Plantlife
Scotland



Designing Nature Networks for Wild Plants and Fungi

Support to enable and empower local action

Contents

1 Introduction 3
2 Scope of this Work..... 4
3 Policy Levers for Nature Networks..... 5
4 Gathering Evidence..... 6
4.1 Sourcing the Right Data 6
4.2 Understanding the value of an existing site..... 10
5 Nature Networks and Species Recovery.....**11**
5.1 Species Priority Lists.....11
5.2 Looking Out for the Small Things.....13
6 Our Recommendations for Wild Habitats.....**14**
6.1 Grasslands.....14
6.2 Temperate Rainforest.....17
6.3 Caledonian Pinewoods.....19
6.4 Peatlands.....20
7 Making Land Use Work for Plants and Fungi.....**22**
7.1 Agriculture.....22
7.2 Forestry.....24
7.3 Tree Planting.....26
7.4 Urban Spaces.....27
8 Cross-cutting Opportunities.....**28**
8.1 Action for Clean Air.....28
8.2 Managing Invasive Species.....30
8.3 Creating Dynamic Landscapes.....31
8.4 Climate Resilience.....33
8.5 Nature Connection.....34
9 Conclusion.....**36**

[1]Front cover img: Drepicter/Istockphoto

1. Introduction



Wild plants and fungi are the foundation of life on Earth. From diverse machair plant communities to the dazzling suites of species found deep in Scotland's temperate rainforest, these groups clean our water and air, support food chains, buffer against climatic extremes and capture massive amounts of carbon.

The ongoing loss of our wildlife is now well-documented and widely acknowledged. Thankfully though, so are the solutions. To allow our wild plants and fungi to flourish we urgently need diverse landscapes rich in well-managed, well-connected habitats.

Creating a Nature Network offers a strategic opportunity to expand and connect existing wildlife-rich areas. Improving connectivity is essential as it gives species room to move and adapt to changing conditions, which lies at the heart of the Lawton Principles (bigger, better and more joined-up).

Co-designing Nature Networks with local stakeholder groups offers an opportunity to mainstream nature recovery work and improve nature-connection across the whole of society. Place-based approaches to conservation produce locally-appropriate actions, and empower communities to interact with and protect local biodiversity.

Plantlife Scotland is publishing this guidance to support local authorities in designing Nature Networks that deliver for plants, fungi, and planet.

With thanks to NatureScot for supporting, funding and facilitating this work.



2. Scope of this Work



This document offers practical recommendations to put plants and fungi at the heart of nature recovery in Scotland. As data underpins decision-making, we begin by signposting to key resources for accessing biological data. We then outline our recommendations for our strategic priorities: **Grasslands, Temperate Rainforest** and **Species Recovery** and additional Scottish habitats with unique and threatened plant communities, **Peatlands** and **Caledonian Pinewoods**.

This guidance is not comprehensive. Some additional resources and organisations to consider include (but are not limited to) the links below:

- **Trees and Woods: At the heart of nature recovery in Scotland** (Woodland Trust Scotland)
- **Better rivers – an end to pollution** (Soil Association)
- Catchment Management Plans e.g. Spey Catchment Management Plan
- **Soil health** (Soil Association)
- **Floodplain Meadows - Beauty and Utility: A Technical Handbook** (Floodplain Meadows Partnership)



We look at how major land uses **Agriculture, Forestry** and **Urban Development** can align with Nature Networks. Finally, we explore **cross-cutting opportunities** where coordinating action for nature at scale will maximise positive impact. Sections include scenario boxes to bring recommendations to life, and case studies of inspiring work already taking place across Scotland.

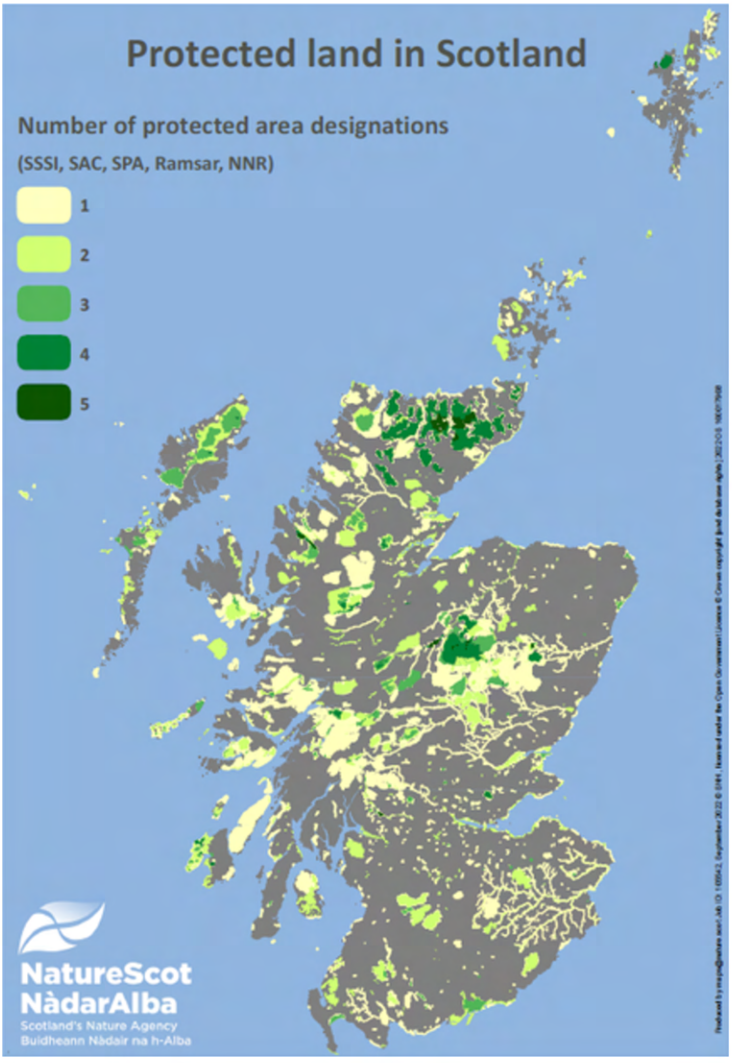
This document is intended to **inform and add value to action where feasible**. Implementing any / as many of these actions as resources allow, and sharing this guidance with other relevant practitioners, will be significant steps forward in ensuring plants and fungi are at the heart of Nature Networks.

3. Policy Levers for Nature Networks

Nature Networks are a key mechanism for delivering Scotland's national and international targets to protect and restore nature (outlined in Scotland's Environmental Strategy and the Global Biodiversity Framework respectively).

By creating ecological corridors across Scotland, Nature Networks offer a route to connect our most important sites for nature (protected areas) with the wider landscape.

The Nature Networks approach is embedded in Scotland's cornerstone policies for biodiversity and planning, and will pave the way for nature recovery planning going forward (see right).



The **Scottish Biodiversity Strategy** lays out the Vision and Outcomes for 2045. Nature Networks are identified as the cross-cutting process for targeting action for nature recovery to 2030 and beyond.

The **Scottish National Adaptation Plan (SNAP3)** identifies Nature Networks as key to delivering outcomes to improve ecological connectivity and climate resilience.

The **fourth National Planning Framework (NPF4)** cites Nature Networks as an essential component of Local Development Plans, serving to connect nature recovery objectives with the planning system.



4. Gathering Evidence

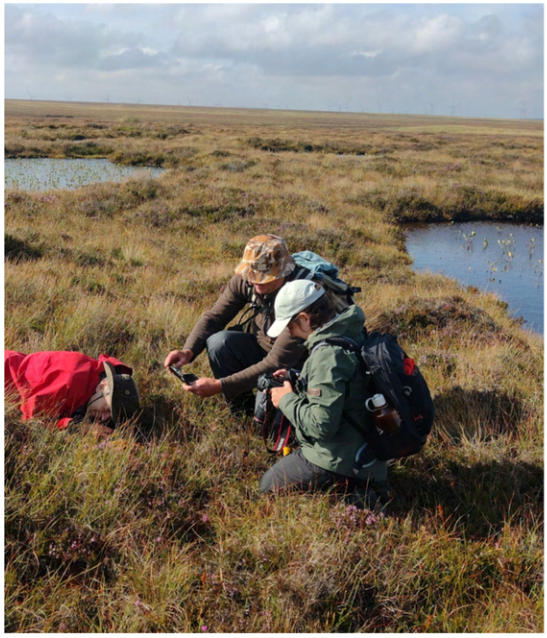


4.1 Sourcing the Right Data

Designing Nature Networks that secure genuine positive outcomes for biodiversity will require reliable, high-quality biological data to inform decision-making. A robust understanding of local habitats and species distributions will allow you to design nature recovery opportunities that match the ecological character of an area, bringing greater benefits for biodiversity present. Below is a list of resources that will support he creation of evidence-led Nature Networks.

National data

- **Nature Network toolbox** - a repository of important resources to inform Nature Networks
- **SiteLink** – GIS layers for protected sites & additional information on designated areas
- **NBN Atlas Scotland** - holds important species data, climate and soil information and associated geographic boundaries
- **Open data hub** - open access to NatureScot's spatial datasets, including:
  - **National Vegetation Classification (NVC)** - mapping plant communities
  - **Grassland fungi mapping database** – key sites for grassland fungi
- **Scotland's Environment Web Data**- a range of environmental data published by various Scottish organisations. Includes:
  - **Habitat Map of Scotland** - habitat and land-use data collected to internationally recognised standards
  - **Scotland's Soils data** - main soil types across Scotland & resources on soil data use



National data

- Scottish Forestry data:
  - **Native Woodland Survey of Scotland**
  - **National Forest Inventory**

- Greenspace and green infrastructure designations:
  - **Ordinance Survey Mastermap Greenspace**
  - **Green Belts**
  - **Open Space Audits and Strategies**
  - **Core Path Plans**

Local data

- **Land Information System (LIS)** – allows you to select an area of land and provides a list of associated datasets & funding opportunities relevant to it

- **Local Nature Conservation Sites & Local Nature Reserves**

- **Local Environmental Record Centres** (LERCs) collect, manage and share environmental data for a defined geographic area. They may be able to signpost you to relevant experts and local groups

- **Local experts** (such as county and regional recorders) and **local groups** (such as **BSBI botany groups** and natural history societies) will have a wealth of knowledge about biodiversity in their area [1]

[1] Local experts and groups will vary in terms of their capacity. Surveys to introduce the Nature Network (its aims and approach), providing respondents with the opportunity to input, will identify those willing to participate without putting unreasonable demands on time.



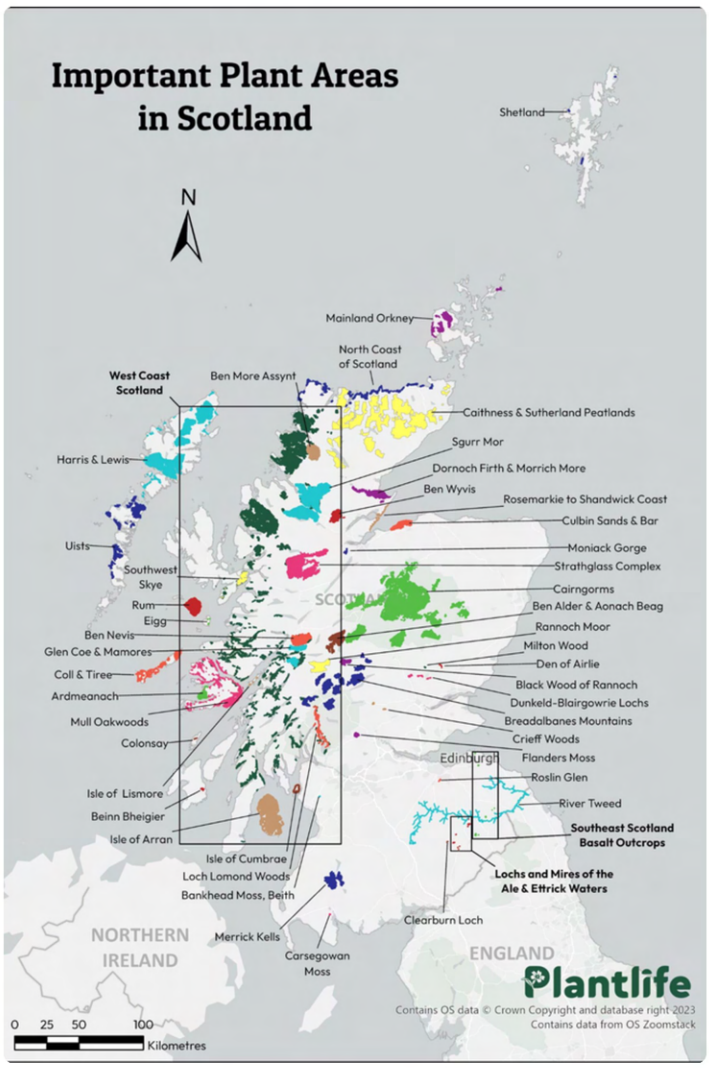
Plantlife spatial data

Plantlife can provide data for:

- **Important Plant Area (IPAs) -** high-quality data showing hotspots of plant diversity and internationally threatened species (includes data on vascular plants, lichens, bryophytes, stoneworts and more)
- **Important Fungus Areas (IFAs)** - point-data indicating important sites for fungi (this is an old dataset and fungal interest should be ground-truthed through examination of local records and discussions with local experts)

....to request this data please email **datagisenquiries@plantlife.org.uk**





Supplementary resources

AECOM EcoUplift Tool – allows you to plan, review and compare different Nature Network land-use scenarios (requires subscription)

SEPA Data sources - a range of environmental datasets including air quality monitoring and the Scottish Wetland Inventory

Vacant & Derelict Land Register – can be used to identify disused urban sites with high restoration potential for support biodiversity and creating urban wildlife corridors

Flood Risk Management Maps

4.2 Understanding the value of an existing site



National datasets are invaluable for identifying candidate sites for connecting and restoring habitats, but there are key limitations to their use. Many national inventories are patchy and incomplete, which means that plans that rely on solely national data can overlook important species and habitats that need protection.

If you are proposing a change to the management of a site (e.g. afforestation or habitat creation) collating local data and conducting on-the-ground surveys are the most reliable routes to ensuring wildlife protection sits at the heart of decision-making.

To protect existing biological value:

Champion the need for Nature Networks plans to be complemented by **ecological surveys** wherever possible (especially relevant when plans are being implemented on the ground).

Different species require surveys at different times of year. Plant surveys should be conducted in spring/summer, whereas sites should be surveyed in the autumn for fungi. Failing to survey at the right time of year risks losing important species from existing sites. See scenario 1. or this blog: **Protecting Waxcaps: All the Losses We Cannot See...**

Environmental Impact Assessments (EIA) regulations will apply when plans are sufficiently large-scale, but sites can house important populations of species regardless of their size. **Field surveys** are always the most reliable way to ensure that special species communities are protected during land use change.





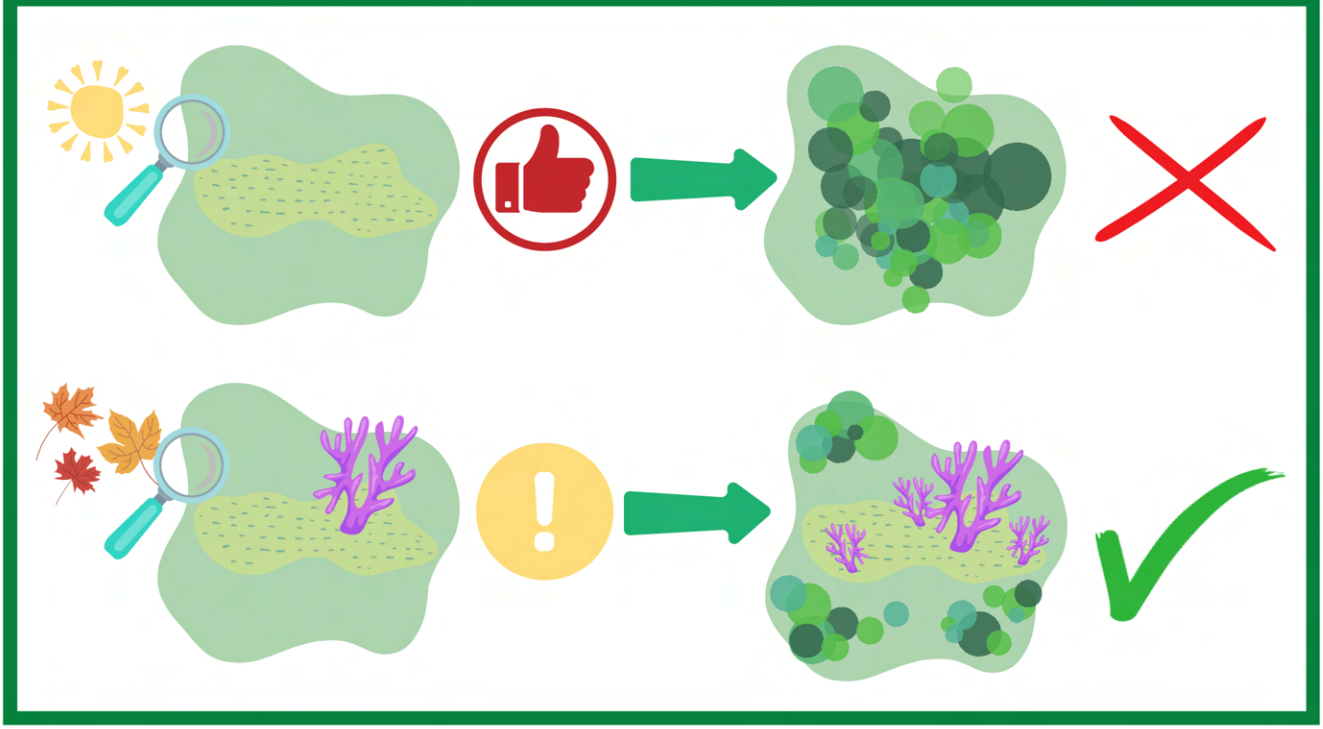
4.2 Understanding the value of an existing site

Scenario 1: Survey at the appropriate times of year to identify, protect and preserve existing biodiversity value

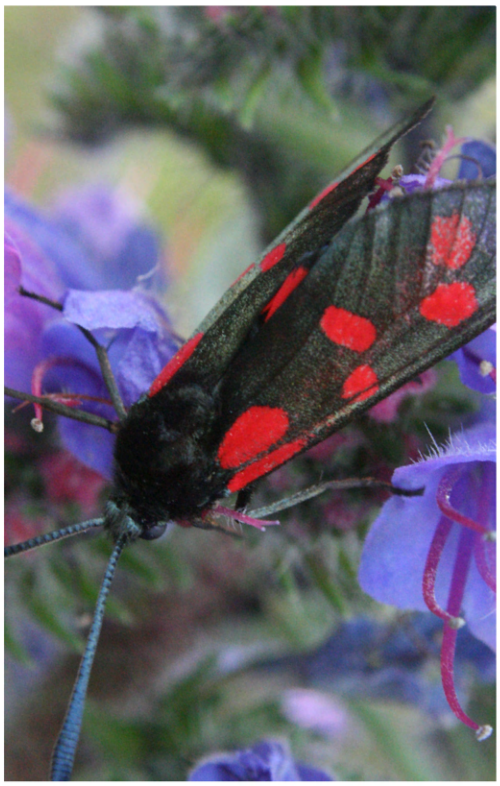
You have carried out a survey in early spring and found no priority species in an area of grassland. Since the site appears to hold no existing value for biodiversity, you decide to plant trees over it for carbon sequestration purposes.

However, a survey carried out in autumn could have revealed the presence of the Violet Coral fungus (Clavaria zollingeri) which is already suffering from extensive declines and classed as 'Vulnerable' in Europe on the International Union for Conservation of Nature (IUCN) Red List. In this case, planting would destroy the population.

Comprehensive surveys are needed at suitable times of year to detect and protect existing species and biodiversity.



5. Nature Networks and Species Recovery



Species are the building blocks of biodiversity. It is the rich and complex interactions between species that underpin functioning ecosystems and the long-term delivery of ecosystem services. Many of our rarest species rely on very specific conditions and processes to survive. To bend the curve on species loss, the distributions and specific management requirements of priority species should be used to inform Nature Network plans.

5.1 Species Priority Lists

Establishing priority species lists steers conservation to where it is most urgently needed and where it will create the greatest impact. Establishing and protecting local species priorities preserves an area's ecological identity and can support locally-declining species which might fall through the gaps in national nature recovery plans.

To identify Nature Network species priorities:

National resources

Scottish Biodiversity List from NatureScot (soon to be updated)

Species At Risk Register from NatureScot

National and Regional Red Lists (species listed under Threatened or Near Threatened):

- The Vascular Plant Red List for Great Britain
- Red List of the bryophytes of Britain (tandfonline.com)
- Red Data list of British Fungi (britmycolsoc.org.uk)
- A Conservation Evaluation of British Lichens and Lichenicolous Fungi (jncc.gov.uk)

...But **Red Lists aren't comprehensive.** Only 1% of fungi have been Red List assessed which means fungi (and other non-red listed species) get left out of any nature recovery plans which exclusively use Red List data.

Section 41 species of principal importance in Scotland UK BAP Priority Species | JNCC - Adviser to Government on Nature Conservation (fungi are better represented here).



Local resources

- County Records and **Rare Plants Registers**
- **Local Nature Conservation Sites** species records
- **LERCs** will hold key data on local species and may be able to signpost you to relevant taxonomic experts
- **Consultation with local communities** to establish species of local significance (such as locally / regionally declining or culturally significant)

Supplementary resources

Research existing or past species-specific recovery projects within your network where priorities and legacies can be integrated into the plans. For example:

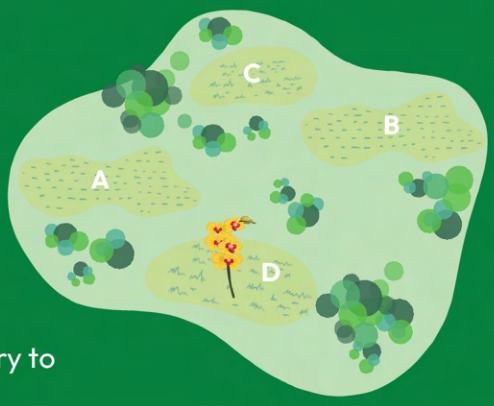
- **Species on the Edge Programme** from NatureScot
- **Scottish Plant Recovery Project** from Botanics Stories

Once **priority species are established** their management requirements, and those of the species they depend on, should be integrated into any relevant nature recovery plans. The presence of priority species across a Nature Network should steer habitat creation opportunities (see scenario 2).

To improve the impact that species-specific action can bring, grouping species into **functional assemblages** can be a useful process. Working to benefit a **nominate target species** which represents a wider assemblage with the same management requirements, will deliver multi-taxa benefits from species-specific actions.

Scenario 2. The presence of priority species across the Nature Network should steer habitat creation opportunities

You are looking to connect two core areas (A and B) of species-rich grassland. Without species data, you might choose to restore a stepping stone meadow at site C. However, this route could ignore an important population of Lady's Slipper Orchid (Cypripedium calceolus) present at site D that would benefit from the positive grassland management.



Species data can guide opportunities for nature recovery to where they will have greatest value.



5.2 Looking out for the Small Things

Diverse assemblages of lichens, bryophytes and fungi support healthy populations of species across every taxa. They might be small, but they play significant roles in nutrient cycling and water retention. They also shelter and support important invertebrate populations, sustaining food chains. Creating Nature Networks that benefit these groups (structurally diverse, well-connected and pollutant-free) will deliver benefits that are shared across food chains and ecosystems.

- The **NBN Atlas Scotland** is a reliable open-access resource for data on these groups.
- Regional Recorders may be able to provide locally relevant recommendations for bringing non-vascular plants and fungi into Nature Networks.
- The recording societies, and their local groups, are the experts on these taxa, but may vary in their ability to engage with the Nature Networks process [2].

[2] Specialist groups will vary in terms of their capacity. Scoping surveys introducing the Nature Network (your aims and approach) and providing respondents with the opportunity to input will identify those willing to participate without putting unreasonable demands on capacity.

For mosses and liverworts

British Bryological Society
Local Groups & Events



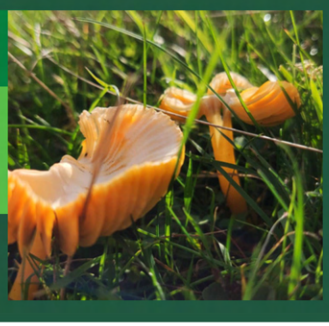
For lichens

British Lichen Society (BLS)
Local BLS groups



For fungi

British Mycological Society
Fungi near you | UK Fungus Day







6. Our Recommendations for Wild Habitats

6.1 Grasslands

"Won't you join me in my meadow?
Let's delight in all we see.
And frolic in the sunshine,
As our love grows by degrees!"
-Robbie Burns

Making up roughly a third of land cover, Scotland's expansive grasslands are an integral part of our landscape as well as our cultural and natural heritage. They can also be highly multifunctional nature-based solutions as they contribute significantly to below-ground carbon storage, improve our wellbeing, stabilise food systems and support specialist and threatened biodiversity.

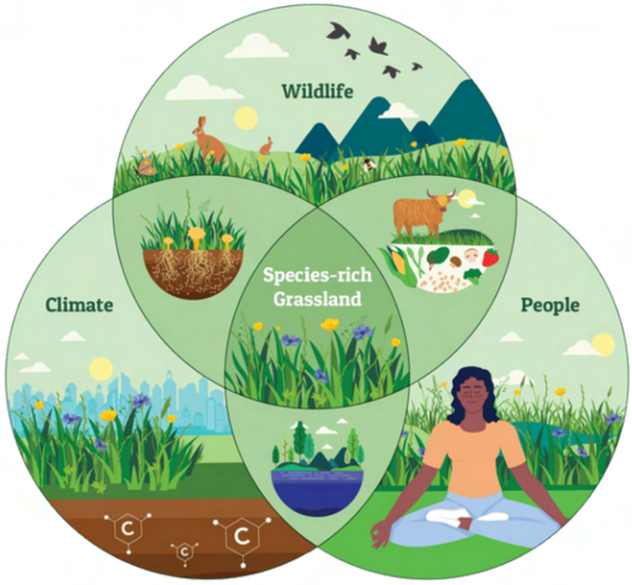
The majority of species-rich grasslands have been lost in the last century and most of our remaining grasslands are species-poor. The unrealized potential of grasslands means they are often lost to development, tree planting and other land-use change, leaving them fragmented and degraded.

Some species-rich grasslands can support as many as 40 species per square metre!



To unlock the potential of grasslands in your Nature Network:

Identify and map networks of **existing species-rich grasslands**. Accessing local knowledge on grassland distribution can be vital as existing grassland datasets are often incomplete and out-dated (see Plantlife's report 'Status, Trends and Definitions of UK Grasslands'). For more information on how this can be done see case study below.



Include existing **species-rich grasslands as priority core areas** within your Nature Network.

Identify opportunities to **create and restore species-rich grasslands** across the network. See Plantlife's good meadow guide on how to establish meadows in the most ecologically considerate way.

When creating new meadows, ensure the use of **local provenance seed sources**. See Plantlife's 'what seed should I use' and 'How to make a meadow with native wildflowers' recommendations.

Integrate opportunities to implement learnings from Plantlife's report Machair to meadows: making the most of Scotland's grasslands.

Engage with **local experts, natural history groups, crofters and communities** to access local knowledge on distinct and vulnerable grassland habitats, such as machair and montane scrub.



Engage with existing **regional and national knowledge networks to inform priorities** e.g. Pasture for Life and Floodplain Meadow Partnership.

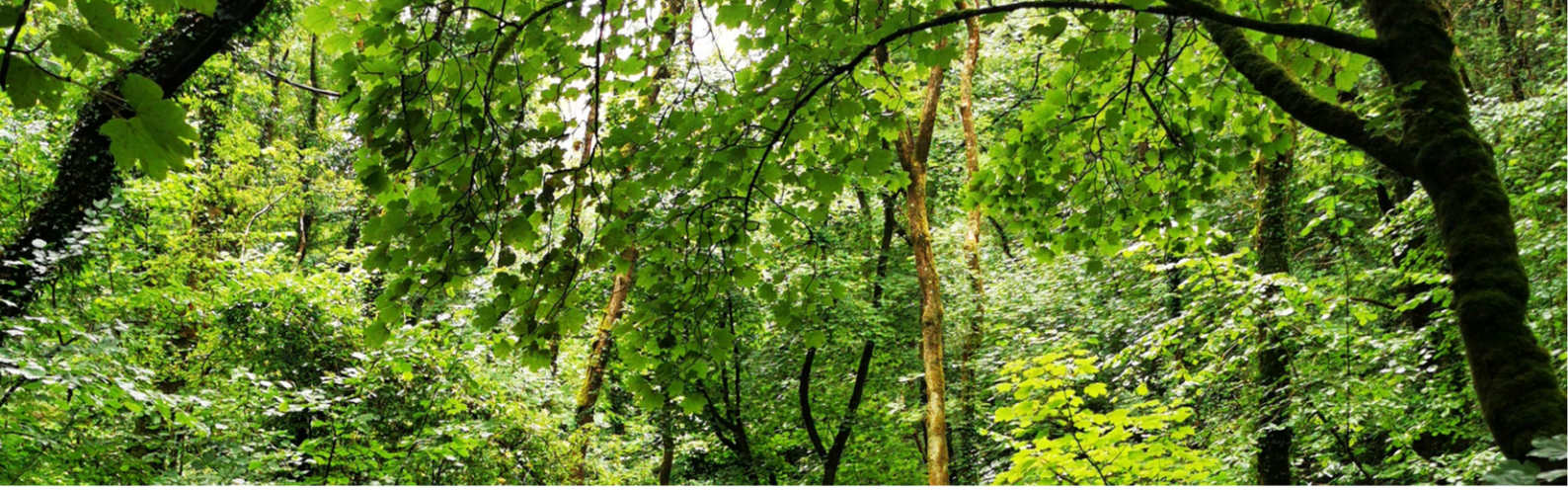
Identify opportunities to **restore and maintain wildflower habitat** on road verges and other green spaces to create a cost-effective network of wildlife corridors. You can find best practice recommendations and additional resources at Plantlife's Road Verge Management hub.

CASE STUDY: Identifying and connecting Clyde Grasslands

The project: Glasgow and Clyde Valley (GCV) Green Network, in partnership with Butterfly Conservation, Bumblebee Conservation Trust and Plantlife Scotland, used a combination of spatial datasets, biological records and local knowledge to map existing species-rich grasslands and identify opportunities for improving connectivity between them.

Their mapping exercise identified over 400 locations where creation, restoration or management of grassland would help reverse habitat loss and create a permeable landscape for grassland species. This data has not only contributed to the essential grassland inventory for the area and national data, but also helped identify the most-cost effective approaches to creating habitat networks. Their methodology and underlying data sources are provided within their Opportunity Mapping Report.





6.2 Temperate rainforest

"I loved the dark drop,
the trapped sky, the smells
Of waterweed,
fungus and dank moss"
- **Seamus Heaney**

Many of the best fragments of temperate rainforests in the world are found on the west coast of Scotland. They hold a wealth of endemic species; housing Europe's healthiest populations of many rare species of lichen and bryophytes, like Tree Lungwort and Prickly Featherwort. They represent an irreplaceable habitat that is internationally significant, yet only about 30,000 fragmented hectares remain in Scotland.

To protect and restore temperate rainforests:

Refer to the Alliance for Scotland's Rainforest's **best practice guidance** for information on how to take action for this globally-important habitat.

GIS layers for the temperate rainforest bioclimatic zone and key rainforest fragments can be found here: **Lost rainforests of Britain – Google My Maps**

Include good condition temperate rainforest sites as high priority core areas within Nature Networks.

Include degraded condition temperate rainforest sites as high priority restoration areas within Nature Networks.

Align Nature Network rainforest restoration objectives with **rainforest funding opportunities**, like the Forestry Grant Scheme (FGS).



Prioritise sensitive restoration of temperate rainforest PAWS (Plantation on Ancient Woodland Sites) using the Woodland Trust's Restoring Ancient Woods guidance. Ancient woodland plant communities have difficulty colonising secondary woodlands but many still persevere in PAWS sites and require sensitive restoration efforts.

Map and integrate mature and veteran trees into the network. See the Ancient Tree Forum's practical management advice - Caring for special wildlife of ancient trees.

If felling is necessary within temperate rainforest sites 'selective logging' and 'Continuous Cover Forestry' practices should be implemented along with low-impact removal of cut trees.

CASE STUDY: Restoring temperate rainforests across the Morvern Peninsula

The project: Across the Morvern peninsula, remaining fragments of temperate rainforest are struggling under oppressive stands of the invasive shrub species *Rhododendron ponticum.*

Led by RSPB Scotland, Saving Morvern's Rainforest is a project showcasing exemplary large-scale habitat restoration work for temperate rainforests. Their conservation plan focuses on eradicating Rhododendron to allow the ground flora to re-establish, demonstrating best practice for invasive species removal. The project also supports local livelihoods and the establishment of a community tree-nursery has created green jobs in the region. Mobilising community action in this way has raised local awareness of conservation outcomes while growing high-quality, locally-adapted trees which will be used to reforest areas where Rhododendron has been cleared.

The project is also empowering more people to become custodians of temperate rainforest by capturing the hearts and imaginations of local communities and school groups. Through storytelling and sharing local of folklore they are inspiring more people to become champions for rainforest protection and restoration.





6.3 Caledonian Pinewoods

Historically they extended across the Highlands, but native Scots pine woodlands have become increasingly uncommon due to changing land management practices. Protecting and expanding native Caledonian Pinewoods is needed to support the specialist communities of plants and fungi that they house.

To restore and expand this irreplaceable habitat:

Include **long-established native Pine woodlands** as priority core areas in your Nature Network.

Promote the use of sensitive management principles to safeguard this habitat and its rare species communities. See Plantlife's Pinewood management guidance.

Encourage natural regeneration and diversification of age structure where Scots Pine woodlands are present. Fast-growing Birch and Rowan form part of the natural understory of these sites and can help connect woodlands.

Appropriately **utilise the deer population for grazing management.** Although intensive deer browsing can prevent natural regeneration, some disturbance by deer at suitable densities (2 individuals / km²) regulates heather growth, preventing it from dominating the ground flora. With more room to grow, woodland plants waiting in the seedbank can establish.



6.4 Peatlands

Scottish peatlands cover over 20% of the country, and store over 1.6 billion tonnes of carbon. This substantial carbon sink is an environmentally significant resource that plays a major role in climate mitigation as well as biodiversity support.

Currently however, much of Scotland's peatland is in a poor or highly modified state, threatening and fragmenting distinctive peatland plant communities. Nature Networks can protect peatlands, supporting upland biodiversity and storing carbon.

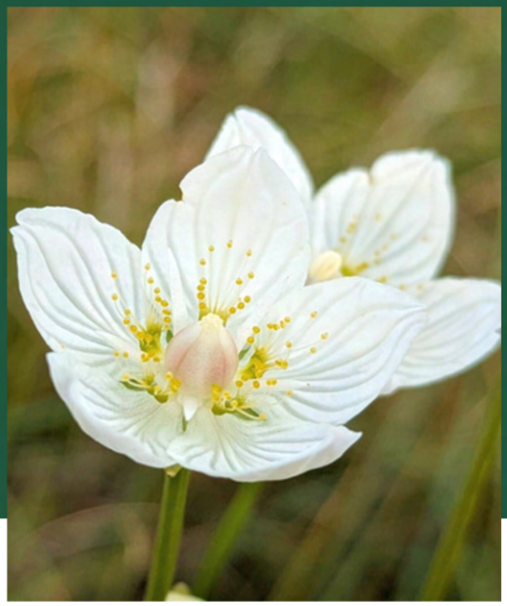


To ensure the protection of peatlands:

Engage with existing **regional and national knowledge networks** to inform priorities e.g. Peatland ACTION, Moors for the Future, Clyde Wetlands.

Include **degraded peatland sites** and **old peat workings** as priority restoration areas within the Nature Network. See Benmore Forest case study below.

Align Nature Network plans with **Scotland's National Peatland Plan** to create healthy and resilient peatlands by 2030.



Champion the use of IUCN's Peatland Code in peatland restoration projects to ensure project standards and attract private carbon market finance.

Become a peat-free local authority and end the use of peat in public green spaces and horticulture to help protect peatlands in Scotland and elsewhere.



CASE STUDY: Forest to bog restoration at Benmore Forest

The project: In 1974, the Meall an Lochain forest (32 ha) was planted on top of a blanket bog that contained peat up to 1 m deep. Planting forestry over peatlands has significant adverse impacts on the biodiversity, climate and functionality of peatland ecosystems. In 2014, funded by NatureScot's Peatland ACTION fund and led by Forestry and Land Scotland (FLS) this project set out to restore the site back to its original conditions.

The project trialled innovative techniques to rewet the bog and remove ploughed ridges across the sloped site. The 12 degrees angle of the hillside and hazardous depths of soft peat presented unique working challenges, and a specialised excavator was required to implement the 'stump flipping and ground smoothing' treatment. This approach recreated the structurally complex physical environment required by peatland plant communities. The bog is now on the road to restoration. The results showed that by June 2023, of the 9 positive indicator species present on a nearby natural bog, 6 were present in the restoring quadrats. The presence of Eriophorum angustifolium and Sphagnum papillosum suggests that the blanket bog is well on its way to recovery.



7. Making Land Use Work for Plants and Fungi



As the custodians of our landscape, landowners and land managers should play a key role in development of the Nature Networks. Considerate integration of plants and fungi into productive land will restore nature while supporting production and increasing the resilience of our farms and forests. True collaborative planning between Local Authorities, farmers, crofters, foresters and local businesses will bring essential on-the-ground perspectives and help identify network opportunities that complement existing land-use types.

"The moorcock springs on whirring wings
Amang the blooming heather:
Now waving grain, wide o'er the plain,
Delights the weary farmer;"

- Robert Burns

7.1 Agriculture

Traditional farming has co-evolved with the Scottish landscape over the last 6,000 years. Many of Scotland's endemic habitats still depend on these practices, from machair grasslands to ancient wood pastures. Nature Networks designed with the inclusion of the agricultural community will benefit nature on-farms and beyond. Biodiversity loss is one of the greatest threats to food security, and creating space for nature within the farmed landscape can embed resilience into ecosystems, food systems and livelihoods.



To foster strong relations between Nature Networks and landowners:

Promote the opportunity that Nature Networks present for diversifying income streams and attracting alternative public and private finance to support nature recovery.



Hear land managers' experiences and value their existing knowledge in order to design complementary and effective ecological corridors which benefit all stakeholders.

Signpost funding opportunities which would enable more nature friendly practices on farms, such as Forestry Grant Schemes (FGS).

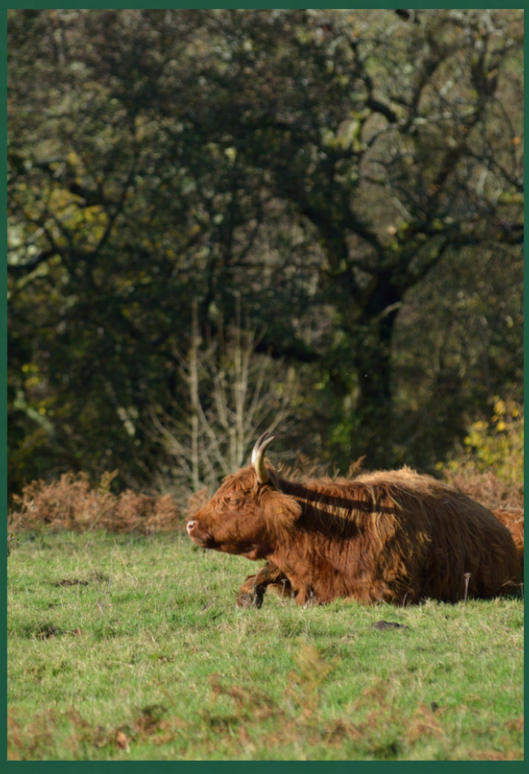
Support landowners to adopt nature-friendly farming practices by sharing resources on regenerative agriculture and sustainable land use, like Nature Friendly Farming guidance or Farming with Nature, and connecting with experienced nature-friendly farming clusters.

Aligning language in Nature Network plans with Agri-Environment Climate Scheme (AECS) terminology may help support future public goods payments and incentivise complementary land use with private landowners.

CASE STUDY: The Ayrshire Nectar Network

The Project: Working with a diverse group of farmers, landowners and local councils, Scottish Wildlife Trust are steering the creation of networks of high-quality, nectar-rich (flower-rich) habitat over several landholdings across Ayrshire. By managing more spaces for wildflowers the project is creating hectares of wildflower meadows across the farm network. These 'pollinator highways' have primarily been created using high-quality seed, introduced from green haylage grown in nearby local donor meadows.

Volunteers across the nectar network have been stewarding these meadows using traditional, sensitive management practices like scything and implementing conservation grazing regimes to improve wild plant and pollinator diversity.



7.2 Forestry



Our trees, woods and forests are iconic features of our landscape and history. However, over half of Scotland's woodlands are currently low-diversity, non-native commercial forests, which are encroaching on the remaining 4% of native woodland.

Well-managed and productive plantations such as Craigvinean forest can be looked to as gold standards for sustainable timber production, wildlife support, carbon storage and human enjoyment (see case study).

To bring more biodiversity into all types of forestry:

Consult with key stakeholders who can advise on the characteristics and priorities for the forest-types present. These will include Forestry and Land Scotland, Scottish Forestry, Woodland Trust and Scottish Wildlife Trust.

Align **Nature Network's restoration objectives with woodland funding opportunities,** for example Forestry Grant Scheme (FGS) and Nature Restoration Fund (NRF).

Look for **opportunities to restore diverse and layered woodland habitats** that capture the needs of as many local species as possible – see Dynamic Landscapes section for more information.

Prioritise sensitive restoration of Plantation on Ancient Woodland Sites (PAWS) using Woodland Trust's Restoring Ancient Woods guidance. Ancient woodland ground-flora communities have difficulty colonising secondary woodlands, however many still persevere on PAWS sites which require sensitive restoration efforts to protect this special interest.

Support foresters to **adopt sensitive silvicultural management practices** such as selective felling and Continuous Cover management to maintain habitat condition and connectivity without compromising on timber production. See Craigvinean forest case study below.



CASE STUDY: Craigvinean & Ladywell land management plan

The project: This active commercial forest carefully balances timber production, biodiversity support and recreational access. Craigvinean forest falls within the River Tay Special Area of Conservation (SAC), home to a number of European Protected Species (EPS). It is widely regarded as one of the most important UK sites for forest raptors, but it is also well used by local walkers and mountain bikers.

Forestry and Land Scotland have designed Craigvinean's 20-year forestry management plan which seeks to improve biodiversity support across the site by reducing their use of disruptive forestry practices such as clear-felling. In fact, Craigvinean forest is now a National Trial Site to demonstrate the feasibility of large scale-application of non-clearfell management. Within the forest, open space habitats that are unsuitable for commercial growing are protected from encroaching Sitka colonisation by buffer zones of broadleaved species. Craigvinean forest sets an example for sustainable timber production and showcases the benefits that nature-friendly forestry can bring, for biodiversity and for recreation and wellbeing.





7.3 Tree Planting

Planting trees currently sits centre-stage in our efforts to address climate change, but poorly planned and targeted woodland establishment can actually cause damage to existing carbon-rich habitats and their wildlife. Following 'Right Tree, Right Place, Right Management' principles will ensure woodland creation, through tree planting or natural regeneration, captures carbon as intended and benefits existing species communities.

To make sure tree-planting delivers positive environmental outcomes:

Opportunities to reforest sites identified as part of the Nature Network **should be guided by data, policy and professional guidance.**

- An **understanding of the ecological value** of the existing site is needed to protect important species from afforestation / habitat creation.
- An **understanding of the carbon storage value** of the existing habitat is needed to protect the site's carbon stores. Planting over ecosystems with carbon-rich soil (like peat) can release more carbon than trees can sequester for many years.

Opportunities to create new woodlands should incorporate **areas of open space and transitional habitats** such as scrub and grassland to provide steeping stones for grassland and edge species.

The **Long-term Forest Plan option** required for establishing larger areas of forest under the Woodland or Forestry Grant Scheme applications should include an accompanying monitoring programme to ensure that trees are reaching maturity.

Where possible, increased woodland cover should be achieved by creating the conditions which will allow trees to regenerate and colonise naturally. Following Kew's **10 golden rules for restoring forests** will ensure that reforestation continues to protect biodiversity.

7.4 Urban Spaces

With most of Scotland's population living in urban areas, green and blue spaces are vital links to nature for health and wellbeing. Creating Nature Networks that span urban and peri-urban landscapes can breakdown urban / rural divisions and bring diversity and nature-based solutions into our towns and cities.



To bring wildlife into the built environment:

Work with key stakeholders e.g. Transport Scotland, property developers and community groups to identify suitable **amenity green spaces and road verges** to act as urban nature corridors. Where ecological corridors are not viable, look to establish **stepping stone habitats** to support biodiversity.

See Plantlife's road verge management guide and Plantlife Meadows hub for more information on how to turn urban green spaces into hotspots of colour and diversity.

Include **native species in planting schemes** to preserve the region's unique botanical identity and increase community appreciation for local flora and fungi.

Reduce pesticide use to minimal levels by eliminating non-targeted use of broad-spectrum herbicides and fungicides and phase out Highly Hazardous pesticides in your area.

Engage with the local community, schools, businesses, planning officers and stakeholders to plan how Nature Networks can interact with urban environments.



CASE STUDY: Fernbrae Meadows

The project: Funded by The Green Infrastructure Strategic Intervention Fund, South Lanarkshire council transformed a disused golf course into a popular urban park. From the project's inception in 2018, different local community groups have worked together to ensure inclusivity and place-based planning. They have now created 20 hectares of greenspace, pathways, cycleways, allotments, outdoor classrooms and more.
The dedication of volunteer groups has now established 10 hectares of wildflower meadows, enhanced 9 hectares of woodland, and restored many more habitats, leading to **Fernbrae Meadow designation as a Local Nature Reserve in 2022**.

8. Cross-cutting Opportunities



Major drivers of environmental decline impact across communities, habitats and landscapes simultaneously. These cross-cutting themes present opportunities where taking a joined-up, landscape-scale approach will maximise benefits across all ecosystems. Capitalising on cross-cutting opportunities through collaborative action and integrated planning with multiple stakeholder groups offers a route to addressing the drivers of decline to create **landscape-scale benefits.**

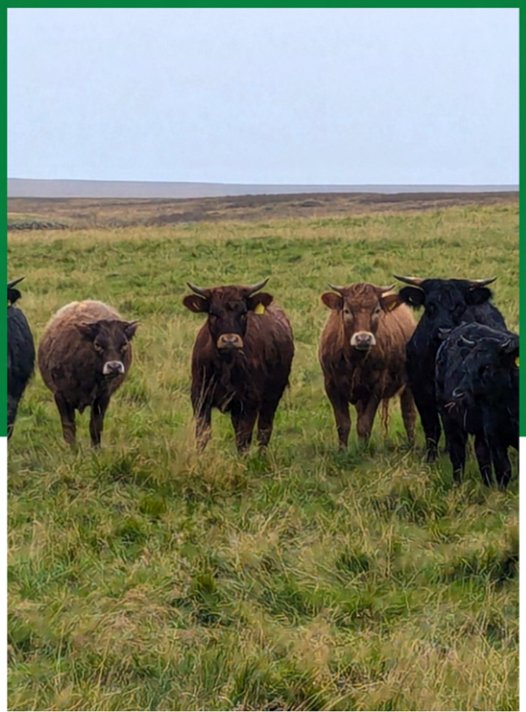
8.1 Action for clean air

All living organisms require clean air. Although Scotland's air quality has improved in recent years, emission and deposition of pollutants are still causing considerable harm to species, habitats and human health worldwide. With agricultural, transport and industrial emissions among the primary contributors, cross-sectoral collaboration will be essential to decreasing emissions at source.

How to integrate air quality objectives into Nature Network plans:

Incorporate spatial data on pollution emissions and deposition hotspots into Nature Network mapping, using Air Quality in Scotland data. See scenario 3 below.

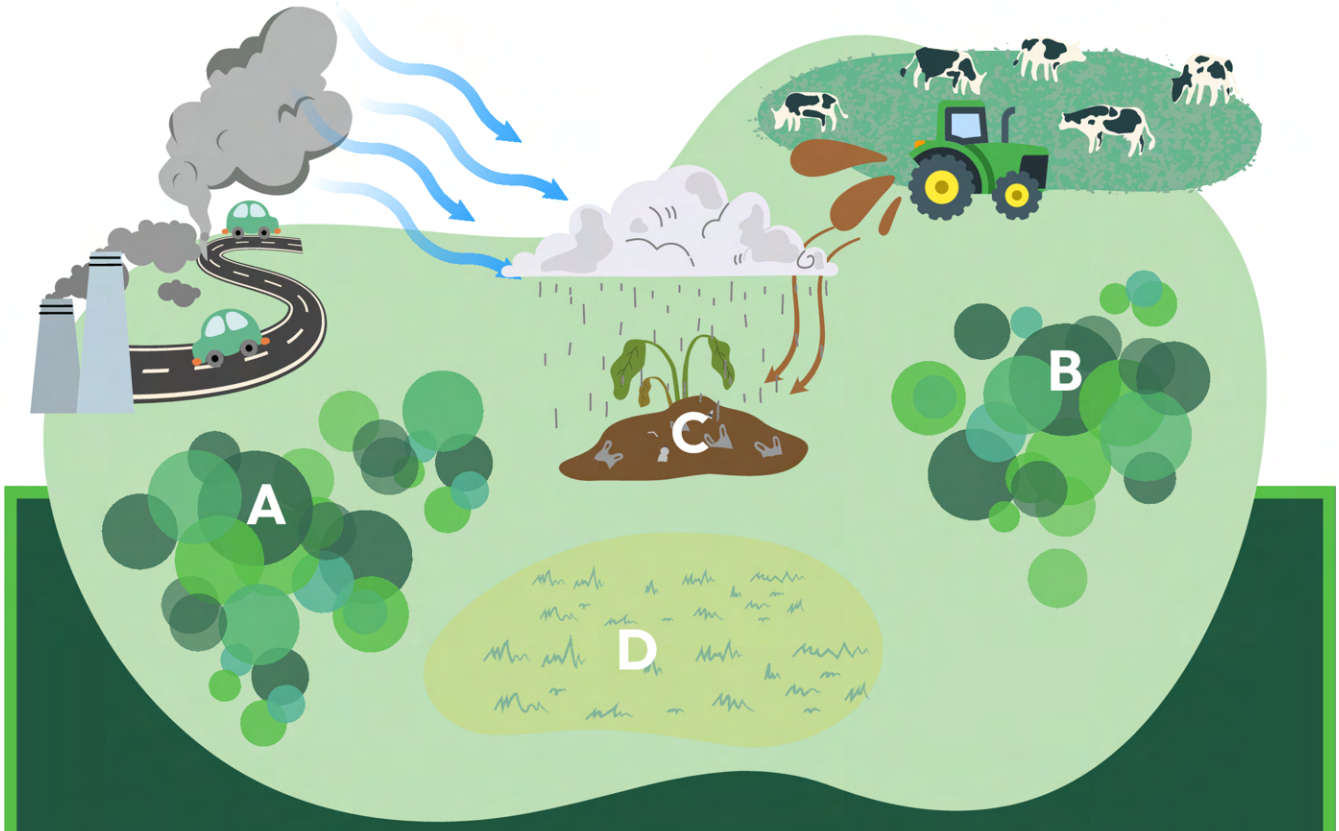
Identify and address the local sources of air pollution, working across departments and with all stakeholders to deliver meaningful outcomes.



Identify habitats and species most at risk of air pollution, and tackle the impacts of nitrogen deposition via habitat restoration.

Plantlife's 'Cleaner air for Scotland's wildlife' report offers in-depth understanding of how critical load exceedance affects semi-natural ecosystems in Scotland.





Scenario 3. Understanding and mapping pollution deposition trends can help ensure that habitat creation is targeted to where it will deliver genuine positive outcomes for biodiversity

Your habitat mapping process has identified a seemingly- ideal location for restoring habitats and improving biodiversity (C). However, years after a restoration attempt, the species aren't recovering, and the site is still in unfavourable condition.

This is because the site is carrying excessive pollutant loads from numerous nearby emission sources. If the mapping process incorporated deposition data from the offset, this site wouldn't have been identified as a high-potential site for recovery. Site D would have been a more appropriate restoration area as the underlying pressures would need to be addressed and reduced before recovery could take place at site C.



8.2 Managing Invasive Species

Although some non-native species have naturalised within our native ecosystems, others are able to reproduce quickly without any natural processes to limit their growth. These species become invasive and threaten the survival of our native species.

Invasive non-native species (INNS) are now responsible for 16% of global extinctions, costing Scottish Government an estimated £200 million a year. By taking a coordinated approach to reducing INNS pressures, our native species can thrive again.

How to integrate invasive species management into plans:

I**dentify and map invasive species** that present the biggest threats to core areas, key habitat corridors and stepping stones sites.

Include measures to **control invasive-non-native species** such as Rhododendron ponticum, Himalayan Balsam, Japanese Knotweed, Giant hogweed, American Skunk Cabbage. See NatureScots Invasive Non-Native Plants page for more information.

Prioritise measures to control invasive species that are damaging to any populations of **keystone species** present within the network.

Encourage community mobilisation. Facilitating the formation of Local Action Groups and supporting those that already exist to continue delivering action against INNS on the ground will increase the scale of action. See the Local Action Group Toolkit for more information.





8.4 Creating Dynamic Landscapes

Our wild places are in constant flux and their management needs to reflect this. Improving habitat diversity and reinstating natural ecosystem processes creates microhabitats which support a diversity of species at all scales. The terms 'wilding' and 'rewilding' have been avoided throughout this document as they are often interpreted to mean abandonment of management. However, we promote the considerate creation of diverse habitats, with transitional, marginal and linear habitat features, where dynamic natural processes are enabled to function.

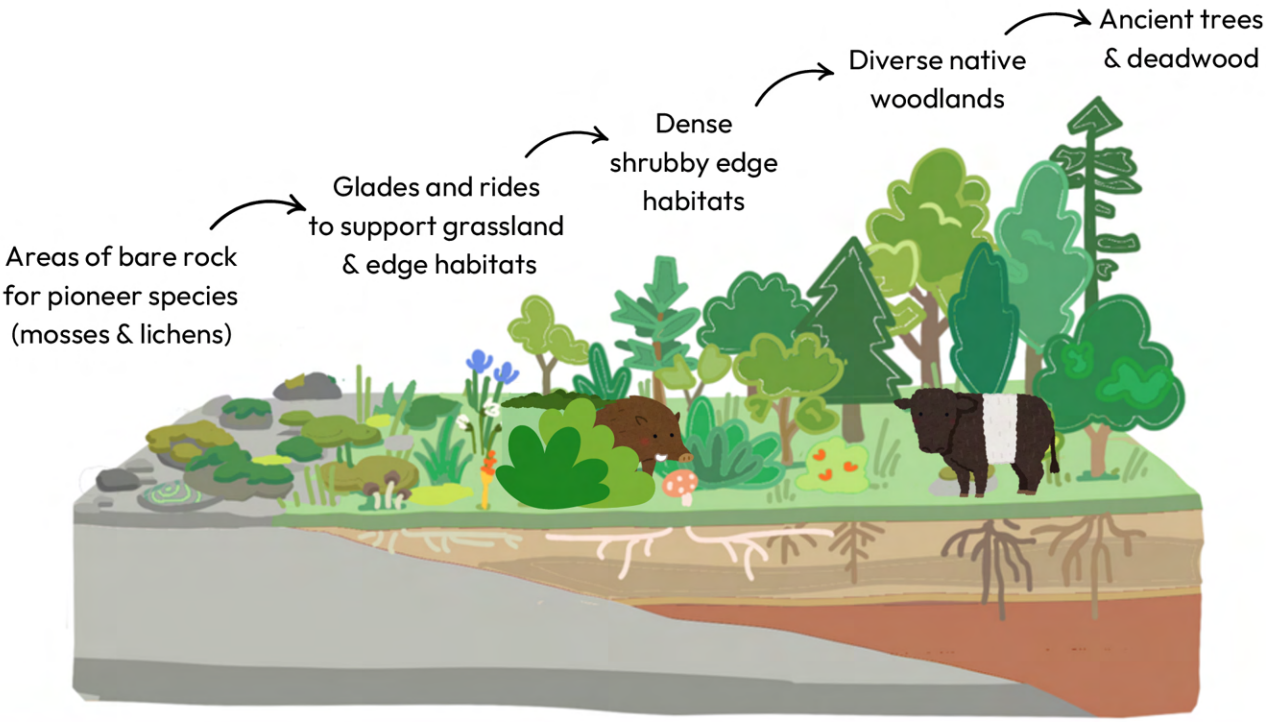
How to integrate dynamic landscapes into plans:

Identify opportunities to **diversify Nature Network habitats** both structurally (different species mixes and different age individuals) and in terms of successional stages (areas of bare ground / exposed rock for pioneer species, open spaces, mature trees for species that take a long time to establish, in situ decaying wood) to facilitate dynamic species turnover.

If appropriate, incorporate **sensitive grazing of herbivores**. Our landscapes have evolved with grazing herbivores, their disturbance modifies the environment, creating localised gaps and germination opportunities which support other organisms around them.

Many habitats and species are negatively impacted by intensive deer grazing - including pinewoods, temperate rainforests, montane areas and peatlands. Align the nature network with **local deer management plans** through consultation with experts, local stakeholders and Deer Management Groups to regulate the impact of high deer densities on the landscape.





Scenario 4. Creating complex and layered habitats is key

You are aiming to restore a degraded woodland and decide to plant trees to expand the tree line. Years later, canopy cover has increased but the woodland is still in poor condition. This is because the populations of plants, animals and fungi that make up a woodland need to healthy for a wood to be in good condition. Introducing diversity and appropriate levels of dynamism will support unique woodland species communities and restore the site to health. To do this:

- **Create gaps** in single age-stand woodlands to introduce structural diversity and to create succession opportunities for young trees to flourish.
- **Protect future veteran trees** to provide homes for late-succession species.
- **Retain deadwood features** (especially standing deadwood where possible) to protect the unique communities of lichens, fungi and invertebrates they support.
- **Manage and remove invasive species** which reduce diversity in ecosystems.
- **Introduce sensitive grazing practices** which create localised disturbance, open new germination opportunities & unlocks new niches in which diversity can flourish.

When creating new woodlands:

- Diversify native tree species as different species have different branching architectures and bark textures, creating complex vertical niches for species.
- Consider expansion via natural regeneration as taking a ‘land-led’ approach will create resilient woodlands filled with locally-adapted species.

8.2 Climate Resilience

Building environmental resilience into an area can begin at the local level. Thriving networks of wild plants and fungi will reduce the negative impacts of rising global temperatures (e.g. flooding, temperature extremes, species decline). Alongside this, community mobilisation and individuals efforts to decarbonise supply chains and reduce emissions at source will be essential. Preventing any additional degrees of warming will reduce projected pressures on our environment.



To integrate climate resilience into Nature Networks:

Align with actions from the **Scottish National Adaptation Plan** (SNAP3).

Embed your networks within other Local Plans to streamline operations and identify opportunities to join-up. These include:

- Climate change strategies (Climate Change Duty associated plans)
- Biodiversity strategies (Local Biodiversity Action Plans)
- Neighbourhood plans (Local Place Plans, Local Outcome Improvement Plans)
- Wellbeing strategies
- Clean air strategies
- Forestry and Woodland Strategies

Connect with existing projects led by larger regional network groups such as:

- Glasgow & Clyde Valley Green Network
- Central Scotland Green Network
- Habitat Network with Inner Forth Futures

Identify opportunities to move towards **a bio-based circular economy** which minimises waste. See Fife Council's approach Grasslands consultation which utilises green waste from mowing for bioenergy and other bio-based products.

Embed resilience into the landscape by restoring habitats that will buffer against extreme weather e.g. restoring floodplain meadows and species-rich meadows to allow better absorption of flood water and reduce soil erosion.



8.5 Nature Connection

Community involvement and mobilisation can re-establish the relationship between people and the landscape. When local groups and individuals interact with our landscape and wildlife, they become empowered to protect them. Focusing resources on community involvement and network-strengthening allows for more sharing of responsibilities, amplifying the impact of Nature Networks and mainstreaming nature-positive action into society.

To bring more people into nature recovery:

Encourage a place-planning approach by providing opportunities for local communities to share their experience and expertise co-creating places and planning policies that best benefit the community.

Empower communities to take action for nature by promoting and signposting to support and resources where they exist e.g. Support for communities | NatureScot.

Connect with and strengthen existing partnerships e.g. pilot Regional Land Use Partnerships and Local Biodiversity Partnerships where they exist.

Promote citizen science projects to improve engagement with conservation, like the National Plant Monitoring Scheme or Waxcap Watch.

Connect and combine communities with existing natural history groups. Voluntary local action can significantly contribute towards biological data collection. Other activities such as wardening and low-intervention habitat management can also inspire more people to become stewards of the living world.

Create opportunities for children and young people to actively participate in nature recovery projects and to engage with the natural environment through initiatives like Forest Schools.





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CASE STUDY:
Edinburgh's Urban Nature Network

The project: The City of Edinburgh Council and the Scottish Wildlife Trust are creating the first urban Nature Network as part of the Edinburgh Living Landscapes Partnership. Co-designed with a range of stakeholder groups (more than 18 NGOs and other groups across the city), the partnership has identified 200+ priority actions to restore nature in Edinburgh.

Empowering communities to participate and take action is central to their approach. The Council has already supported the creation of Friends of Groups across the city, and is working with schools to improve their local greenspaces directly. The partnership is now piloting their first Nature Network in Leith. Their **Monitoring and Evaluation Framework** identifies society, nature and partnership as key themes in their Nature Network. By embracing local knowledge, the plans are prioritising actions to deliver the biggest impact for people and wildlife.





9. Conclusion

Embedding the principles outlined in this document into your Nature Network will drive tangible, positive change for local wildlife and communities. Proactively targeting conservation efforts towards wild plants and fungi, the species at the foundation of food chains, will deliver cascading benefits across ecosystems and food systems. Nature Networks present an opportunity to extend a much-needed lifeline to these fundamental groups and create a thriving natural environment for future generations of all species.

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Plantlife is the global charity working to enhance, protect, restore and celebrate the wild plants and fungi that are essential to all life on earth. With two in five plant species at risk of extinction, biodiversity loss is now the fastest it's ever been – which means our work has never been more vital.

We champion and accelerate conservation action, working at the heart of a global network of individuals and organisations, to influence and inspire landowners and land managers, public and private bodies, governments and local communities.

As time begins to run out, we are using our position as the global voice for wild plants and fungi to bring lasting and positive change to our natural world – for everyone's sake.

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