Scottish Biodiversity Strategy to 2045

Tackling the Nature Emergency in Scotland

Scottish Government
Riaghaltas na h-Alba

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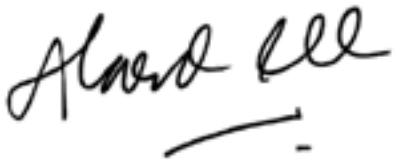
Ministerial Foreword

Dr Alasdair Allan
Acting Minister for Climate Action



There is international consensus around the urgent need to act decisively to address the twin crises of biodiversity loss and climate change together. Just like climate change, the loss of species and degradation of our natural environment is an existential threat to humanity. And just like climate change, the action needed is both urgent and transformative. That's why the Scottish Government is clear that this is an emergency that requires a swift and energetic response.

This Strategy articulates a vision for a future where Scotland's natural environment is restored and is supporting thriving communities and wildlife alike, proposes outcomes and key objectives that will set us on the path to deliver this vision, and establishes the architecture needed for the cross-government delivery and the deep collaboration we need with partners, stakeholders and land managers. Tackling the nature emergency is a long-term endeavour, and it will not be achieved within the lifetime of any single Parliamentary term. We are therefore putting in place a range of vital measures to ensure that this Strategy will continue to be relevant, and direct the delivery of the lasting outcomes for biodiversity that we need to see in Scotland, whatever the political complexion of future governments.

At the heart of this Strategy is collaboration. No one can tackle the nature emergency alone, and I want to thank the many stakeholders, including farmers, other land managers, marine industries, their representatives, and individuals who have engaged with the development of this Strategy. I look forward to working together and supporting each other to deliver the change we need to see.

The nature emergency is a global emergency and so this partnership needs to extend beyond our borders. That's why I am committed to working with partners across the UK, EU and the world to support progress in protecting and restoring nature wherever it is.

This Strategy was first published in draft during the COP15 meeting of the United Nations Convention on Biological Diversity in Montreal, Canada: the pivotal meeting which agreed the new Global Biodiversity Framework. On behalf of the United Nations, the Scottish Government had secured the support of over 300 sub-national governments, countries, regions and cities around the world for the Edinburgh Declaration. Scotland had the privilege of presenting the outcome of that process at COP15, calling for a high ambition outcome, and securing recognition of the role of sub-national governments of countries, regions and cities in delivering for biodiversity in the new Global Biodiversity Framework.

This final version reflects the agreement made at COP15 and is published alongside a delivery plan, which sets out a detailed action plan for the whole of government that will guide our work to tackle the nature emergency over the coming years. The First Ministers' address at COP16 reiterated the critical importance of a collaborative, whole-of-government approach to nature restoration.

Executive Summary

The Global Climate Emergency and the Nature Emergency are twin reinforcing crises: the actions we take to address each are fundamental to our wellbeing and survival as a species. There is now an indisputable body of evidence that biodiversity, both globally and in Scotland, is in real trouble. Our efforts to address the crisis to date have generated some lessons and local successes, but we urgently need to accelerate and scale up those efforts to drive landscape and seascape scale recovery.

This Strategy sets out a clear ambition: for Scotland to be **Nature Positive** by 2030, and to have restored and regenerated biodiversity across the country by 2045. Our vision is:

By **2045**, Scotland will have restored and regenerated biodiversity across our land, freshwater and seas.

Our natural environment, our habitats, ecosystems and species, will be diverse, thriving, resilient and adapting to climate change.

Regenerated biodiversity will drive a sustainable economy and support thriving communities, and people will play their part in the stewardship of nature for future generations.

To deliver the Vision, we have identified a detailed set of **Outcomes** which help us to define and understand what success will look like by 2045:

- across our land and seascapes.
- on land.
- in rivers, lochs and wetlands.
- in marine and coastal environments.

These Outcomes will be achieved through detailed actions set out in Delivery Plans.

This Strategy identifies the following six objectives which have shaped the development of actions to deliver our high-level goals, continuing progress towards our aim of halting the loss of biodiversity and being nature positive by 2030.

1. accelerate restoration and regeneration;
2. protect nature on land and at sea, across and beyond protected areas;
3. embed nature-positive farming, fishing and forestry;
4. protect and support the recovery of vulnerable and important species and habitats;
5. invest in nature; and,
6. take action on the indirect drivers of biodiversity loss.

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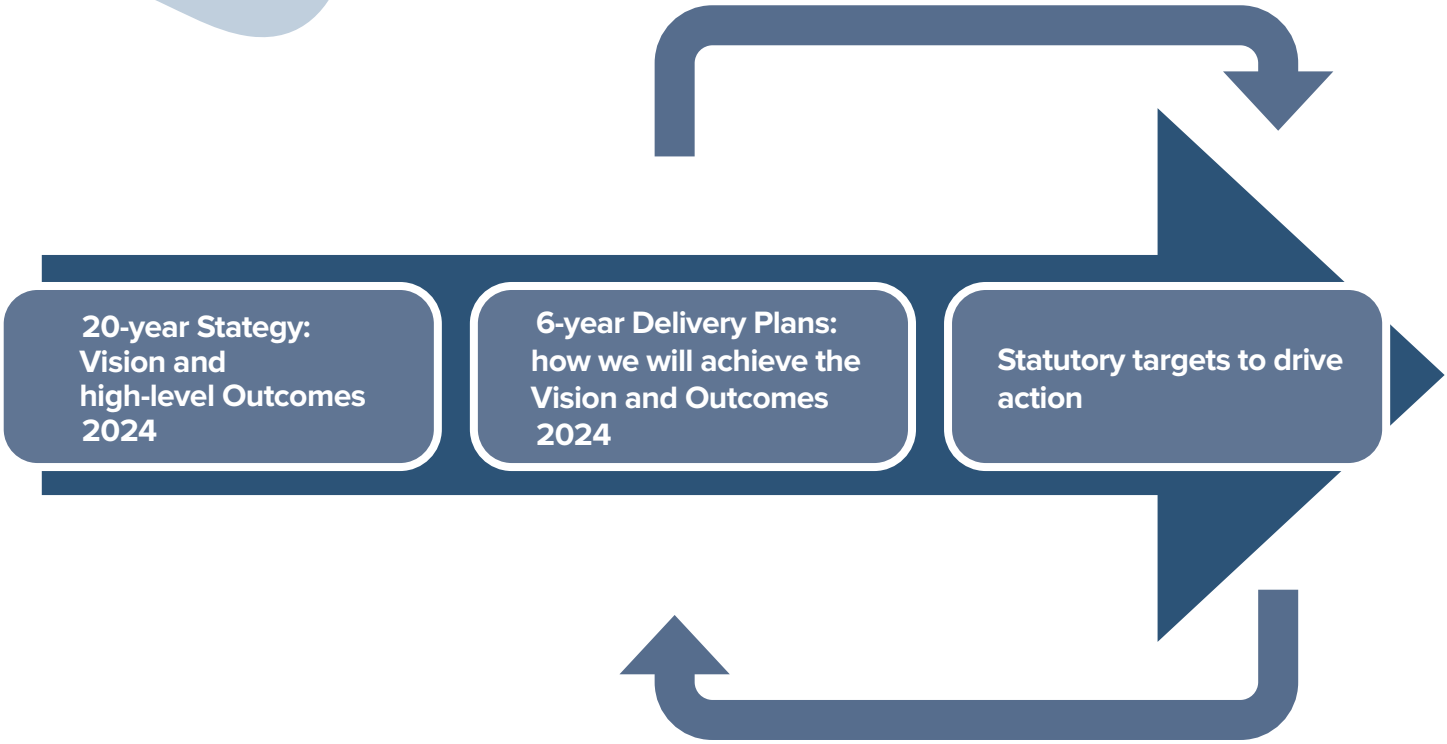
The Strategy forms one part of a Strategic Framework for Biodiversity which sets out the steps we are taking to deliver our ambitious Vision and Outcomes. Our Strategic Biodiversity Framework includes three components:

- this Strategy, which sets out our high-level Vision and Outcomes;
- delivery Plans to be reviewed every six years which set out detailed actions we will take; and,
- statutory Targets for nature restoration to be put in place through a Natural Environment Bill.



Achieving our Vision and Outcomes is also dependent on us implementing a range of enabling conditions for success:

- governance.
- monitoring and evaluation.
- securing sufficient investment.
- public engagement.

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Chapter 1: Introduction

Introduction

1.1 What is Biodiversity and why is it important?

Biodiversity is the web of life. It is the variety of all living things and the ecosystems where they live (on land or in water). It comprises the living organisms in a particular space, whether in a window-box, garden, park, meadow, peatland, river, loch, estuary, ocean, beach or mountain top.

Biodiversity inspires people. It has enormous value in its own right but is also central to our survival as a species. Our economy, jobs, health and wellbeing depend on it and it is an integral part of our culture and way of life. More than half of the world's GDP (US$44 trillion) is thought to be dependent on nature in some way. Yet humanity has caused the **loss of 83% of all wild mammals and half of all plants**.

> Nature is our home ... Good economics demands we manage it better. We are part of nature, not separate from it."
>
> The Economics of Biodiversity:
> The Dasgupta Review

Biodiversity supports food production and security: through insect pollination in farming and horticulture; and our fishing industry, which depends on resilient and productive seas. It provides the blueprint for many modern medicines and contributes to our wellbeing, providing recreation, relaxation and a sense of place. Healthy biodiversity protects soil from eroding, purifies water and helps prevent and mitigate flooding.

We face **twin reinforcing crises**: a decline in biodiversity will exacerbate the climate crisis – and a changing climate will accelerate the rate of biodiversity loss.

The role biodiversity plays in addressing and mitigating the impact of climate change is vital. Globally, when they are functioning well, ocean and land ecosystems remove around 50% of human-made carbon dioxide emissions each year. The more the world warms, however, the more stress will be placed on ecosystems, triggering feedback loops that will accelerate warming and extreme weather events. Protecting and regenerating biodiversity is the best chance we have to mitigate and adapt to climate change.

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Biodiversity, Nature And Natural Capital

These terms are often used interchangeably but they are not precisely the same. In this document:

biodiversity refers to the variability among living organisms within terrestrial, marine and aquatic ecosystems, and the ecological complexes they are part of. This includes diversity within species, between species and across ecosystems.

nature includes biodiversity, geodiversity and the natural elements of our landscapes and seascapes. It encompasses all the underpinning features and forces that have continued since the Earth was formed from summit to seabed including rocks, landforms, soils and processes like weather systems. Nature has shaped our history, culture and identity. The best way to truly understand the importance of biodiversity is to imagine what nature would be like without it.

Natural Capital is a concept that recognises Nature as a valuable asset which provides a stock and flows of ecosystem services (for example clean air, carbon storage, flood management, food production and recreational opportunities). Collectively these underpin and benefit our society and economy. Framing the natural environment in this way emphasises the need to invest in, and manage, this asset within safe environmental limits.

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1.2 Why do we need a Biodiversity Strategy?

The Strategy sets out a nature positive vision for Scotland – one where biodiversity is regenerating and underpinning a healthy and thriving economy and society and playing a key role in addressing climate change. The Scottish Biodiversity Strategy will sit alongside Scotland's Climate Change Plan and, through developing and driving investment in nature-based solutions, will play a significant role in delivering our commitment to Net Zero. In its own right, it sets out how we will protect and regenerate biodiversity to ensure the sustainable flow of ecosystem services on which we all depend. The Strategy also speaks to the economic and social opportunities regenerating our biodiversity will bring – new investment, new job opportunities for communities and for our overall health and wellbeing.

The Scottish Biodiversity Strategy is for everyone – large corporate players, small businesses, land managers, non-governmental organisations and Scotland's communities and citizens whose decisions in everyday lives as producers and consumers have an impact on biodiversity. Only by coming together to deliver substantial changes in the way we use and manage the asset which is our natural environment can we avoid irreversible damage to biodiversity.

Scotland is fully committed to implementing international obligations and participates actively in international multilateral fora, supporting the United Nations Convention on Biological Diversity (CBD) and implementing key regional agreements such as the Bern Convention and the Convention for the Protection of the Marine Environment in the North-East Atlantic (OSPAR), as well as to maintaining or exceeding European Union (EU) environmental standards.

Delivering a nature positive future for Scotland requires a multi-sectoral, whole of society approach. Key policies and strategies increasingly recognise the fundamental importance of biodiversity to achieving broader environmental, economic and social objectives. The Strategy provides a significant and unique opportunity to draw on a range of policy levers and mainstream positive outcomes for biodiversity across Government.

A Nature Positive Scotland by 2030

1.3 An international Biodiversity crisis

At the time of writing, biodiversity is declining faster globally than at any other time in human history. The IPBES **Global Assessment of Biodiversity** (May 2019) identified five direct drivers of global biodiversity loss:

- changing use of the land and sea especially for agriculture, forestry, fish farming and coastal infrastructure.
- direct exploitation of organisms via harvesting, logging, hunting and fishing.
- climate change.
- pollution.
- invasive non-native species (and growing prevalence of pathogens).

These direct drivers are associated with a range of indirect drivers of biodiversity loss, including socio-cultural values and behaviours, demographic and consumption factors, poor governance and the impacts of some technological innovations. The global use of natural resources has more than tripled since 1970 and continues to grow. This, in turn, has led to a huge increase in waste of raw and manufactured food and other goods, and an entire industry based on recycling the materials and embodied energy they represent.

Both increased consumption and, in response, production is an outcome of people's increasing distance from, and understanding of how the products they consume are produced and their impact on biodiversity and the natural environment more generally.

> "In the past 50 years, the human population has doubled, the global economy has grown nearly fourfold and global trade tenfold, together driving up the demand for energy and materials."
>
> IPBES (2019) Global assessment report on biodiversity.

1.4 Drivers of biodiversity loss across Scotland's land and seascapes

In Scotland, the evidence around the scale and nature of the biodiversity crisis is also strong and continues to mount. The evidence base points consistently to a natural environment that has been heavily degraded, with continued declines across much of our land and seascapes. Evidence derived from monitoring and evaluation will be key to assessing progress and determining the future actions we take to deliver our Vision and Outcomes, which will be set out in our three-yearly statutory reports on implementation of the Scottish Biodiversity Strategy.

On land

Around 70% of Scotland is solely or partially managed for agriculture (roughly 10% arable and 20% pasture, with the remainder rough grazing, which in the uplands is often secondary to grouse moor and red deer estate management).

There have been profound changes in agricultural practices in Scotland over the last century. Prior to the First World War, horses were the primary source of power on most farms, spilled grain provided food for birds such as sparrows and stock ponds and their margins were valuable habitats for a wide range of plants and animals. Since then, increased mechanisation has led to the loss of drinking ponds for working horses or for cattle on their way to market. In some parts of Scotland, the decline in the number of small farms has led to a decline in diversity in the countryside as fields were enlarged and rationalised.

Changes to ploughing and crop rotations, increased fertiliser use and high livestock numbers have negatively impacted soil and water quality, carbon storage and resulted in increasing greenhouse gas emissions. Large-scale heavy grazing and browsing pressures have reduced the diversity, complexity and resilience of soils and plant life, leading to further reductions in invertebrates, birds and other animals. The past 50 years has witnessed a loss of non-cropped habitat and major loss and fragmentation of all farmland habitats.

The outcome has been substantial long-term decreases in key farmland bird populations: declines of more than 50% for greenfinch, kestrel, and lapwing and 25- 50% declines in oystercatcher and rook since 1994. There have also been substantial long-term decreases in pollinators and species-rich grasslands, for example a 39% loss of lowland meadows.

There are however some nascent signs of recovery across Scotland's farmland landscape. Many farmers across Scotland have managed to incorporate improved levels of biodiversity through protecting and restoring features such as ponds, hedges and wildflower margins.

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The drainage of ponds and marshes has increased the rate and extent of wetland loss. Reduced water storage capacity and soil compaction has intensified flood risk. Soil erosion through cultivation and trampling by animals close to watercourses has added individually small, but cumulatively large, pollution loads to freshwater bodies. Nitrogen pollution and nutrient enrichment of water courses and bodies is linked to a reduction in the diversity of aquatic plant and animal life.

Scotland's uplands (above the limits of enclosed farmland) comprise a range of habitats including moorland, rough grassland, blanket bog, woods and species-rich grasslands. The majority of this land is managed for field-sports and livestock grazing and some multi-functional uses (e.g. renewable energy, nature conservation and amenity interests). Management practices giving rise to high stocking densities of sheep, heavy impacts of grazing, browsing and trampling by deer and inappropriate muirburn especially on deep peat has led to the degradation and loss of upland and peatland habitats. Deer management groups across the Highlands have made significant efforts and progress to reduce upland deer populations. However, more work is required to allow our habitats to regenerate. Overall at least 25% of wider uplands are considered to be in poor condition. A range of species and habitats is declining, especially waders, hen harriers, mountain willow and juniper. The greatest decline in birds has been in uplands, with 18% decline since 1994; 17 species contribute to this indicator with 9 in long-term decline.

Scotland is the most wooded of the UK countries (19% woodland cover) but this is well below the current European average of 37%. Approximately a third of Scotland's woodland is considered native. This includes globally important areas of Scottish rainforest, including oak and hazel woodland, and Caledonian pine forest – recognised as being of very high value to biodiversity, but currently fragmented, lacking understorey and restricted in range. Woodland biodiversity faces a challenge from red and roe deer numbers and ranges, and invasive non-native species, specifically rhododendron, which restrict natural regeneration, habitat restoration and undermine replanting efforts. However there are positive signs we are turning the tide: Scotland is currently creating around 80% of the UK's new woodland – 40% of which is native and the woodland birds indicator shows a positive trend (increasing 58% between 1994-2018).

Urbanisation continues to steadily impact on lowland particularly through the expansion of low-density housing and associated developments. Some amphibians, for example, are good at exploiting urban infrastructure such as sustainable drainage systems but others struggle in modern cities with urban birds declining steadily since the early 2000s.

In our rivers, lochs and wetlands

Scotland's rivers, lochs and wetlands supply drinking water, support fisheries and aquatic biodiversity, generate hydropower, mitigate flood risk, store carbon and are an essential resource for business and recreation.

The Scottish Environment Protection Agency's (SEPA) monitoring shows that overall 64% of our rivers and lochs are in good or better than good condition in 2020. This is based upon an assessment of water quality, flows and levels, physical condition and barriers to fish migration. This is an improvement of three percentage points since 2015. Scotland's third **River Basin Management Plan (2021-2027)** and the **Wild Salmon Strategy** are key. The former plan aims to achieve 81% of the water environment being in a good or better condition by 2027 and 90% in the long-term once natural conditions have recovered.

Issues which need tackling include increasing water scarcity and abstraction, rising water temperatures, rural diffuse pollution, wastewater, man-made barriers to fish migration and physical modifications to rivers, invasive non-native species (INNS) such as Japanese knotweed, giant hogweed and North American signal crayfish have considerable impacts on freshwater ecosystems and these are intensifying. Healthy riparian woodlands are critical for the health of water systems and bodies but they are declining in coverage and condition. Poorly vegetated upper catchments and canalised river systems exacerbate downstream flash flooding events.

Case Study: Landscape Scale Catchment Restoration in Glen Muick

A river catchment is an area where water is collected naturally by the landscape. Planning nature restoration at this scale allows projects to be located in the best place, taking account of the shape of a glen, structure of a river network and other natural features, such as floodplains and landscapes.

The River Dee Trust and the Dee District Salmon Fishery Board, supported by the Cairngorms National Park Authority, have been working with land managers to re-naturalise one of the major upland tributaries of the River Dee, the Muick. This is a great example of landscape scale river restoration bringing long term, multiple benefits. River restoration, alongside nearby peatland restoration and woodland expansion, will benefit many species and deliver multiple ecosystem services.

(a) Erecting small tree enclosures by the River Muick, Glen Muick, Deeside. ©Lorne Gill/SNH

(b) View of Muick and river Cairngorms (NNR)

- Removing flood banks and creating shallow scrapes has reconnected the river with natural channels and floodplains, which will reduce the impact of floods, droughts and low flows, and improve water quality.
- Large trees and roots anchored to the riverbed naturally create new pools and gravel beds, shelter from predators and a source of invertebrates; spawning and feeding grounds for species including salmon and freshwater pearl mussel.
- Deer legs, leftovers from surrounding sporting activities tied to the riverbed, pump nutrients into an impoverished system.
- Riparian woodland planting in previously bare uplands supplies the fallen trees of the future and shades burns which are now too warm – lethal to young salmon.
- These works are also catalysing a new, green economy – creating jobs in the design, build and monitoring of restoration schemes as well as supporting the traditions and economy of an internationally renowned salmon fishing river and creating a more sustainable, resilient river of the future.

In marine environments, seas and on our coasts

Scotland's seas are highly dynamic, supporting a diverse range of habitats and species. They are of significant cultural and socio-economic importance, especially to local coastal and island communities, and support an array of marine industries. If managed sustainably, Scotland's seas can continue to provide a range of ecosystem services, including food (through fishing and aquaculture) and renewable energy.

Scotland's Marine Assessment 2020 (SMA 2020) highlights the increasing impacts of climate change and ocean acidification. It notes that disturbance of the seabed by bottom-contact towed fishing gear remains a significant, and the most widespread pressure, with the 'no loss in extent' target for subtidal biogenic habitats indicator not being met. The last 30 years have also seen significant changes in the plankton community with potential implications for marine food webs, including commercial fish species. The abundance of some offshore whales, dolphins and porpoise has remained stable, whilst the abundance and distribution of coastal bottlenose dolphins on the east coast has increased. The grey seal population has increased but while the harbour seal population is recovering on the west coast, it continues to decline in the North Coast and Orkney Islands marine regions.

Seabird numbers have been largely stable since 2011, but at a greatly reduced level compared to the 1986 baseline. Across species there are markedly different trends with the most significant decreases in surface-feeding birds. Overall, Scotland's wintering waterbirds continue to increase in abundance, although species exhibit different trends with some changing their range in response to environmental change.

Scotland's coastal habitats are experiencing pressure from climate change. Rising sea levels and larger and more frequent storm-surges are causing erosion and reducing the connectivity of some beach, dune and machair habitats. These factors have led to changes in species composition. Saltmarshes and some dune systems play an important role in increasing the resilience of coastlines to these pressures by reducing and absorbing wave energy and providing a buffer for sensitive inland habitats. However, these may be adversely affected by higher seasonal rainfall, increasing variation in groundwater and freshwater run-off.

Scotland's estuaries are vital for waterbirds such as waders, ducks and geese. They provide safe feeding and roosting areas, enabling many thousands of waterbirds to use them as places to winter and refuel on their way to other destinations. Climate change is resulting in shifts in populations of some of our waterbirds, but coastal areas in Scotland remain internationally important.

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Chapter 2: Strategic Vision and Outcomes

The previous chapter outlined the scale and scope of the biodiversity crisis and the growing international consensus that urgent and deep rooted action is needed to halt biodiversity loss and bend the curve to ensure a nature positive future. The Strategy's vision sets out Scotland's response to the challenge:

> By 2045, Scotland will have restored and regenerated biodiversity across our land, freshwater and seas.
>
> Our natural environment, our habitats, ecosystems and species, will be diverse, thriving, resilient and adapting to climate change.
>
> Regenerated biodiversity will drive a sustainable economy and support thriving communities and people will play their part in the stewardship of nature for future generations.

This Vision encapsulates three core ideas: that urgent action is needed at scale across our land and seascapes; that we are looking to the future – regenerating biodiversity and building resilience to climate change; and that people and communities are central to a nature positive future.

Underneath the 2045 term vision sits a key milestone of halting biodiversity loss by 2030, in line with the **Leaders' Pledge for Nature**. This milestone will enable us to assess whether we are on track to achieving the longer term vision.

2.1 Outcomes - what does success look like?

Delivering this Vision will mean a Scotland that looks substantially different to what we are familiar with today. To help define what success looks like we have identified, in conjunction with experts and stakeholders, a set of Outcomes which capture how our land and seascapes will need to evolve.

By 2045 across our land and seascapes:

- ecosystems will be diverse, healthy, resilient and deliver a wide range of ecosystem services.
- protected areas will be larger, better connected and in good condition.
- the abundance and distribution of species will have recovered and there will be no loss of diversity within species.
- Scotland's internationally important species will have increased in numbers and have healthy resilient populations.
- natural capital will be embedded in policy making.
- nature-based solutions, such as tree-planting, peatland and blue carbon habitat restoration, will be central to our efforts to deliver NetZero and adapt to climate change.
- harmful invasive non-native species (INNS) will be managed so that established INNS no longer degrade native habitats and species or impede their restoration and regeneration and new introductions are managed quickly and effectively.
- biodiversity as a concept will be understood and valued across the population and embedded in educational curriculums.

On land by 2045

- Nature Networks across our landscapes will underpin the resilience and health of species and habitats.
- Farmland practices will have resulted in a substantial regeneration in biodiversity, ecosystem and soil health and significantly reduced carbon emissions while sustaining high quality food production.
- Management of deer ranges, grouse moors and upland agriculture will be contributing to the regeneration of biodiversity in upland areas.
- Forest and woodland management will have led to sustainable natural regeneration; a greater diversity of woodland species; increased woodland cover with a healthy understorey, enhanced woodland connectivity; and improved integration of trees into other land uses.
- Soil health will have been improved by tackling loss of organic carbon, erosion, compaction, and the impacts of grazing, air pollution and climate change, and will function as a nature-based solution to flooding, erosion and biodiversity loss.
- The actions we take to improve biodiversity will create new green jobs and economic opportunities to supporting thriving communities.
- Towns and cities will include nature-rich environments close to all communities, contributing to Nature Networks and measurable increases in urban biodiversity.
- Multi-functional urban nature-based solutions will enable people and biodiversity to adapt to our changing climate by cooling the urban environment and managing extreme rainfall events, with blue and green infrastructure designed and managed to benefit biodiversity, provide habitats and allow wildlife to move through urban areas.

In rivers, lochs and wetlands by 2045

- The extent of restored catchments and improvements in ecological status of rivers, lochs and wetlands will have increased with waterbodies in good condition.
- Riparian woodland will have expanded reducing the average temperature of our rivers and burns, leading to increases in freshwater fish species and other wildlife.
- A substantial, widespread and ongoing programme of peatland restoration will have led to the majority of Scotland's peatlands being in good condition, a net sequester of carbon with thriving wildlife and biodiversity.
- The extent, condition, connectivity and resilience of wetlands, including floodplain wetlands and pond habitats will have significantly improved.
- Beavers, salmon recovery and riparian woodland will be established as key ecological components of restored rivers and wetlands.

In marine and coastal environments by 2045

- The health, condition, and resilience of pelagic, coastal, shelf, and deep sea marine habitats will have been restored, supporting wider ecosystem function, providing increased benefits to society, and contributing to climate resilience and adaptation through nature-based solutions.

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Case Study: Farmland Waders

Curlew feeding on shoreline at outlet to basin just beyond SSSI boundary.
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Lapwing chick
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Loch Leven - bird nest and eggs
NatureScot

Waders, although often seen in winter in large numbers in coasts and estuaries, migrate inland in spring to nest in upland farmland and lowland moorland. They favour semi-natural, rough grazing or less intensively managed moorland or arable land. Livestock farms in Scotland's marginal uplands provide important habitat. As ground nesters, they like open ground with a diverse sward, for hiding nests and chicks and wet areas with broken ground for feeding on worms and insects.

Kinclune Organic Farm in Angus is an upland grassland livestock farm. Rowan and Marguerite Osborne bought Kinclune in 2002 and underwent the organic conversion process. After 16 years, they remain committed to organic management with the benefits of lower input costs and organic premiums on their produce as well as seeing increased biodiversity.

Their daughters, Virginia and Aylwin, members of the Nature Friendly Farming Network, are continuing the livestock business, alongside agri-tourism. They have been working with the RSPB and Working for Waders since 2020 to improve wader habitat on Kinclune. Organic grazed grassland provides superb breeding habitat and Kinclune boasts five species of vulnerable protected wader: Curlew; Lapwing; Common Snipe; Oystercatcher and Redshank. The UK population of these once common species is in decline, with Curlew and Lapwing on the UK Red List of species most at risk, while the Common Snipe, Redshank and Oystercatcher are on the Amber List. Scotland holds an estimated 15% of the global breeding population of Eurasian Curlew.

The sisters' approach to wader conservation is five-pronged:

(1) habitat improvement and creation, including removing trees which provide predator perches, creating wader 'scrapes' (shallow pools for feeding) and re- wetting areas of formerly improved, but unproductive, land;

(2) sward management, through rush cutting and livestock grazing management, including exclusion or low density grazing where appropriate;

(3) nest identification, monitoring and protection through grazing management and altering the farming calendar (including silage cutting);

(4) monitoring and reporting breeding success with the RSPB and Working for Waders and adapting farming practices accordingly, as well as contributing to Nature Scot supported research and data collection; and,

(5) controlling predators, including foxes and corvids, which predate eggs and chicks.

Although the sisters' approach to wader conservation is comprehensive, they are keen to encourage other farmers, demonstrating that small changes to farm management practices can make a big difference to our severely threatened species.

2.2 Objectives for 2030

Six-year Delivery Plans will set out in detail the actions needed to deliver these Outcomes. The first plan will be published alongside this Strategy. Work on the Delivery Plan has been guided by the following six strategic Objectives which have shaped our development of actions to deliver our high-level goals. Cumulatively these will drive the transformation needed to ensure Scotland is on track to meet the 2030 milestone of halting biodiversity loss and being Nature Positive. It will also ensure that Scotland is seen as a global leader in fulfilling its international obligations.

Accelerate restoration and regeneration

If we are to achieve our Vision and Outcomes, we need to address restoration of our degraded landscapes and ecosystems more urgently and at greater scale than we have done up to now.

Protect nature on land and at sea, across and beyond protected areas

Much of our special biodiversity is found in protected areas. These are among the 'jewels in the crown' – this biodiversity is rare, sometimes endangered, and globally significant.

Embed nature-friendly farming, fishing and forestry

Areas under agriculture, fisheries and aquaculture, and forestry must be managed more sustainably, in particular through the conservation and sustainable use of biodiversity, increasing the productivity and resilience of these production systems.

Recover and protect vulnerable and important species

Scotland is home to significant populations of species which are at risk from the threats outlined in this Strategy. Climate change will mean that the profile of species and populations in Scotland will need to adapt but we must make every effort to prevent the extinction of globally threatened species.

Invest in nature

We know that both public and private investment in nature will be required in order to deliver this Strategy. Green Investment is increasing internationally and Scotland has committed to developing a values-led, high-integrity market for responsible investment in nature.

Take action on the indirect drivers of biodiversity loss

The **IPBES Global Assessment Report on Biodiversity and Ecosystem Services** (May 2019) identifies both direct and indirect drivers of biodiversity loss. The five direct drivers emerge from the indirect drivers, the 'societal values and behaviours that include production and consumption patterns, human population dynamics and trends, trade, technological innovations and local through global governance'. In the next chapter, we set out the importance of addressing these in order to support more traditional efforts to deliver the Strategic Vision for biodiversity.

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Chapter 3: Enabling Conditions for Success

This Strategy establishes an ambitious vision and a set of outcomes which will deliver that vision. But we don't just need bold words – we need to ensure we drive the transformative change that will deliver this vision. In developing the Strategy we have identified factors which have limited the success of previous strategies.

Scotland published its first Biodiversity Strategy in 2004. Although there is evidence of some good work on specific habitats and species, the ongoing decline of biodiversity demonstrates that we must do a great deal more and at scale to 'bend the curve' of biodiversity loss. Key lessons include the need to:

- **work more strategically and at scale.**
- **systematically mainstream biodiversity** across sectors and the wider policy landscape (e.g. agriculture, energy, housing, industry, education, health and transport).
- **focus on ecosystem health** and land and seascape-scale regeneration rather than on management for individual species.
- **ensure sufficient investment** and appropriately blend public and private funding.
- **strengthen accountability** for delivery, including evidence based monitoring frameworks and statutory targets to hold us to account.

We have therefore developed a Framework approach to ensure that we move beyond ambitious words to a point where we mobilise actions and investment of sufficient scale and scope to deliver a nature positive future.

3.1 Scotland's Strategic Framework for Biodiversity

This Strategy represents the first element in Scotland's Strategic Framework for Biodiversity. The Framework has been developed through engagement with a range of stakeholders, including land managers, environmental organisations, local authorities and other partners. The Strategic Framework comprises:

1. a high-level **Strategy** setting out a 2045 Vision for biodiversity in Scotland, and a set of Outcomes which articulates what 'success looks like'.
2. a series of six-year rolling **Delivery Plans** which will set out in detail the range of actions needed to deliver the Vision and Outcomes. The delivery plans will reflect a programme of mainstreaming biodiversity across Government. We will pursue policy reforms which promote better understanding of the multiple values of nature's contributions, deal with the causes of environmental harm and offer the potential to both conserve nature, generate economic benefits and support thriving communities. This will mobilise key sectors and policy areas and ensure coherence and alignment with key strategies.
3. **statutory targets** for nature restoration that cover land and sea and a framework for setting, monitoring, reviewing and reporting on those targets. These targets, like our climate targets, will secure accountability, driving action across Government. They will be focused on achieving the overarching goal of this Strategy, of halting biodiversity loss by 2030, and restoring Scotland's natural environment by 2045. The targets will be achievable and challenging, developed in consideration of available evidence and through consultation. They are expected to include outcome targets that accommodate species abundance, distribution and extinction risk and habitat quality and extent. The targets will reflect the challenges of a changing climate.

   Delivery plans will set out and reflect the need for a participatory and inclusive, whole-of-society approach that engages: a wide range of delivery partners including local authorities and non-governmental organisations (NGOs); local communities; business, especially land- and water-based businesses; and the scientific and research community. They will be inclusive, engaging and empower stakeholders and communities through local and regional institutions.

3.2 Governance, Monitoring and Reporting

New arrangements for governance, monitoring and reporting will be published alongside this Strategy in a free-standing format which delivers accountability, can remain agile and dynamic and accommodates Scotland's international, regional and national reporting obligations. This approach provides multiple advantages:

- high standards of scrutiny and peer review.
- transparency, and clarity on indicators and metrics which reflect increases in biodiversity.
- cost effectiveness.
- maintain and increase global influence.
- compare performance, share what has worked and learn from others to improve continuously.

3.3 Investment

An **Investment Plan** will identify practical actions we need to take which will help target public, private and philanthropic investment on the delivery of biodiversity priorities to deliver a nature positive future. Our **Market Framework for responsible private investment** in natural capital supports the development of natural capital markets that are responsible, benefit communities and are valued for their environmental and financial integrity. The investment plan will align to this and promote use of our **Principles for Responsible Investment in Natural Capital**.

3.4 Public Engagement and Communications

We will need to mobilise actions by individuals, organisations, small, medium and large businesses and adopt a whole-of-society approach to deliver a nature positive Scotland. We will initiate a programme of public engagement to increase understanding of the nature of the biodiversity crisis and the drivers of loss including those associated with people's consumption and production choices. Leading through our Curriculum for Excellence, we will mobilise our whole education and skills development system to promote increased understanding of our relationship with nature and positive action to secure its sustainable use.

We will work with delivery partners to

- identify and eliminate incentives that are harmful to biodiversity.
- identify and overcome other obstacles to achieving our goals.
- help society understand the impact they have on biodiversity both in Scotland and, through their supply chains, the rest of the world.
- develop new frameworks for private sector investment and innovation.
- enable them to comply with new reporting requirements.

We want all levels of government to participate fully in the delivery of our goals for biodiversity, in line with the principles identified in the Edinburgh Process led by the Scottish Government for the CBD for COP15, and with the Edinburgh Declaration. In particular, cities and local authorities play key roles in conserving, restoring and reducing threats to biodiversity, in meeting people's needs through sustainable use and equitable benefit-sharing, in developing the tools and solutions needed for implementing biodiversity protection actions, and in monitoring and reporting. Their actions in mainstreaming biodiversity ensure that support is in place at all levels. They are uniquely positioned to deliver the outreach, awareness, and uptake of our goals for biodiversity across the whole of society, facilitating engagement with key stakeholders to implement our Strategic Framework.

Case Study: Deadwood Management in Scotland's National Forests

Myathropa florea larva in a Scots pine stump rot in woodland at Rothiemurchus near Aviemore in Strathspey. ©Lorne Gill/NatureScot

Blera fallax, Pinewood Hoverfly being released in Abernethy Forest, May 2011 ©Lorne Gill/NatureScot

Buxbaumia viridis - large log habitat (in this case birch) ©NatureScot/Dave Genney

Many species of birds, amphibians, reptiles and mammals forage, shelter and rear young in and around deadwood and veteran trees, and these are even more valuable for a range of insects (especially beetles), fungi and lichens. Deadwood is also vitally important for species in aquatic ecosystems. Standing trees that are dying or dead (called snags), decaying logs and small pieces of deadwood on the forest floor are vital for forest biodiversity and are maintained whenever possible.

Supporting Scotland's Vision for Forestry, Forestry Land Scotland (FLS) work hard to enhance biodiversity adding thousands of tonnes of new deadwood across Scotland's national forest each year, which provides habitat for hundreds of generalist and specialist species. They focus on increasing the provision and retention of scarce types of deadwood, such as large-diameter snags and logs, keeping deadwood in woodland during tree harvesting operations, leaving dead or dying veteran trees and logs on-site, and creating piles of deadwood.

FLS have been working with the **Royal Zoological Society of Scotland, and the Rare Invertebrates in the Cairngorms** project, to create specific deadwood habitat for rare species, including the endangered pine hoverfly, one of the rarest species in Scotland. Previously thriving in pinewoods across the country, it currently can only be found at one or two sites due to a lack of suitable deadwood habitat for its larvae which develop and feed in the water that collects in rot-holes in Scots pine stumps. In 2022, this conservation management resulted in adult hoverfly being spotted in the wild for the first time in nearly a decade.

A longhorn beetle (Rhagium bifasciatum) in Scots pine woodland at Curr Wood near Dulnain Bridge Strathspey. ©Lorne Gill/ NatureScot

Conclusion

Although Scotland's biodiversity is highly degraded, there is also evidence that we can halt the declines and reverse biodiversity loss. We have a renewed understanding of the need to prioritise actions to restore and regenerate biodiversity across government and wider society.

This Strategy, as part of our Strategic Framework for biodiversity in Scotland provides a path to deliver our Vision and Outcomes for 2045.

We all benefit from and depend on biodiversity to stay alive and we all contribute to biodiversity loss through our actions and choices – so the Nature Emergency really is everybody's problem. At the same time, however, that means it's in our hands to make the choices which will reverse biodiversity loss in Scotland by 2045.

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Glossary of Biodiversity Terms

Glossary of Biodiversity Terms

Definitions are taken from accepted international sources where practical such as the Convention on Biological Diversity (**CBD Glossaries**) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (**IPBES Glossary**).

Where these definitions have been modified, this is noted e.g. replacing 'animals and plants' with 'organisms' in order to include other taxa such as fungi, shortening particularly long definitions or adding examples for clarity. Other definitions are taken from Levin (ed) Encyclopedia of biodiversity or as stated.

Agri-environment scheme
Schemes that provide funding to farmers and land managers to farm in ways that supports biodiversity, enhance the landscape, and improve the quality of water, air and soil (see also agroecology as integral to such schemes). (IPBES)

Alien species
A species occurring in an area outside of its historically known natural range as a result of intentional or accidental dispersal by human activities (also known as an exotic or introduced species). (CBD)

Aquaculture
The farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants, involving interventions such as regular stocking, feeding, protection from predators, to enhance production. (IPBES)

Baseline
A minimum or starting point with which to compare other information (e.g. for comparisons between past and present or before and after an intervention). (IPBES)

Biodiversity
Short for biological diversity, the diversity of life in all its forms – the diversity of species, of genetic variations within one species, and of ecosystems. (CBD)

Plants, animals and micro-organisms in a given area or volume. (IPBES)

Carbon cycle
The process by which carbon is exchanged among the ecosystems of the Earth. (IPBES)

Carbon sequestration
The long-term storage of carbon in plants, soils, geologic formations, and the ocean. Carbon sequestration occurs both naturally and as a result of anthropogenic activities and typically refers to the storage of carbon that has the immediate potential to become carbon dioxide gas. (IPBES)

Carbon storage
The biological process by which carbon in the form carbon dioxide is taken up from the atmosphere and incorporated through photosynthesis into different compartments of ecosystems, such as biomass, wood, or soil organic carbon. Also, the technological process of capturing waste carbon dioxide from industry or power generation, and storing it so that it will not enter the atmosphere. (IPBES)

Circular economy
A model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. (EU)

Co-design
A participatory approach to design, in which community members are treated as equal collaborators in the design process

Conservation
The management of human use of nature so that it may yield the greatest sustainable benefit to current generations while maintaining its potential to meet the needs and aspirations of future generations. (CBD)

Conservation of Biodiversity
The management of human interactions with genes, species, and ecosystems so as to provide the maximum benefit to the present generation while maintaining their potential to meet the needs and aspirations of future generations; encompasses elements of saving, studying, and using biodiversity. (CBD)

Corridor
A geographically defined area which allows species to move between landscapes, ecosystems and habitats, natural or modified, and ensures the maintenance of biodiversity and ecological and evolutionary processes. (IPBES)

Driver
The factors that, directly or indirectly, cause changes in nature, anthropogenic assets, nature's contributions to people and a good quality of life.

- Direct drivers of change can be natural and/or anthropogenic. Direct drivers have direct physical (mechanical, chemical, noise, light etc.) and behaviour-affecting impacts on nature. They include, inter alia, climate change, pollution, different types of land use change, invasive alien species and zoonoses, and exploitation.
- Indirect drivers are drivers that operate diffusely by altering and influencing direct drivers, as well as other indirect drivers. They do not impact nature directly. Rather, they do it by affecting the level, direction or rate of direct drivers.
- Interactions between indirect and direct drivers create different chains of relationship, attribution, and impacts, which may vary according to type, intensity, duration, and distance. These relationships can also lead to different types of spillover effects.
- Global indirect drivers include economic, demographic, governance, technological and cultural ones. IPBES give special attention among indirect drivers, to the role of institutions (both formal and informal) and impacts of the patterns of production, supply and consumption on nature, nature's contributions to people and good quality of life. (IPBES – modified)

Ecology
A branch of science concerned with the interrelationship of organisms and their environment; the study of ecosystems. (CBD)

Ecosystem
Communities of organisms interacting with each other and with their non-living environment – forests, wetlands, mountains, lakes, rivers, deserts and agricultural landscapes. (CBD - modified)

Ecosystem approach
The Ecosystem Approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. The Ecosystem Approach places human needs at the centre of biodiversity management. It aims to manage the ecosystem, based on the multiple functions that ecosystems perform and the multiple uses that are made of these functions. The ecosystem approach does not aim for short-term economic gains, but aims to optimize the use of an ecosystem without damaging it. (CBD)

Ecosystem diversity
The variety of ecosystems that occurs within a larger landscape, ranging from biome (the largest ecological unit) to microhabitat. (CBD)

Ecosystem health
Ecosystem health is a metaphor used to describe the condition of an ecosystem, by analogy with human health. Note that there is no universally accepted benchmark for a healthy ecosystem. Rather, the apparent health status of an ecosystem can vary, depending upon which metrics are employed in judging it, and which societal aspirations are driving the assessment. (IPBES)

Ecosystem services
Processes by which the environment produces benefits useful to people, akin to economic services. (CBD)

Eco Tourism

Travel undertaken to witness sites or regions of unique natural or ecologic quality, or the provision of services to facilitate such travel that have the least impact on biological diversity and the natural environment. (CBD)

Endangered species

A technical definition used for classification referring to a species that is in danger of extinction throughout all or a significant portion of its range. IUCN The World Conservation Union defines species as endangered if the factors causing their vulnerability or decline continue to operate. (CBD)

Ex situ conservation

A conservation method that entails the removal of germplasm resources (seed, pollen, sperm, individual organisms, from their original habitat or natural environment.

Keeping components of biodiversity alive outside of their original habitat or natural environment. (CBD) e.g. botanic gardens, zoos, biobanks.

Extinction

The evolutionary termination of a species caused by the failure to reproduce and the death of all remaining members of the species; the natural failure to adapt to environmental change. (CBD)

Extirpation

The local or regional loss of a species that stills exists elsewhere. This is sometimes referred to as local extinction.

Functional connectivity (landscape connectivity)

The degree to which the landscape facilitates the movement of organisms (animals, plant reproductive structures, pollen, pollinators, spores, etc.) and other environmentally important resources (e.g., nutrients and moisture) between similar habitats. Connectivity is hampered by habitat fragmentation (q.v.). (IPBES – for Landscape connectivity)

Gene

The functional unit of heredity; the part of the DNA molecule that encodes a single enzyme or structural protein unit. (CBD)

Genetic diversity

The variety of genes within a particular population, species, variety, or breed. (CBD)

Geodiversity

The variety of the geological and physical elements of nature, such as minerals, rocks, soils, fossils and landforms, and active geological and geomorphological processes. (IUCN)

Habitat

A place or type of site where an organism or population naturally occurs. (CBD)

Habitat degradation

The diminishment of habitat quality, which results in a reduced ability to support organisms. Human activities leading to habitat degradation include polluting activities and the introduction of invasive species. Adverse effects can become immediately noticeable, but can also have a cumulative nature. Biodiversity will eventually be lost if habitats become degraded to an extent that species can no longer survive. (CBD – modified)

Habitat fragmentation

Fragmentation of habitats occur when a continuous habitat has become divided into separate, often isolated small patches interspersed with other habitats. Small fragments of habitats can only support small populations and these are more vulnerable to extirpation. The patches may not even be habitable by species occupying the original undivided habitat. The fragmentation also frequently obstructs species from migrating. Habitat fragmentation stems from geological processes that slowly alter the lay out of the physical environment or human activities such as land clearing, housing, urban development and construction of roads or other infrastructure. Adverse effects sometimes are not immediately noticeable and sufficient habitats may ostensibly be maintained. However inbreeding, lack of territories and food shortage are some of the problems small populations can encounter. Fragmentation of habitats is therefore expected to lead to losses of species and genetic diversity in the longer term. (CBD – modified)

Habitat loss
The outcome of a process of land use change in which a 'natural' habitat-type is removed and replaced by another habitat-type, such as converting natural areas to production sites. In such process, species that previously used the site are displaced or destroyed. Generally this results in a reduction of biodiversity. (CBD – modified)

Indicator
Observed value representative of a phenomenon to study. In general, indicators quantify information by aggregating different and multiple data. The resulting information is therefore synthesised. In short, indicators simplify information that can help to reveal complex phenomena. (EEA)

In situ conservation
A conservation method that attempts to preserve the genetic integrity of gene resources by conserving them within the evolutionary dynamic ecosystems of the original habitat or natural environment. (CBD)

Invasive species
Invasive species are those that are introduced – intentionally or unintentionally – to an ecosystem in which they do not naturally appear and which threaten habitats, ecosystems, or native species. These species become invasive due to their high reproduction rates and by competing with and displacing native species that naturally appear in that ecosystem. Unintentional introduction can be the result of accidents (e.g. when species escape from a zoo), transport (e.g. in the ballast water of a ship); intentional introduction can be the result of e.g. importing animals or plants or the genetic modification of organisms. (CBD)

Just transition
Introducing changes in the economy to deliver environmental benefits in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind. This involves maximising the social and economic opportunities of climate action, while minimising and carefully managing any challenges – including through effective social dialogue among all groups impacted, and respect for fundamental labour principles and rights. (ILO)

Keystone species
A species that has a disproportionately large effect on its environment relative to its abundance. (Paine 1995, the term's originator.)

Landscape
An area as perceived by people, whose character is the result of the action and interaction or natural and/or human factors. (EU – European Landscape Convention)

Land-use
The socio-economic purpose of the land. Areas of land can be used for residential, industrial, agricultural, forestry, recreational, transport etc. purposes. Land use/cover area frame statistical survey, abbreviated as LUCAS, is a European field survey programme funded and executed by Eurostat, which applies standardised types of land use. (EU Eurostat – modified)

Mitigating measures (mitigation)
Measures that allow an activity with a negative impact on biodiversity, but reduce the impact on site by considering changes to the scale, design, location, process, sequencing, management and/or monitoring of the proposed activity. It requires a joint effort of planners, engineers, ecologists, other experts and often local stakeholders to arrive at the best practical environmental option. An example is the unacceptable impact on biodiversity of the construction of a certain road that is mitigated by the construction of a wildlife viaduct. (CBD – modified)

Native species
Plants, animals, fungi, and micro-organisms that occur naturally in a given area or region. (CBD)

Nature (natural environment)
All living and non-living things, and processes that occur naturally on Earth. (CBD – modified)

Nature-based solution
Actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human wellbeing and biodiversity benefits. (IUCN)

Nature network
A Nature Network connects together nature-rich sites, including restoration areas and other environmental projects, through a series of areas of suitable habitat, habitat corridors, and stepping-stones.

Nature-positive
Halting and reversing nature loss by 2030, measured from a baseline of 2020. (Locke et al. 2020.)

Red List
The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction. (CBD – modified)

Regeneration
The process of assisting the recovery of ecosystem processes serving and/or enhancing biodiversity and ecosystem resilience. This may not necessarily be the original habitat type or include the original species communities. In woodland, regeneration is the spontaneous recovery of native tree species that colonise and establish in abandoned fields or natural disturbances; this process can also be assisted through human interventions such as fencing to control livestock grazing, weed control, and fire protection. (Crouzeilles et al. 2017.)

Regenerative farming (agriculture)
An approach to farming that uses soil conservation as the entry point to regenerate and contribute to multiple ecosystem services. (Schreefel et al. 2020.)

Note that Schreefel et al. (2020) found multiple definitions of Regenerative Agriculture.

Restoration
The process of assisting the recovery of an ecosystem towards or to good condition, as a means of conserving and/or enhancing biodiversity and ecosystem resilience; for habitat types listed in Annexes I and II, restoration means the process of assisting their recovery to the highest level of condition attainable. (EU – proposed)

Restoration measure
Any measure assisting ecosystem recovery actively or passively towards or to good condition and enhancing biodiversity, including measures taken for the improvement of the condition of an ecosystem or for the re-establishment of natural and semi-natural ecosystems, as well as measures to improve the connectivity of natural and semi-natural ecosystems, and to enhance species populations, also across national borders. (EU – proposed)

Soil health
The continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. (USDA). The concept connects agricultural and soil science to policy, stakeholder needs and sustainable supply-chain management. (Lehmann et al. 2020.)

Species
A group of organisms capable of interbreeding freely with each other but not with members of other species. (CBD)

Species diversity
The number and variety of species found in a given area in a region. (CBD)

Sustainable development
Development that meets the needs and aspirations of the current generation without compromising the ability to meet those of future generations. (CBD from Bruntland Commission Report, 1987.)

Wild species
Organisms captive or living in the wild that have not been subject to breeding to alter them from their native state. (CBD)

Wildlife
Living, non-domesticated animals. Some experts consider plants also as part of wildlife. (CBD)

Under the Nature Conservation (Scotland) Act 2004 Scottish Ministers must designate as the Scottish Biodiversity one or more strategies for the conservation of biodiversity. This strategy replaces the previous strategy *Scotland's Biodiversity: Its in your hands 2004* and the associated 2020 *Challenge for Scotland's Biodiversity* supplement.

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