

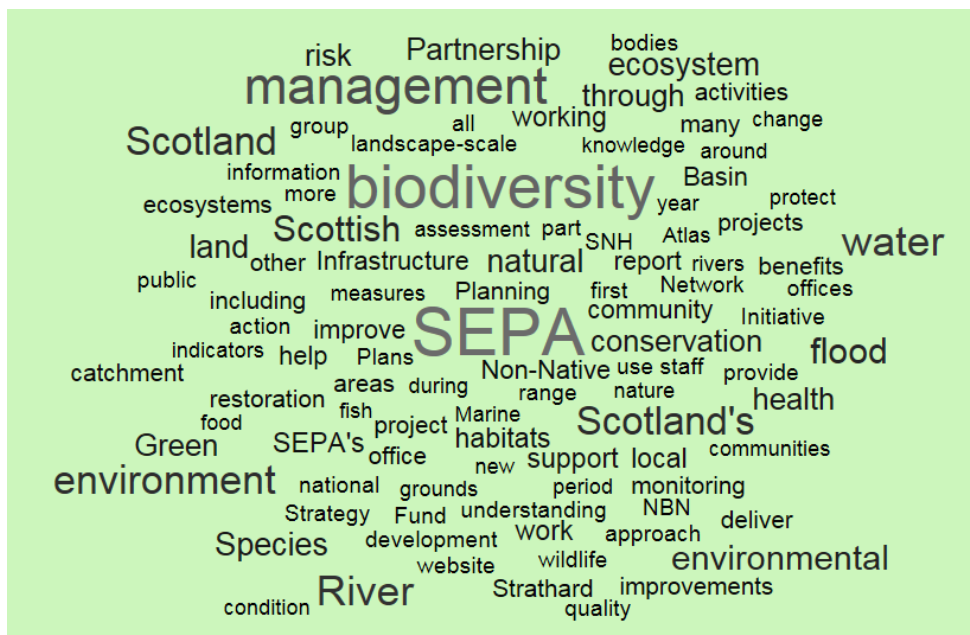
Biodiversity Duty Report 2015-2017

Scottish Environment Protection Agency



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Dedicated to the memory of Dr John Sawyer (1968-2015), in whom we found an inspirational and visionary collaborator and who is much missed.



Summary of highlights for 2015-2017 report

Healthy ecosystems, including the health of their habitats and species, are essential if SEPA's goal of a Scotland benefitting from One Planet Prosperity is to be achieved. Protecting habitats and species (biodiversity) through environmental permitting is an integral part of SEPA's regulatory remit and remains our most widespread contribution to conserving and restoring biodiversity, including the special features of European Protected Areas (SACs and SPAs) and Sites of Special Scientific Interest (SSSIs).

River Basin Management Plans are another important way that SEPA makes a contribution. The second set of plans for Scotland (RBMP2) were published in 2015, identifying many measures for improving the ecological condition of Scotland's waters by 2021. Between 2015 and 2017, actions begun as a result of the first set of River Basin Management Plans led to many improvements, such as returning river flow and opening up access for migratory fish to a ten mile-long stretch of the River Garry. Through the Water Environment Fund, SEPA provided funding and advice for many projects improving the physical condition of the water environment. For example, fish barrier removal projects in 2016 restored access for migratory fish (e.g. salmon, sea trout, eels) to 302 km of river length.

We now have biodiversity action plans for all of our offices with grounds. These include actions to improve habitats and conditions for species, and local outreach projects. Working in partnership, we established the Strathard Initiative in the Trossachs in 2015, to improve joint working between public bodies, land managers and communities using an 'ecosystems approach' to land management.

Our extensive environmental monitoring programme, involving over 32,000 environmental samples a year, continues to include many ecological samples (e.g. 18,000 ecological samples in 2016/17). This provides information on populations of fish, plants and invertebrates in freshwaters, estuaries and coastal waters. Some of these records provided evidence of previously unknown populations of rare plants and fish, for example for the ancient group of plants known as bryophytes (e.g. mosses) in catchments across Scotland, and for two species of lampreys in southwest Scotland.

We have supported the development of web resources on the 'Scotland's Environment' website for the Scottish Biodiversity Strategy - for the Landscape-Scale Conservation Working Group, and as a platform for Scotland's Ecosystem Health Indicators. SEPA was delighted, in early 2015, to be able to provide pivotal initial funding that allowed the development and establishment of an innovative new online platform, the NBN Atlas Scotland, for accessing Scotland's millions of biodiversity records held on the National Biodiversity Network's (NBN) database. This is the first such system in the UK.

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Biodiversity Duty Report 2015-2017:

Scottish Environment Protection Agency

Introduction

Biodiversity is the variety of species, habitats, ecosystems and genetic resources – in other words, the richness of nature. Biodiversity is an important part of the Scottish Government's vision of a smart, sustainable and successful Scotland. Biodiversity sustains the natural systems that provide vital goods and services to society, supporting tourism, farming, forestry, aquaculture and fishing industries. It adds variety to our urban green spaces and contributes to improving the health and well-being of the people of Scotland. Scotland's nature can, and does, inspire our people. For all of these reasons, biodiversity is important to SEPA.

Under the Nature Conservation (Scotland) Act (2004), all public bodies in Scotland are required to further the conservation of biodiversity when carrying out their responsibilities. The Wildlife and Natural Environment (Scotland) Act (2011) requires public bodies in Scotland to provide a publically available report, every three years, on the actions which they have taken to meet this biodiversity duty. This report provides SEPA's response to that reporting duty for the period 2015-2017.

Introductory information about SEPA

The Scottish Environment Protection Agency (SEPA) is Scotland's principal environmental regulator, protecting and improving Scotland's environment. As a non-departmental public body of the Scottish Government, our role is to make sure that the environment and human health are protected, to ensure that Scotland's natural resources and services are used as sustainably as possible, and to contribute to sustainable economic growth.

With around 1300 people based in offices across Scotland, we regulate and advise on a wide range of environmental activities. As an organisation with a strong science base, we constantly assess the quality of our environment by monitoring our air, land and water and use our findings to advise government, industry and the public on environmental best practice.

We help business and industry to understand and comply with their [environmental responsibilities and legislation](#) and have a range of enforcement powers which we can apply to ensure that regulations are complied with. We also work in partnership with other agencies, organisations and policy makers, to increase environmental understanding and build consensus on [environmental priorities and issues](#). We are also responsible for delivering [Scotland's flood warning system](#), working with the Scottish Government to deliver [Scotland's Zero Waste Plan](#), operating the Scottish aspect of the [Radioactive Incident Monitoring Network](#) and work with the [Health and Safety Executive](#) to control the risk of major accidents at industrial sites.

SEPA has clear statutory duties to protect biodiversity through its regulatory and other functions. SEPA's lead roles in River Basin Management and Flood Risk Management Planning and as a statutory consultee in the Town and Country Planning system also present us with duties and opportunities to further the conservation of biodiversity. Our contribution through these functions during 2015-17 is described below.

An overview of SEPA's regulatory role

We protect and improve Scotland's environment in a number of ways. These include: helping regulated operators and individuals to understand and comply with environmental regulations and to realise the many economic and social benefits of good environmental practice. This approach benefits the environment, the economy and communities, and means we can focus our resources (including our enforcement powers) on tackling the most important environmental issues.

Our responsibilities include regulating:

- [activities that may pollute water](#);
- [activities that may pollute air](#);
- [waste storage, transport, treatment and disposal](#);
- [the keeping and disposal of radioactive materials](#);
- [activities that may contaminate land](#).

SEPA launched its new regulatory strategy, [One Planet Prosperity](#), in 2016, outlining how we will deliver the new approach to regulation that was introduced by the [better environmental regulation](#) programme.



SEPA's biodiversity duties

SEPA has a public body biodiversity duty¹ to further the conservation of biodiversity through the way we exercise our various regulatory and other functions. We also have statutory duties to protect designated features in nature conservation sites (Sites of Special Scientific Interest², Special Areas of Conservation and Special Protection Areas³) through all of our environmental licensing regimes. In the Scottish Government's [Non-Native Species Code of Practice](#)⁴, SEPA, as a statutory body, is identified as the habitat lead for still and flowing freshwater habitats.

¹ Section 1 of the Nature Conservation (Scotland) Act 2004

² Section 15 of the Nature Conservation (Scotland) Act 2004

³ Conservation (Natural Habitats, &c) Regulations 1994

⁴ Under section 14C of the Wildlife and Countryside Act 1981, as amended by the Wildlife & Natural Environment (Scotland) Act 2011 <http://www.gov.scot/Publications/2012/08/7367>

Mainstreaming

Regulation

Healthy ecosystems, including the health of their habitats and species, are essential if SEPA's goal of a Scotland benefitting from [One Planet Prosperity](#) is to be achieved. Globally, the over-use of the planet's natural resources is leading to significant declines in biodiversity. SEPA's [One Planet Prosperity strategy](#) is our response to the challenge faced by all nations in addressing this over-use.

Protecting habitats and species (biodiversity) is an integral part of SEPA's regulatory remit. SEPA is responsible for setting standards in environmental permits that protect and help to improve the quality of land and soil, air and water. As reported in [our previous three year report](#), this area of SEPA business remains the most widespread contribution we can make overall to conserving and enhancing biodiversity. This is both directly where we take account of potential impacts on a species or habitat when assessing an environmental permit application, and indirectly through the overall reduction of potentially damaging pollutants and regulation of potentially damaging activities that results from our permitting and other activities. Through regulation, SEPA helps to protect both biodiversity and the natural capital (biological and physical natural resources) that provide benefits to individuals, businesses and wider society.

In the period 2015-17, SEPA has successfully operated its Nature Conservation Procedure for Environmental Licensing to ensure that our regulatory decisions, across the range of regulatory regimes for which SEPA is responsible, help to implement our statutory duties to protect the designated features of European conservation sites (Special Areas of Conservation and Special Protection Areas)⁵ and Sites of Special Scientific Interest. We have also worked with Scottish Natural Heritage (SNH) to streamline the Nature Conservation Procedure to support better joint decision-making between the two agencies. We work well and routinely with SNH and operate a regular series of National Liaison Group meetings to support our joint work.

The majority of applications of the Nature Conservation Procedure have been for controlled activities in freshwaters (under the Controlled Activities Regulations regime, for point-source discharges, water abstractions for hydro power and other purposes, and engineering and impoundment works). We have also undertaken many Habitats Regulations Appraisals and SSSI damage risk assessments for marine cage aquaculture and emissions to air, including for energy from waste/ biomass facilities and for pig or poultry farms.

River Basin Management Plans (RBMP)

River Basin Management Planning is a statutory requirement arising from the European Water Framework Directive. River Basin Management Planning provides a process through which SEPA and partners can work together to identify pressures, then prioritise and deliver biodiversity enhancement and protection of the water environment. [River basin management plans](#) for the Scotland, and Solway Tweed river basin districts set targets for improving water quality, impacts on flows and levels and the physical condition of the water environment and preventing deterioration.

The RBMPs also set Protected Area objectives and identify measures for the improvement of certain Special Areas of Conservation and Special Protection Areas. Specifically, the RBMPs

⁵ Under the Conservation (Natural habitats, etc.) Regulations 1994 as amended

set out improvements required for certain SACs and SPAs⁶ where Scottish Natural Heritage and SEPA have determined, in accordance with [UK-wide guidance](#), that the conservation of the protected species or habitats on those sites is dependent on the status of water.

RBMP2, the second set of RBMPs covering 2016-2021, was published in December 2015. The many improvements to the water environment of Scotland identified in the two RBMPs are targeted at improving the ecological status of Scotland's waters. As such, the RBMP process contributes greatly to the delivery of SEPA's biodiversity duties. The actions planned under the RBMP2 process [are summarised on SEPA's website](#). For example, during the report period, work began on extending the rural diffuse pollution priority catchments programme from 14 original to 43 new catchments and an additional 72 smaller focus areas.

Flood Risk Management Planning

SEPA's responsibilities under the [Flood Risk Management \(Scotland\) Act 2009](#) include the development of Flood Risk Management Strategies covering 14 Local Plan Districts in Scotland. The strategies summarise the main flooding issues and flood impacts within each District, and set out a vision for how flooding should be managed including, where appropriate, the use of natural flood management (see below). The first set of strategies were [published by SEPA](#) in June 2016.

In March 2015, [SEPA published a Strategic Environmental Assessment \(SEA\)](#) for the Flood Risk Management Strategies, ensuring that the envisioned measures to address flood risk, to be planned by all local authorities through their Flood Risk Management Plans, would be sustainable. For the first time in a Strategic Environmental Assessment undertaken by SEPA, the assessment was underpinned by an ecosystem services approach. This allowed us to assess the potential change to ecosystem services arising from different actions. The assessment considered which ecosystems were most likely to be affected by different actions, and the subsequent effects on the ecosystem services delivered by that ecosystem.

Natural flood management: Natural flood management typically involves slowing or storing flood water and covers a spectrum of techniques from full-scale restoration of the course of a river or intertidal habitat to smaller-scale land management measures such as upland drain blocking. In addition to benefits for flood risk management, these techniques can often also easily incorporate, and contribute to, improvements in biodiversity, water quality, and carbon storage which can improve access to wildlife, health and wellbeing, recreation and jobs.

In January 2016, SEPA published its guidance on natural flood management, the [Natural Flood Management Handbook](#), to support the increased uptake of natural flood management approaches through the Local Authority Flood Risk Management Planning process. Through the report period, we continued to explore the delivery of additional, multiple benefits, including benefits for biodiversity, associated with natural flood management measures through involvement with partners in several restoration projects, e.g. [the Allan Water](#), [the Eddleston Water](#) and the [Firth of Forth Futurescapes](#). Also, since 2016, SEPA has played a leading role in the development of the Strathard Initiative, based in the Duchray catchment in the Loch Lomond and The Trossachs National Park. Working with the local community, the local authority, the forestry, land management and conservation sectors, the National Park Authority and others, this project has an objective, amongst others, to identify and trial land management and natural flood management measures in the Duchray catchment to contribute to reducing flood risk.

⁶ SACs and SPAs are identified under the [Conservation \(Natural Habitats, &c.\) Regulations 1994](#)

Action for biodiversity conservation

River Basin Management Planning

The previous section highlighted the overall contribution to the protection and restoration of Scotland's water biodiversity through the River Basin Management Planning process. A number of specific improvements were highlighted by media coverage, including a major initiative concluding in October 2017, [to return river flow to a ten mile-long stretch of the River Garry](#) that had previously been largely dry since the mid-1950s as a result of an industrial water transfer scheme. [This restoration promises major benefits](#) for adult salmon spawning and juvenile salmon production.

Delivering improvements to the physical condition of the water environment is a key challenge for the River Basin Management Plans. A key delivery mechanism for required improvements is the provision of support and funding for voluntary improvements and working in partnership with others. Since 2008, the Scottish Government has provided funding for a [Water Environment Fund](#) to deliver non-regulatory improvements to the physical condition of the water environment. Through 2015-17, the [Water Environment Fund](#) has supported a wide range of projects to improve the physical condition of the water environment, restoring important habitats and delivering benefits for biodiversity (examples of [current](#) and [completed projects](#)). The fund has progressively increased to a current value of c. £4.6 million in 2017/18.

Another important element of our work on restoring the physical condition of Scotland's water environment is encouraging, facilitating and helping to fund the removal or bypassing of barriers to the passage of migratory fish, such as salmon, sea trout, eels and lampreys. As examples of progress, [our Annual report for 2015-16 reported](#) that, over the year, 16km of river length was treated for physical condition and fish access and then [our Annual Report for 2016/17 reported](#) that projects completed that year opened up 302km of river to migratory fish.

A specific project with significant environmental benefits was the installation of fish passes at two redundant weirs, seven kilometres apart on the Avon Water in South Lanarkshire. These weirs obstructed fish access to approximately 100km of quality water upstream. On completion, six water bodies will have improved status. Of these, five move to High status and one to Moderate status. The full cost was close to £1.45million and £1.15million was provided by the Water Environment Fund. It was a partnership between us, the River and Fisheries Trusts of Scotland, Clyde River Foundation, Avon Angling Club and the landowners. Communities and landowners were engaged during the design of the project and there were local public meetings. BBC Radio Scotland broadcast an item on 08 March 2016 and articles on the project appeared in national newspapers and social media.



Before and after photos of Ferniegair Weir, Avon Water © SEPA

Non-Native Species

Non-native species (NNS) are animals or plants that have been introduced (deliberately or accidentally) by human activity to an area in which they do not naturally occur. Invasive non-native species (INNS) are sometimes referred to as ‘invasive alien species’. These are non-native species, such as Japanese Knotweed and North American Signal Crayfish, with the ability to spread rapidly and become dominant in an area or ecosystem, causing adverse ecological, environmental and economic impacts. Some INNS can also affect our health. SEPA is one of the relevant organisations in Scotland with statutory responsibilities in respect of Non-Native Species, including Invasive Non-Native Species, with SEPA leading on freshwater habitats. SEPA’s role is [described in more detail on our website](#). In early 2016, on behalf of the Non-Native Species Habitat Lead organisations, we launched [a Non-Native Species reporting portal on Scotland’s Environment website](#). This supports citizen science involvement in reporting Non-Native Species of concern.

In January 2017 a Scottish Event Biosecurity Support Guide, and accompanying risk assessment, was published and is hosted on the [GB Non-Native Species Secretariat website](#). The guide, funded and coordinated by SEPA, had substantial input from sporting body partners, the Scottish Canoe Association, the Royal Yachting Association, the Green Blue, and the Rivers and Fisheries Trusts of Scotland. It aims to help organisers of water contact sports events to prevent the introduction or spread of non-native species and diseases.

During the reporting period, SEPA also provided written and verbal evidence to the Scottish Parliament’s Petitions Committee on public petitions concerning North American signal crayfish and riparian invasive non-native plants.

SEPA also supports the work of other lead bodies on Non-Native Species, where relevant. For example, the work of Marine Scotland as the lead body for marine habitats. An example of this during the report period 2015-17 came about following the discovery of the invasive non-native species Carpet Seasquirt, *Didemnum vexillum*, in the sealoch, Loch Creran. SEPA was an active partner in a group led by Marine Scotland, with Scottish Natural Heritage and representatives of the local marine community, which determined priorities for action to control and contain the outbreak. A cross-sector community biosecurity plan was completed in May 2017, funded by Marine Scotland and Scottish Government (Aquaculture), based on biosecurity advice from the [Marine Pathways Project](#), and is being facilitated at a local level as a response to the threat to biodiversity as well as a sector of the aquaculture industry.

Restoration of degraded peatland

The restoration of degraded peatland is essential to ensure that it stores and locks up large amounts of carbon. Scottish Natural Heritage (SNH) is managing the £8 million ‘[Peatland Action](#)’ fund for 2017/18 on behalf of the Scottish Government. SEPA supports SNH in delivering this target and has worked with SNH to ensure that the risk of unintended environmental side effects is minimised in a pragmatic way.

During 2017, SEPA Water Regulation and Ecology specialists worked with SNH to update its guidance to facilitate peatland restorations. For example, changes were made to state that only the blocking of those ditches over 1 metre wide to raise water levels would attract the need for Controlled Activity Regulations (CAR) permits and that the risk of run-off resulting in diffuse pollution could be minimised through a minimum 5 metre buffer between bare peat surfaces and watercourses.

Improvements to biodiversity around our offices

All SEPA offices with grounds have an up-to-date biodiversity action plan detailing improvement measures and outreach projects to be carried out. An example target as part of our annual sustainability report for 2015 [can be found here](#).

[Twelve offices now support wildflower areas and semi-natural habitats in their grounds](#). Bird feeders are present at 15 offices. Bird baths, nest boxes, insect homes and bat boxes have also been erected in many offices. The pond installed at Dingwall office is maturing and is attracting oystercatchers, ducks, and gull chicks. Hedges planted over several years are becoming well-established and providing shelter and food for wildlife. A 'Bioblitz'-survey in the grounds around our 'Angus Smith Building' at Eurocentral near Holytown (North Lanarkshire) revealed interesting wildlife residents, including rare plants, moths and amphibians.

SEPA is also working together with communities, local business and other organisations to improve biodiversity outwith our grounds and to educate people on biodiversity. Activities for improving biodiversity included planting of UK native trees in various locations (e.g. 800 at Glen Finglas, Brig o' Turk), removing trees and gorse from Flanders Moss and litter picking around a number of SEPA office areas. Events on education included a walk with Syrian refugees on Flanders Moss, to show them our countryside and biodiversity; a macro-invertebrate sampling day for local school children to show them the diversity of River Nith wildlife in Dumfries; and assisting with new flower borders at a local school in Kirkwall.

Transforming a piece of 'green desert' into a colourful living space: example from SEPA Stirling office

In common with many offices in business parks, SEPA's office in Stirling is surrounded by intensively managed lawn that provides little habitat for most species. SEPA's Green Network decided to take on the challenge and plan and create a 12x10m biodiversity bed and a 4.5x10m herb bed in front of the office that would not only be good for biodiversity but also be attractive and fit for an office grounds.

To allow more time for creating a detailed garden plan, a gap year with a wildflower mix was planned for the biodiversity bed. The turf was removed in 2015, exposing the poor soil beneath it, which was then given a shallow rotovation. A special wildflower mix with poppies, cornflowers and corn marigold was enriched with red and white clover to improve the soil. The mixture grew well and provided lots of flowers and colour, enjoyed by wildlife but also by SEPA staff, visitors and passers-by. The full beauty of the flowers was captured for posterity and is incorporated into the décor of the office, as part of two meeting rooms and in the sign at the Strathallan House reception.

After removing a lot of the red clover and creating a seating area, planting started in October 2016 with great help from many SEPA staff. Planting includes crab apples, roses and other small bushes, as well as spring bulbs and a huge variety of perennials. Most plants survived the first winter but were still relatively small. With the ground being more open again, poppies and cornflowers came up again and provided a spectacular sight.

The biodiversity garden will change over time: With the perennials, shrubs and trees becoming established and increasing in size, the wildflowers will have less space to occupy but they will always mingle/self-seed between the other plants, providing an additional splash of colour in the garden. The garden needs a few more years to become fully established but is already a delight to staff. There is some interest all year round (flowers & fruits, scent, buzzing bees) and it changes with the seasons. Feedback from staff (especially those waiting at the coffee van) and visitors has been overwhelmingly positive. Staff from neighbouring offices have sought our advice. It has been a great return from a few enthusiasts investing their lunch time in some gardening.



Drone fly (*Eristalis pertinax*, a hover fly) on cornflower in
SEPA's Stirling office garden (© Scot Mathieson)



SEPA Stirling wildflower meadow © C. Erber

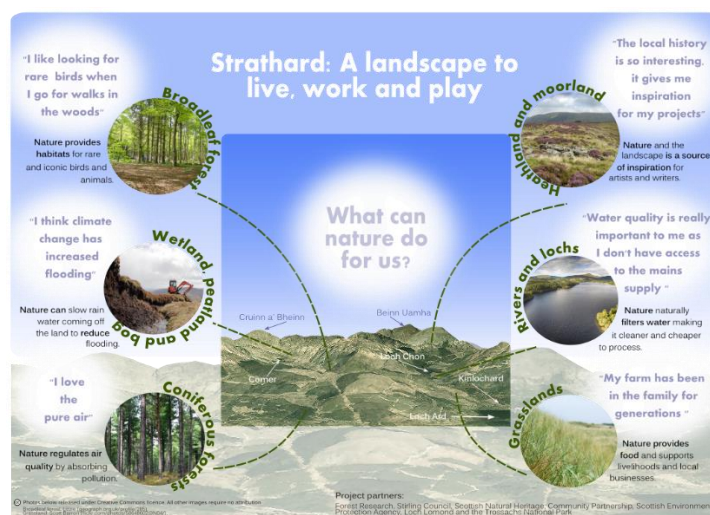
Partnership working and biodiversity communications

Partnership Working

As a means of working to deliver [One Planet Prosperity](#) and [sustainable flood risk management](#), SEPA is engaged in many partnerships which are also working to protect, improve and enhance the biodiversity of Scotland, as described by the following range of examples.

Strathard Initiative - A landscape to live, work and play

The Strathard Initiative is a collaborative project that is developing and trialling more effective land and water management decisions in Strathard, a rural area of western Scotland. The partnership was established by SEPA in 2015 to look for opportunities to improve joint working between public bodies, land managers and communities using an 'ecosystems approach' to land management.



Stakeholder engagement is at the heart of an ecosystems approach; working with the Community Partnership, we are engaging local people and businesses in decision making. A range of techniques are being used, including opportunity mapping, film making, co-designed surveys, community meetings and using interactive maps to encourage interest and help communities and land managers to visualise land management changes. The partnership successfully used the Strathard Story Map <http://arcg.is/2AbY7dq> to engage the community and keep everyone updated as the initiative developed.



© M Harvey, Community Partnership (2015)

The next stage of the project is looking to align the initiative with delivery of the Strathard Community Action Plan, and exploring mechanisms for agencies and the community to work together on projects which achieve multiple objectives on the ground. Current projects include: developing a natural flood management demonstration project in the Duchray catchment, improving interpretation of local sites and

recreation, invasive species control projects, peat restoration, water and forestry best practice management training, plus local cultural and natural heritage projects.



Community group visit to Loch Ard forest, to raise awareness of land management practices, discuss issues that affect the community and engage the community directly in Forest management planning process 'design your forest'.

© A Sobey, Community Partnership (2017)

Landscape-scale conservation

SEPA is engaged in a number of other partnerships working at a catchment scale, where the protection, improvement and enhancement of the biodiversity of the river and its catchment is one of the drivers for the partnership. In addition to the Strathard Initiative reported above, these include the [Dee Catchment Partnership](#), [the Tweed Forum](#), [the Spey Catchment Initiative](#) and a number of others.

These are examples of landscape-scale conservation (also known as an ecosystem approach). This is land management that involves working in collaboration and working at a large scale - often around a catchment, estuary or other recognisable landscape unit. This is a scale at which natural systems tend to work best and where there is often most opportunity to deliver real and lasting benefits. In this way, we can deliver environmental, social and economic benefits that are more difficult to achieve by managing small sites individually. Collaborating across landscapes means that land (and water) managers (public, private or third sector) can achieve greater success than working in isolation.

To support the development of landscape-scale conservation, SEPA has worked with [the Landscape-Scale Conservation Working Group](#), a sub-group of the Scottish Biodiversity Strategy. A key objective of this group is to support the development of a network of practitioners delivering landscape-scale conservation projects across Scotland. In 2017, we helped the group to develop and launch [a webpage on Landscape-Scale Conservation](#) on the Scotland's Environment website developed and hosted by SEPA. This provides information, and guidance and is available to everyone with an interest in developing projects.



Screenshot from [Landscape-Scale Conservation page](#) on Scotland's Environment website

Natural Environment Research Council's Hydroscape project

SEPA sits on the Advisory Board of the £multimillion NERC funded [Hydroscape project](#) that started in December 2015 and which aims to improve understanding of how connectivity, stressors, and the interactions between the two impact on freshwater habitats. The Hydroscape is composed of multiple water bodies and types, including rivers, streams, lakes and ponds. The outputs from this research project will help SEPA to understand better the impact of Water Environment Fund river restoration work on Scotland's biodiversity.

EKLIPSE research and knowledge exchange

[EKLIPSE is a European Mechanism](#) developed to answer requests from policy makers on issues related to biodiversity and ecosystem services. EKLIPSE organizes and facilitates knowledge synthesis processes, horizon scanning and societal dialogue on topics that relate to or impact on biodiversity and ecosystem services by making the best knowledge available. In 2016, SEPA was successful in securing EKLIPSE research resource, to pull together a temporary partnership of researchers and practitioners to help answer the question: '[How can environmental regulators support businesses to improve the outcomes of their operations for biodiversity, with a focus on small and medium-sized enterprises in the food and beverage sector in Europe?](#)'

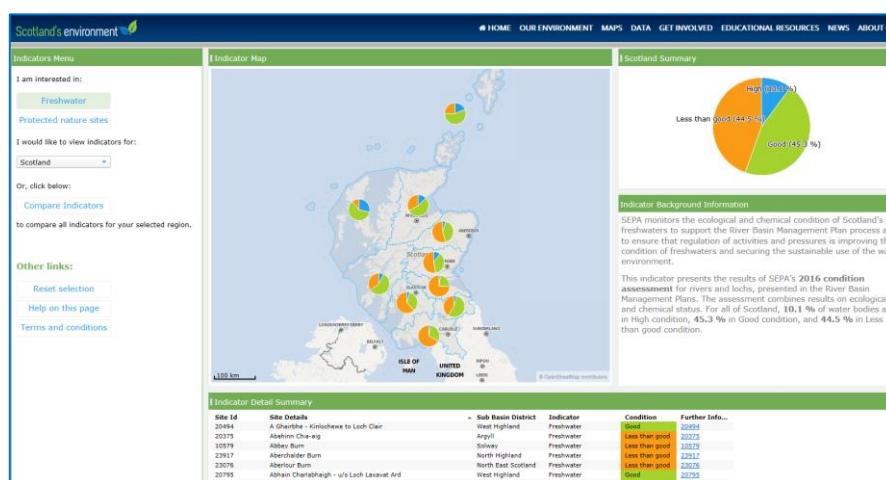
To date, a literature review has been completed, and a European-wide group of biodiversity and food business industry experts has been established to gather best available knowledge and experience to contribute to the research.

Ecosystem Health Indicators for the Scottish Biodiversity Strategy

People are part of ecosystems. We benefit from the services they provide, from clean water to the health benefits of a walk in the woods. Ecosystem health is a measure of the status of ecosystems. The partnership of organisations working to deliver the [Scottish Biodiversity Strategy](#) agreed that a suite of ecosystem health indicators was required to support work on the Strategy and which help us to understand where action should be taken to restore ecosystem health and associated benefits. Specifically, ecosystem health indicators were required to:

- prioritise action to protect or enhance ecosystem health
- assess progress in delivery of the [Scottish Biodiversity Strategy](#).

While ecosystems and biodiversity are important in their own right, all of the food we eat and the resources we use ultimately come from nature, so ecosystem health is relevant to all of us. Accordingly, during the reporting period, SEPA worked in partnership with SNH, Scotland's Rural College, the James Hutton Institute, the Centre for Ecology and Hydrology and others, to lead and coordinate the development of a suite of ecosystem health indicators for Scotland. This culminated in 2017 with the launch of [a platform for the viewing of the indicators](#) on the [Scotland's Environment website](#) developed and run by SEPA. The first two indicators to be published included [the Freshwater indicator developed by SEPA](#).



Screenshot from [Freshwater Ecosystem Health Indicator](#) on Scotland's Environment website

Green Infrastructure

Green infrastructure is many things to many people but, in general terms, it is the vegetated and water features that exist in a landscape, from existing parks and greenspaces through to designed environmental features such as green roofs and street trees. Green infrastructure provides environmental benefits, biodiversity refuges and connectivity across a landscape, and can be particularly beneficial in urban environments where they can mitigate against climate change.

During the period 2015-17, SEPA has been pleased to support Scottish Natural Heritage (SNH) in developing and implementing the Scottish Government's [Green Infrastructure Strategic Intervention \(GISI\)](#), part of the 2014 - 2020 European Regional Development Fund (ERDF) programme. The aim of the ERDF is to invest in communities to help them to grow economic activity and employment. The Green Infrastructure Strategic Intervention aims to improve Scotland's urban environment by increasing and enhancing greenspace in our towns and cities, especially close to areas of multiple deprivation.

£15 million of ERDF money is available through two competitive funds. With collateral funding contributions, the GISI should deliver a total value of £37.5m of investment throughout the course of the programme. This will provide [high impact improvements to the quantity, quality and accessibility of greenspace and other green infrastructure in urban Scotland](#), targeted to benefit our most deprived communities. SEPA serves on the Project Management Board and Scrutiny Panel that decide on funding allocations and has also provided technical environmental expertise to assist SNH in the assessment of a number of the applications.

SEPA is also a regular participant in the [Scottish Green Infrastructure Forum](#), a group of organisations, businesses and individuals interested in furthering the use of green infrastructure in Scotland.

The Riverfly Partnership

The many species of flies which have larval stages that live in rivers form an important source of information for us on the state of our river environments. Understanding the condition of the populations of flies that are part of a river's invertebrate life can provide early indications of potential pollution problems in a river. Through SEPA's involvement with the Anglers Riverfly Monitoring Initiative (ARMI), we have also become more involved with [the Riverfly Partnership](#). The Partnership's objectives are threefold:

- protect the water quality of our rivers
- further the understanding of riverfly populations
- conserve riverfly habitats.

In 2015, SEPA assisted at two training workshops for Galloway Fisheries Trust volunteers. These courses were delivered by accredited trainers from the Clyde River Foundation. In 2016, a SEPA ecologist became accredited as an ARMI trainer and delivered his first training course to the Loch Lomond Angling Improvement Association.

In 2017, SEPA took on an increased role for training, carrying out seven river fly monitoring training courses. This involved a total of 48 volunteers being trained (five of whom were receiving refresher training). The Forth Fisheries Trust requested three of these training courses from funding that they received. Other groups trained came from the Bridge of Weir Angling Club, Friends of the River Kelvin, Forth District Salmon Fishery Board, Slamannan A&PA, Lothian Angling Club, River Forth Fisheries Trust, Falkirk Community Trust, SRUC students and staff from Oatridge College, Loch Lomond Angling Improvement Association, RSPB staff at Kelvingrove, Countryside rangers for East Ayrshire Council based at Dean Castle Country Park and members of the Kilmarnock Angling Association.

Biodiversity Communication & Awareness-raising

SEPA at the Royal Highland Show

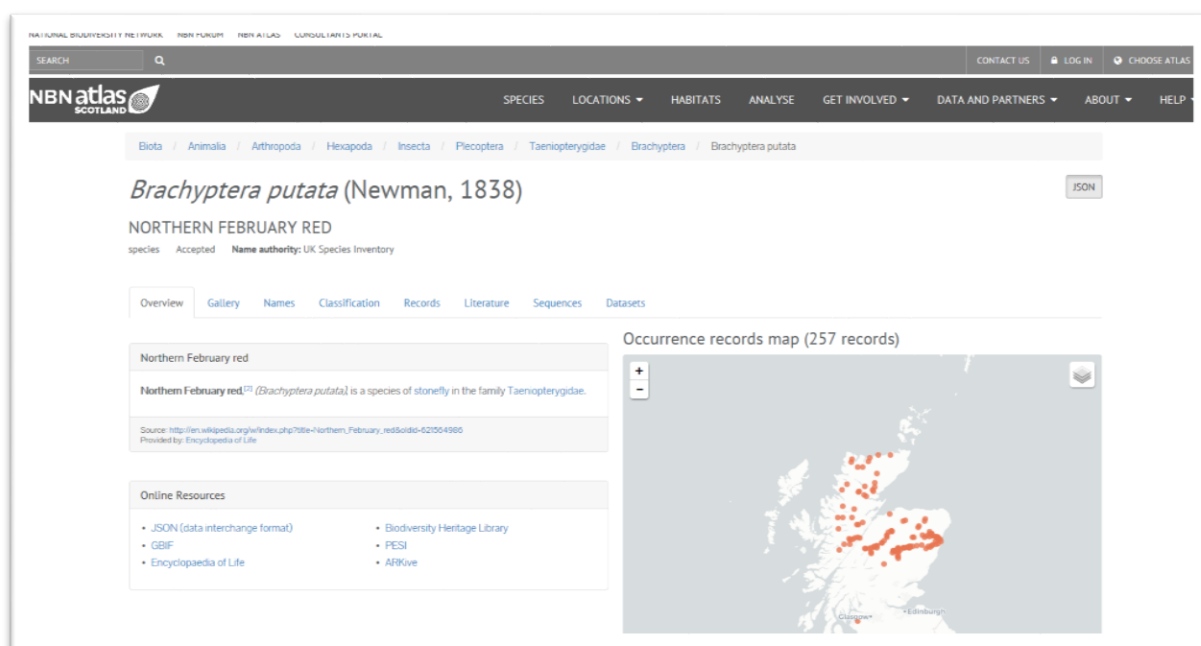
SEPA contributes to the displays and stands in the Scottish Government tent for its environment bodies in June each year at the Royal Highland Show. Sometimes the theme provides a significant opportunity for promotion of biodiversity. For example, in 2015, the overall theme of the tent was based around the [Year of Food and Drink Scotland 2015](#) and the [International Year of Soils 2015](#). The SEPA stand focused on the links between soils and food, the importance of earthworms in the soil and the role of earthworms in composting vegetation and food waste. The display drew on SEPA's [Making the Case for Soil](#) materials. The centrepiece of the display was a giant snakes and ladders floor game, which used the characters from the [Wriggle blog](#). Children playing the game could enter a competition to win the game for their school. Live specimens of the four main types of



earthworms were displayed in jars adjacent to the floor game. Next to the earthworms, there was an exhibit demonstrating the effects of bioturbation. Children were encouraged (with permission from their teacher/ parent) to take material home to build their own display and to submit pictures of it to SEPA. The Minister for Environment, Climate Change & Land Reform, Dr Aileen McLeod, was impressed by the intriguing mixture of education, professionalism, and fun on the stand.

NBN Atlas Scotland

SEPA was delighted, in early 2015, to be able to provide pivotal initial funding that allowed the development and establishment of a new online platform to access Scotland's millions of biodiversity records held on the National Biodiversity Network's (NBN) database. [The NBN Atlas Scotland](#) (or 'the Atlas of Living Scotland', as it was known at the time) was the brainchild of Dr John Sawyer, the then-CEO of the NBN Trust. The NBN Atlas Scotland is the first such system to be developed in the UK and has piloted an innovative approach which is now spreading to other parts of the UK. The NBN Atlas Scotland is a free online tool that provides a platform to engage, educate and inform people about the natural world. It will help to improve biodiversity knowledge, open up research possibilities and change the way that environmental management is carried out in the UK. SEPA continues to contribute support to the development of the system.



[Screenshot](#) from the NBN Atlas Scotland

The NBN Atlas Scotland is innovative as the combination of the multiple sources of information about species and habitats, and the ability to interrogate, combine, and analyse these data – in a single location – has not been done before, on this scale. It aims to facilitate learning about and understanding Scotland's wildlife. The NBN Atlas Scotland, developed as part of the [Scotland's Environment Web network](#), was officially launched on 1st April 2017.

A very sad footnote to this development was the tragic [death of John Sawyer](#) in November 2015, at much too-early age of 47. Those of us in SEPA who worked with him were, like many others in our biodiversity community, inspired by his clarity of vision, his enthusiasm for life and his desire to bring about change for the better. We have dedicated this report to his memory and will continue to work to deliver his vision for biodiversity information sharing.

Scottish Biodiversity Information Forum

Related to the establishment of the new NBN Atlas Scotland, the [Scottish Biodiversity Information Forum](#) (SBIF) has been undertaking [a comprehensive review and redesign](#) of the biological recording infrastructure in Scotland. Through this Review, the partnership aims to determine the optimum infrastructure for biological recording. SEPA has participated in the review's workshops, feeding ideas in to the review and continues to work as part of the SBIF Advisory Group to oversee the review and its implementation.

Monitoring

Background to SEPA environmental monitoring programme

Why we monitor

SEPA has a duty to monitor and report on the state of Scotland's environment and to use that scientific understanding to inform our independent regulation of activities that may affect its quality. We publish a wide range of environmental information and advise Ministers, partner bodies, regulated industry and the public on environmental issues.

Understanding the functioning of our ecological systems underpins all environmental decision making. All of our basic requirements (food, clean air, clean water) require functional ecosystems. The only way to assess whether human activities are sustainable is to understand those ecosystems, and to use that understanding to support decision making. We monitor and assess the ecological condition of Scotland's seas, rivers, lochs, bathing beaches, aquaculture sites and priority catchments so that:

- Areas that are damaged can be identified
- remedial actions and restoration can be focused
- opportunities for further development can be identified

We provide ecological advice and information to underpin the delivery of SEPA's regulatory strategy through:

- focused permitting and land-use planning advice
- pollution and incident support
- effective enforcement support
- intelligence that delivers an effective sector approach

We deliver hydro morphological information that is used in the national flood risk assessment and deliver some targeted advice on Natural Flood Risk Management projects.

How we monitor

We employ experts in many fields of science, including hydrology, chemistry, ecology, algology, ecotoxicology, hydromorphology, hydrogeology, and oceanography. Our scientists analyse a wide range of samples collected from across Scotland's air, land and water environments.

We test for more than 500 individual chemical parameters and the diversity and abundance of 2,000 plant and animal species in marine, freshwater and terrestrial habitats. We also conduct analyses of solid waste arisings and audit check analyses of gaseous emissions to the atmosphere.

In the year 2016-17, we collected more than 32,300 environmental samples and, in a typical year, we deliver 700,000 determinations. This work supports SEPA's statutory monitoring (EC directives) and its general duty to assess and report on the state of Scotland's environment. Of these, in 2016/17 for example, almost 18,000 samples were ecological, taken for monitoring of populations of fish, water plants and invertebrates in freshwaters, estuaries and coastal waters.

SEPA maintains and operates a network over 400 gauging stations and more than 500 rain gauges and provides a national flood warning and forecasting service. This allows us to

provide detailed sustainable flood management and planning advice. SEPA holds over 30 years of hydrometric data for Scotland's rivers. These data are invaluable in characterising the long-term pressures on Scotland's environment, particularly in relation to the assessment and management of the consequences of climate change.

Our testing, analysis and interpretation covers a wide range of environments throughout Scotland, including contaminated land, fresh and saline waters, soils and sediments, sewage and industrial effluents, leachates, fauna and biota, and landfill gases. Data from our national wetland monitoring network (over 70 monitoring locations) has contributed to improving the scientific understanding of the ecology of these habitats in a Scottish setting. These long-term data are being used to inform many conservation and flood management projects.

Biodiversity recording on SEPA Office grounds

iRecord is an online site for recording, managing and sharing wildlife sightings. During the period of this report, SEPA staff members have begun to make use of a bespoke form on iRecord for uploading wildlife sightings at SEPA offices. This allows SEPA to monitor biodiversity improvements around the office grounds and engage staff in the activities undertaken, and to ensure that such data are made available to the wider community of biodiversity data users through the National Biodiversity Network.

Additional biodiversity knowledge improvements from SEPA monitoring programme – lower plant and fish examples

Lower plants – Bryophytes: As part of its Water Framework Directive duties, SEPA must undertake monitoring of aquatic macrophytes to help assess the ecological status of our rivers and lochs. Aquatic macrophytes are plants visible to the naked eye and include the ancient group of plants known as bryophytes. Bryophytes include mosses, liverworts and hornworts. They are particularly important as a food source and habitat for some of the aquatic invertebrates which SEPA also monitors. Bryophytes are relatively difficult to identify and are often overlooked and under-appreciated, especially in the aquatic environment. Because of this, the bryophyte flora has not been recorded and mapped to the same extent as their flowering/higher-plant counterparts.



Water of Deugh at Burnfoot
An example of a bryophyte-rich river

SEPA Ecology staff who are trained macrophyte surveyors have been lucky enough to survey some rarely visited locations and find several new records for the [biological 'vice-counties'](#) that are used by botanists to collate plant records in the British Isles. There are 112 British vice-county areas and one for the Channel Islands. SEPA's bryophyte identifications are verified by a specialist in the Royal Botanic Garden Edinburgh for sharing with the wider biodiversity network. Vice-county records are supplied to the Botanical Society of Britain and Ireland and the National Biodiversity Network to keep distribution records up to date. SEPA routinely monitors *circa* 250 rivers and 40 lochs for macrophyte assessments and many more have been surveyed once in the first RBMP cycle. SEPA has found new vice-county records have been found for 19 species, from 13 vice-counties and 18 different waterbodies.

Fish – Confirmed and new lamprey records in south-west Scotland: Sea lampreys are a nationally scarce fish species and had previously been observed in only 35 Scottish rivers. Through a combination of a citizen science publicity campaign and visual and fishing surveys by SEPA staff, we identified the continued presence of sea lampreys in the River Leven, their recent occurrence in the River Clyde and a first record from the Black Cart, as well as pointing to a first record of spawning sea lampreys in the River Kelvin, the River Doon and the River Garnock. Although this work was undertaken in 2014, [the results were published in The Glasgow Naturalist journal](#) in 2016.

Subsequent electrofishing work by SEPA in the River Garnock near Kilwinning in September 2016 also recorded river lampreys in that river for the first time. Until recently, only the non-migratory brook lamprey was known from the River Garnock. SEPA also [published this result in the Glasgow Naturalist](#) in 2016.

Annex A: Contribution to targets

The following table shows the targets or key steps in the Scottish Biodiversity Strategy to which SEPA has contributed.

Targets/key steps from Chapter 1 (Healthy ecosystems) of the "2020 Challenge for Scotland's Biodiversity"	Justification
(1.1) Encourage and support ecosystem restoration and management, especially in catchments that have experienced the greatest degradation	River Basin Management Plans/ Water Environment Fund; SEPA environmental licensing
(1.2) Use assessments of ecosystem health at a catchment level to determine what needs to be done	River Basin Management Plans; Ecosystem Health Indicators at national level; Strathard Partnership at catchment level
(1.3) Government and public bodies, including SNH, SEPA and FCS, will work together towards a shared agenda for action to restore ecosystem health at a catchment-scale across Scotland	River Basin Management Plans; Strathard Partnership at catchment level; SEPA environmental licensing
(1.4) Establish plans and decisions about land use based on an understanding of ecosystems. Take full account of land use impacts on the ecosystems services that underpin social, economic and environmental health	River Basin Management Plans; Water Environment Fund; Strathard Partnership at catchment level
Targets/key steps from Chapter 3 (Biodiversity, health and quality of life) of the "2020 Challenge for Scotland's Biodiversity"	Justification
(3.2) Support local authorities and communities to improve local environments and enhance biodiversity using green space and green networks, allowing nature to flourish and so enhancing the quality of life for people who live there	Support to SNH Green Infrastructure Strategic Intervention, Scottish Green Infrastructure Forum; Scotland's Greenspaces map on Scotland's Environment website; steering group for Glasgow & Clyde Valley Green Network
(3.3) Build on good practice being developed by the National Health Service (NHS) and others to help encourage greenspace, green exercise and social prescribing initiatives that will improve health and wellbeing through connecting people with nature	Support to SNH Green Infrastructure Strategic Intervention, Scottish Green Infrastructure Forum; Scotland's Greenspaces map on Scotland's Environment website
(3.5) Encourage public organisations and businesses to review their responsibilities and action for biodiversity, and recognise that increasing their positive contribution to nature and landscapes can help meet their corporate priorities and performance	Outreach to local businesses and communities as part of our Greening SEPA target for biodiversity on SEPA grounds

Targets/key steps from Chapter 4 (Wildlife, habitats and protected places) of the "2020 Challenge for Scotland's Biodiversity"	Justification
(4.3) Integrate protected areas policy with action for wider habitats to combat fragmentation and restore key habitats	Water Environment Fund; Support to Landscape-Scale Conservation Working Group and provision of platform on Scotland's Environment website
Targets/key steps from Chapter 5 (Land and freshwater management) of the "2020 Challenge for Scotland's Biodiversity"	Justification
(5.1) Promote an ecosystem approach to land management that fosters sustainable use of natural resources and puts biodiversity at the heart of land-use planning and decision-making	Diffuse Pollution priority catchment work under RBMP2; Strathard Initiative - demonstrate catchment project; Scottish Forum for Natural Capital's Future Land Management Business Models Working Group; Strategic Environmental Assessment of Flood Risk Management Strategies used an ecosystems approach
(5.2) Ensure that measures taken forward under the Common Agricultural Policy encourage land managers to develop and retain the diversity of wildlife habitats and landscape features	Diffuse pollution measures in priority catchments, including buffer strips, and encouraging of farm wetland construction, fencing off river corridors, etc.
(5.4) Put in place the management necessary to bring Scotland's protected areas into favourable condition and improve the ecological status of water bodies	River Basin Management Plans: measures for achieving protected areas objectives for nature conservation protected areas
(5.5) Ensure that biodiversity and ecosystem objectives are fully integrated into flood risk management plans, and restore wetland habitats and woodlands to provide sustainable flood management	The preparation of Scotland's 14 Flood Risk Management Strategies took account of designated sites as part of the assessment of flood risk management; Strategic Environmental Assessment of these strategies included an ecosystems approach
(5.6) Restore and extend natural habitats as a means of building reserves of carbon and to help mitigate climate change	Delivery of improvements and restoration to the water environment through Water Environment Fund
(5.7) Provide clear advice to land and water managers on best practice	Advice to land managers and farmers on diffuse pollution, particularly in priority catchments and focus areas
Targets/key steps from Chapter 6 (Marine and coastal) of the "2020 Challenge for Scotland's Biodiversity"	Justification
(6.4) Achieve good environmental status for Scottish seas	River Basin Management Plan measures for transitional and coastal waters; Controlled Activities Regulations licensing regime