Biodiversity and community owned land in Scotland – an analysis

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2025

The Centre for Mountain Studies

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Scottish Funding Council
Comhairle Maoineachaidh na h-Alba

FEARANN COIMHEARSNACHD NA H-ALBA | COMMUNITY LAND SCOTLAND

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1 Summary findings

- It remains challenging to access boundary data for landownership boundaries in Scotland;
- While biodiversity is a public policy priority, its assessment on individual landholdings is difficult;
- Attempts to assess community landholdings contributions to biodiversity is further compounded by community landowners having many pressing priorities, with the primary focus being to ensure sustainability for local communities and deliver immediate community benefits;
- 12 of the 18 largest community landowners referred to 'conserving, protecting or enhancing the environment or natural heritage.' Although there may be a lack of explicit focus on biodiversity, in most cases environmental sustainability is central to community aspirations;
- The largest community-owned land contains a high percentage of designated sites per land area - almost double that as for Scotland as a whole. Community-owned land also holds a higher proportion of sites in favourable condition, *and* a higher proportion in unfavourable condition;
- The largest community-owned contains proportionately more peatland (41% of land area as opposed to 13% for Scotland as a whole). A significant proportion of this peatland is deep peat;
- Nine of the 11 largest community landowners for which recent count data was available, were managing deer at densities less than five deer per km2 which is compatible with woodland regeneration and ecological restoration;
- Local communities often hold rich knowledge of features and localities that hold biodiversity value which may not appear in either national datasets or local biodiversity records; It is recommended that there is better:
    - transparency and accessibility of land ownership boundaries
    - clarity on public objectives, measures and outcomes for biodiversity for landowners
    - transparency of land management outcomes for biodiversity
    - guidance for landowners on monitoring biodiversity including community engagement
    - capture of community local value and knowledge, to be integrated into management planning and monitoring

2 Funding

This report was funded by an Innovation Voucher from the Scottish Funding Council between September 2024 and February 2025. The Standard Innovation Voucher scheme encourages new collaborations between a Scottish organisation and a university or college.

Community Land Scotland was established to provide a collective voice for community landowners in Scotland and has over 130 member organisations, ranging from community landowners of major crofting estates in the Western Isles to inner city community hubs in diverse communities. Their vision is for the community ownership of land and buildings to be a significant driver of sustainable development across the whole of Scotland.

The Centre for Mountain Studies (CMS) conducts research that contributes to the sustainability of upland and mountain environments and communities, and facilitates knowledge exchange activities that engages stakeholders and communities in contemporary upland issues.

3 Background

Since 2000, there has been a significant focus on land reform in Scotland within the Scottish Parliament, and community ownership has been a prominent feature in this. Through various mechanisms including funding, legislation and organisational support, community groups now own over 840 assets, of which two-thirds are land. Over 2.7% of land in Scotland is now owned by community organisations (Official Statistics for Community Ownership in Scotland 2023), this figure is slightly higher if older community landowners, who don't meet the constitutional criteria for the statistic, are included. Alongside this trend interest, awareness and associated policy focus on biodiversity have been increasing within Scotland. Bringing these two themes together – community ownership and biodiversity – has been the starting premise for this report.

4 Introduction

Concerns about Scotland's declining biodiversity have gained public policy prominence following the declaration of a nature emergency by the Scottish Parliament in November 2020. This has prompted the publication of the Scottish Biodiversity Strategy, its associated delivery plan in December 2024, and the Natural Environment Bill in February 2025. There has also been an increasing focus on the relevance of community landownership to biodiversity, with the latest Land Reform (Scotland) Bill introduced to Parliament in March 2024. This proposes to place legal responsibilities on the owners of large landholdings[1] to show how they use their land, and how that land use contributes to key public policy priorities such as addressing climate change and protecting and restoring nature. There is a proposal for

> 'large landholdings' to have a land management plan that sets out '…how the owner is managing or intends to manage the land in a way that contributes towards…. increasing or sustaining biodiversity'.

Under the Official Statistics for Community Ownership in Scotland 2023, **community ownership** is defined as

> 'a place where people live which can be clearly defined, such as the boundaries of a specific town or village or specific postcode units'.

Ownership is:

> '... defined in the legal sense: a legal title coupled with exclusive legal right to possession. This excludes instances where a community group rents or leases an asset or any other arrangement where a community group has the use of an asset, but ownership is not held by a community group.'

Defining **biodiversity** is more challenging. The term first came to global attention with the Convention on Biological Diversity in Rio in 1992, which defined biological diversity as:

> '... the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.'

The most recent policy definition in Scotland comes from the Scottish Biodiversity Strategy, published in December 2024, which defines biodiversity as:

> '… 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.'

[1] Under the Land Reform (Scotland) Bill, the proposed definition of a 'large landholding' is one 'that exceeds 3,000 hectares in area' or 'forms part of an inhabited island, and is a single holding or a composite holding that— (i) exceeds 1,000 hectares in area, and 15 (ii) constitutes more than 25% of the land forming the island.'

The delivery plan of the Scottish Biodiversity Strategy, published in December 2024, details the six key objectives of the strategy. These are to:

1. Accelerate restoration and regeneration
2. Expand and connect protected areas and improve their condition
3. Promote nature-friendly farming, fishing and forestry
4. Recover and protect vulnerable and important species
5. Invest in nature
6. Take action on the indirect drivers of biodiversity loss.

The delivery plan lists 165 actions to make Scotland '...a nature positive nation'. Of these 165 actions, the vast majority involve further plans or development (as indicated by the key words used to describe them, Table 1) with only nine having clearly measurable outcomes. Of these nine, the research team concluded that three could directly be delivered by landowners: these involve reducing the spread of invasive non-native species; increasing deer culls and increasing woodland (Table 2).

Table 1. Scottish Biodiversity Delivery plan 2024-2030. Key words used to describe the 165 actions.

Key word from action (frequency used)			
Develop (30)	Work with (3)	Achieve	Feasibility studies
Ensure (13)	Assess (2)	Adapt	Fulfil
Implement (11)	Complete (2)	Address	Mainstream
Publish (7)	Continue (2)	Adopt	Manage
Increase (6)	Enhance (2)	Attain	Meet
Deliver (5)	Improve (2)	Build	Prioritise
Identify (5)	Maintain (2)	Champion	Put in place
Introduce (3)	Progress (2)	Collate	Reduce
Review (5)	Provide (2)	Consult	Refresh
Promote (4)	Revise (2)	Contribute	Represent
Support (4)	Strengthen (2)	Design	Scale
Undertake (4)		Designate	Set up
Establish (3)		Drive	Share
Explore (3)		Embed	Take
Raise awareness (3)		Encourage	Transition
Reduce (3)		Engage	Update

Table 2. Scottish Biodiversity Delivery plan 2024-2030. Measurable actions only

Action	Summary of MEASURABLE action	Date to be achieved	Practical action for community landowner to contribute to?
2.13	81% of all Scotland's waterbodies (rivers, lochs, groundwater, transitional (estuary/ firth) and coastal waters) to achieve a 'good' or better classification	2027	Indirectly
3.1	Reduce the rate of establishment of known or potential INNS by at least 50% compared to 2000 level:	2030	Yes
3.2	Reduce the impacts of INNS in at least 30% of priority sites.	2030	Indirectly
5.2	Increase national deer cull by 25-30% (from 200,000 – 250,000); achieve densities of 5-8 deer per km² in each of the DMG's in the Cairngorms National Park; deer densities of around 2 deer per km² where woodland regeneration is a priority and required to achieve UK Forest Standard	2030	Yes

8	At least 30% of land, freshwater and sea protected or conserved and effectively managed to support nature in good health	2030	Indirectly
8.1	At least 30% of land and sea is protected or conserved, as protected areas or Other Effective Area-Based Conservation Measures (OECMs) and effectively managed to support nature restoration	2030	Indirectly
9.1	Designate at least one new National Park within the current parliamentary term subject to the outcome of the reporter investigation and public consultation.	2026	Indirectly
19.1	Meet annual woodland creation target as set in the Scottish Government Climate Change Plans currently 18,000 hectares of new woodland annually (including 4000ha of native woodland).	Annual	Yes
21.4	Genetic Scorecards for 50 marine and terrestrial species compiled and published. Twenty-five Gene Conservation Units registered by 2025, 50 registered by end-2028	2025 2028	No

The Natural Environment (Scotland) Bill, recently introduced to Scottish Parliament would place a responsibility on ministers to introduce legally binding nature restoration targets. This will necessitate the development of a set of indicators that can be employed across terrestrial and marine habitats to systematically monitor progress towards meeting such targets. This is an opportunity to align and streamline approaches to biodiversity monitoring and assessment that should improve our understanding of how biodiversity is changing across Scotland. Opportunities for engagement with such indicators at landholder level would be beneficial for communities and other landowners.

Beyond the Biodiversity Strategy, there are several other public policy objectives for biodiversity in Scotland. One of the 81 outcomes for the National Performance Framework for Scotland is for biodiversity, which is assessed from three measures:

- Index of abundance of marine species
- Index of abundance of terrestrial species
- Index of occupancy of terrestrial species.

This is based on a combined statistic from 14 seabird species (for marine), 133 birds, 25 butterflies, nine mammals and 170 moths (for terrestrial) and data for bryophytes (218 species), lichens (650 species), freshwater invertebrates (151 species), terrestrial insects (1,104 species), and terrestrial invertebrates (excluding insects) for 'occupancy'.

The Cairngorm National Park Authority is developing a Nature Index, which aims to provide

> '...a baseline for the quality and extent of key ecosystems in the National Park and a robust framework to monitor change and evaluate success over time.'

The Index will produce a number formed from a composite of indicators selected from the main species groups – lower plants, vascular plants, invertebrates, fish, amphibians, birds and mammals, combined with further indirect indicators that give information on the *biodiversity potential* of an area; for example, the presence of dead wood or the amount of natural regeneration.

NatureScot is developing an outcome-based approach to measure biodiversity enhancement on farms and crofts to enable delivery of agri-environment payments. The pilot project is developing 'habitat scorecards' and methods for measuring climate and soil outcomes as well as establishing baseline monitoring. There are also several funding schemes for biodiversity where public money seeks to 'buy biodiversity', Table 3.

Table 3. Scottish government funded biodiversity schemes

Fund name	Biodiversity mention
Nature restoration fund	'*to protect and restore Scotland's biodiversity while helping us build resilience to climate change*'
Peatland Action	'play a role in flood regulation, water quality and support nationally and internationally important biodiversity'
Forestry grant scheme	'*provides support for capital work that will benefit a range of priority habitats and species, as defined in the Scottish Biodiversity Strategy and European Directives.*'

All the above objectives, tools and schemes focus largely on process (management) rather than outcomes (measurable biodiversity gains), although the Scottish Government is understood to be looking at developing an 'ecosystem restoration code' and biodiversity credits. Yet despite biodiversity being a high priority in public policy, there are no clear, consistent criteria for community landowners to assess biodiversity on the land they manage. Instead, contribution towards biodiversity is assessed by proxy indicators or management practices.

5 Methodology

This research took a multi-tiered approach in attempting to understand community landowners' assessment of biodiversity in terms of proxy indicators and management practices.

A literature review was conducted to ascertain definitions of and the links between biodiversity and community land ownership in Scotland. The research team then collected and collated land ownership data under licence from Who Owns Scotland and Unlocking Sasines, Registers of Scotland to create a GIS map layer for the largest areas under community landownership in Scotland from Official statistics for Community Ownership 2023, for the purposes of this report defined as being over 1,000ha, noting 10 of these are also over 5,000ha. The research team combined North Harris and Loch Seaforth estates, as these are in effect under the same ownership (Urras Ceann a Tuath na Hearadh / North Harris Trust), to produce 18 landholdings over 1000 ha, which can be seen in Table 4 and Figure 1. 1000 ha was chosen in relation to area thresholds in the land reform bill.

Table 4. Community landholdings in Scotland over 1,000ha

Landholding	Landowner	Year	Area (ha)
South Uist Estate	Stòras Uibhist	2014	37,637
Stornoway Trust Estate	Urras Steòrnabhaigh/Stornoway Trust	2004	28,000
North Harris Estate, Scalpay Estate, Loch Seaforth estate	Urras Ceann a Tuath na Hearadh/North Harris Trust	2002	24,979
Galson Estate	Urras Oighreachd Ghabhsainn/Galson Estate	1995 (2000)	23,234
Glencanisp and Drumrunie Estates	Assynt Foundation	2018	18,257
Barvas Estate	Urras Sgire Oighreachd Bharabhais/Barvas Estate	1908	13,676
The Pairc Estate	Pairc Trust	1997	10,840
Glendale Estate	Glendale Estate	2002	9,306
Luskentyre, Borve and Scaristavore Estates	Urras Taobh Siar Na Hearadh/West Harris Trust	1997	7,346
Knoydart Estate	Knoydart Foundation	2009 (2020)	7,082
Carloway Estate	Urras Oighreachd Chàrlabhaigh/Carloway Estate	2003	4,755
Tarras Valley Nature Reserve	Langholm Initiative	2006	4,250
Isle of Eigg	Isle of Eigg Heritage Trust	2002	2,994
Borve and Annishadder Township	Borve and Annishadder Township	2014	1,821

Isle of Gigha	Isle of Gigha Heritage Trust	2005	1,384
Sutherland Estates' crofting townships of Portgower, Gartymore, West Helmsdale and Marrel	Garbh Allt Community Initiative	2016	1,252
Little Assynt Estate	Culag Community Woodland Trust	1923	1,173
Ground at Glen Mallie Woodland and South Loch Arkaig Woodland	Arkaig Community Forest	2003	1,072

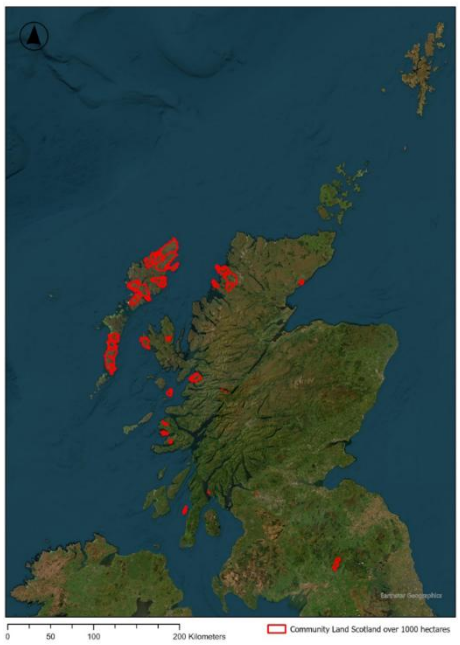
The research team assessed the strategic approach of these largest community landowners to biodiversity by reviewing their governance documents, ultimately identifying if and how biodiversity was explicitly mentioned.

Publicly available data sets of biodiversity management proxies focussing on designated sites, priority species, peatland, woodland and deer were analysed against landownership boundaries, Table 5, to understand the contribution made by the largest community landowners in comparison to the country as a whole.

Table 5. Data sets used to assess biodiversity

Biodiversity proxy measure	Publicly available dataset
Biodiversity priority species	NBN species atlas NatureScot biodiversity priority species list
Deer densities	NatureScot deer count data
Designated sites	Designated site condition
Peatland depth and condition	James Hutton Institute peat depths and condition maps
Woodland condition	Ancient woodland inventory Native Woodland survey of Scotland

Figure 1. Community landholdings in Scotland over 1,000ha



6 Limitations of data and analysis

It remains challenging to access boundary data for landownership boundaries in Scotland. A large proportion of community-owned land considered in this study is in the northwest Highlands,

specifically in the Outer Hebrides. This area has seen a significant amount of large community buy-outs, and now over 72% of land in the Outer Hebrides is currently community-owned, and over 75% of the population lives on that community land.

There are several reasons for the scale of these buyouts in this geography, much of which can be attributed to historic colonisation, the clearances, enclosures, and land valuations. Whilst beyond the scope of this study, this is briefly explained by Finlay MacLennan who runs Community Land Outer Hebrides:

> '"The opportunity of land ownership […] played at people's heartstrings a little in terms of righting some of the historical injustices there have been, in terms of people's relationship with the land." The Highland Clearances, the promise of land following the First World War, large areas of croft land, and legal and financial mechanisms have been significant drivers in communities wishing to, and being able to, buy these estates. Finlay continues: "so it's kind of like we owe it to ourselves as a community, historically, to take the opportunity."'

Much of this area in the Outer Hebrides is characterised by peatland, with NatureScot stating that it covers some 70% of the land area. Furthermore,

> 'there is a near absence of woodland due to human activities and livestock grazing over many hundreds of years, combined with the severe climate, and in many areas, lack of suitable soils.' (NatureScot).

Crofting is the predominant form of land use, where it is estimated that approximately two-thirds of the land in the Outer Hebrides is held in crofting tenure. There are therefore limitations in extrapolating the case of these community landowners in the Outer Hebrides to be reflective of other areas in Scotland.

This study is further limited in its focus on community landowners over 1,000 ha. There are many small to medium community landowners whose contributions have not been assessed. Lawrence and Macaulay (2024) explore this in further detail, providing examples with community landowners including Carsphairn Community Woodland, Glenan Woods, Glengarry Community Woodlands and Inchinnan Development Trust, whose activities, governing documents, or objectives have dedicated focus on improving and measuring biodiversity. Further research may seek to investigate these smaller community landowners and whether biodiversity is easier to prioritise and manage at these scales.

7 Results

7.1 Data availability

An immediate challenge was in collating the GIS boundaries for community landowners. Despite access to the Sasines and Land Registry data and the list of community-owned land and Sasines data, Who Owns Scotland data provided the most accessible way to obtain GIS shapefiles for the largest community landowners. This is further expanded upon in the discussion.

7.2 References to biodiversity

When reviewing associated online governance documents, objectives or aims of the largest community landowners, 12 out of 18 referred to 'conserving, protecting or enhancing the environment or natural heritage' (without explicitly referencing biodiversity) - Table 6. The community landowners listed are engaged in a variety of projects, many of which are contributing to biodiversity. For example, North Harris Estate has a range of objectives which contribute to increasing biodiversity, and include reducing deer numbers, and enhancing native woodland. Lawrence and Macaulay (2024) noted that

> 'while the North Harris Trust (Urras Ceann a Tuath na Hearadh) is committed to enhancing this rich natural heritage, the land is seen as very much for its people rather than simply as land in of itself. The Trust has initiated a range of projects that have greatly increased the

amount of native woodland in North Harris. By encouraging regeneration around fragmented areas of remnant woodland, supplemented with planting in suitable areas, the intention is to create a network of native woodland habitat across the estate'

The Knoydart Foundation have focussed on deer numbers and have recently set up a community venison supply. They state:

'our land management team effectively manage the deer population and recently embarked on the ambitious landscape scale Black Hills Regeneration project which seeks to regenerate biodiversity and strengthen community resilience.'

Again, Lawrence and Macaulay (2024) state that

'the reduction in deer impact was anticipated to lead to a cascade of positive changes: regeneration of habitats from sea level to mountain tops; re-establishment of native species like the Black grouse; native woodland planting without extra fencing; natural regeneration of woodlands within an open landscape; peatland restoration and montane habitat regeneration; maintenance of old field systems and iconic views with controlled livestock grazing.'

Furthermore, other community landowners have been specifically focussed on removing non-native tree species, such as Arkaig Community Forest, which states

'in 2022 we constructed our tree nursery, in order to produce locally grown trees to aid in the reforestation of the Arkaig Forest and other similar projects.'

In addition to managing land for biodiversity, many community landowners have partnered with environmental Non-Government Organisations (eNGOs), which have an interest in managing land for biodiversity and restoration more broadly. For example, the Isle of Eigg have a partnership which includes the Scottish Wildlife Trust, an eNGO which had provided funding towards purchase costs and remains as a board member and adviser. Loch Arkaig, Assynt Foundation (Glencanisp and Drumrunie Estates) and Langholm Initiative have partnerships with the Woodland Trust Scotland. The John Muir Trust have supported the acquisition of and have had partnerships with the North Harris Trust, Galson Estate and the Langholm Initiative in the Tarras Valley.

Table 6. The priority of biodiversity in governing documents for the largest community landowners

Landowner	**Aim / article / objective**	**Management objectives referring to biodiversity Quote from Aims / Articles of Association / Objectives**
Arkaig Community Forest	3.3	*To restore and protect the natural environment of the area, and in particular to restore and enhance the native woodland habitats and other semi-natural habitats and associated flora and fauna of the area*
Assynt Foundation (c)	5.1	*To manage community land and associated assets for the benefit of the Community and the public in generation as an important part of the protection and sustainable development of Scotland's natural environment*
Borve and Annishadder Township	8	*The protection of conservation of the environment*
Culag Community Woodland Trust/ Urras Coille Choimhearsnachd Chulaig		*The organisation aims to manage its land for the benefits of the local community through improvement to the environment, providing employment and training, enabling improved access to promote well-being, and through encouraging education about the area's natural environment*
Garbh Allt Community Initiative		
Glendale Estate		

Isle of Eigg Heritage Trust	9	*To take all appropriate measures to conserve the natural heritage (being the flora and fauna, the geological, physiographical and archaeological features, and the natural beauty and amenity) of the Isle of Eigg for the benefit of the community of the island and the public at large and to promote open public access thereto insofar as this is not detrimental to such conservation;*
Isle of Gigha Heritage Trust		
Knoydart Foundation	4.1	*To work for the benefit of the people of Knoydart to improve their quality of life while conserving and preserving the character and natural beauty of Knoydart*
Langholm Initiative	4.3	*The advancement of environmental protection and improvement through the provision of opportunities to engage with the local environment.*
Pairc Trust		
Stòras Uibhist		
Urras Ceann a Tuath na Hearadh/North Harris Trust	3.1	*To take all appropriate measures to conserve the natural heritage (being the flora and fauna, the geological, physiographical and archaeological features, and the natural beauty and amenity) of North Harris for the benefit of the community and the public at large and to promote open public access thereto insofar as this is not detrimental to such conservation*
Urras Oighreachd Chàrlabhaigh / Carloway Estate	2	*To advance environmental protection or improvement including preservation, sustainable development and conservation of the natural environment, the maintenance, improvement or provision of environmental amenities for the community and/or the preservation of buildings or sites of architectural, historic or other importance to the community.*
Urras Oighreachd Ghabhsainn / Galson Estate	5	*The protection and conservation of the environment*
Urras Sgire Oighreachd Bharabhais / Barvas Estate	5.	*To advance environmental protection or improvement including preservation, sustainable development and conservation of the natural environment, the maintenance, improvement or provision of environmental amenities for the Community and/or the preservation of buildings or sites of architectural, historic or other importance to the Community.*
Urras Steòrnabhaigh/Stornoway Trust		
Urras Taobh Siar Na Hearadh/West Harris Trust		

7.3 Community owned land and designated sites

Analysis of the public biodiversity data sets against the area for community landholdings over 1,000 ha (Table 7) found that community owned land contains a high percentage of designated sites - almost double that of Scotland as a whole. Community-owned land also holds a higher proportion of sites in favourable condition, *and* a higher proportion in unfavourable condition when compared to Scotland.

7.4 Community owned land and peatland

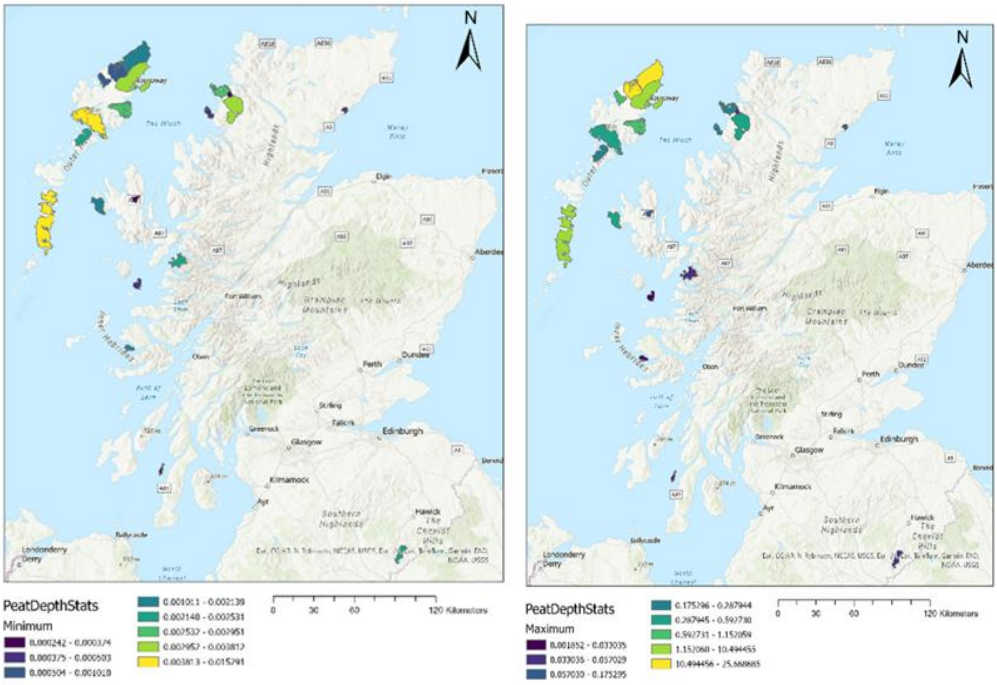
Large community-owned landholdings also proportionately more important for peatland compared to the rest of Scotland (41% of the land area of the largest community landholdings as opposed to 13% for Scotland as a whole). A significant proportion of this peatland is deep peat (Figure 2). Large community-owned landholdings also have proportionately less area under woodland and ancient woodland - in fact, a very small proportion, compared to Scotland as a whole. As mentioned above,

the link between this and the history of buyouts in the northwest highlands and islands, particularly in the crofting areas, is strong, and the land typology contains much peatland.

Table 7. Biodiversity indicators for community landholdings over 1,000 ha and Scotland

	Community landholdings over 1,000 ha (% Scotland)	**Scotland** (% Scotland)
Land area	214,264 (2.7%)	8,023,352 (100%)
	Area within community landholdings over 1,000ha (% of community landholdings over 1,000ha)	**Area within Scotland** (% Scotland)
Designated sites (SSSIs)	101,954 (48%)	1,889,824 (24%)
Designated sites in favourable condition	51,346 (24%)	1,255,102 (16%)
Designated sites in unfavourable condition	50,557 (24%)	565,762 (7%)
Peatland	87,286 (41%)	1,068,290 (13%)
'Natural' peatland	42,805 (20%)	622,934 (8%)
Modified, drained or eroded peatland	44,481 (21%)	445,356 (6%)
Native woodland	1,555 (0.7%)	311,222 (3.8%)
Ancient woodland	595 (0.3%)	352,766 (4.4%)

Figure 2. Peat depth on largest community-owned landholdings



7.5 Community owned land and species

Analysing species records as a measure of biodiversity on landownership boundaries proved challenging to interpret. The NatureScot biodiversity species list contains 1,947 species: 20 species of mammals; seven reptiles and amphibians; 105 birds; 13 fish; 304 terrestrial invertebrates; 83 aquatic invertebrates; 245 vascular plants; 457 non-vascular plants and 713 fungi – (mammals, reptiles and amphibians and fish species are shown in Table 8) - all of which are considered priorities. Records of these species on the National Biodiversity Network Gateway have different data resolutions; being recorded in a range of tetrad resolutions including 100m, 1km, 2km, 5km and 10km grids. Using presence/absence of records at this resolution removes species density from consideration, giving a single record the same weight as multiple records. Records are also heavily influenced by recorder effort (i.e. the presence of local recorders in an area).

Table 8. Priority species from NatureScot biodiversity species list (mammals, reptiles, amphibians and fish *only*).

Mammals	**Reptiles and amphibians**	**Fish**

Water Vole European Hedgehog Wildcat Brown Hare Mountain Hare Otter Pine Marten Orkney Vole Polecat Brandt's Bat Daubenton's Bat Whiskered Bat Natterer's Bat Noctule Nathusius's Pipistrelle Pipistrelle Soprano Pipistrelle Brown Long-eared Bat Black Rat Red Squirrel	Common Toad Natterjack Toad Great Crested Newt Slow-worm Sand Lizard Adder Common Lizard	Sturgeon Allis Shad Twaite Shad Eel Vendace Powan Smelt Atlantic Salmon Sea Trout Arctic Charr River Lamprey Brook Lamprey Sea Lamprey

Shapefiles were imported for each landholding into NBN Atlas and a report run to show the number of species recorded, Table 9.

7.6 Community owned land and deer densities

The most recent deer count data for the largest community landowners was available for 11 of the 18 largest community landholdings (Table 9). Of these, nine had counts less than 10 deer / km2, the average for the highlands, with eight having densities less than five deer/km2.

Table 9. Species records from NBN gateway and deer densities from recent count data from NatureScot

Landowner	Number of species from NBN Atlas records	Deer count area	Count date	Deer density /km2
Stòras Uibhist	>5,000	South Uist	Aug 22	3
Urras Steòrnabhaigh/Stornoway Trust	>2,500	Harris & Lewis	Sep-22	2
Urras Ceann a Tuath na Hearadh/North Harris Trust	>2,000	Harris & Lewis	Sep-22	11
Urras Oighreachd Ghabhsainn/Galson Estate	>1,500	Harris & Lewis	Sep-22	2
Assynt Foundation	>1,500	West Sutherland (Assynt peninsula)	Mar-22	5
Urras Sgire Oighreachd Bharabhais/Barvas Estate	>500	Harris & Lewis	Sep-22	1
Pairc Trust	>1,500	Harris & Lewis	Sep-22	1
Glendale Estate	>2,000	n/a		
Urras Taobh Siar Na Hearadh/West Harris Trust	>1,500	Harris & Lewis	Sep-22	4
Knoydart Foundation	>2,000	Knoydart	Mar-21	12
Urras Oighreachd Chàrlabhaigh/Carloway Estate	>500	Harris & Lewis	Sep-22	0
Langholm Initiative	>1,500	*n/a*		
Isle of Eigg Heritage Trust	>2,500	*n/a*		
Borve and Annishadder Township	>1,000	*n/a*		
Isle of Gigha Heritage Trust	>1,000	*n/a*		
Garbh Allt Community Initiative	>1,000	*n/a*		

Culag Community Woodland Trust/Urras Coille Choimhearsnachd Chulaig	0	West Sutherland (Assynt peninsula)	Mar-22	3
Arkaig Community Forest	<500	*n/a*		

8 Discussion

8.1 Availability and standardisation of data

This report looked at the 18 largest community landholdings to assess biodiversity through publicly available data. An initial finding was the limited access of adequate data. The Land Registration (Scotland) Act 2012 was aimed at making all land ownership in Scotland transparent. It introduced a digital map-based register to replace the historic paper-based Register of Sasines, with a target to have all of Scotland's land registered by December 31, 2024. To date, just under 60% of land has been uploaded. Instead, Who Owns Scotland data provided more information. A similar conclusion was reached by Miller et al, 2024 in a review of landownership data in Scotland. They concluded that:

> '... the only readily usable source of land ownership data with both land parcels and owners attributed is Who Owns Scotland, the outcome of a private citizen's initiative. Otherwise, land ownership relevant data is fragmented with data collected across multiple organisations with different remits. This leads to partial coverage: spatially, temporally, and thematically. This limits the attribution of tenure to individual land parcels and the identification and classification of active land managers and final beneficiaries of land. Such fragmentation is inherently limiting for transparency as, at best, it implies the need to integrate these sources, a substantially challenging task from a technical and institutional perspective.'

Unless and until an equally transparent and ideally more accessible and user-friendly alternative is developed, it will prove a difficult and highly technical task to access the types of information necessary to conduct this exercise on the scale of an estate. Furthermore, unless this task is assumed by a public body, future access to this data will depend on the current administrator of Who Owns Scotland. This lack of long-term resilience should be of concern to all who rely on this information.

While biodiversity is a public policy priority, its assessment on individual landholdings is difficult for several reasons. Measuring biodiversity means counting the number of species, or the number of occupied ecological roles (Haug *et al*., 2023). For individual landholdings this requires a significant resource and expertise in a wide range of taxa with collection and collation over decades. The data for large community landowners show an impressive range of species from 500 to 5,000 recorded so far, but also a high variability between landholdings. Although it is difficult to ascertain from public data, this is likely to be as much the result of the distribution of species experts' efforts as necessarily a reflection of the biodiversity richness of a landholding alone.

Fundamentally, there is currently no standard way for landowners to assess biodiversity. The Cairngorm National Park Authority is currently developing a Nature Index, collating a wide range of available datasets to create an index to provide a baseline of 'the species, habitats and ecosystems' within the park, to monitor future change. This is based on the Norwegian Nature Index which

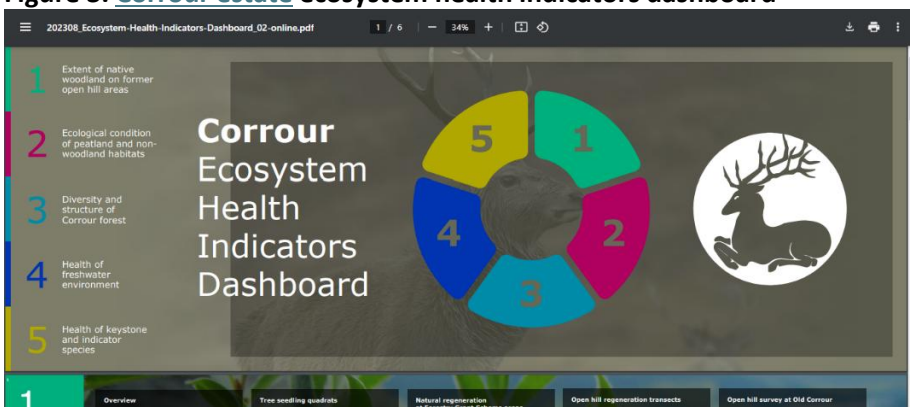
> 'measures the state of biodiversity in Norway and provides an overview of the development of ecosystems for selected species groups and themes'.

Given that the Cairngorms National Park, one of the most protected areas in Scotland with biodiversity as a key objective within its management, is only now developing a way to assess biodiversity, it is not surprising that community landholdings have little data or lack of methodologies for measuring biodiversity. This is not unique to community landowners; most large landholding in Scotland over 1,000ha do not publicly mention biodiversity or have any measures of

biodiversity within them. Instead, if any information is provided, it tends to focus on land management approaches[2] rather than biodiversity data.

Some private estates which have focussed on improving biodiversity on their land have developed online dashboards to display biodiversity data. For example Glen Lochay estate (5,186ha) and Corrour estate (23.067ha) (Figure 3). These are individual estate initiatives which could form the basis of a standardised approach.

Figure 3. Corrour estate ecosystem health indicators dashboard



8.2 Prioritisation of biodiversity

As well as the lack of a standardised approach, attempts to assess community landholdings contributions to biodiversity is further compounded by community landowners having many pressing priorities, with the primary focus being to ensure sustainability for local communities and deliver immediate community benefits. Monitoring, including baseline and biodiversity, is lower down the priority list, reflecting the findings of studies indicating that social and economic objectives have been pursued in community landownership policy and practice ahead of environmental goals (Pillai, 2010).

Twelve of the 18 landholdings mentioned biodiversity type terms in their founding or constitutional documents. It is worth noting that two of the landholdings were acquired over a century ago (Glendale and Stornoway) before environmental conservation or biodiversity were in the public or political consciousness. More recent community buyouts have increasingly focussed on the environment and biodiversity (such as Tarras Valley).

Although there may be a lack a specific focus on biodiversity, in most cases environmental sustainability is central to community aspirations for the land they manage. A recent study (Lawrence and Macaulay, 2024) which looked at community landowners and rewilding across a broad range of types and sizes of community landowners, including five of those assessed here (Glencanisp and Drumrunie Estates; Knoydart Estate; Ground at Glen Mallie Woodland and South Loch Arkaig Woodland; North Harris Estate, Scalpay Estate, Loch Seaforth estate and Tarras Valley Nature Reserve) sought to 'understand whether community ownership or management is associated with a shift towards rewilding or ecological restoration objectives, and whether those objectives lead to outcomes that register on the 'spectrum' of rewilding'. The study concluded that:

[2] In a report on 'The contribution of rural estates for Scotland's wellbeing economy', the authors used the approach of how land management was '...implementing sustainable agriculture; responsibly managing ancient woodland and environment sites, restoring peatland and other habitats; supporting wildlife conservation; implementing sustainable deer management practices and supporting sustainable visitor management' to assess how 'estates contribute to Scotland's biodiversity and natural capital'.

> ‘community ownership is often motivated by a wish to see more nature friendly management objectives and ecological improvements and all our examples included some element of narrative indicating that the community aimed to improve nature outcomes.’

8.3 Biological monitoring

One area for which public data is not available and at which community landowners contribute significantly is in community participation in biological monitoring. Lawrence and Macaulay (2024) highlight that:

> ‘The role of community ownership in ecological restoration may be better evidenced with the development of an accessible toolkit which matches community scope, and allows flexibility for participatory design of targets and indicators.’

One such tool is iNaturalist which enables ‘citizen scientists’ to upload species records and data. Such an approach is used by Friends of Glenan Wood · iNaturalist and Aye Naturalist - Friends of Glenan Wood.

Previous research has also highlighted the role of community engagement in enhancing the role of community landowners to tackle the other ‘'twin’ crisis of climate change (Macaulay and Daglish, 2021), with case studies including the restoration of peatland and the effective management of woodlands and other natural areas. Due to the intrinsically intertwined nature of these crises, it may be assumed that the same ‘added value’ of community engagement in such efforts will be present in community landowners’ approach to promoting biodiversity.

From 2026, farmers in Scotland will be required to undertake a biodiversity audit as part of accessing agricultural payments. This will involve the development of a habitat map at farm or croft level, which will include habitats and linear features on farmland. Guidance will also be provided to assess the current condition habitats. The aim is to develop an audit which is a simple tool. As well as being relevant to farmers and crofters on community-owned land, there may be elements of the audit process useful for wider use by land owners and community groups.

8.4 Public measures

In this study, the largest community landholdings contained a large percentage of designated sites when compared to Scotland as a whole. While this mostly reflects the fact that most communities have acquired already protected areas (with designations beginning in 1949 for Sites of Special Scientific Interest (SSSIs)), it also illustrates the key role that community landowners have in managing and maintaining some of the nation’s most important protected sites. The largest community landowners also manage significant areas of Scotland’s peatlands, much of which is in poor condition and has the potential for restoration. The corollary is that the peatlands of the north and west contain very little woodland and hence the largest community landowners (which are predominately situated in the north and west) have a disproportionately small area of woodland.

Deer count data found that nine of the 11 largest community landowners for which recent count data was available were managing deer at densities less than five deer per km2. While deer impacts varies with geography and habitat, as a broad rule of thumb, less than five deer per km2 is generally considered compatible with woodland regeneration (Gullet et al 2023) and ecological restoration. Therefore, large community landowners appeared to be focussed on sustainable deer management and by association ecological restoration and biodiversity were likely to benefit, even if they were not necessarily primary objectives.

9 Recommendations

This report has highlighted the need for:

Better transparency and accessibility of land ownership boundaries

As highlighted throughout this study access to land boundaries remains challenging, despite steps being taken to facilitate this. Who Owns Scotland remains the easiest platform to obtain land ownership boundaries.

Clarity on public objectives, measures and outcomes for biodiversity for landowners
Despite being a major component of national and international policy, this report has also highlighted the challenge of determining what exactly biodiversity is and what it means for landowners in Scotland. The Scottish Biodiversity Strategy and its associated delivery plan, while not aimed at landowners specifically, does not directly articulate practically what landowners should be monitoring or managing.

Better transparency of land management outcomes for biodiversity
It is hard to quantify biodiversity benefits being delivered by landowners of all types. Publicly available standardised management plans for large landowners detailing action being undertaken for biodiversity, including monitoring would be a useful tool for assessing delivery of public benefit. So too would development of a standardised dashboard for large landholdings to report on biodiversity outcomes, as a number of privately owned landholdings are doing.

Guidance for landowners on monitoring biodiversity
A recommendation from this study is that community landowners have improved access to guidance on assessing and monitoring biodiversity. As an example a series of outline steps are shown in Figure 4 towards establishing a biodiversity monitoring strategy. This aligns with the outcome of the report by Lawrence and Macaulay (2024) which states:

> 'The role of community ownership in ecological restoration may be better evidenced with the development of an accessible toolkit which matches community scope, and allows flexibility for participatory design of targets and indicators.'

Reviews of biodiversity conservation repeatedly note that:

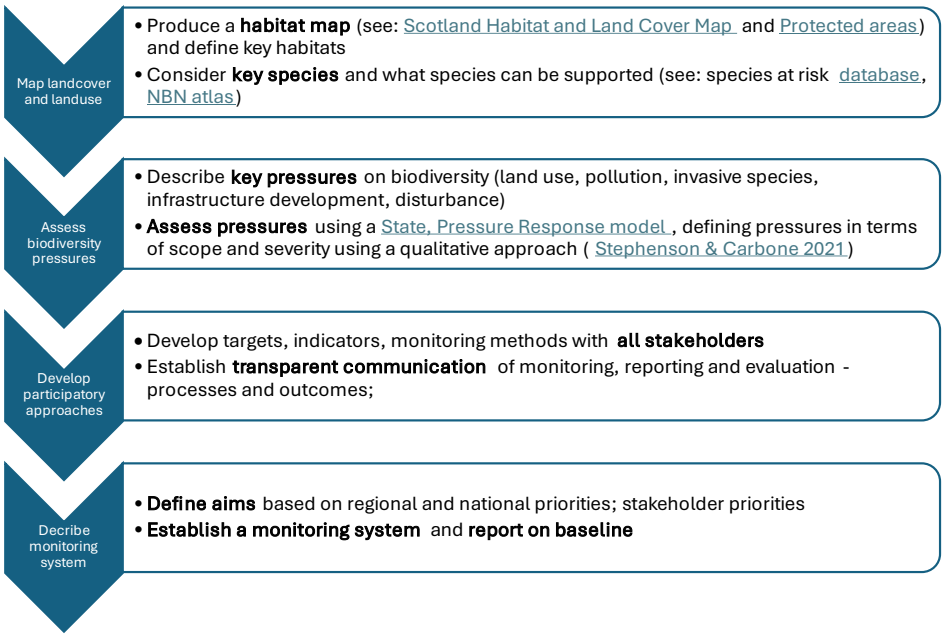
> 'local and experiential knowledge is underutilised in environmental decision making [and] needs to be brought together into decision-making locally and nationally, and integrated with scientific evidence' (Pakeman et al 2023).

This applies to the monitoring and evaluation of biodiversity outcomes. Community landowners cannot know if or how they are achieving their biodiversity objectives if they lack the resources to monitor them. Given the range of interpretations of 'biodiversity' reviewed in this report, there are a range of entry points for community assessment of biodiversity and this may be considered as component of each of the steps suggested here. The most suitable approach will depend on the landholding and the history and cultural of community involvement in land management.

Local communities often hold rich knowledge of features and localities that hold biodiversity value which may not appear in either national datasets or local biodiversity records. Community engagement processes should capture local value and knowledge; information which can then be integrated into management planning and monitoring. For example, community members in Perth and Kinross are invited to contribute to the identification of core biodiversity areas as part of NatureScot's Nature Networks initiative.

As well as being able to identify, features unrecorded elsewhere, communities hold valuable information on historical biodiversity presence, absence and trends. Community members can have an important role in monitoring biodiversity. As well as the development on indicators, volunteers can record data using citizen sciences approaches. Apps such as inaturalist and ebird are becoming increasing popular can may prove a useful tool.

Figure 4. Steps toward establishing a biodiversity monitoring strategy



10 Acknowledgements

Josh Doble – Community Land Scotland for input and comments
Eddie Carver, Steve Carver – Wildland Research Ltd for GIS mapping
Alan Laws, Steve Davie, Euan Nelson - Unlocking Sasines, Registers of Scotland for landownership data
Andy Wightman - Who Owns Scotland for landownership data
James Irvine – NatureScot for deer data
Ciaran Robb, Fraser Macfarlane – James Hutton Institute for peatland data
Darlene Russell – University of the Highlands and Island for advice on innovation voucher