



Summary

- Scotland's decision-makers must respond swiftly and robustly to the growing nature and climate emergency. Restoring our freshwater habitats can make an important contribution to this, acting as nature-based solutions to climate change and providing habitats for many species. Scotland's rivers are an essential part of our freshwater environment.
- However, Scotland's rich industrial heritage has resulted in a legacy of interventions and barriers in our freshwater environments, particularly to free-flowing rivers. Few rivers in Scotland can be considered to be free-flowing, with knock on effects for migratory species, sediment removal and flooding.
- Scottish rivers have been confined and constricted to prevent them flooding adjacent land. Our rivers need space to move and adjust naturally to varying water volumes so that they can regenerate habitat, improve wildlife, and help us adapt to climate change. Natural processes such as functioning floodplains will lessen the impact of flooding events, acting as a nature-based solution to climate change, whilst also contributing to biodiversity restoration through the creation of floodplain wetlands.
- Government policy and strategies must support:
 - Projects that will restore freshwater habitats as critical nature-based solutions to climate change.
 - Existing work to identify and remove unnecessary/defunct structures on or rivers, and enforcement to deal with unconsented works.
 - Knowledge-sharing about techniques that work with natural processes with key stakeholders, particularly Local Authorities, and those involved in Flood Risk Management.
 - Aligning nature-based solutions to flood management with the Scottish Planning Policy, particularly the draft National Planning Framework 4 (NPF4) currently under parliamentary scrutiny
 - Comprehensive assessments of the impact of new structures upon freshwater, beyond just considering the impacts on migratory fish.
 - The restoration and recreation of wetlands, such as reedbeds, ponds, wet meadows and wet woodlands to make a significant contribution to securing biodiversity.
 - Measures avoiding development on floodplains, arable reversion and implementing measures such as crop rotations to adapt to the effects of climate change.
 - Habitat restoration and creation, planned and prioritised through a spatially mapped national Nature Network informed by local knowledge to enhance ecosystem connectivity.
 - Establishing a range of funding sources for habitat restoration.

- Including a target on free-flowing rivers in the monitoring framework for the Environment Strategy. For example, the EU's Biodiversity Strategy for 2030 includes a target to restore at least 25,000km of free-flowing rivers.¹

Introduction

Scotland, and the world, is facing an interlinked nature and climate emergency. 1 in 9 species in Scotland is at risk of extinction - driven largely by the impacts of human activity on the natural world.² Scotland also ranks 28th from the bottom in the Biodiversity Intactness Index (BII), a global analysis of how much human activity has impacted nature. Of the 27 EU member states, 85% rank more highly than Scotland in biodiversity intactness.³

Scotland is, however, renowned for its freshwaters. They provide a home to iconic species such as the Atlantic salmon and Freshwater pearl mussel, provide drinking water, are used to generate electricity, support game fisheries and are essential for the production of food and drinks, such as whisky. As such they are important for our heritage and promote health and well-being by providing opportunities for many recreational activities and aesthetic enjoyment. Their natural capital means that they have considerable economic value.

Scotland's rich industrial heritage has resulted in a legacy of interventions and barriers in our freshwater environments, particularly to free-flowing rivers. Rivers have been dammed to power industrial processes, generate electricity and to provide drinking water. Although many barriers have been removed, over 2,200 barriers remain in Scottish rivers. Whilst some of these are still operational, many are no longer used but still block the flow of the river, and the path of salmon and sea trout on their migratory journeys. The result is that few rivers in Scotland can be considered to be free-flowing.

Free-flowing rivers are, by contrast, largely unaffected by human-made changes to their flow. Water and sediments can move downstream unimpeded, fish and invertebrates can migrate freely, the river is free to move and adjust naturally on its flood plain, whilst also replenishing groundwater sources. The draft River Basin Management Plan for Scotland⁴ aims to remove or ease 262 man-made barriers by 2027. At this rate of action it will take over 50 years to free our rivers.

Why do we need free-flowing rivers?

¹European Commission, 2021. *EU Biodiversity Strategy for 2030*, p.14. Available at:

<https://op.europa.eu/en/publication-detail/-/publication/31e4609f-b91e-11eb-8aca-01aa75ed71a1>

² https://scotlink.org/files/state-of-nature-report-scotland_.pdf

³ <https://www.rspb.org.uk/about-the-rspb/about-us/media-centre/press-releases/stark-reminder-to-new->

[msps/#:~:text=Scotland%20ranks%2028th%20from%20the,than%20Scotland%20in%20biodiversity%20i](https://www.rspb.org.uk/about-the-rspb/about-us/media-centre/press-releases/stark-reminder-to-new-)
ntactness.

⁴ <https://www.sepa.org.uk/media/591408/draft-rbmp-three.pdf>

Scottish rivers have been confined and constricted to prevent them flooding adjacent land. Our rivers need space to move and adjust naturally to varying water volumes so that they can regenerate habitat, improve wildlife, and help us adapt to climate change. This would allow for more flooding incidents to be managed by natural processes while contributing to biodiversity restoration and acting as a nature-based solution to climate change.

Easing of barriers, which typically involves the installation of fish passes to allow the upstream and downstream movement of migratory fish, does not reinstate natural river processes such as sediment movement, or restore natural flow regimes. The only way to restore natural flow processes and sediment movement is to remove the barriers completely.

River banks are also an essential habitat for reptiles, particularly grass snakes and common lizards. Floodplain wetlands provide habitat for water beetles, amphibians, and wetland plants. Most rivers are disconnected from their floodplains by embankments and flow control structures, limiting the scope of those floodplains to hold water during high flows and hence ameliorate downstream flooding issues⁵.

An often overlooked element of our rivers is the flow of water below the river. A stream or river is far more than the water we see in the river channel. The flow of water amongst the stones and gravels below and alongside the river is incredibly important for biodiversity and the river environment. It forms a refuge and habitat for the young of many invertebrates and often influences the chemistry and life in the river above. These invertebrate populations have a direct link to fish populations as important sources of food and so are vital to both Scotland's food and drink and tourism sectors.⁶ This underground flow is of vital importance in ensuring the resilience of rivers to climate change. Abstraction, development and pollution can all affect this habitat, with sedimentation, and the subsequent blocking of the tiny spaces between the gravels a particular problem.

What needs to happen?

We need to accelerate the implementation of both strategic and specific actions to manage catchments in ways that reduce freshwater pollution, improve water quality and restore natural flow processes as part of efforts to address the nature and climate emergency. These interventions will both support nature's recovery, and help the freshwater environment become more resilient to the impacts of climate change.

⁵ Maltby, E., Ormerod, S., Acreman, M., Blackwell, M., Durance, I., Everard, M., Morris, J., Spray, C., Biggs, J., Boon, P., Brierley, B., Brown, L., Burn, A., Clarke, S., Diack, I., Duigan, C., Dunbar, M., Gilvear, D., Gurnell, A., Jenkins, A., Large, A., Maberly, S., Moss, B., Newman, J., Robertson, A., Ross, M., Rowan, J., Shepherd, M., Skinner, A., Thompson, J., Vaughan, I. and Ward, R. (2011). Chapter 9: Freshwaters – Openwaters, Wetlands and Floodplains. UK National Ecosystem Assessment, pp. 295-360, Cambridge, UK, UNEP-WCMC

⁶ The economic value of game fishing was estimated at £112 million per annum in Scotland in 2004 (Radford, A., Riddington, G. & Anderson, J. (2004) The Economic Impact of Game and Coarse Fishing in Scotland. Report prepared for Scottish Executive Environment and Rural Affairs Department.)

Nature-based solutions to climate change⁷ are increasingly recognised as an essential approach to water management and we must restore wetlands and rivers, including managing water flow patterns, in ways that promote ecosystem processes. Restoring and rewetting drained peatlands is a key nature-based solution to climate change, with the scope to lock up carbon, benefit biodiversity and enhance human well-being. However, nature-based solutions are not yet sufficiently incorporated into strategic and project plans - we urge the forthcoming Scottish Biodiversity Strategy to consider the central role nature-based solutions can play in efforts to reverse Scotland's biodiversity declines.

Existing work to identify and remove unnecessary/defunct structures, and enforcement to deal with unconsented works, must be stepped up. Preference must be given to schemes which utilise nature-based solutions/natural flood management wherever possible; it will not always be possible to adapt to climate change and the pressure to implement hard engineering solutions in order to attempt to do so must be resisted; we must instead think in terms of mitigating the impacts of a changing climate and select solutions which work with nature. Working with natural processes is now more readily considered but there remain questions that concern some stakeholders, such as around long-term maintenance, liabilities and so on, which would benefit from resolution.

As our understanding of such techniques grows, findings must be widely communicated amongst stakeholders, particularly to Local Authorities, to ensure that all involved in Flood Risk Management are able to draw upon techniques that work with natural processes in the widest sense, considering for example not just leaky dams, but measures such as soil health.

Similarly, there are **opportunities to align nature-based solutions to flood management with the Scottish Planning Policy, particularly the draft National Planning Framework 4 (NPF4)** currently under parliamentary scrutiny, and the Land Use Strategy. The 'mainstreaming' of nature-based solutions across government policies is a key step in tackling the climate and nature emergencies.

Where new structures are required, assessments of their impact upon freshwater ecology should extend further than only considering migratory fish. Invertebrate species can travel far shorter distances than fish and weirs and other barriers could have an exaggerated impact on their dispersal. Weirs, dams and other structures also alter sediment flows in watercourses which has implications for invertebrate and plant species both in the channel and in riparian features such as gravel beaches and bars.

The restoration and recreation of wetlands, such as reedbeds, ponds, wet meadows and wet woodlands, will make a significant contribution to securing biodiversity, healthy functional ecosystems and the provision of ecosystem services, as well as being crucial to the protection and enhancement of rivers, lakes and other freshwater habitats. In particular, the ecological and ecosystem services value of floodplains need to be better recognised, and the potential risk to rivers and lakes of failing to

⁷ <https://www.naturebasedsolutionsinitiative.org/what-are-nature-based-solutions/>

undertake improvements to wetlands should be considered as part of the cost-benefit assessment for land-based enhancements.

Measures such as avoiding development on floodplains, arable reversion and implementing measures such as crop rotations will support our adaptation to the effects of climate change, helping to restore the functionality of some floodplains. Other measures such as **targeting tree planting in riparian areas** will help to shade watercourses and prevent water temperatures from rising.

Connectivity is a key attribute required for healthy, functioning ecosystems. **Habitat restoration and creation, planned and prioritised through a spatially mapped Nature Network informed by local knowledge, could be used to enhance connectivity**, directly (e.g., fish passage projects which improve physical connectivity, and enhancements to lateral connectivity by reconnecting rivers with their floodplains) as well as by considering the quality of connected habitats. For example, a river restoration project may be more valuable if it links upstream and downstream areas which have already been restored, as it increases the area of connected high-quality habitat. Mapping of priority wetland habitats would also identify existing areas of good-quality habitat as well as opportunities for restoration and allow the identification of areas where habitat restoration or re-creation will be valuable to support biodiversity delivery as well as creating functional floodplains / coastal habitats that can play a role in flood and coastal erosion risk management. There is scope for policies to support habitat connectivity to be included in NPF4.

Habitat restoration and creation should be funded by a combination of sources including Water Framework Directive and River Basin Management Plan focused funding, Scottish Rural Development Programme payments from the government, Flood Risk Management Funding, Scottish Water investment programme and other sources, and through developer-funded delivery of Biodiversity Net Gain. Together, this spatial planning and framework integration can deliver the “urgent step change in effort” that the biodiversity crisis demands⁸.

As the in-channel opportunities to improve freshwater biodiversity are progressively realised, focus must shift to other freshwater habitats, underpinned by a shift in focus that favours the restoration of natural processes as the most sustainable footing for biodiversity recovery. Such habitats should include smaller water bodies including **ponds, ditches, springs and wetlands**. Both cost and technical feasibility have limited action in these waters to date; to counter this, natural ecosystem function should underpin a ‘no-regrets’ approach to restoration.

Measures to improve joint working should also be supported, including via the sharing of information so that stakeholders are clearer on the contributions that they could make to improving the state of estuarine and coastal waters by undertaking work further up the catchment. Funding criteria for catchment-based projects should include an assessment of whether they have incorporated actions which will contribute to improvements.

⁸ https://ipbes.net/sites/default/files/2018_ldr_full_report_book_v4_pages.pdf

Finally, it is important to monitor our progress towards freeing up our rivers. **The government should include a target on free-flowing rivers in the monitoring framework for the Environment Strategy** and progress towards meeting that target should be reported on a regular basis.

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