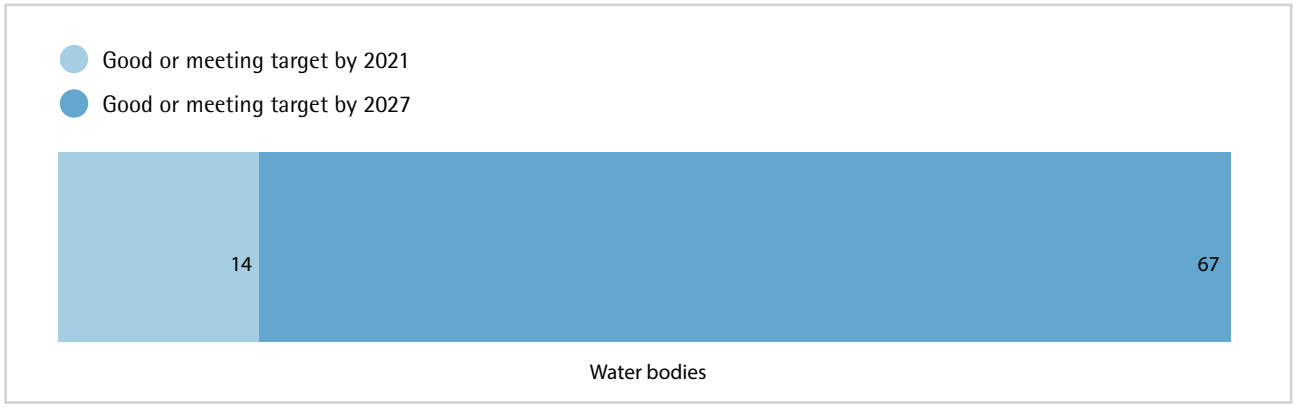
Across the district, 81 water bodies are adversely affected by modifications to their beds, banks or shores (Figure 18).

Figure 18 – Surface water bodies adversely affected by modifications to their physical condition



The objectives set for improvements to the physical condition of these water bodies are shown in Figure 19:

Figure 19 - Expected improvements in the physical condition of surface water bodies (number of water bodies).



Action to deliver improvements

Action in England

Twenty six water bodies in the English area of the district have impacts from alterations to their physical condition. Of these, 18 are classed as either heavily modified or artificial water bodies (HMWB or AWB), and 17 of those have mitigation measures assessments planned. Government and agencies (Environment Agency) work with partners and interested groups to identify appropriate mitigation measures to achieve Water Framework Directive objectives in artificial and heavily modified water bodies. Mitigation measures are practicable steps that can be taken to mitigate adverse impacts from beneficial human activities such as impoundments for water resources, or structures that provide flood defence.

Three of these water bodies have improvements planned for 2021 as part of a package of water resources measures that are to be implemented on the Haweswater system, as part of United Utilities' investment programme. This will include upgrading the intake on Swindale Beck with associated improvement for fish passage and implementation of gravel management plans.

All eight of the natural water bodies, along with nine HMWBs have physical modifications as a result of agricultural land management practices. In many cases, such pressures may be addressed by measures that tackle rural diffuse pollution.

Countryside Stewardship also has a strong focus on measures that address both water quality and habitat problems. Re-naturalising of rivers, fencing of watercourses, tree planting and wetland creation can all help restore and improve physical condition in water bodies.

Action in Scotland

During the period 2009 to 2015, Scotland began developing a strategy to address this pressure:

- the Scottish Government established a dedicated fund (the Water Environment Fund) to support improvements to the physical condition of water bodies;
- SEPA set up a national team to administer the fund, support and promote improvement projects;
- the Scottish Government and SEPA initiated five catchment-scale pilot projects to identify and demonstrate how to combine improving the physical condition of water bodies with reducing the risk of flooding, in a Scottish context. One of these, on the River Nith, is in the Solway Tweed river basin district;
- a set of principles to underpin delivery of future work was outlined in the supplementary plan*, Improving the physical condition of the water environment.*[8]

Of the 81 water bodies affected by modifications to their physical condition, 55 lie in the Scottish area of the district.

During the period 2015 to 2027, improvements will be made to the physical condition of all 55 of these water bodies. Making improvements to the physical condition of the water environment on this scale over this timescale will be a significant challenge. To help meet it:

- the Scottish Government will increase the sums available through the Water Environment Fund for supporting improvements to the physical condition of water bodies;
- SEPA and local authorities will work together with voluntary organisations, land managers, local communities and businesses to deliver improvements and maximise associated social and economic benefits;
- public bodies will take action to reduce the impact of structures that they own or maintain, such as culverts;
- local authorities will encourage developers to incorporate action to improve the physical condition of the water environment in development proposals.

A phased approach is being taken, with 52 water bodies across Scotland prioritised for improvement by the end of 2021. Of these, 11 are in the Solway Tweed river basin district.

8 www.sepa.org.uk/media/37336/improving-physical-condition-scotlands-water-environment.pdf

In selecting these water bodies, SEPA took into account the benefits their improvement could provide to their local communities as well as the feasibility of delivery, including how much progress has been made towards building the necessary partnerships over the last six years.

Improvements to the physical condition of the remaining 44 water bodies are planned by the end of 2027. Over the next six years, SEPA will carry out the necessary preparatory studies required to plan and deliver the required works. If progress on any of the water bodies that have been prioritised for improvement by 2021 proves slower than anticipated, this will provide the potential to bring forward action on other water bodies instead.

This phased approach is necessary as it is not be feasible to improve all the affected water bodies across the whole of Scotland by the end of 2021 due to:

- the large number of water bodies involved and the scale of improvements required;
- the considerable length of time required to complete the complex process of designing an effective solution in discussion with local communities and land managers and then undertaking the necessary civil engineering work for each water body;
- the currently limited pool of necessary specialist expertise across Europe.

5 Barriers to fish movement

There are significant benefits to be gained from removing or easing barriers to fish movement, particularly in an area such as the Solway Tweed district. Improvements help to:

- sustain healthy fish populations by allowing access to habitat that would otherwise be inaccessible, particularly spawning and nursery habitat;
- sustain economically-important fisheries;
- assist in the conservation of fish species: Atlantic salmon, bullhead and lamprey are among the wildlife conservation interests for which Special Areas of Conservation have been designated;
- re-connect partially separated river ecosystems and restore natural sediment movement, where removal of a barrier is a viable option;
- optimise conditions for freshwater pearl mussels, which depend on the presence of migratory fish during various stages of their life-cycles;
- reconnect populations of river-dwelling fish that may be artificially genetically isolated and at greater risk of local extinction.

Scale of problem and targets for improvement

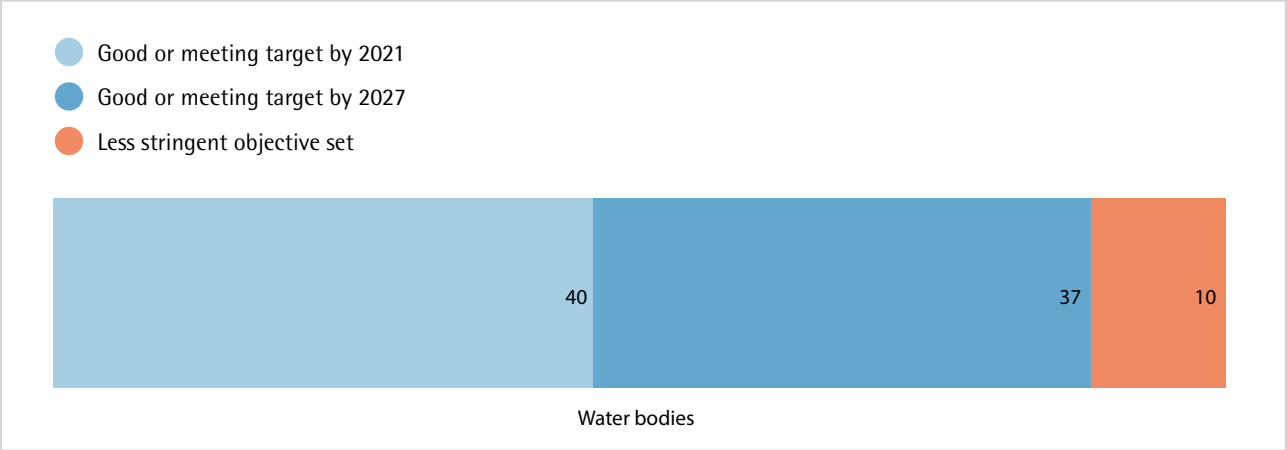
There are around 63 weirs, dams or other man-made structures currently known to be posing a barrier to fish migration in the district's rivers. The vast majority of these are in Scotland, where they are adversely affecting the status of fish populations in 86 water bodies (Figure 20).

Figure 20 - Water bodies affected by barriers to fish movement



The measures planned during the period 2015 to 2027 will achieve good access for fish in 87 water bodies across the district.

Figure 21 – Expected improvements to fish access. Date shown is when all impassable barriers will be removed and access for migratory fish reinstated to the water body.



In Scotland, SEPA has assessed that it will not be possible to restore good access for fish migration in 10 particular water bodies. These are surface water bodies upstream of water storage reservoirs that have been designated as heavily modified water bodies (see Appendix 8.1). These are shown in Figure 21 as water bodies with less stringent objectives. SEPA designated the reservoirs as such because restoring them to a natural condition would result in the loss of the benefits they are providing, for example, to drinking water supply. The height of the dams on these reservoirs means it is not feasible to provide fish passage, or doing so would have a significant adverse impact on the benefits provided by the reservoirs.

Action to deliver improvements

There are many possible options for removal or easement of barriers to fish movement:

- where possible and appropriate, the structure may be demolished;
- in some situations, covering the structure with a rock ramp, or adding carefully placed baffles may address the problem;
- there will be many structures, particularly those in active use, where the only solution is a technical fish pass.

Work to remove barriers and improve fish passage has historically involved cross border working; the fisheries of the Scottish area of the Border Esk are looked after by the Environment Agency, and the English parts of the Tweed system are overseen by the River Tweed Commissioners. The Border Esk fish barriers project, for example, was a partnership between Galloway Fisheries Trust, the Esk and Liddell Improvement Association and the Environment Agency.

The region now has established populations of the invasive non-native North American signal crayfish, and man-made barriers will not be removed where they are preventing them from spreading to upstream waters. It is also possible that new barriers may be required in future where there is potential to prevent further spread.

Action in England

A package of water resources measures are to be implemented on the Haweswater system as part of United Utilities' investment programme. This will include upgrading the intake on Swindale Beck with associated improvement for fish passage and implementation of gravel management plans.

Action in Scotland

Between 2009 and 2015:

- regulatory controls were introduced that enabled SEPA to work with operators of dams and weirs to ensure those operators take such steps as are necessary to provide for fish migration;
- the Scottish Government established a dedicated fund (the Water Environment Fund) to help to address barriers to fish migration caused by abandoned structures;
- SEPA set up a national team to administer the fund, support and promote barrier removal projects;
- SEPA, the Rivers And Fisheries Trusts of Scotland (RAFTS) and its members worked together to significantly expand and improve the information Scotland holds on the number, location and ownership of barriers to fish migration;
- a set of principles to underpin delivery of future work was outlined in the supplementary plan, *Improving the physical condition of the water environment.*

There are 41 weirs and dams, and 21 other man-made structures that are acting as barriers preventing or restricting fish migration in 86 water bodies within the river systems of the Scottish area of the district. The other man-made structures include culverts under roads and railways, and bridge reinforcements.

A phased approach to restoration is being taken, running over 12 years because it would not be feasible to address all the barriers across Scotland in a shorter period. This is because of:

- the scale of the programme of civil engineering works that is required;
- the amount of time involved in designing effective solutions, commissioning the necessary civil engineering works, and then undertaking them;
- the limited number of existing specialists in the restoration of fish passage.

Across the whole of Scotland, 177 barriers have been prioritised for removal by the end of 2021, including 32 in the Solway Tweed river basin district. This will improve fish migration in 39 water bodies in the district.

In selecting these barriers, account was taken of the quantity of suitable river habitat that would become accessible following removal of the barrier, and the necessary sequencing of removal work in river systems affected by multiple barriers.

During the period 2021 to 2027, the remaining 30 barriers will be addressed, and fish migration improved in a further 37 water bodies. To help achieve this, SEPA will carry out investigations between 2015 and 2021 on the remaining 30 barriers to identify the work required.

If progress on any of the barriers prioritised for action by 2021 proves slower than anticipated or new information means that priorities change, SEPA will review whether action on other barriers can be brought forward.

Removing barriers on this scale between 2015 and 2021 will be a significant challenge. To help meet it:

- the Scottish Government will expand the role of the Water Environment Fund in supporting action to secure the removal of barriers created by abandoned weirs and other structures;
- SEPA and voluntary organisations, such as the Rivers and Fisheries Trusts of Scotland (RAFTS), will work with land managers, local communities and businesses to remove barriers created by abandoned weirs and dams or by other structures;
- public bodies will take action to address barriers to fish migration created by structures that they own or maintain, such as culverts and bridges;
- SEPA will increase its work with those responsible for dams and weirs to ensure they take appropriate action is taken to provide for fish migration.

6 Water flows and levels

The flows of rivers and the water levels in lakes, lochs and groundwaters can be affected by abstraction for a variety of purposes. In some cases, this can impact on the abundance and diversity of aquatic plants and animals by reducing the extent, quality, diversity and connectivity of aquatic habitats. As well as addressing these impacts, improving water flows and levels will provide a range of wider benefits, including:

- improving the quality of local landscapes by, for example, restoring flows to dry, or nearly dry, rivers;
- helping protect fish populations and support runs of migratory fish, such as Atlantic salmon;
- improving the health and range of populations of wild plants and animals, including rare and endangered species;
- expanding opportunities for water-based recreation.

Scale of problem and targets for improvement

Across the district, 38 water bodies can be adversely affected by pressures on water flows and levels (Figure 22). The scale of pressures and their impacts varies between wet and dry years. The main pressures on flows and levels are from water abstractions or reservoirs used for public water supply, hydroelectricity generation and the irrigation of crops.

In total, the effects of abstractions and impoundments to deliver a public water supply are affecting the most water bodies (17). In the Scottish area, six water bodies are affected by hydropower generation and nine by agricultural irrigation.

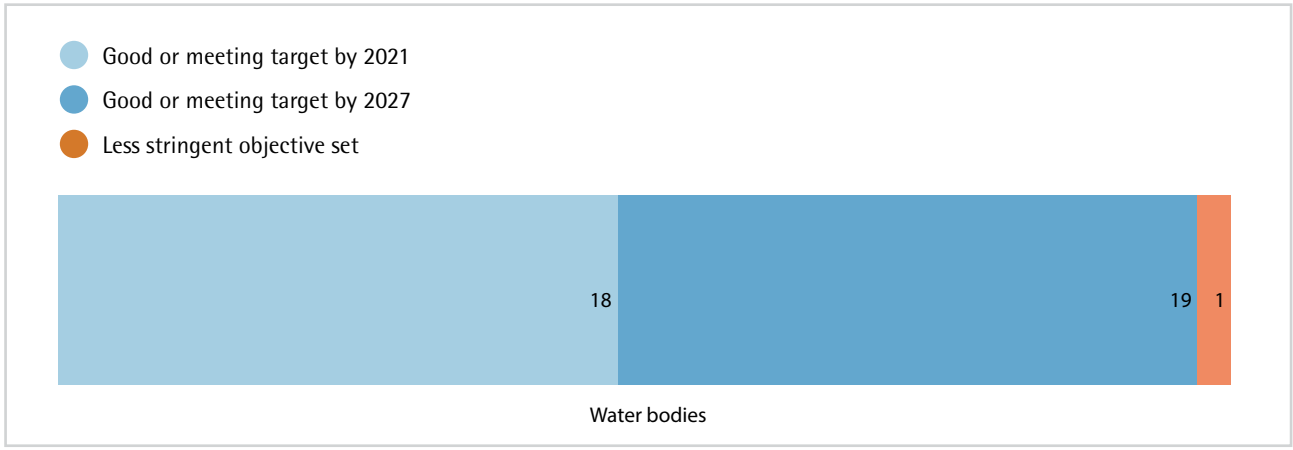
Water bodies where flows and levels are affected by the diversion of water to, storage in, or abstraction from, reservoirs for uses such as public water supply or hydroelectricity generation have been identified as heavily modified water bodies (see Appendix 8.1). This is to reflect the importance of the benefits those uses provide. Only those improvements that can be made without a significant impact on these benefits are required to achieve a good condition. Water bodies where flows and levels are already in this condition are not discussed here.

Figure 22 – Water bodies affected by changes to natural flows and levels of water



The objectives set for improvements to the flows and levels of these water bodies are shown in Figure 23.

Figure 23 – Expected improvements to flows and levels (number of water bodies).



Action to deliver improvements

Improvements to flows and levels are largely delivered by regulatory measures, and each country has its own system.

Action in England

The eight water bodies in the English area of the district that are at worse than good status because of change from natural flows and levels, are all as a result of public water supply.

Measures will be put in place by 2021 to address the problem on four of these, via the water company investment programme.

Action in Scotland

Over the period 2009 to 2015:

- Regulatory controls were introduced, enabling SEPA to require operators of reservoirs and abstractions to take such steps as are necessary to improve water flows or levels.
- Scottish Ministers established a publicly-funded investment programme, known as the Quality and Standards programme, to enable Scottish Water to make the investments needed to reduce pressures from its public water supply reservoirs and abstractions.
- With the help of information from operators of reservoirs and abstractions and from environmental monitoring programmes, significant improvements in understanding of the extent of pressures on water flows and levels have been made in Scotland.

The measures for securing improvements in water flows and levels that were established in the first planning cycle will enable objectives in the Scottish part of the district to be met during the next two planning cycles.

Across Scotland, the main change that has been made for the second river basin management plans is the re-prioritisation of improvements for the period 2015 to 2021. This primarily affects water bodies used for hydroelectricity schemes.

Phased improvements

At a national level, improvements have been phased to the period 2021 to 2027 for two reasons:

(i) because of the scale and complexity of the programme of works required, it would not be feasible to improve flows and levels by 2021 in all the affected water bodies and protected areas;

(ii) there is insufficient evidence of impacts on the water bodies that are close to the boundary between good and moderate conditions to be certain that improvement action is needed. Proceeding before there is sufficient certainty could incur unnecessary and disproportionate expense.

During the period 2015 to 2021, SEPA will develop and apply new and improved assessment methods to increase understanding of the impact of pressures on flows and levels. This will enable decision to be made about whether action is required to improve water flows or levels in the set of water bodies and that data currently indicates are adversely affected, but for which there is not yet sufficient evidence to be certain that this is the case.

Water bodies will be reprioritised between the periods 2015 to 2021 and 2021 to 2027 if understanding of environmental priorities changes or if, in discussion with operators, it is found that doing so would significantly reduce the costs of delivering the improvements. The overall balance of effort between the two cycles will, however, remain similar.

Water bodies affected by abstractions or reservoirs used for public water supply

During the period 2015 to 2021, Scottish Water will improve flows and levels in four of the nine water bodies affected by its abstractions and reservoirs. It will also carry out the studies needed to design and plan improvements to the other five water bodies thought to be affected. During the period 2021 to 2027, Scottish Water will then take such actions as are necessary to improve flows and levels in those remaining water bodies.

Water bodies at risk only in unusually dry years

For eight surface water bodies and one ground water, the risk of water flows being worse than good is only high during unusually dry spells of weather. These water bodies are rivers used to supply water for irrigating agricultural land in the Tweed catchment. In most years and for most of the time, the abstraction of water for irrigation does not have adverse impacts on aquatic plants and animals. To ensure the achievement of good flows in these water bodies, SEPA will work with the farmers concerned to ensure they take the necessary steps during these unusually dry spells to prevent their abstractions adversely affecting water flows and levels.

7 Invasive non-native species

There are many non-native plant and animal species in the UK, although only a small number of them become invasive, potentially causing significant impacts on natural plant and animal communities, wild fisheries and recreation. Management is challenging as complete eradication is costly and for some species, not possible. Climate change is likely to have an impact on biodiversity in future by affecting the distribution of native and non-native species.

There are at least 30 invasive non-native species that have been found in rivers, lakes, estuaries or coastal waters somewhere in the UK. Another 30 species have been identified that, although not yet present, could pose a significant risk to the condition of our natural aquatic plant and animal communities if they are introduced into the UK.

Nine water bodies in the district are at worse than good status due to the impact of invasive non-native species. All of these are in the Scottish part of the basin and affected by the presence of North American signal crayfish (Figure 24). For these water bodies, good status is not expected to be achieved by 2027 due to a lack of effective control and eradication methods and a less stringent objective has been agreed. This will be reviewed accordingly, as and when technological advances are made.

A much larger number of water bodies are at risk of deterioration because of the potential for invasive non-native species to spread from nearby water bodies where they are already established. Of the species already present in the UK, those identified as posing an immediate risk to the most water bodies in the district are the North American signal crayfish and the leathery sea squirt. A detailed assessment in Scotland has identified 70 water bodies as at risk in this area of the district.

Figure 24 – Water bodies at worse than good status (left) or at risk of deterioration (right) as a result of invasive non-native species



Current management of INNS – Great Britain and Europe

The approach to dealing with invasive non-native species is set out in the *Great Britain Invasive Non-native Species Strategy*. The strategy aims to minimise the risk posed by, and reduce the negative impacts of, invasive non-native species. It adopts a hierarchical approach stressing prevention, followed by early detection and rapid response and finally long-term management and control.

The most effective and least expensive measure is to reduce the number of new species introduced and slow the spread of those that are already present by applying good biosecurity (measures to reduce the risk of spreading diseases and invasive non-native plants and animals) and promoting the 'Check, Clean Dry' and 'Be Plantwise' campaigns.

When new invasions occur, rapid response is led by the Great Britain Programme Board (made up of senior representatives from across Britain's administrations) who work with partners to eradicate species, where practicable.

Some species cannot be eradicated. Where possible, the aim is to contain these species using good biosecurity measures. In order to be able to implement rapid response of eradication or containment, a national early warning system is maintained for priority species ('Species Alert').

Stricter rules on non-native species came into force in 2015 under the new European legislation on Invasive Alien Species (IAS). It follows the same hierarchical approach as the Great Britain Non-native Species Strategy of:

- prevention through identification of priority pathways of introduction and spread and pathway action plans;
- surveillance mechanisms, rapid response and eradication;
- control and containment where eradication is not possible.

Under this legislation, a watch list of species of EU concern is to be drawn up and stronger provisions made for enhancing regional cooperation for species of national concern, even if they are not included on the EU list. Implementation of the regulation is gradual and will take place throughout the period of this plan.

Within the district, The Solway Firth Partnership leads the way in biosecurity planning in Britain. Working within the district, they have developed and are working to implement the Solway Firth Biosecurity Plan, which covers a substantial part of the district's coastal and marine waters.

Actions to manage INNS in England

The Environment Agency and Natural England currently use existing legislative powers, such as the Keeping and Introduction of Fish Regulations 2015 and Wildlife and Countryside Act 1981, to control movements of invasive non-native species. A recent change in legislation, implemented in April 2014, introduced a ban on selling five high risk plant species including water primrose and floating pennywort. The Marine Management Organisation uses policies within emerging marine plans and marine policy statements to support controlling and mitigation against invasive non-native species. Natural England manages invasive non-native species at selected protected sites as appropriate.

Government agencies also work with a broad range of non-governmental organisations to implement the updated Great Britain strategy on invasive non-native species, which includes species impact risk assessments, action plans and rapid response. All sectors work together to develop and implement codes of practice to reduce the spread of invasive non-native species. Local action groups can be set up to deal with invasive non-native species and raise awareness.

Building awareness and understanding is an important part of the management strategy.

Influencing recreational water users to slow the spread of invasive non-native species by promoting the actions in the 'Check, Clean, Dry' campaign is a key action.

The UK government helps the GB non-native species secretariat co-ordinate alert systems, species records and a central repository for information, including public online and smart phone submission of species records.

Actions to manage INNS in Scotland

Between 2009 and 2015:

- the legislative framework for controlling the introduction and release of non-native species was strengthened, and a new statutory group to co-ordinate work under that framework was set up;
- the Rivers And Fisheries Trusts of Scotland (RAFTS) and public bodies worked together to produce biosecurity plans for freshwaters, and to remove invasive plant species from the banks of rivers;
- public bodies and other organisations worked together to set up local Invasive Species groups, in both the River Tweed catchment and for Dumfries and Galloway, to raise awareness of invasive non-native species and the steps that can be taken to prevent and their spread;
- a general code of good practice explaining the risk posed by invasive non-native species and a specific code of practice on avoiding the introduction into Scotland of the fish parasite, *Gyrodactylus salaris*, were published;
- a contingency plan for responding to the introduction of the fish parasite *Gyrodactylus salaris* was prepared;
- the supplementary plan to guide river basin planning strategy and actions on invasive species was published;[9]
- public bodies supported work to investigate techniques for controlling the spread of North American signal crayfish.

9 *Managing Invasive Non-Native Species in Scotland's Water Environment: A supplementary plan to the river basin management plan (2013)*, available at www.sepa.org.uk/media/37362/managing-invasive-non-native-species_plan.pdf

During the period 2015 to 2027 period, the approach developed between 2009 and 2015 will be continued, with the aim of minimising the risk of introduction and spread of invasive species and disease:

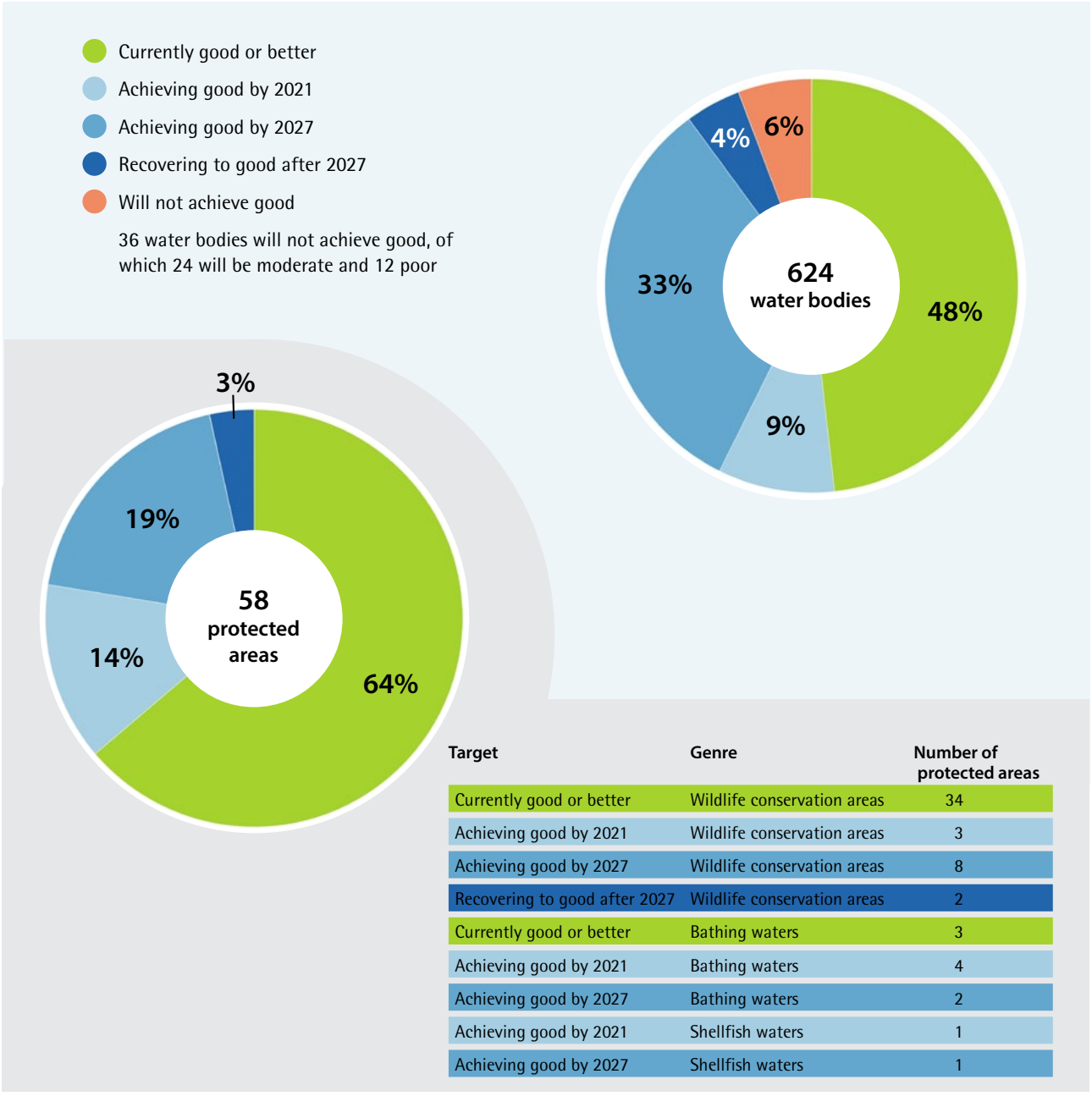
- A zero tolerance approach will be taken to actions that could result in introductions of invasive species. Police Scotland will work with other public bodies to ensure legislation banning or restricting the possession, sale and release into the wild of invasive non-native species is rigorously enforced.
- Public bodies and non-government organisations will continue to work together to raise awareness of how invasive species can spread and the steps businesses and the public need to take to minimise risks using biosecurity measures. This will include developing further biosecurity plans where appropriate.
- Public bodies and other organisations will work together to carry out and co-ordinate the monitoring needed to give early warning of the first appearance of new invasive species, including encouraging help from businesses and the public.
- Where there are early warnings of the appearance of new species, such rapid action as is feasible and proportionate to destroy or contain the species concerned before they can become established will be taken.
- The Scottish Government will work with administrations across the UK to ensure action is taken to reduce the risk of introductions via ship ballast water in line with protocols established by the International Maritime Organisation.
- There will be continued support for further research aimed at developing effective eradication methods.

8 Summary of objectives for the Solway Tweed river basin district

Expected improvement in the condition of water bodies which are worse than good in 2015

The actions planned for the period 2015 to 2027 are expected to achieve a good condition in 273 of the 321 water bodies that are not at good condition in 2015. Achievement of these objectives would also safeguard the quality of drinking water sources in drinking water protected area and achieve improvement objectives for bathing waters, shellfish waters and the water bodies on which protected areas for the conservation of internationally important wildlife depend.

Figure 25: Improvement objectives for water bodies and protected areas for the period 2015 to 2027



Target	Genre	Number of protected areas
Currently good or better	Wildlife conservation areas	34
Achieving good by 2021	Wildlife conservation areas	3
Achieving good by 2027	Wildlife conservation areas	8
Recovering to good after 2027	Wildlife conservation areas	2
Currently good or better	Bathing waters	3
Achieving good by 2021	Bathing waters	4
Achieving good by 2027	Bathing waters	2
Achieving good by 2021	Shellfish waters	1
Achieving good by 2027	Shellfish waters	1

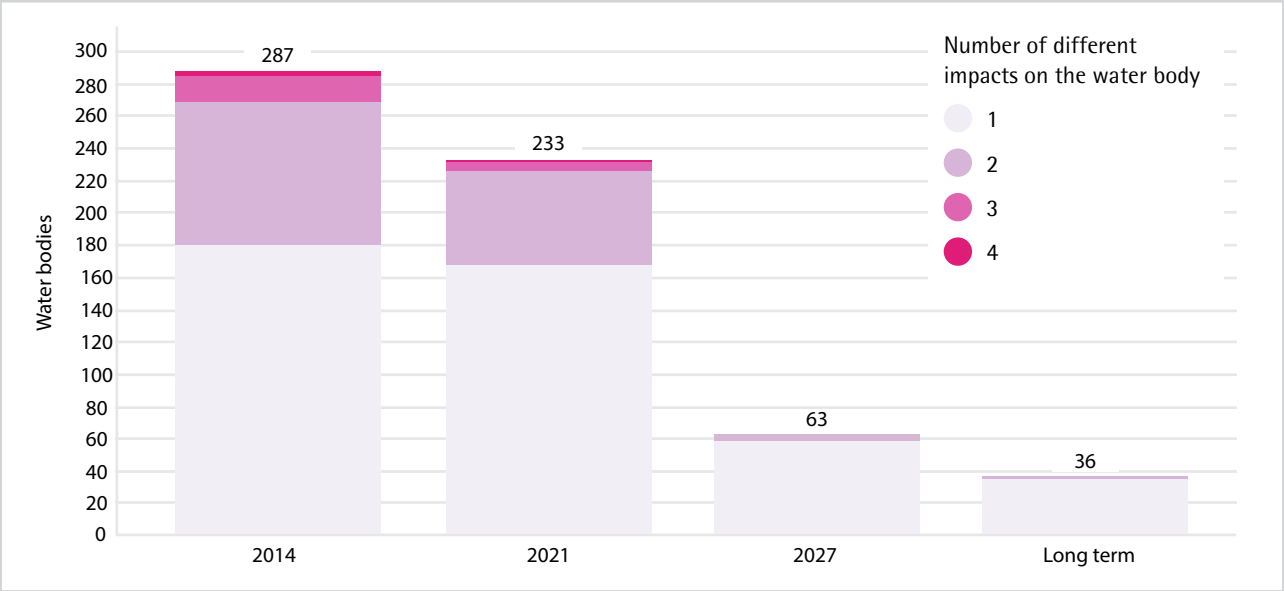
Note to Figure 25

The information on protected areas for wildlife conservation refers to the condition of the relevant aspects of the water bodies on which the conservation of the areas' protected wildlife depend. The achievement of the areas' conservation goals may depend on factors other than the condition of the water environment or, in exceptional cases, may ultimately require the condition of the water environment to be better than good.

Projected effect of the plan on the extent of pressures and the state of the water environment

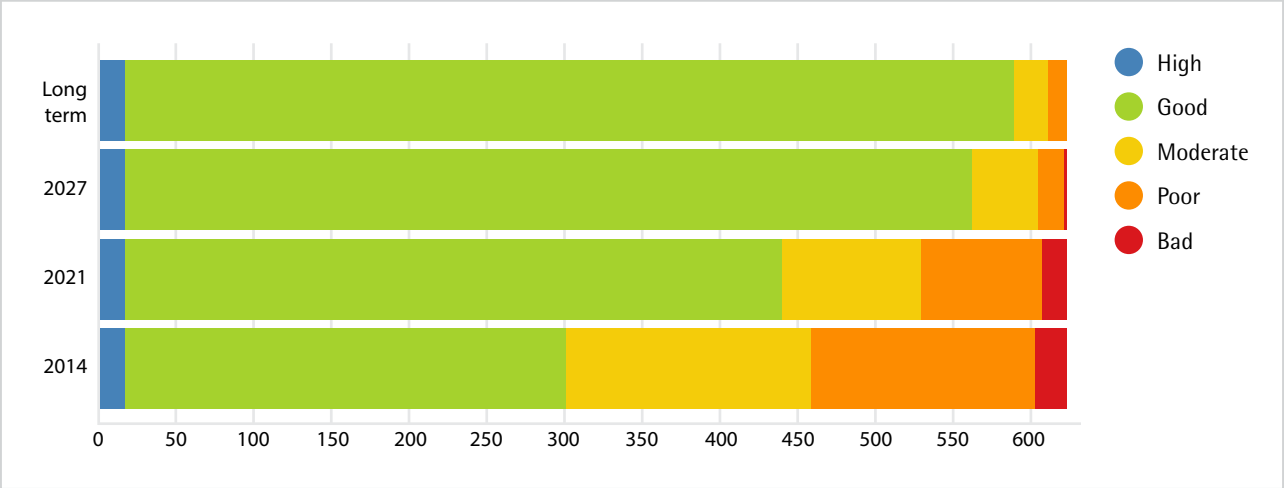
As well as improving the overall condition of water bodies, the programme of measures will progressively reduce the number of water bodies that are subject to multiple impacts. This will ensure that even those water bodies that do not achieve a good condition will be under the least pressure possible. Achieving a good condition in some water bodies will not be possible. This is because it is not currently technically feasible to make all the improvements that would be necessary or because it would be disproportionately expensive to do so.[10]

Figure 26 - Expected progress in reducing the number of water bodies subject to multiple impacts



10 Live links to SEPA Water Environment Hub and the Environment Agency Geostore data explorer will be added.

Figure 27 – Projected condition of water bodies in 2021, 2027 and the longer term



Based on the agencies' understanding of the state of the water environment in 2014, achieving the objectives for the period 2015 to 2027 set out in this plan would result in 90% of the water bodies in the district being in a good or better condition by 2027. Pressures on another 4% would have been addressed and they would be in the process of recovering to a good condition.

Working on the catchment scale, with partners across the district, this route map will maximise the value of the waters in the Solway Tweed river basin district, which support wildlife, businesses and communities.