# Mapping Scottish landownership

## Research Briefing

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## Context

The Scottish Government Rural and Environment Science and Analytical Services (RESAS) division funds the Strategic Research Programme 2022 - 2027 to advance the evidence base in the development of rural affairs, food and environment policies.

One of the themes (Theme E) of the Strategic Research Programme is on Rural Futures. This theme has 3 research topics: rural communities, rural economy and land reform. There are 2 projects within each topic, led by Scotland's Rural College (SRUC) and James Hutton Institute (JHI). This publication sits within a series of publications as part of this theme.

Within the land reform topic, the two projects are

1) Impacts of Land-Based Financial Support Mechanisms on Land Values, Landownership Diversification and Land Use Outcomes
2) Scotland's Land Reform Futures

This current research on land markets and land use change aims to understand whether recent land transactions are leading to (and fuelled by) land use change, for example, towards achieving net zero. Relatedly, it aims to explore the influence of financial support mechanisms on land values, particularly the recent interest in carbon schemes. It will provide an evidence base for understanding the effects increased land values are having on Scottish Government land reform goals to further improve transparency of land ownership, help ensure large scale land holdings deliver in the public interest, and empower communities by providing more opportunities to own land and have more say in how land in their area is used.

Previous publications are:

A Rapid Evidence Assessment of Investment Decision-Making for Land (June, 2023)

Assessing land use change: International evidence review (June, 2023)

Rural Land Values and Land Diversification (May, 2023)

Rural Land Values, Sales and Investment Trends (December, 2023)

This research is part of the wider project "Impacts of land-based financial support mechanisms on land values, landownership diversification and land use outcomes" (SRUC-E3-1/C3-1). This Research Briefing demonstrates our work to date on a workpackage concerned with mapping the ownership, sales, land use (change) and monetery flows of Scottish land over time. It provides a working methodology, applied to a small case study. In future years this method will be used to map multiple larger case studies across Scotland. This specific research is entitled "Mapping public monetary flows into Scottish land using a landownership typology" (Deliverable D4.2).

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**List of Acronyms (in order of appearance)**

**RoS** Registers of Scotland (A Public Organisation responsible for administrating the Land Registry in Scotland)

**WOS** – Who Owns Scotland (A project and data set administrated by Andy Wightman that spatially depicts land ownership in Scotland)

**NFEO** - National Forest Estate Ownership Scotland (A data set administrated by Scottish Forestry that spatially depicts ownership of estates)

**ISLO** – Improvement Service Scotland Land Ownership (A data set administrated by Improvement Service Scotland that spatially depicts land ownership)

**NRLV** – Non-Residential Land Values (A data set administrated by Registers of Scotland that spatially depicts recent (2018-2023) land transactions)

**INSPIRE** – INSPIRE (A data set administrated by Register of Scotland which is a Cadastral Map and contains the location of ownership polygons at ground level in Scotland)

**RPID** - Rural Payments and Inspections Division (A Public Organisation responsible for administrating Rural Payments such as the Agri-Environmental Climate Scheme, Basic Payments Scheme and the Forestry Grant Scheme)

**LPIS** – Land Parcel Information System (A data set administrated by Rural Payments and Inspections Division (RPID) that spatially depicts beneficiaries of public grants and subsidies)

**RESAS** - Scottish Government Rural & Environmental Science & Analytical Services (A Department of the Scottish Government that fund strategic research and administer data sets relating to agriculture and the environment)

**JAC** – June Scottish Agricultural Census (A data set administrated by Scottish Government Rural & Environmental Science & Analytical Services (RESAS))

**LPID** – Land Parcel ID (One attribute in the Land Parcel Information System (LPIS) data set which identifies an individual land parcel)

**CPH** – County Parish Holding (One attribute from the June Scottish Agricultural Census (JAC) data set that is required to keep livestock on land or a building)

**BRN** – Business Reference Number (One attribute in the June Scottish Agricultural Census (JAC) that is prescribed to a business. There may be multiple parcels of land under one BRN)

**DW** – “Dealing with Whole” (One attribute in the Non-Residential Land Values (NRLV) dataset that indicates that a whole land parcel is being transacted)

**TP** – “Transfer of Part” (One attribute in the Non-Residential Land Values (NRLV) dataset that indicates that part of a land parcel is being transacted)

**CEH** – UK Centre of Ecology and Hydrology (A research institute based in England)

**OS** – Ordnance Survey (The national mapping agency for the UK)

**WIG** – Woodland Improvement Grant (A grant administrated by Scottish Government as part of the Forestry Grant Scheme)

**WIAT** - Woodlands In and Around Towns (One type of Woodland in Scotland)

# Highlights

**What were we trying to find out?**

We developed a methodology to determine if there is a relationship between landownership and, firstly, land use decisions (a land use change, continuation on the same path, diversification etc.), and secondly, monetary flows into land, and whether either of these are affected by a recent sale (i.e. a sale triggers a change of land use or a change of monetary flows). This is a multi-year process which is ongoing. In this research briefing we present our work to date, which includes a working example of an area of the Spey Catchment.

**What did we do?**

We utilised multiple data sources to compile a map representing land ownership, recent sales, monetary flows and land use/land cover. This was a complicated task, with a new method created to aid and partly automate this process. The main data set utilised to map land transactions was purchased from the Registers of Scotland (RoS) which proved very hard to work with due to multiple inconsistencies at the data entry stage. Land ownership was mapped primarily with purchased Who Owns Scotland data. Land use/cover was mapped using a suite of different data sources. When the process was refined, it was applied to a small case study.

Parallel to the mapping work, a landownership typology was created. This is a seven-fold typology that categorises individual parcels of land according to size, ownership, land use, type (farm/forest/estate), size descriptor and any defining characteristics. The ownership typology was then applied to the case study area. Multiple data sources were used to map monetary flows.

**What did we learn?**

Spatially mapping landownership and recent sale transactions of land is complex and arduous. Despite these issues, we still managed to create a working methodology for mapping landownership using Registers of Scotland data, and successfully integrated this with multiple other data sources. Through this process we have developed a tool that is (once the landownership level is complete) fully automated and can produce useful maps and descriptors of any piece of land in Scotland, so long as ownership is known.

**What do we recommend and what happens next?**

In the coming years of the project this mapping exercise will be applied to four case study areas across Scotland (Tweed Catchment, Spey Catchment, Shetland Islands, and Galloway and South Ayrshire Biosphere Reserve). The case study presented in this Research Briefing is static in time, but we also intend to map these areas over multiple historic years to track patterns in landownership, land use change and monetary flows into land.

## Executive Summary

- This research is our work to date on developing and applying a methodology to monitor relationships between land ownership (and recent transactions of ownership), land use and monetary flows into Scottish land.

- Being able to demonstrate landownership is complicated, especially spatially as the Land Registry in Scotland is incomplete, inconsistent and, if land has not transacted since 1979, split between the new (map-based system) and old (Register of Sasines) system.

- This research undertook the complex task of utilising inconsistent and fragmented Registers of Scotland data. It builds on the methodology presented previously in Gibson-Poole and Sepulveda (2023) and expands on it by adding multiple layers of data to the analysis.

- To attain a near complete layer of landownership, four stages of processing were required to make the data workable. Once this layer was complete, multiple other data sources were overlaid on top of the ownership layer.

- In parallel, a landownership typology was developed which has seven levels of consideration. This typology can automatically classify any piece of land in Scotland with a useful descriptor, for example: “a privately owned, medium sized farm situated in lowland area with predominately high-quality land “*of which has a new owner*”.”

- As well as demonstrating landownership and land use/coverage, multiple publicly available data sources on financial flows into land (subsidies, grants, feed-in tariffs, carbon schemes) were added to the typology to be able to indicate where public money was being received.

- This methodology and typology was applied to a small case study area (catchment of the river Spey) to act as a proof-of-concept, with maps produced demonstrating each level of the typology.

- Further, the typology was then applied to a single land holding to demonstrate the levels of detail that can be achieved. Again, multiple maps were produced to demonstrate the methodology working.

# 1 Introduction

Land ownership is a key policy area for the Scottish Government. It is well reported that the concentration of landownership in Scotland is the highest in Europe and possibly of all developed countries (Scottish Land Commission, 2019, Wightman, 2013, Glenn et al., 2019). This was due to the persistence of feudal tenure of historic Lairds which was only formally abolished in law in 2000. Since then, Scotland has introduced a progressive and ongoing land reform agenda, with Acts in 2002 and 2016, with another the Land Reform (Scotland) Bill- introduced on 13 March 2024. This Bill aims to reform the law around large landholdings and certain types of leases of land.

Being able to demonstrate landownership is complicated, especially spatially as the Land Registry in Scotland is incomplete, inconsistent and, if land has not transacted since 1979, split between the new (map-based system) and old (Register of Sasines) system. In the near future the Land Registry will be completed, but for now it is difficult to provide a clear and complete understanding of land ownership in Scotland. A recent review of available data for mapping land ownership in Scotland confirmed that data availability was limited, expensive and hard to collaborate with (Miller et al., 2024).

Adding to these complexities, there has been a recent interest in purchasing Scottish land as an investment opportunity (McMorran et al., 2022, Merrell et al., 2023, Glendinning et al., 2023). This is due to the interest in nature-based solutions to carbon sequestration which produce saleable carbon credits (also known as natural capital payments), the Scottish Governments ambitious targets towards achieving Net Zero, and favourable financial incentives to meet this goal (primarily through the Forestry Grant Scheme and Peatland Action funding). Reports of trans-national pension funds, wealthy private individuals and companies/corporations buying land in Scotland have captured the public's attention and calls for greater scrutiny of largescale purchases of land have been aired (Glenn et al., 2019). As some of these purchases are motivated by attaining natural capital payments or through commercial forestry opportunities (although this interest has recently cooled (Glendinning and Merrell, 2023)), there is an expectation that some degree of land use change will occur after a purchase, of which may have either negative or positive social and/or economic impacts on the communities living in the vicinity of this 'green investment' strategy (McKee et al., 2023). Fundamentally, the sudden attention in Scottish land as an investment opportunity has negative consequences for Scotland's land reform agenda, as communities are being priced out of the land market (Wightman, 2024b).

Within this context, the purpose of this research is to map landownership in Scotland and to overlay data around financial flows into land and data on land use (change). This Briefing Paper serves two functions. Firstly, it builds on and implements the previously published methodological Working Paper (see Gibson-Poole & Sepulveda, 2022, available here) of how to use Registers of Scotland data in GIS software. Secondly, the paper introduces a landownership typology. This is a useful tool rooted in Scottish/UK policy and the academic literature. This multi-criteria typology is then applied to a small case study, with the intention to continue this work during the future of the project. The case study used is one section of the catchment of the River Spey.

# 2 Methodology and Data

Below is an explanation of the main methodology employed and main data sources used. It is worth noting that some of the statements (particularly around using Register of Scotland data in Section 2.1.2) came from email correspondences or notes taken in meetings with Registers of Scotland and/or the Scottish Land Commission (who are also using the data in a similar fashion).

## 2.1 Landownership identification

The foundation of this work is the ability to identify the boundaries of landownership within the area of interest as completely as possible, as all further processing and analysis will build on this layer. For this report, an area with the catchment of the River Spey is used as an example (Figure 1), with the intention of mapping four case study areas (catchment of River Tweed and Spey, Shetland and Galloway and South Ayrshire Biosphere Reserve – indicated on the inset map) over the course of the project. The approach taken is to utilise existing data of known ownership and integrate it with land sale data supplied from the Registers of Scotland (RoS) and with agricultural land parcel data from the Scottish Government (Table 1). To integrate these datasets, a four-stage process was followed so that landownership could be identified and expanded upon to produce a single homogenous layer covering part of the River Spey Catchment.

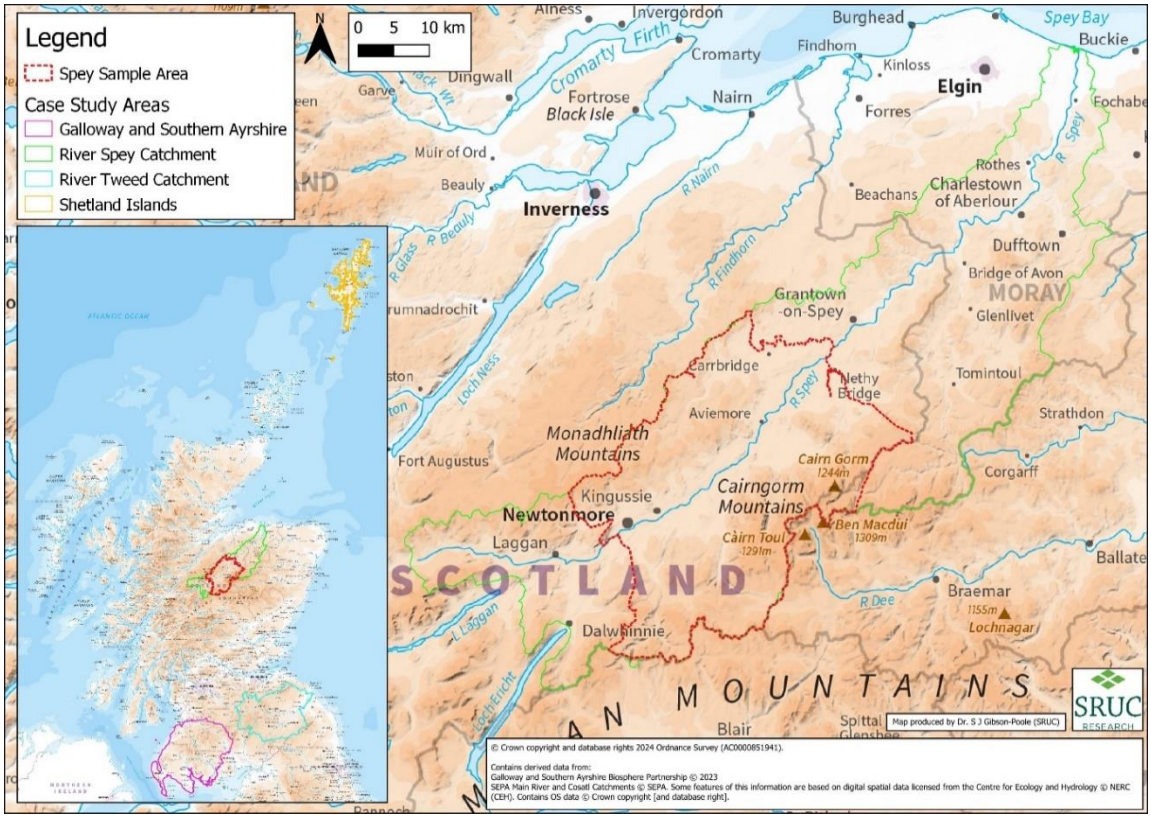


***Figure 1: Area of River Spey Catchment used as the basis for methodological development of the landownership typology***

***Table 1: List of data layers, sources and acronyms used to create ownership layer.***

| Source | Data layer (acronym) |
|---|---|
| Andy Wightman | Who Owns Scotland (WOS) |
| Scottish Forestry | National Forest Estate Ownership Scotland 2019 (NFEO) |
| Improvement Service Scotland | Land Ownership (ISLO) |
| Registers of Scotland | 2018 – 2022 Non-Residential Land Values (NRLV) |
| Registers of Scotland | INSPIRE (INSPIRE) |
| Rural Payments and Inspections Division (RPID) | Land Parcel Information System (LPIS) |
| Scottish Government Rural & Environmental Science & Analytical Services (RESAS) | June Agricultural Census 2021 (JAC) |

### 2.1.1 Landownership (Stage 1 – 2)

The first stage was the simplest, with the integration of the '[Who Owns Scotland]' (WOS) data with known forest boundaries supplied within the National Forest Estate Ownership (NFEO) dataset. This involved the conversion of the data layers to the same 2 metre grid (to automatically resolve small overlaps within each data layer)

before joining the layers in a union and resolving any areas of overlap due to the union. The second stage integrates Improvement Service Scotland's Land Ownership (ISLO) data in a similar manner with the stage 1 ownership layer, with the extent of the ISLO polygons taking priority over WOS or NFEO polygons.

### 2.1.2 Landownership (Stage 3)

The third stage required the integration of Non-Residential Land Value Data (NRLV) from RoS, which itself required processing and filtering before integration could be attempted. This was because NRLV point data had to be matched to ownership polygons derived from RoS's INSPIRE dataset, so that a spatial footprint of each NRLV transaction could be realised. The method developed by Gibson-Poole and Sepulveda (2022) in the first year of this project was found to have some issues (Scottish Land Commission, 2023) and was therefore modified to improve the matching process (details of this modified method will be within an updated version of Gibson-Poole and Sepulveda (2022)).

Even with these modifications, problems with the quality of the matching process persisted due to a range of issues that are difficult to resolve automatically:

- The way RoS generate the origin (X/Y point) of each NRLV transaction is not always over the actual area of land that has been transacted (it can be over the area of the parent title ID for instance).
- INSPIRE polygons generated by RoS are not always showing the true ownership boundary (due to difficulties in identifying this boundary from the textural information of each title within the register).
- Each NRLV point not always reporting the actual area of land that had been transacted within the subject's field (this was only required within the registration system to unambiguously identify the parcel of land for more complicated registrations, obtaining the actual area may be possible via further data purchasing from RoS).
- The inclusion of data that indicated a change to part of a registered title that had not actually been transacted itself (which was unexpected, leading initially to false reporting of potential transactions).

These issues were discussed with RoS when they were identified so that amendments to the matching process could be made and improvements to areas, such as the generation of INSPIRE polygons, are expected from RoS within the first or second quarter of 2024. However, due to these issues the automatically matched NRLV data had to be manually checked to remove any erroneously matched data, as well as filtering to show only the latest matched transactions, as some parcels of land had been transacted multiple times within the 2018-2022 timeframe of the NRLV data (primarily areas destined to become housing developments). Once these manual

checks were resolved, land that was less than 3 hectares[1] in size was ignored, before the NRLV polygon data was converted to a 2 metre grid and joined in a union with the Stage 2 ownership layer (Figure 2).

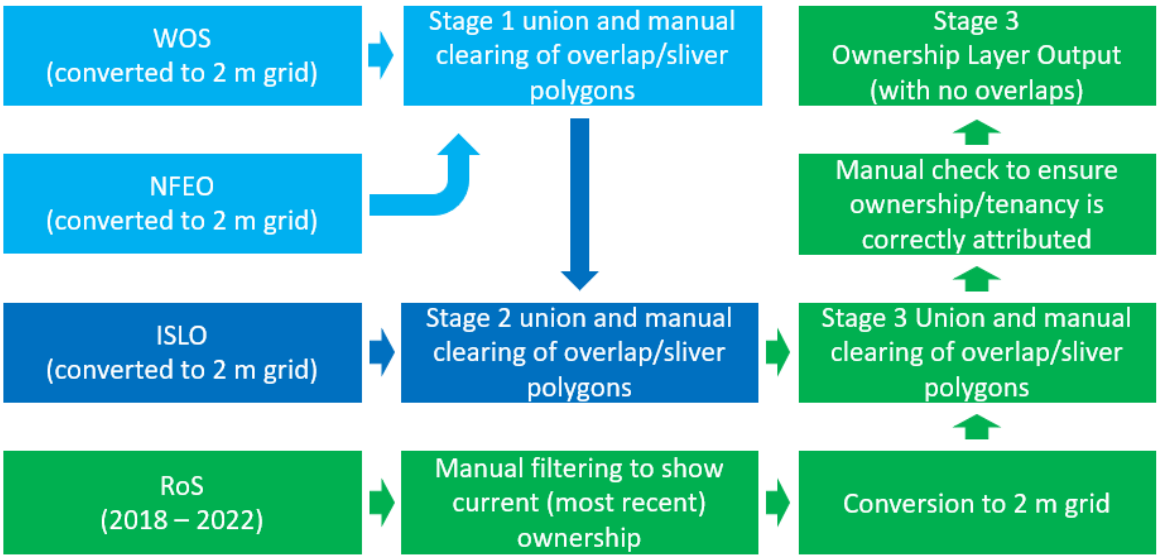


*Figure 2: Workflow for Stages 1-3*

A final manual check was required to resolve minor overlaps/sliver polygons resulting from the union, correctly attributing tenancy (for NRLV data with a deed type indicating as such) and confirmation of ownership change (where the NRLV data overlapped that of the existing Stage 2 ownership layer). During these manual checks features such as indications of land destined for housing development were noted (areas matched to local development plans), as well as indications of estate expansion (matching of new owner names to existing ownership layer) and if an estate had a new owner.

### 2.1.3 Landownership (Stage 4)

The fourth stage required the integration of LPIS boundaries (with accompanying agricultural census data), to further fill in gaps within the Stage 3 ownership layer. Each polygon within the LPIS data has a land parcel ID (LPID), which within the agricultural census data is related to a county parish holding (CPH; a CPH can have one or more LPID's related to it), which in turn is related to a business reference number (BRN; a BRN can have 1 or more CPH's related to it).

The LPIS data was anonymised, so it was not possible to directly attribute it to the Stage 3 ownership layer via the use of any existing owner names or businesses. Therefore, the Stage 3 ownership layer was utilised to give context to the LPIS layer

[1] Hectare - a metric unit of square measure, equal to 100 acres (2.471 acres or 10,000 square metres).

by attributing potential ownership to particular BRN's via a spatial overlay, and where a BRN was not spatially attributed with an existing owner, these could be regarded as independent owners (i.e. specific farm business, crofts etc.).

The LPIS data was reduced down to the case study area before being cleaned (removal of land parcels that had no CPH, or a CPH of 0, or no link to the JAC; setting a unique BRN based on the CPH if existing BRN was 0). The area of each land parcel was identified before the land parcels were converted to centroids. A spatial join between these centroids and the Stage 3 landownership layer was then made to identify which BRN's were associated with existing ownership. Where there was no spatial overlap the BRN was used as a temporary identifier for ownership.

The percentage of land from a single CPH was then identified per landowner (as a single CPH could be spread over several landowners), before the following rules were applied to set the final ownership for each LPIS land parcel (Figure 3):

- If only one landowner is associated with the BRN then that landowner has ownership.
- If identified as a croft[2] with only one holding (i.e. one CPH) or multiple holdings that are all indicated as crofts, then set as independent ownership regardless of the number of associated landowners.
- If more than one landowner is associated with the BRN then the landowner that controls the largest percentage area has that ownership.

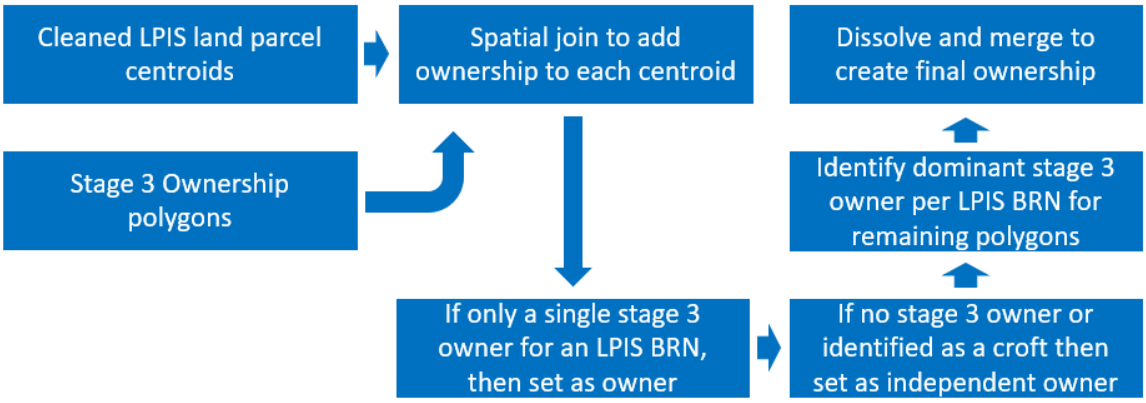


***Figure 3: Workflow for Stage 4***

[2] The Crofting Register held by RoS (https://www.ros.gov.uk/our-registers/crofting-register) was not used to identify crofts for this iteration of landownership identification, as discussion with RoS revealed that it is not yet fully complete with regards to the spatial boundaries for each registered croft. The Crofting Register will however be investigated in the next iteration, as the crofts that are fully mapped within the register may show a more complete ownership boundary compared to just the LPIS boundaries extracted (i.e. field boundaries as well as the farm steading and areas not registered within the LPIS system).

Once ownership was identified and set, holdings from an independent owner that were less than 3 hectares in size were excluded. LPIS polygons were dissolved, converted to the same 2 metre grid as the Stage 3 ownership layer and merged with the Stage 3 ownership layer to create a final layer depicting ownership land parcels for the entire area of interest.

# 3 Mapping Landownership and Transactions

## 3.1 Summary of ownership within the sample area

The size of the area within the River Spey catchment totalled about 118,221 hectares, of which about 115,979 hectares were successfully mapped with regards to ownership (98 %). In total, 88 separate landowners with land parcels greater than 3 hectares were identified, with the source of each derived from the following data layers:

- WOS, 24 (~105,365 hectares)
- NFEO, 7 (~9,107 hectares)
- ISLO, 3 (~34 hectares)
- NRLV/INSPIRE,19 (~350 hectares)
- LPIS/JAC, 35 (1,121 hectares)

The use of the LPIS/JAC data helped to fill in gaps within the ownership layer and expanded some of the areas which already had identified owners within the other datasets. It also highlighted some interesting aspects in that some large estate areas (identified within the WOS dataset) had the same BRN, indicating that they all had the same potential owner. These estates were highlighted within the WOS dataset as being owned by separate managing companies, but all essentially having the same owner, so these will need to be accounted for in the future (a manual fix was applied for this case study to keep the ownership separate based on the managing companies).

One area of concern with the method applied to identify ownership, is where very large areas of ownership (identified within the WOS dataset) are potentially not well defined. This can lead to a large number of agricultural holdings and business being within that area of ownership and therefore impossible to separate from it (as there is no way of knowing if those business are, or are not, related to that particular owner). This anomaly only affected a single owner within the sample area of interest, but further investigation into this will need to be made to find an effective resolution (most likely in collaboration with Andy Wightman).

Further to this, more refinement is required with regards to the integration of the LPIS boundary data at Stage 4 of the ownership processing. Currently holdings that have a mixed or wholly rented tenancy are essentially indicated as independent landowners, which may well not be the case. This is less of an issue where the land parcels are already over known ownership (from stages 1-3), but where they are not, being able to attribute ownership effectively to a CPH that is wholly rented is desirable (this will

also allow the setting or indication of tenancy for that owner). Likewise, for a CPH that has mixed tenancy, being able to identify which part of a CPH is rented (and to whom) and which is owned needs to be resolved.

Discussion with colleagues from James Hutton Institute will explore this aspect further to find an effective resolution, although setting the actual type of land tenure might prove challenging for data post 2021 due to this information being deprecated from the JAC, as James Hutton Institute have already reported on (Miller et al., 2024).

## 3.2 Summary of RoS NRLV transactions within the sample area

Within the NRLV transactions, there were 3 tenancy related transactions (some for quite large areas of land) and a number of other transactions of interest:

- 7 identified as for housing development.
- 7 that appear to be farmland.
- 2 that appear to be more related to large dwellings with their land parcel (potentially small estates).
- 1 that is now a community asset (Boat of Garten woodlands and loch).
- 1 that is a commercial/urban (Coylumbridge hotel).
- 1 that relates to a salmon fishing permission for a stretch of the Spey.

### 3.2.1 Notes of interest regarding ownership within the RoS NRLV transactions

Only commercial related owners are identified within the RoS NRLW data, however there are flags that can help identify other private aspects of ownership:

- 3 records indicated a granter/applicant surname match, indicating that the sales have remained within a family (all were farmland related).
- Interrogation of applicant addresses revealed that one of the applicants involved in a lease of a land parcel was a foreign applicant (an Australian address).

### 3.2.2 Issues encountered when processing RoS NRLV transactions

Section 2.1.2 already indicated the methodological issues encountered whilst processing the RoS NRLV transactions to match them with the INSPIRE dataset. However, further data intricacies were identified that may cause issues for later stages of this project, when the identification of the price of land (and its potential change) is required.

For the value of land, two indications are given; the “Consideration” (the monetary amount that is paid for a property transaction), and the “Value” (the amount stipulated as the value of a transaction when the price paid, or consideration is not the true market value).

These however are often not provided, or both have a value of 0. Sometimes this could be because there are multiple parts to a transaction (or dual registrations), where the value/consideration could well be indicated in the related transaction. This can be the case if there is a “Dealing with Whole” (DW) transaction record, as well as a Transfer of Part (TP) record. These linked transactions are usually indicated via the mentioning of “Dual Reg” within the transactions subjects’ text, and the TP record should indicate the title number of the DW record as its parent title (however the subjects attribute is a free format text field so spelling errors/inconsistencies can also cause issues here).

There can also be other, smaller areas of land within the larger area that have their own title numbers and are not obviously linked in any way to the main DW/TP transaction but can have the same value/consideration as the larger DW or TP transaction, leading to some confusion that may be difficult to resolve without manual analysis. For example:

> Kinrara estate, purchased by Lost Forest Ltd. (Brewdog) in late December 2020. The main DW transaction has a consideration of 0 with no value given, but its related TP transaction has a consideration of £8,800,000 (with no value given). However, three other smaller areas transacted at the same time (within the main area of the estate), with each having their own title number and no direct linkage to the overarching DW record (other than spatially), but also each had a value of £8,800,000 (the gardener’s cottage, one of the large houses on the estate and a neighbouring small parcel of land). Interestingly the large house and neighbouring small parcel of land were subsequently sold a year later for £1,061,000 (again, the same consideration indicated for both), but the areas of land were less than 3 hectares in size and so too small to be included within the analysis of this report.

Further to this, considerations can be monetary or non-monetary (such as an implement of a will, or love favour and affection[3]), and if part of the consideration is non-monetary (or is monetary but only relates to a part share of the property) then the consideration will be marked as 0, as it does not represent the true market value of the property. In situations such as this then the value field should be populated as it is used by RoS to charge a registration fee. However, this does not always seem to be the case, which may pose difficulties when identifying the value of land at time of sale and will require further discussion with RoS to hopefully identify the reasons behind this.

[3] A non-monetary form of transferring land or property as a gift to a relative, partner or friend.

# 4 Creating a Landownership Typology

A typology of landownership that also incorporates elements of land use and financial flows into land would be a valuable tool for researchers, policy-makers, public organisations and practitioners (land managers etc.). Using the previously discussed methodology, a typology was created, rooted in Scottish policy and findings from the academic literature. Feedback was gained from a group of influential stakeholders and the typology was refined following their expert guidance. The purpose of this typology is to provide a framework so that we can gain a nuanced understanding of the investment strategies, motivations around land use change and uptake of public funding across a range of different landowner categories. The typology could also be useful for a range of organisations and businesses. It has seven levels of consideration, that start broad and become narrower. Each of the levels of the typology are explained in the sections below, but an overview of the workflow of the typology can be seen in ***Figure 4*** with key data sources of each stage presented on the right-hand-side. A section of the Speyside catchment has been used to demonstrate the typology below.

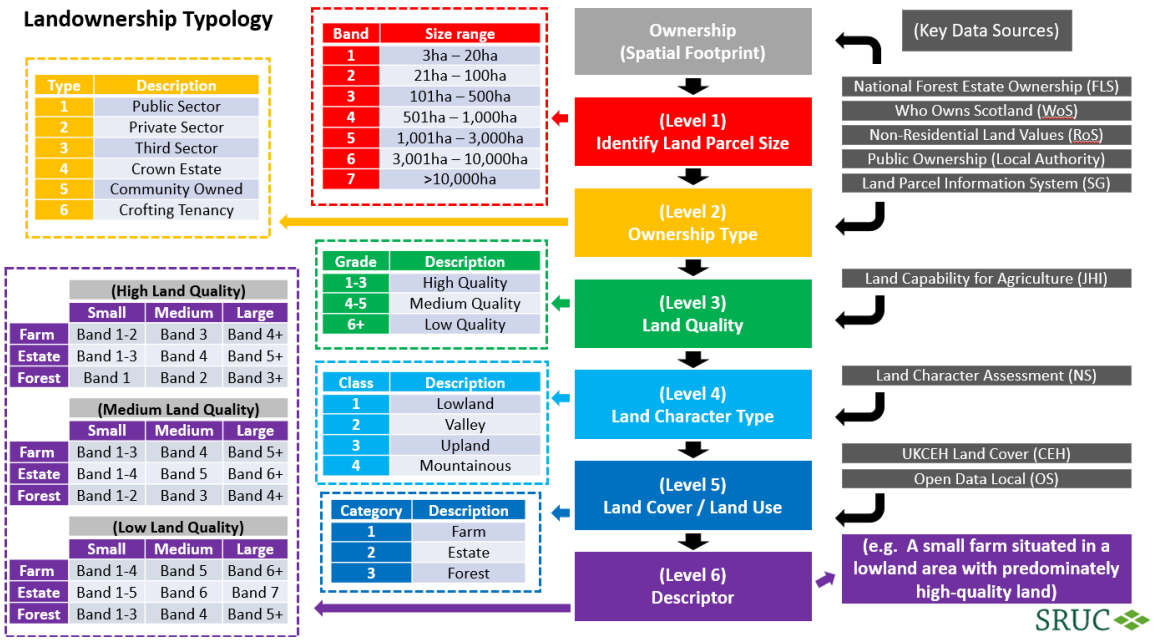


*Figure 4: Landownership Typology Workflow Overview*

## 4.1 First Level Consideration – Size Band (in hectares)

Land parcel size in hectares is the first level consideration given that agricultural subsidies and other governmental support schemes are largely based on quantity/scale of land. In the typology, seven size bands are applied to cover a wide range of different holdings in Scotland. These bands were developed based on desk-based analysis of (what we called) 'policy truths' implemented in Scottish/UK policy

(i.e. figures that are used in various policies to delineate different sizes of landholdings).

Policies including regulations, subsidies, and support schemes were analysed across a range of land use types including agriculture, forestry, and restoration schemes (e.g. peatland). Relevant academic literature and land agent industry reports were also used to garner size bands. A first draft of these bands was presented to stakeholders who provided feedback on the number of bands and the appropriate size ranges for each band, which was then incorporated into the final typology. This includes seven bands, with lower and upper bounds of 3 hectares and >10,000 hectares (Table 2).

***Table 2: Land Typology Level 1 - Land size (Hectares)***

| Band | Size range |
|---|---|
| **1** | 3 – 20 hectares |
| **2** | 21 – 100 hectares |
| **3** | 101 – 500 hectares |
| **4** | 501 – 1,000 hectares |
| **5** | 1,001 – 3,000 hectares |
| **6** | 3,001 – 10,000 hectares |
| **7** | >10,000 hectares |

The main areas of feedback from stakeholders concerned the degree of heterogeneity across land use types at the lower end of the scale and therefore additional bands were included at this smaller scale to reflect this. Stakeholders agreed that using 3 hectares as the smallest amount was appropriate, reflecting both pragmatic considerations as well as the minimum eligible area for many Scottish Government agricultural support schemes including the Small Farm Grant Scheme and Basic Payment Scheme.

At the higher end of the scale, whilst perhaps not so relevant for agriculture, the inclusion of the final band (>10,000ha) was deemed relevant in the analyses of estates, following both the BIGGAR Economics and Scottish Land and Estates (2023) 'The Contribution of Rural Estates to Scotland's Wellbeing Economy report and Hindle *et al* (2014) . Using this simple single level typology, the map of the case study area looks as follows (***Figure 5***).

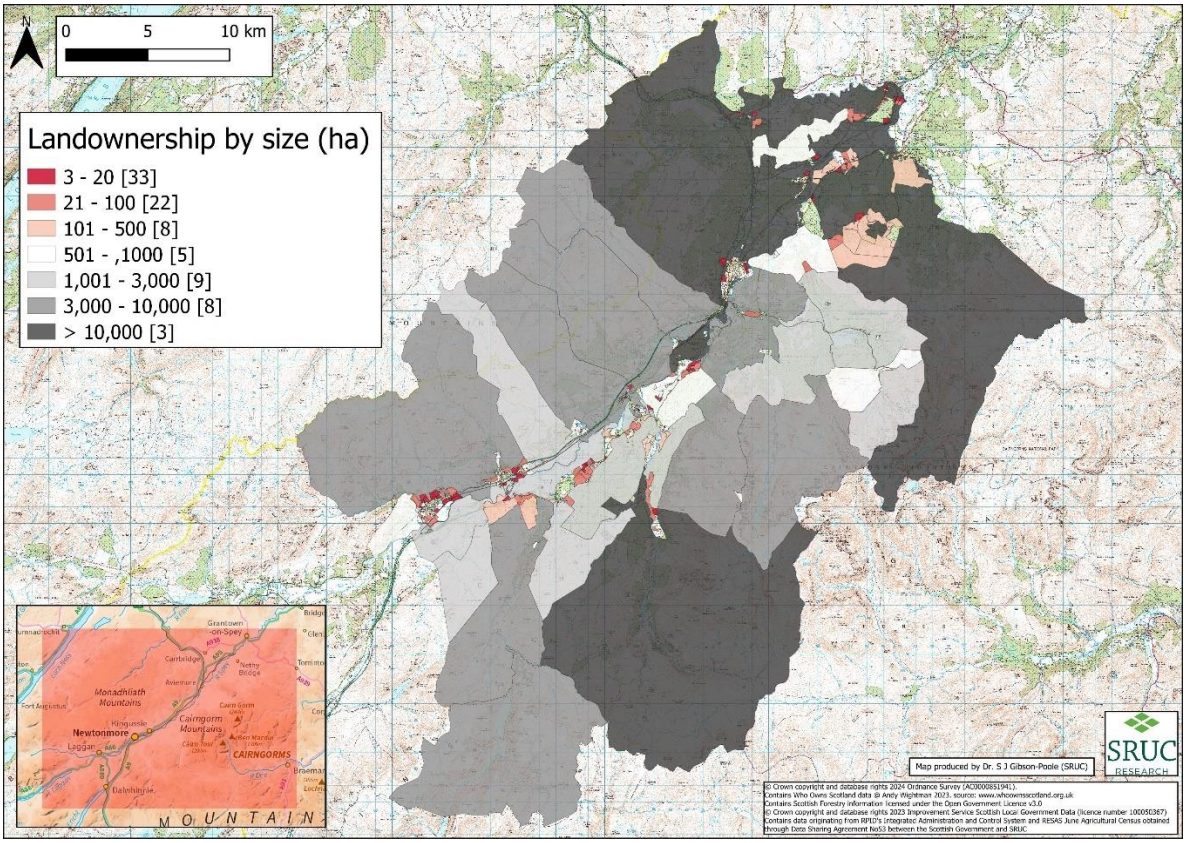


*Figure 5: First Level Consideration - Landownership by Size Band*

### 4.1.1 Level 1 Methodology

The area of each ownership land parcel was identified and categorised into the bands indicated in Table 2.

## 4.2 Second Level Consideration - Ownership type

Considering ownership is a central theme of the research, different ownership types are the second level consideration. The categories of ownership are: public sector, private sector (companies, funds and private individuals or families), third sector, crown, community owned and crofting tenancy. This enables us to reach the lowest level of ownership possible, rather than stopping at tenanted, except where crofting is concerned. Land ownership categories are collated using data from each of the data sources used to create the final ownership layer, with the default being private sector if no other ownership type is supported. Using this Second Level Consideration, the map of the case study area looks as follows (***Figure 6***).

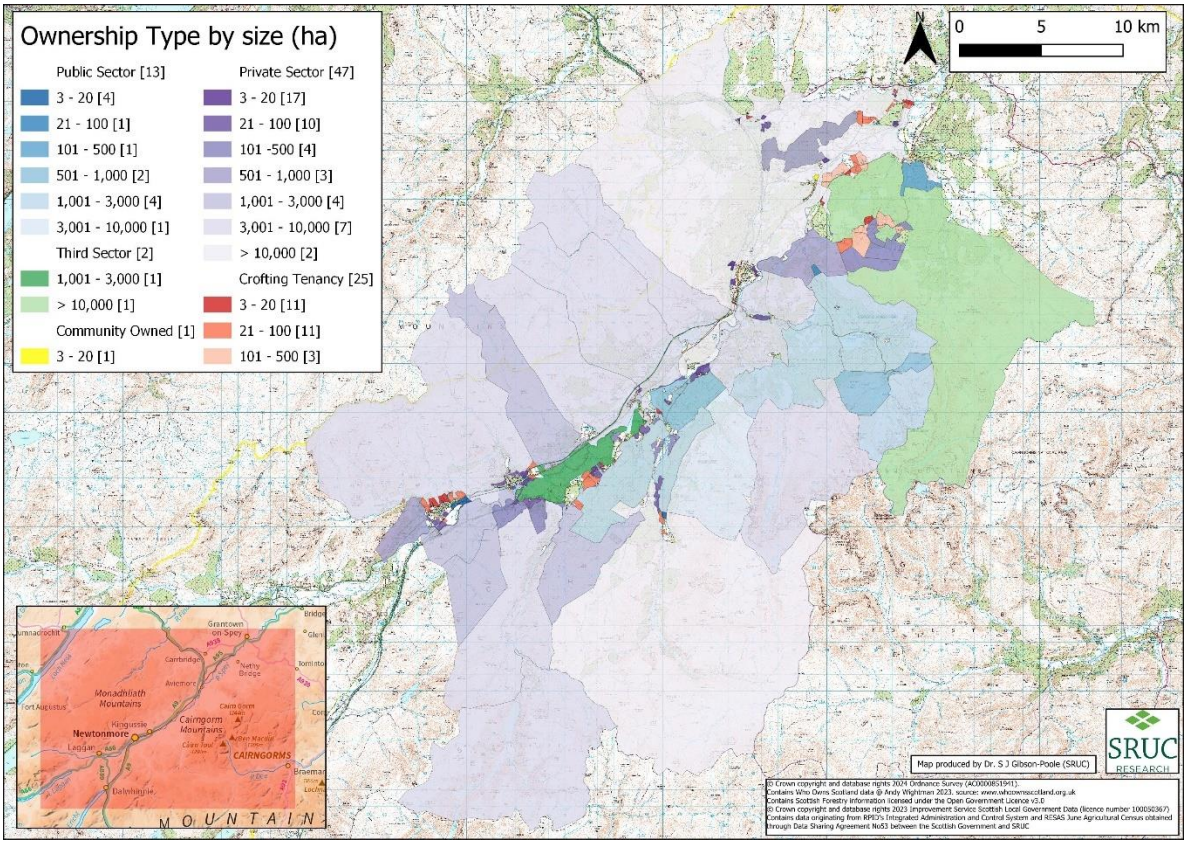


*Figure 6: Second Level Consideration - Ownership Type and Size Band*

### 4.2.1 Level 2 Methodology

Ownership Type is primarily set by the identified owner from the WOS and NRLV datasets, but the JAC dataset is also used specifically to identify crofts (Table 3) – this could be a company name, an organisations, a private individual etc.. As the Speyside case study used here is small, the list of names we came across was also reasonably small (see Value Column in Table 3). This list will no doubt expand when using the typology over larger areas of Scotland.

*Table 3: Ownership Type set for each Landowner Parcel based on Attribute Information from Layers used to build Ownership Layer*

| Layer | Attribute | Value | Ownership Type |
|---|---|---|---|
| **WOS / NRLV** | Owner / Applicant Name(s) | Forestry and Land Scotland | Public |
| | | Highland Council | |
| | | Highlands and Islands Enterprise | |
| | | Scottish Natural Heritage | |
| | | Royal Society for the Protection of Birds | Third Sector |
| | | The Crown (Crown Estate Scotland) | Crown Estate |
| | | Her Majesty Queen Elizabeth II | |
| | | His Majesty King Charles III (Crown Estate) | |
| | | Canup Ltd. | |
| | | Contains the word 'Community' | Community Owned |
| **JAC** | Croft Rented/Owned | If either attribute is greater than 1 | Crofting Tenancy |
| **(NA)** | | Any remaining record | Private Sector |

Note: Any remaining landowner not identified in this process had its ownership type set to Private Sector.

### 4.3 Third Level Consideration – Land Quality

This third level of consideration was included after consultation with stakeholders. They specifically highlighted the significant differences (in terms of scale and land use) between land grades, and the associations connected to 'upland' and 'lowland' categorisations. There is not one universally accepted definition of what constitutes upland or lowland in a Scottish context, in terms of elevation or another quantifiable metric. Instead, upland versus lowland distinctions typically encompasses elevation, typology, soil type, as well as cultural aspects.

To identify land quality, the James Hutton Institutes Land Capability for Agriculture dataset was used (available here). This seven-class system grades land on its potential productivity, based on its physical characteristics such as soil, climate, and relief. To avoid overcomplicating the typology we grouped together land grades into three categories (Table 4), High Quality (Grades 1-3), Medium Quality (Grades 4-5), and Low Quality (6+). The inclusion of this third level encapsulates the often-inferred land quality differences between 'upland' and 'lowland' land types, as larger upland land parcels are more likely to have poorer land than smaller lowland ones (***Figure 7***).

*Table 4: Land Quality Categories set based on Land Capability Class Values.*

| Land Capability Class | Land Quality Category |
|---|---|
| **1 - 3** | High Quality |
| **4 - 5** | Medium Quality |
| **6 +** | Low Quality |

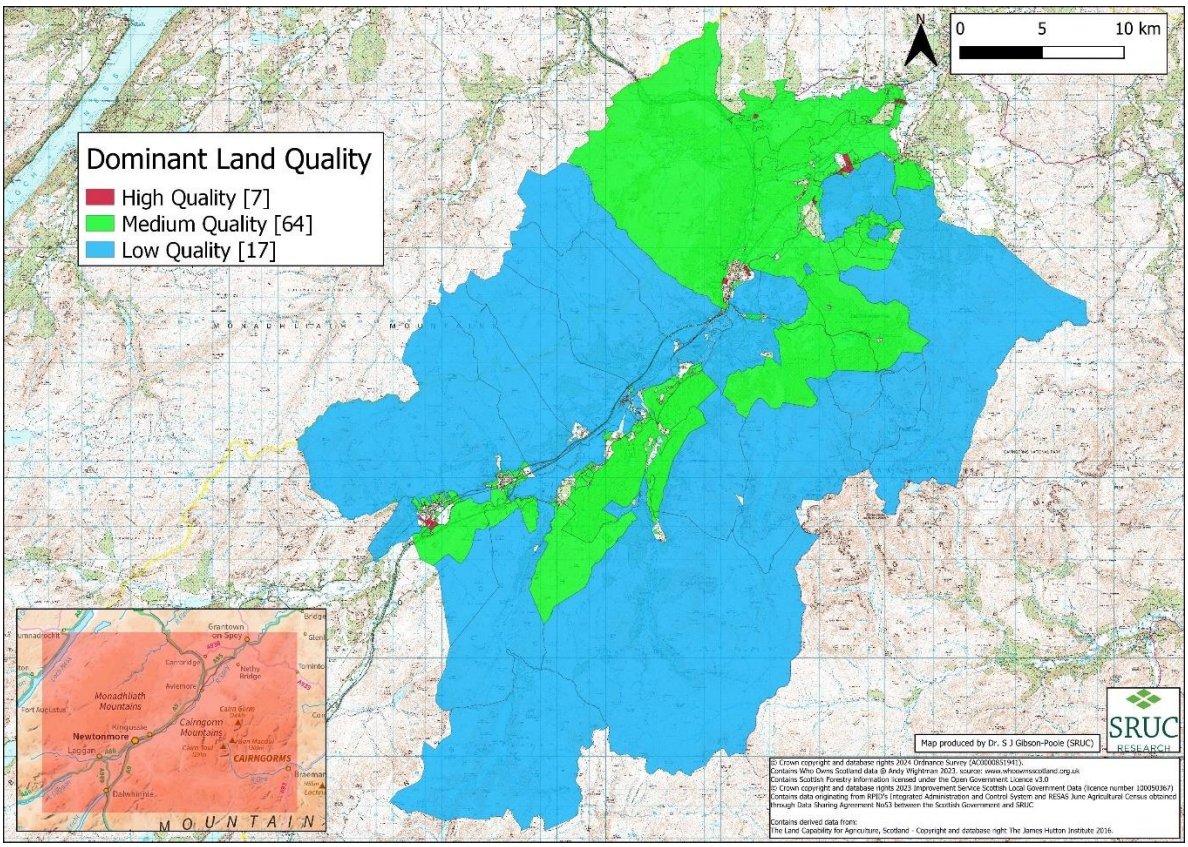


*Figure 7: Third Level Consideration – Land Quality*

### 4.3.1 Level 3 Methodology

To create the land quality level, the Land Capability for Agriculture (250k) dataset produced by the James Hutton Institute was used, as this dataset contains grades for all of Scotland and despite its age, still has value in indicating the likely quality of land.

The dataset was clipped to the boundaries of the sample area and converted to the same 2 metre grid as the ownership layer, before identifying the most dominant land capability class type per ownership land parcel and setting the land quality value as indicated in Table 4.

## 4.4 Fourth Level Consideration – Land Character Type

To further encapsulate distinctions between ‘upland’ and ‘lowland’ land types highlighted through stakeholder feedback, we include Land Character Type as the fourth level consideration in the typology. This used NatureScot’s Land Character Assessment data (available here) to classify land as lowland, valley, upland, or mountainous (Table 5), based on the area of each class within each ownership land parcel. This allows for the inclusion of topographical (landform and land cover) as well

as cultural and experiential aspects (settlement patterns) in the typology which play a qualitative role in distinguishing the scale and use of ‘upland’ and ‘lowland’ land types (Figure 8).

***Table 5: Land quality Categories set based on Land Capability Class Values***

| Class | Land Character Type |
|---|---|
| **1** | Lowland |
| **2** | Valley |
| **3** | Upland |
| **4** | Mountainous |

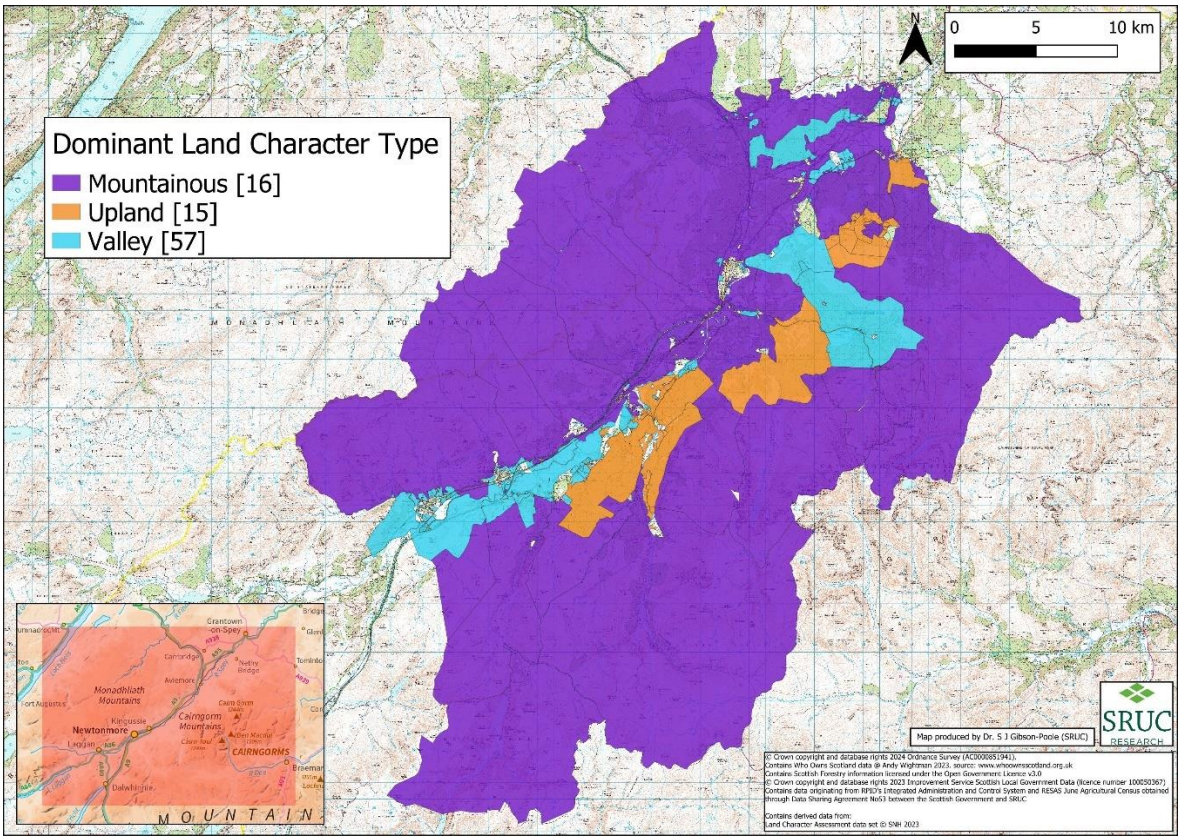


***Figure 8: Fourth Level Consideration - Land Character Type***

### 4.4.1 Level 4 Methodology

To create the Land Character Type level, the Landscape Character Assessment data produced by NatureScot was utilised, as it contains both a range of more specific landscape character types but also a set of 4 super classes that were used directly to obtain the landscape character types of this typology (Table 5).

The dataset was clipped to the boundaries of the sample area and converted to the same 2 metre grid as the ownership layer, before identifying the most dominant land character type class type per ownership land parcel.

## 4.5 Fifth Level Consideration – Land cover/land use

Given our interests are to investigate links between changes in land ownership, land use (change) and financial incentives, the fifth level consideration in the typology is land use/land cover. Land use is primarily used within the typology in a relatively broad way, by characterising each ownership land parcel as either a farm, estate or forest (***Figure 9***).

These land uses are derived from the identified land cover, which itself was comprised of remotely sensed data from the Centre of Ecology and Hydrology (CEH) using their Land Cover Map dataset (available here), along with Ordnance Survey Open Map Local data (available here) to get more refined indications of infrastructure, waterways and woodlands. The method used to generate the land cover data can be replicated to represent each year from 2017 onwards, so that the land cover of each ownership land parcel can be queried in later analysis to help understand changes that might have occurred. which could be indicative of the type of development that has taken place (i.e. an increase in woodland or a change from agricultural use to urban development).

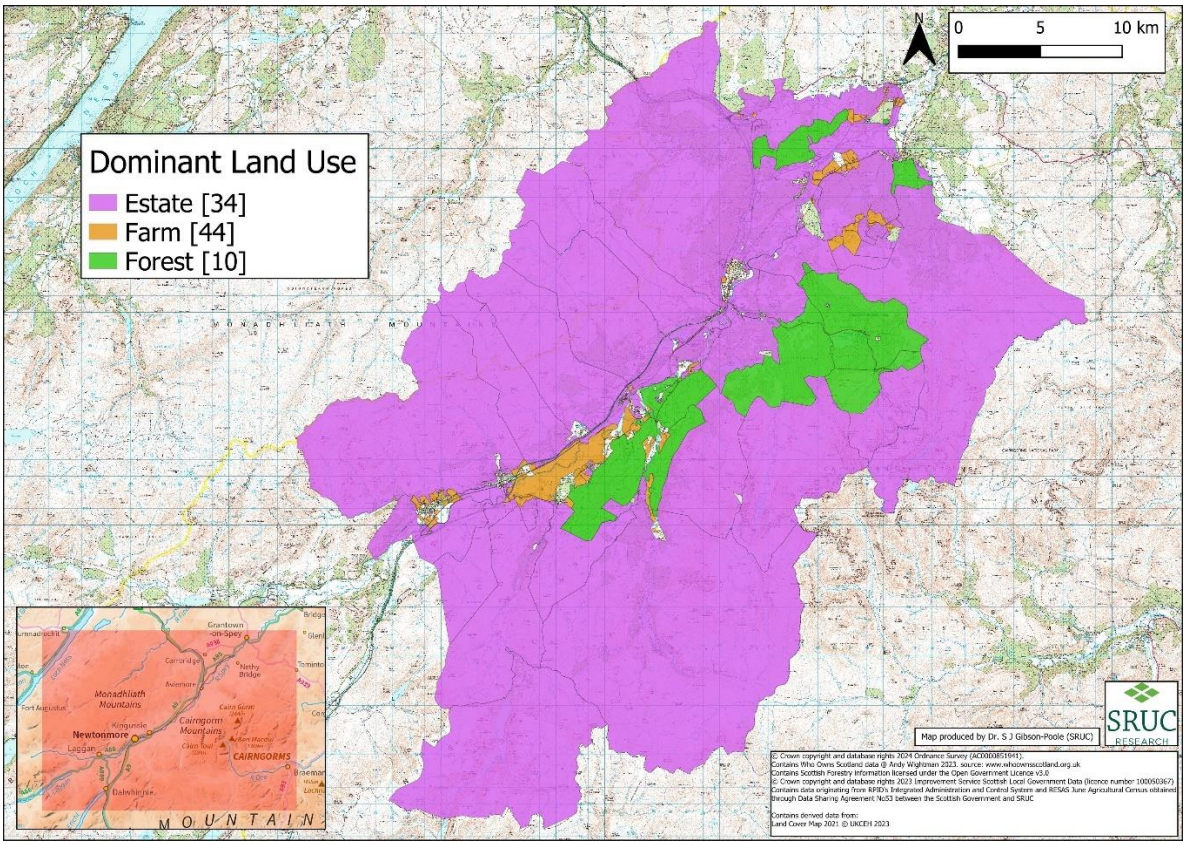


***Figure 9: Fifth Level Consideration – Land Cover/Land Use***

### 4.5.1 Level 5 Methodology

To generate the land use per ownership land parcel, first the land cover had to be identified. A workflow was used (Figure 10) to add successive layers of detail from Ordnance Survey Open Maps Local data over the top of remotely sensed data sourced from CEH to create an output using the same 2 metre grid as the existing ownership layer (***Figure 11***).

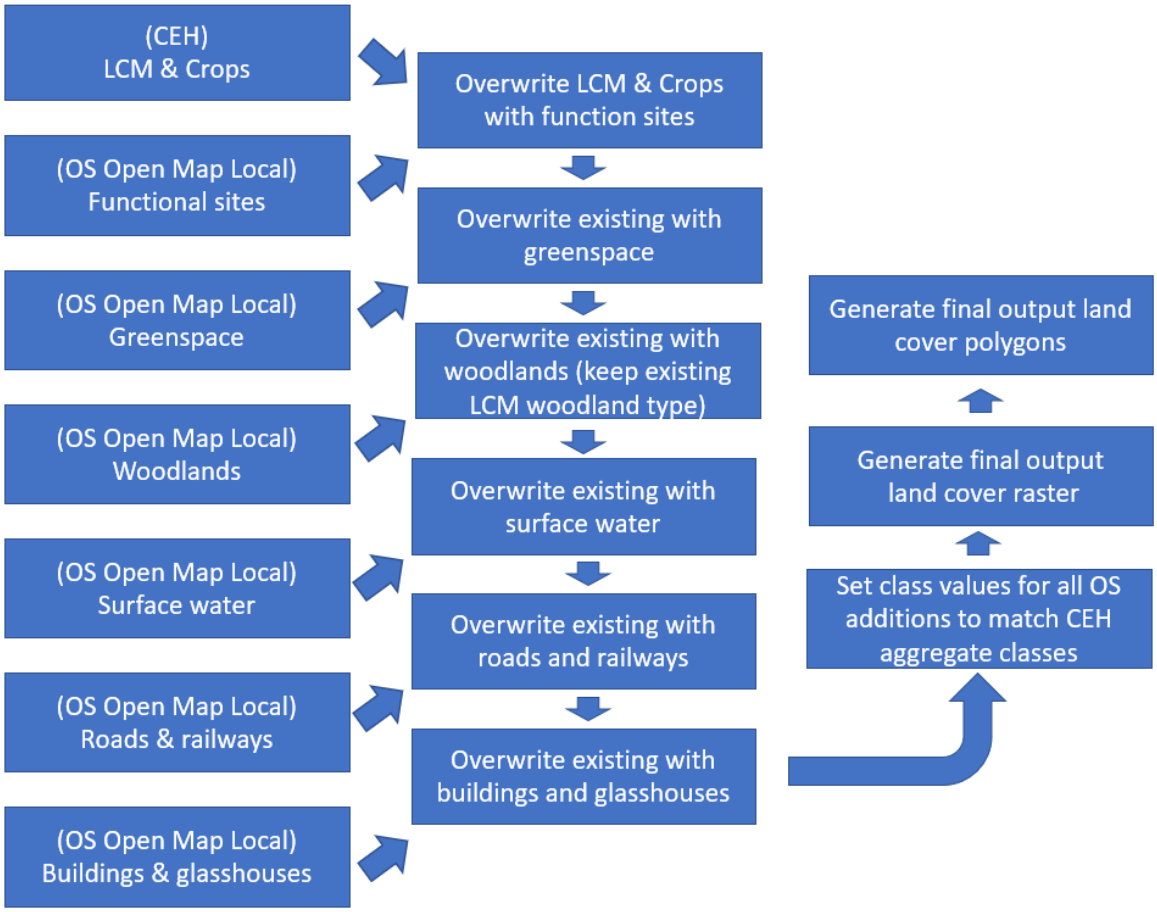


***Figure 10: Workflow Diagram showing the process of creating the Land Cover Layer using Data from CEH and OS***

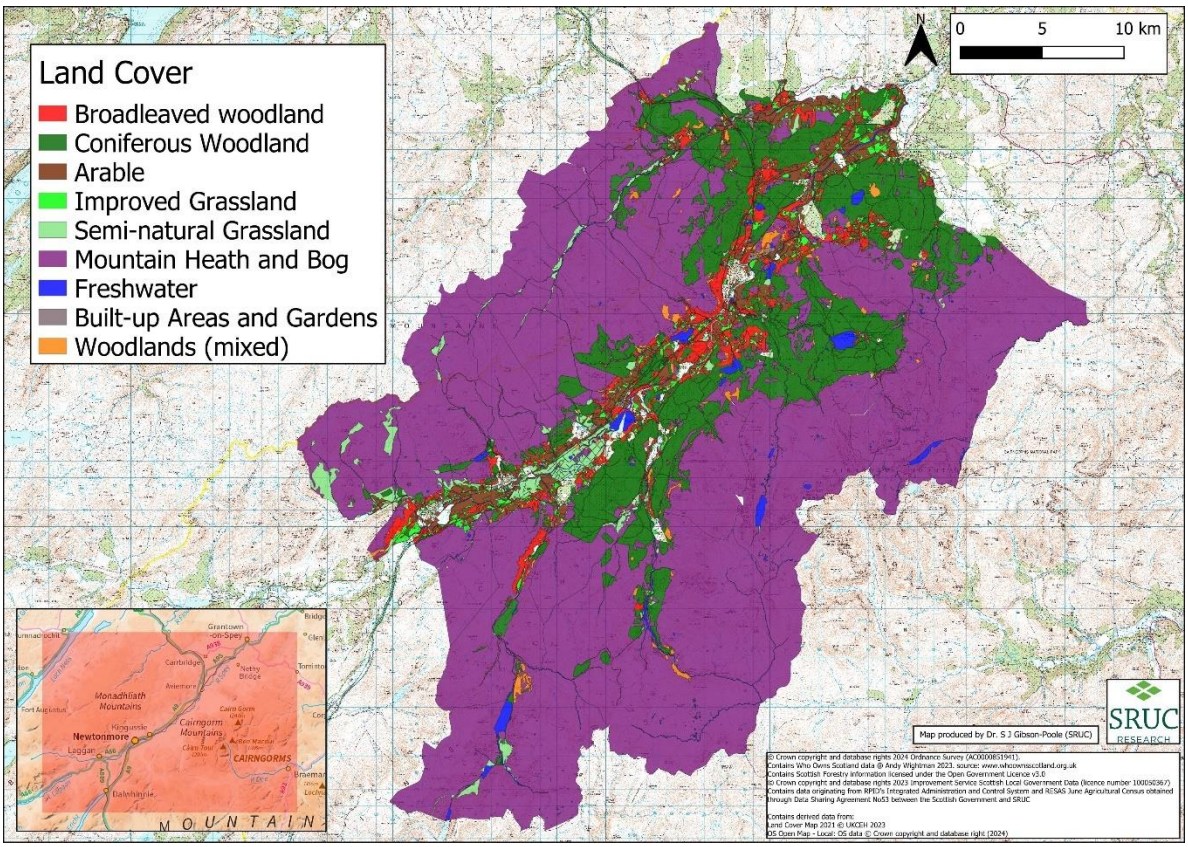


*Figure 11: Fifth Level Consideration – Stage 1; Land Cover Types*

The land cover per ownership land parcel was then used to identify a type of land use through the application of a set of ratios and rules, that combined certain land cover classes to indicate a particular land use (Table 6).

*Table 6: Land Cover Classifications Combined to Represent Specific Land Uses*

| Combined Land Cover | Land Cover Class |
|---|---|
| **Farm classes** | Arable, Improved Grassland, Semi-natural Grassland |
| **Forest classes** | Broadleaved Woodland, Coniferous Woodland, Woodlands (mixed) |
| **Estate classes** | Mountain Heath and Bog, Freshwater, Built-up Areas and Gardens |

Ratios between these combined land cover classes were made to give an indication of land use, before applying the below set of rules to identify the final land use (Figure 9). The rules are relatively simple, and anything that is either not a forest or farm is by default an estate (as estates themselves can be very varied, such as large upland areas with a diverse range of land cover classes, or smaller and centred around a single large house), or indeed it could be a housing development (a housing estate).

**Forest Land Use**:

- The ownership land parcel originated from the NFEO dataset or;
- Must be equal to or greater than 80 % land cover in the combined forest classes.

**Farm Land Use**:

- If the ownership land parcel is indicated as a croft within the JAC dataset or;
- Farm ratio must be higher than the Estate ratio and the Farm ratio must be higher than the Forest ratio.

**Estate Land Use**:

- Anything that has not been identified as either a Forest or a Farm.

### 4.6 Sixth Level Consideration – Descriptor

This consideration provides a qualitative descriptor for a plot of land, determined by its Size Band (First Level Consideration) and Land Use (Fifth Level Consideration). This results in descriptors such as: large estate, medium estate, medium farm, small farm, large forestry etc. Three matrixes were created in accordance with the Land Quality (Third Level Consideration) that help to account for heterogeneity across land use types (Table 7, Table 8, Table 9).

Using the matrixes as an example, a 'medium' sized farm (size Band 3) on High Quality land (Grade 1-3) is much smaller than a 'medium' sized farm (size Band 5) on Low Quality land (Grade 6+). Likewise, a 'medium' farm (size Band 4) on Medium Quality land (Grade 4-5) could be the same size as a 'large' forest (size Band 4+) on the same quality of land.

***Table 7: 'Land Grade 1-3 (High Quality) Descriptors'.***

| High Quality Land | | | |
|---|---|---|---|
| | **Small** | **Medium** | **Large** |
| **Farm** | Band 1-2 | Band 3 | Band 4+ |
| **Estate** | Band 1-3 | Band 4 | Band 5+ |
| **Forest** | Band 1 | Band 2 | Band 3+ |

Note: Arable farm sizes were determined using NatureScot

*Table 8: 'Land Grade 4-5 (Medium Quality) Descriptors'.*

| Medium Quality Land | | | |
|---|---|---|---|
| | **Small** | **Medium** | **Large** |
| **Farm** | Band 1-3 | Band 4 | Band 5+ |
| **Estate** | Band 1-4 | Band 5 | Band 6+ |
| **Forest** | Band 1-2 | Band 3 | Band 4+ |

Note: Forest size was calculated following Tilhill & Goldcrest's (2021) UK Forest Market Report

*Table 9: 'Land Grade 6+ (Low Quality) Descriptors'*

| Low Quality Land | | | |
|---|---|---|---|
| | **Small** | **Medium** | **Large** |
| **Farm** | Band 1-4 | Band 5 | Band 6+ |
| **Estate** | Band 1-5 | Band 6 | Band 7 |
| **Forest** | Band 1-3 | Band 4 | Band 5+ |

However, Land Quality alone does not necessarily give a good description with regards to the topography of the location of the ownership land parcel (e.g. high quality land could be within a lowland setting or within a valley). Therefore, in addition to the descriptor generated via the matrices, the Land Character Type was also added to give a better qualitative description to the size and topographic setting of each ownership land parcel.

For instance, a small farm on high quality land could be described as either:

- "*A small farm situated in a lowland area with predominately high-quality land*".

Or;

- "*A small farm situated in a valley area with predominately high-quality land*".

### 4.6.1 Level 6 Methodology

As the Size Bands, Land Use type and Land Quality were already known, the matrices (Table 7, Table 8, Table 9) were used to set a value of either Small, Medium or Large to each ownership land parcel. To give further descriptive context to the descriptor of each ownership land parcel, the Land Character Type was added on top of the results generated from the matrices to give the full descriptor for each ownership land parcel (Figure 12).

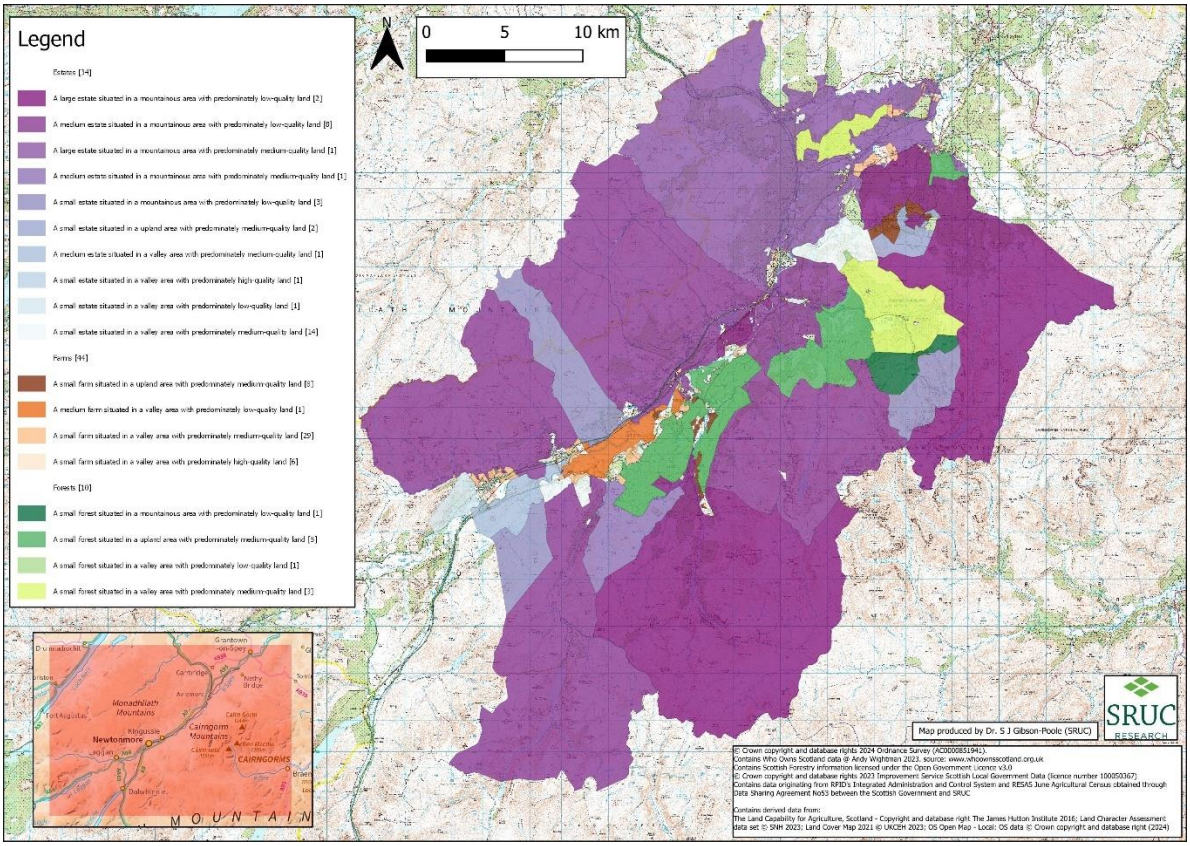


*Figure 12: Sixth Level Consideration - Descriptor of each Ownership Land Parcel*

## 4.7 Seventh Level Consideration – "Of which" statements

This includes statements which provide an even more in-depth qualitative description for the activities that are occurring within each ownership land parcel. These were determined firstly through leveraging a combination of data sources (Table 11), and secondly by the research team to cover the main aims of the project, especially with regards to the potential flow of public money into each ownership land parcel. Table 10 shows the "Of Which" statements identified so far, and should the need arise then further statements can be added as the project progresses (i.e. to cover potentially new sources of funding).

For example, "Of which has tenants", "Of which has a new owners", "Of which is expanding", "Of which has applied for a Woodland Carbon Code grant". The rationale for including these statements is to provide key details that may be masked through a stricter typology. For example, two medium-sized upland farms with predominately low quality land may appear very similar using six levels of considerations, but include an statement to one of them that says "of which has a windfarm" and the picture suddenly looks very different.

The result of categorising a piece of land using the seven levels of considerations will be statements such as:

- A privately owned, medium sized farm situated in lowland area with predominately high quality land "*of which has a new owner*".

Or

- A publicly owned, medium sized estate situated in an upland area with predominately medium quality land "*of which has applied for a peatland action grant and rents agricultural land*".

***Table 10: A Description of the different "Of Which" Statements used to help identify the Activity Occurring on each Ownership Land Parcel.***

| "Of Which" Statement | Description |
|---|---|
| **'Has new owners'** | The ownership land parcel has had a new owner since 2018 (derived from RoS data) |
| **'Is expanding'** | An identified landowner has purchased an additional land parcel since 2018 (derived from RoS data) |
| **'Has tenants'** | The ownership land parcel has rented part or all of the land parcel (derived from RoS data) |
| **'Rents agricultural land'** | JAC data indicates that some or all of the land parcel is being rented. |
| **'Has multiple agricultural holdings'** | JAC data indicates that more than one county parish holding is associated with that landowner. |
| **'Has multiple agricultural businesses'** | JAC data indicates that more than one business reference number is associated with that landowner. |
| **'Receives Rural Payment funding'** | JAC data indicates that at least part of the ownership land parcel is qualified for rural payment funding. |
| **'Has applied for a Peatland Action grant'** | An application for a peatland action grant has been made within an ownership land parcel |
| **'Has applied for a woodland Carbon Code grant'** | An application for a woodland carbon code grant has been made within an ownership land parcel |
| **'Has applied under the Forest Grant Scheme'** | An application under the forest grant scheme has been made within an ownership land parcel |
| **'Has a wind farm'** | The ownership land parcel contains at least one active wind turbine |
| **'Has planned a wind energy project'** | The ownership land parcel contains planning for at least one wind turbine |
| **'Receives Wayleave payment[4]'** | Power lines intersect across part of the ownership land parcel. |

[4] Wayleave payments are a form of compensation paid to landowners who have energy infrastructure on their land. It is a payment to compensate for lost agricultural incomes or as a form of rent for housing the infrastructure.

### 4.7.1 Level 6 Methodology

Multiple datasets (Table 11) were used to generate the various “Of Which “statements for each ownership land parcel. For each statement a simple Boolean flag is set to indicate if that statement is in effect for that land parcel or not. Analysis later on in the project will interrogate the full details of the potential financial inputs behind elements such as the various grants, agricultural payments, wayleave etc.

***Table 11: Datasets used for setting “Of Which” Flags***

| Dataset | Used for “Of Which” statement |
|---|---|
| (Registers of Scotland)<br>Non-Residential Land Values | • Has new owners<br>• Is expanding<br>• Has tenants |
| (RESAS/RPID)<br>JAC / LPIS | • Rents agricultural land<br>• Has multiple agricultural holdings<br>• Has multiple agricultural business<br>• Receives rural payment funding |
| (NatureScot)<br>Peatland Action points / polygons | • Has applied for a peatland action grant |
| (Scottish Forestry)<br>Woodland Carbon Code polygons | • Has applied for a woodland carbon code grant |
| (Scottish Forestry)<br>Woodland creation Options/Claims<br>Tree Health Options/Claims<br>WIG Restructuring Regeneration Options/Claims<br>WIG New Natural Regeneration Options/Claims<br>WIG WIAT Footpaths<br>SMF Livestock Exclusion<br>SMF Low Impact Silvicultural Systems<br>SMF Native Woodlands<br>SMF Public Access Rural<br>SMF Public Access WIAT<br>SMF Species Conservation | • Has applied under the forest grant scheme |
| (Improvement Service Scotland)<br>Renewable Energy Sites Points<br><br>(Open Street Map)<br>Wind Turbine Points | • Has a wind farm<br>• Has planned a wind energy project |
| (Open Street Map)<br>Power Infrastructure Lines | • Receives wayleave payment |

# 5 Demonstrating the Landownership Typology

Section 4 highlighted the development of the landownership typology, showing the final descriptor of the 88 different landowners within the area of interest of the River Spey catchment. The breakdown of these can be seen in Table 12, however this is a small section of a larger case study area we are using in this project (the four case studies are: the catchment of the river Spey and Tweed, Shetland and Galloway and South Ayrshire Biosphere Reserve) and is used as a proof-of-concept that will be developed in the coming years over larger geographies.

***Table 12: Count of Descriptor Types identified for each Landowner***

| Descriptor | Count |
|---|---|
| A small farm situated in a valley area with predominately medium-quality land | 29 |
| A small estate situated in a valley area with predominately medium-quality land | 14 |
| A medium estate situated in a mountainous area with predominately low-quality land | 8 |
| A small farm situated in a upland area with predominately medium-quality land | 8 |
| A small farm situated in a valley area with predominately high-quality land | 6 |
| A small forest situated in a upland area with predominately medium-quality land | 5 |
| A small estate situated in a mountainous area with predominately low-quality land | 3 |
| A small forest situated in a valley area with predominately medium-quality land | 3 |
| A large estate situated in a mountainous area with predominately low-quality land | 2 |
| A small estate situated in a upland area with predominately medium-quality land | 2 |
| A large estate situated in a mountainous area with predominately medium-quality land | 1 |
| A medium estate situated in a mountainous area with predominately medium-quality land | 1 |
| A medium estate situated in a valley area with predominately medium-quality land | 1 |
| A medium farm situated in a valley area with predominately low-quality land | 1 |
| A small estate situated in a valley area with predominately high-quality land | 1 |
| A small estate situated in a valley area with predominately low-quality land | 1 |
| A small forest situated in a mountainous area with predominately low-quality land | 1 |
| A small forest situated in a valley area with predominately low-quality land | 1 |

## 5.1 Landownership typology detailed example

In this section we apply the previously discussed Landownership Typology to a single land holding (Kinrara Estate) in the catchment of the river Spey. The Kinrara estate was chosen as it has already been used within this report to highlight issues with identifying land value, and as an estate with new ownership, it also shows a variety of the “of which” statements, due to grant funding that has been applied for by the new landowner.

### 5.1.1 Typology Level 1 - 3

The land parcel size is roughly 3783 hectares (Band 6) and the details from the WOS layer indicates a named company as the owner, therefore, ‘Private Sector’ (Type 2). The land quality was varied but greater than 80% Grade 6+ and therefore indicated as ‘Low Quality’ grade land (Figure 13).

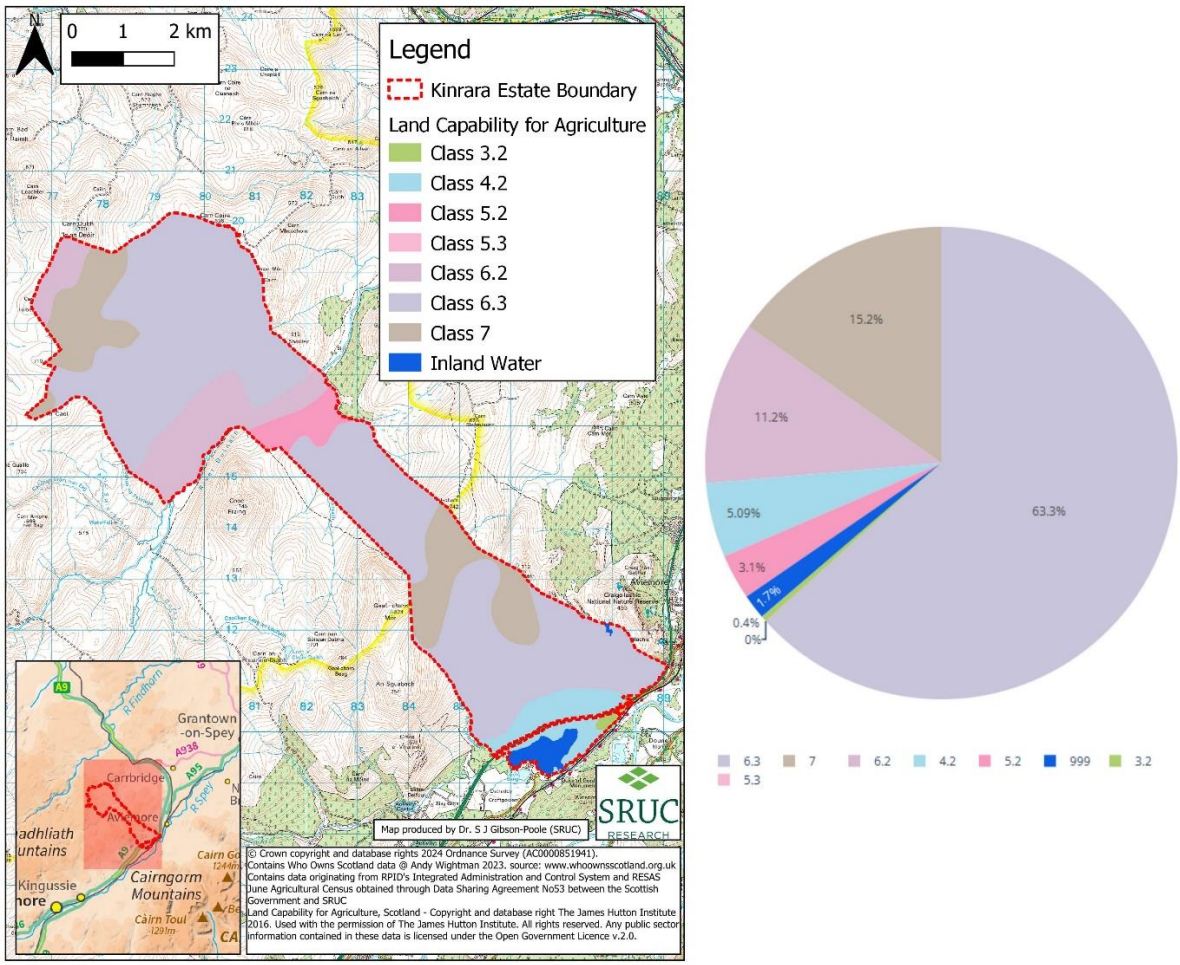


*Figure 13: Example of First to Third Level Considerations on a Single Land Parcel*

### 5.1.2 Typology Level 4

The land character type on the estate is split between two main classes, with greater than 80% regarded as mountainous within the landscape character assessment. Therefore 'Mountainous' (Class 4) land character type (***Figure 14***).

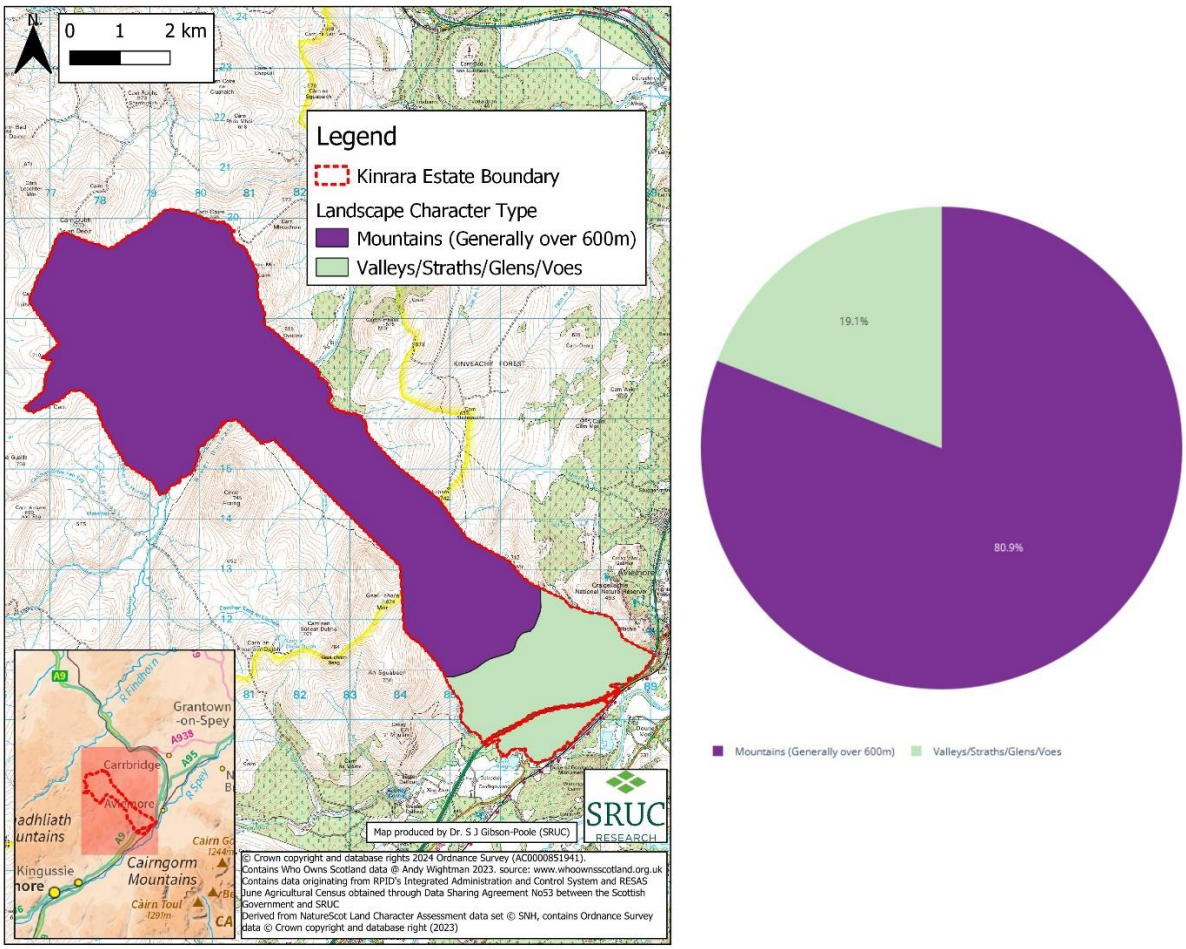


***Figure 14: Example of Fourth Level Considerations on a Single Land Parcel***

### 5.1.3 Typology Level 5-6

The land cover of the estate is dominated by mountain heath and bog (Figure 15), and although there is some woodland/forestry, it is less than 80% and the ratio between farmland-related classes and estate-related classes indicates that this is an 'Estate' (Category 1).

Therefore, the descriptor for this estate is "*A medium estate situated in a mountainous area with predominately low-quality land*".

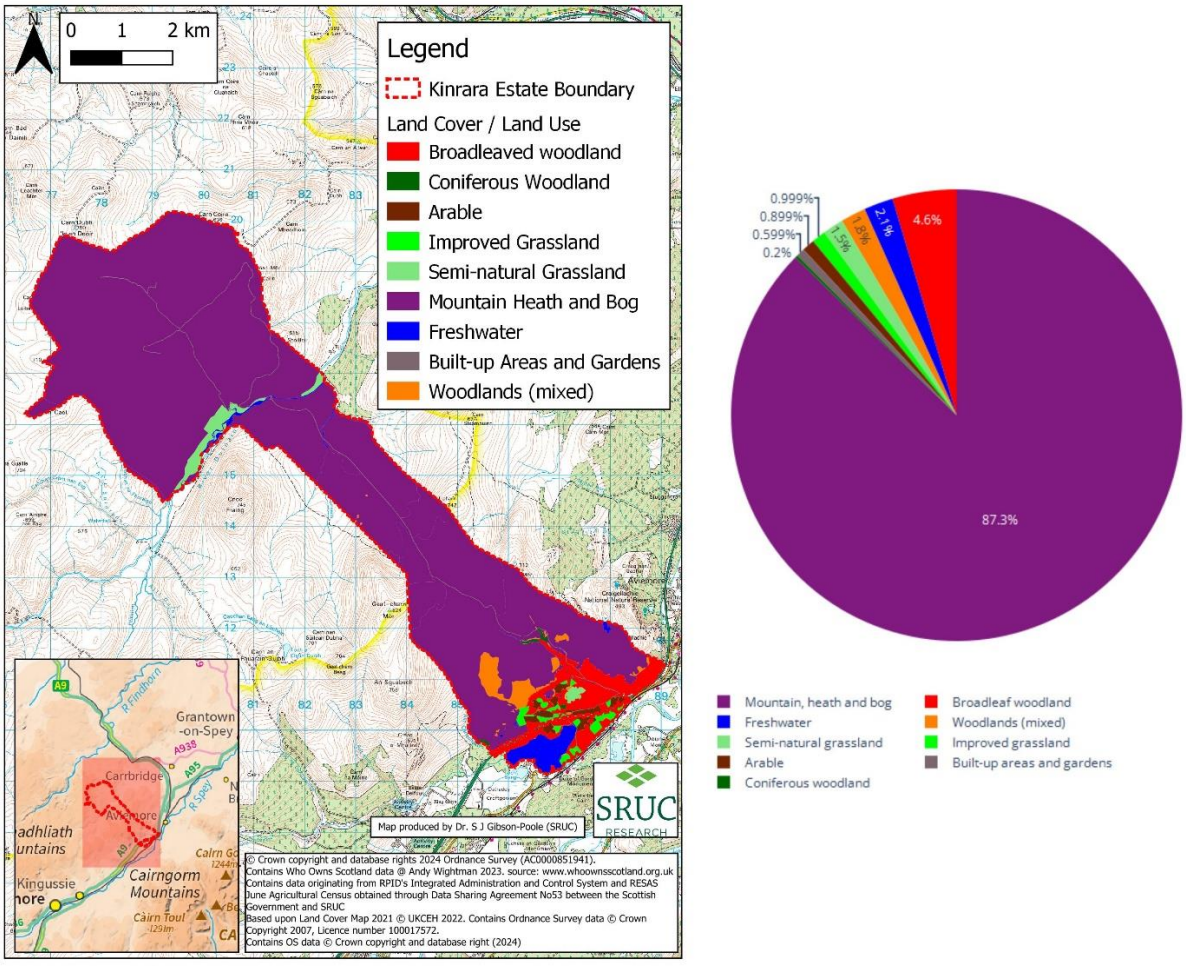


***Figure 15: Example of Fifth and Sixth Level Considerations on a Single Land Parcel***

### 5.1.4 Typology Level 7

Several “Of Which” statements were identified for the estate, as it has new owners (as of 29/12/2020), receives rural payment funding, has applied for a Peatland Action grant (three separate grants in fact), has applied under the Forest Grant Scheme (two different schemes in this case) and receives Wayleave payment, as a section of powerlines transects part of the estate (***Figure 16***).

Therefore, the estate can be fully described as a privately owned medium sized estate situated in a mountainous area with predominately low-quality land, “*of which has new owners, receives rural payment funding, has applied for a Peatland Action grant, has applied under the Forest Grant scheme and receives wayleave payments*”.

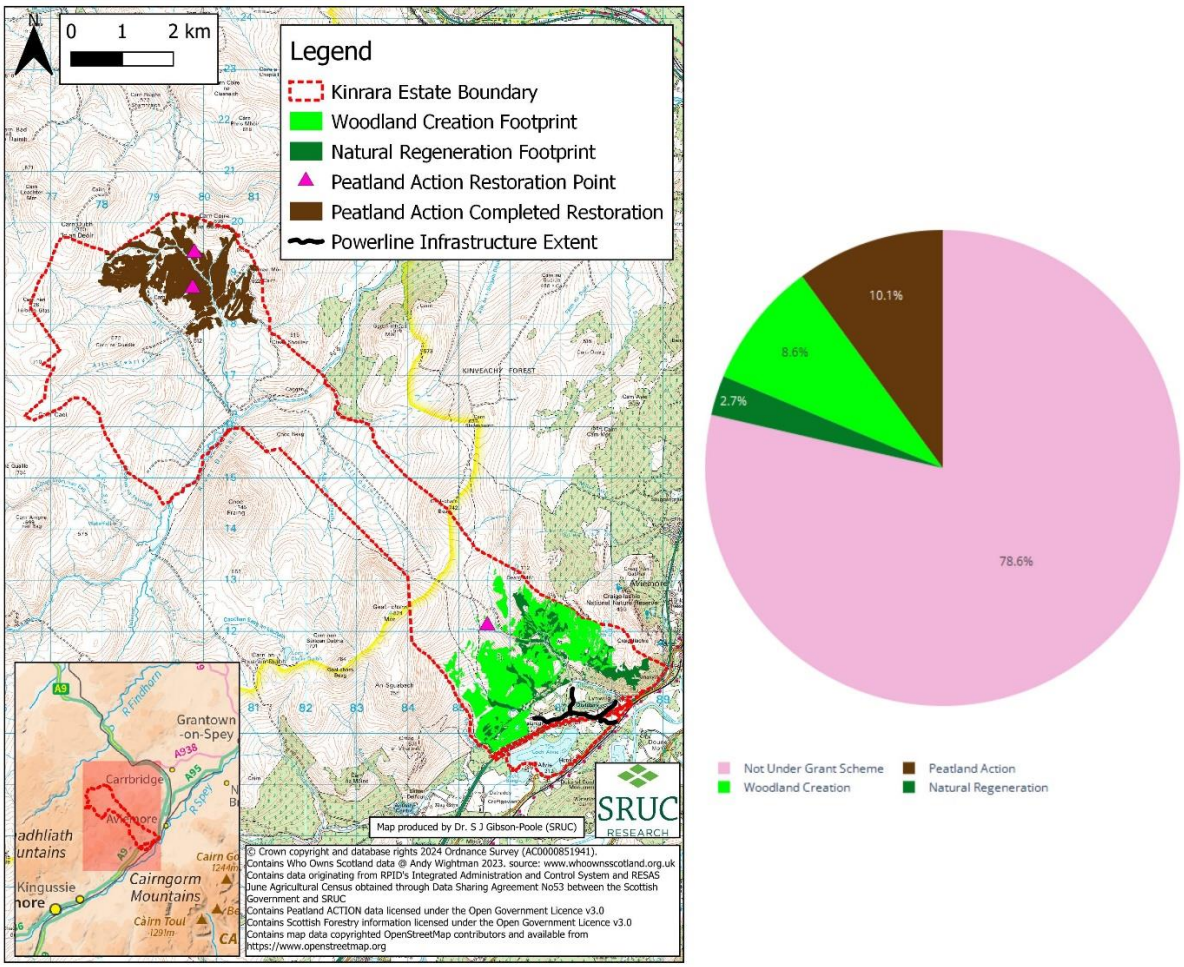


***Figure 16: Example of Seventh Level Considerations on a Single Land Parcel***

# 6 Conclusions

This report has introduced a new typology that can automatically produce a descriptor of a land parcel in Scotland after the base ownership layer is created. The descriptors are broad enough to capture the great diversity in ownership, size, quality and use of land, but also specific enough to be useful in a range of contexts. Firstly, the typology could be useful for the Scottish Government and various other public organisations. It can help to roll out measures recently introduced in the new Land Reform Bill (Scotland) 2024, such as identifying land parcels that are neighbouring, but owned by the same person or company, identifying land parcels that will require a mandatory Land Rights and Responsibility Statement or may help to determine when a future sale may require lotting. It can also help to plan future land use policies (particularly on a landscape scale) and financial incentives as it provides detailed maps of where, and importantly who, is currently receiving these payments. Secondly, the typology may also be of use to the private sector, such as land agents or land management companies in standardising the way land is described (based on multiple dimensions), valued, or used in the future. Thirdly, the map may be useful for organisations like Community Land Scotland or community groups (who are looking to register an interest or purchase land) to strategically plan future community buy outs.

However, the construction of this typology has proved challenging throughout. The key challenges have been different licensing agreements, and the fusion of spatial data that is not that well aligned. Crucially, the data sets used in the creation of this tool all have different licensing agreements, meaning some can be used publicly whereas others can only be stored and used by the licensee (in this case Scotland's Rural College- (SRUC)). As the Registers of Scotland data was purchased, and their current model is to monetise the data, it will be hard to make the new typology an open and public tool without reform to their systems or business models. In the short-term there is potential for the tool to become available to public organisations or government departments. Another issue is the cost of the data. Currently, Registers of Scotland charge per-plot which is a reasonable price if you are only concerned with one plot of land (such as a community group wishing to register an interest in a plot of land), however in this project the entirety of Scotland was required which came at a substantial cost. This data also needs regularly updating with recent transactions which are more expensive than historical data. There is also a cost for Who Owns Scotland data. Additionally, there are multiple data licenses involved in the construction of this typology, some of which do not allow the sharing of data and have very limited uses in terms of outputs.

From a data processing standpoint, the fusion of spatial data that is not that well aligned always results in level of compromise and some manual amendments. Construction of the ownership layer was the most difficult in this respect and there are still areas to be worked on to further refine the process. This aligns with Miller et al. (2024) who recently reviewed the available data sources on landownership and

concluded that the differences in accessibility, the timeframes for updating and the cost of this data was not fit-for-purpose. New data may also be incorporated as the Registers of Scotland have produced a new dataset (Unlocking Sasines), which may assist further with regards to identifying ownership for mixed tenure agricultural land parcels. This dataset is still being updated by Register of Scotland and access to it is being sought to enable its integration as this project continues.

Challenges also arise from the lack of standardisation at the data entry stage. Currently data is added to the Register by a selling land agent or solicitor. There are very few standardised parts or sections of the form, even with some records being recorded in Hectares and others in Acres. There are multiple open text fields which invite inconsistency across the Register. A new form could be developed which standardises many of the input fields (multiple choice sections) and do not allow some sections to be missed (mandatory fields).

The typology itself was easier to create spatially but required more detailed initial research and discussion with stakeholders to devise. It opens a window into the types and scale of ownership and will prove very useful when analysing financial flows of data, as it will enable the categorisation of those monetary flows. The monetary flows themselves are the next task at hand for this project, as although their presence can be identified within each ownership land parcel, obtaining the actual monetary value of the various grants and subsides may also prove to be challenging.

Identifying the actual value of land transacted over the timeline of this project is also a next major step and may also pose some problems that will need to be addressed. The analysis of the data so far is in concordance with the issues already highlighted by the Scottish Land Commission (2023) and Andy Wightman (2024a) in their recent reports on the actual value of land, so further discussion with them and Registers of Scotland will be required to identify an effective solution where values are not indicated due to non-monetary considerations.

Finally, the creation of an annual time series of data that shows the changes in landownership and the changes in land cover and use over time, should enable a better understanding of the cause and effect of land values within the case study areas being covered by this project. Being able to view the flow of public money within this time series and see the changes resulting from it will highlight both positive and potentially negative effects caused by changing land values, all of which will be able to inform interested stakeholders and enable effective policy in the future.

### 6.1 Recommendations

Further work is required to turn the typology and maps into a user-friendly tool. A Trusted Research Environment would be a useful first step which could be used by public organisations and researchers funded through the public purse. This would allow for greater collaboration across organisations and allowed for evidence-driven policy making decisions to occur at the landscape scale. We suggest that the Register

of Scotland have a statutory requirement to provide data on recent transactions to the Trusted Research Environment annually. It would also prove highly beneficial if the forms used for registering a transaction of the Register are amended to allow for higher levels of standardisation across entries. This would include mandatory fields, multiple choice sections, and standardising the metrics used to measure land.

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Ian Merrell – ian.merrell@sruc.ac.uk

@RuralPolicySRUC

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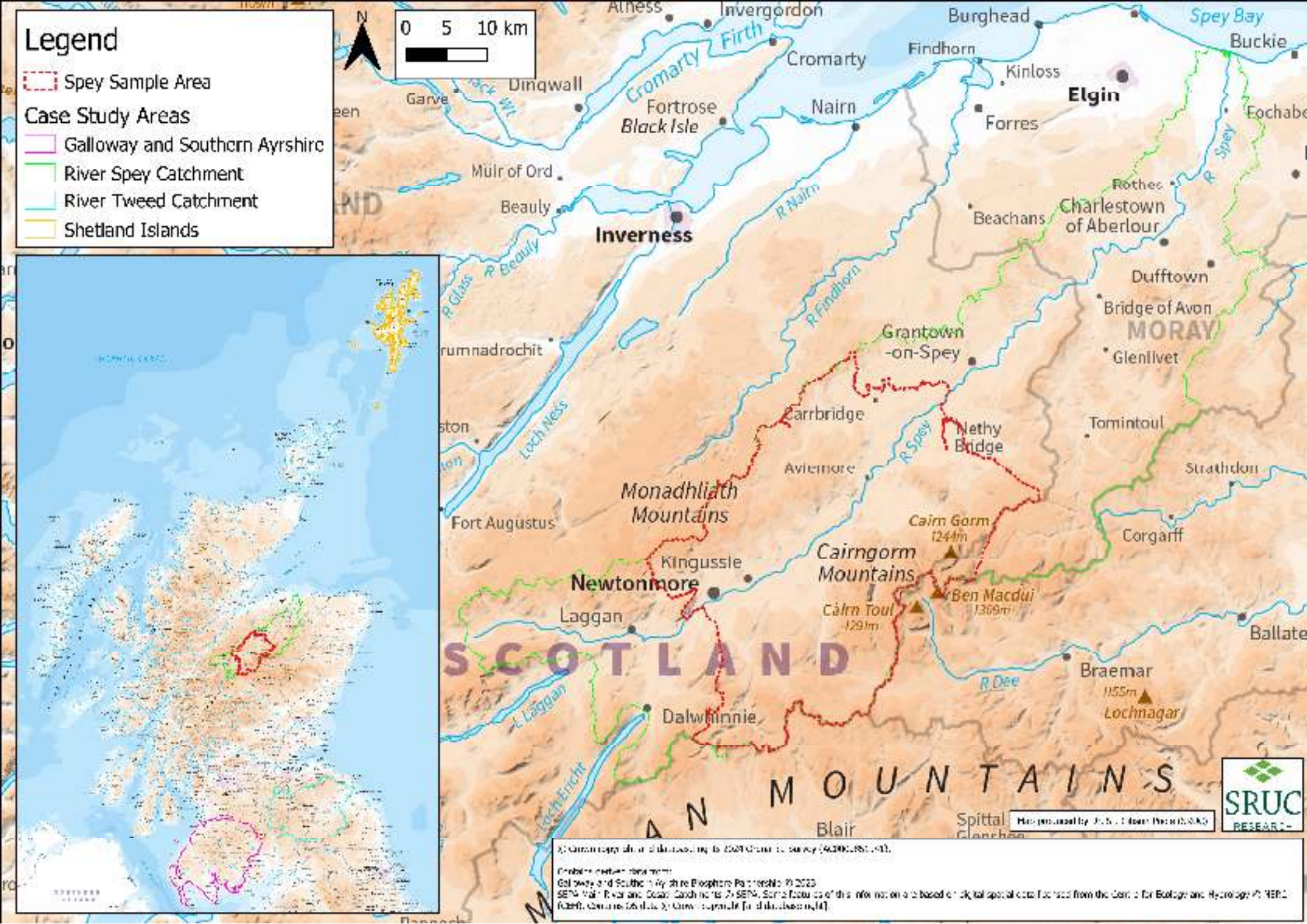

Legend
Spey Sample Area
Case Study Areas
Galloway and Southern Ayrshire
River Spey Catchment
River Tweed Catchment
Shetland Islands
N
0 5 10 km
Invergordon
Cromarty Firth
Cromarty
Burghead
Spey Bay
Buckie
Findhorn
Kinloss
Elgin
Forres
Nairn
Fortrose
Black Isle
Dingwall
Garve
Muir of Ord
Beauly
Inverness
R Beauly
R Glass
R Nairn
R Findhorn
R Spey
Rothes
Charlestown of Aberlour
Beachans
Dufftown
Bridge of Avon
MORAY
Glenlivet
Grantown-on-Spey
Carrbridge
Nethy Bridge
Tomintoul
Strathdon
Aviemore
Loch Ness
Fort Augustus
Monadhliath Mountains
Cairn Gorm
1244m
Corgarff
Kingussie
Newtonmore
Cairngorm Mountains
Ben Macdui
1309m
Cairn Toul
1291m
Laggan
Ballate
SCOTLAND
Braemar
1155m
Lochnagar
R Dee
Dalwhinnie
Loch Laggan
Loch Ericht
Blair
Spittal
GRAMPIAN MOUNTAINS
SRUC
RESEARCH

# Landownership Typology

| Type | Description |
|---|---|
| 1 | Public Sector |
| 2 | Private Sector |
| 3 | Third Sector |
| 4 | Crown Estate |
| 5 | Community Owned |
| 6 | Crofting Tenancy |

| Band | Size range |
|---|---|
| 1 | 3ha – 20ha |
| 2 | 21ha – 100ha |
| 3 | 101ha – 500ha |
| 4 | 501ha – 1,000ha |
| 5 | 1,001ha – 3,000ha |
| 6 | 3,001ha – 10,000ha |
| 7 | >10,000ha |

| Grade | Description |
|---|---|
| 1-3 | High Quality |
| 4-5 | Medium Quality |
| 6+ | Low Quality |

| Class | Description |
|---|---|
| 1 | Lowland |
| 2 | Valley |
| 3 | Upland |
| 4 | Mountainous |

| Category | Description |
|---|---|
| 1 | Farm |
| 2 | Estate |
| 3 | Forest |

**(High Land Quality)**

| | Small | Medium | Large |
|---|---|---|---|
| Farm | Band 1-2 | Band 3 | Band 4+ |
| Estate | Band 1-3 | Band 4 | Band 5+ |
| Forest | Band 1 | Band 2 | Band 3+ |

**(Medium Land Quality)**

| | Small | Medium | Large |
|---|---|---|---|
| Farm | Band 1-3 | Band 4 | Band 5+ |
| Estate | Band 1-4 | Band 5 | Band 6+ |
| Forest | Band 1-2 | Band 3 | Band 4+ |

**(Low Land Quality)**

| | Small | Medium | Large |
|---|---|---|---|
| Farm | Band 1-4 | Band 5 | Band 6+ |
| Estate | Band 1-5 | Band 6 | Band 7 |
| Forest | Band 1-3 | Band 4 | Band 5+ |

**Ownership (Spatial Footprint)**

**(Level 1) Identify Land Parcel Size**

**(Level 2) Ownership Type**

**(Level 3) Land Quality**

**(Level 4) Land Character Type**

**(Level 5) Land Cover / Land Use**

**(Level 6) Descriptor**

(Key Data Sources)

National Forest Estate Ownership (FLS)

Who Owns Scotland (WoS)

Non-Residential Land Values (RoS)

Public Ownership (Local Authority)

Land Parcel Information System (SG)

Land Capability for Agriculture (JHI)

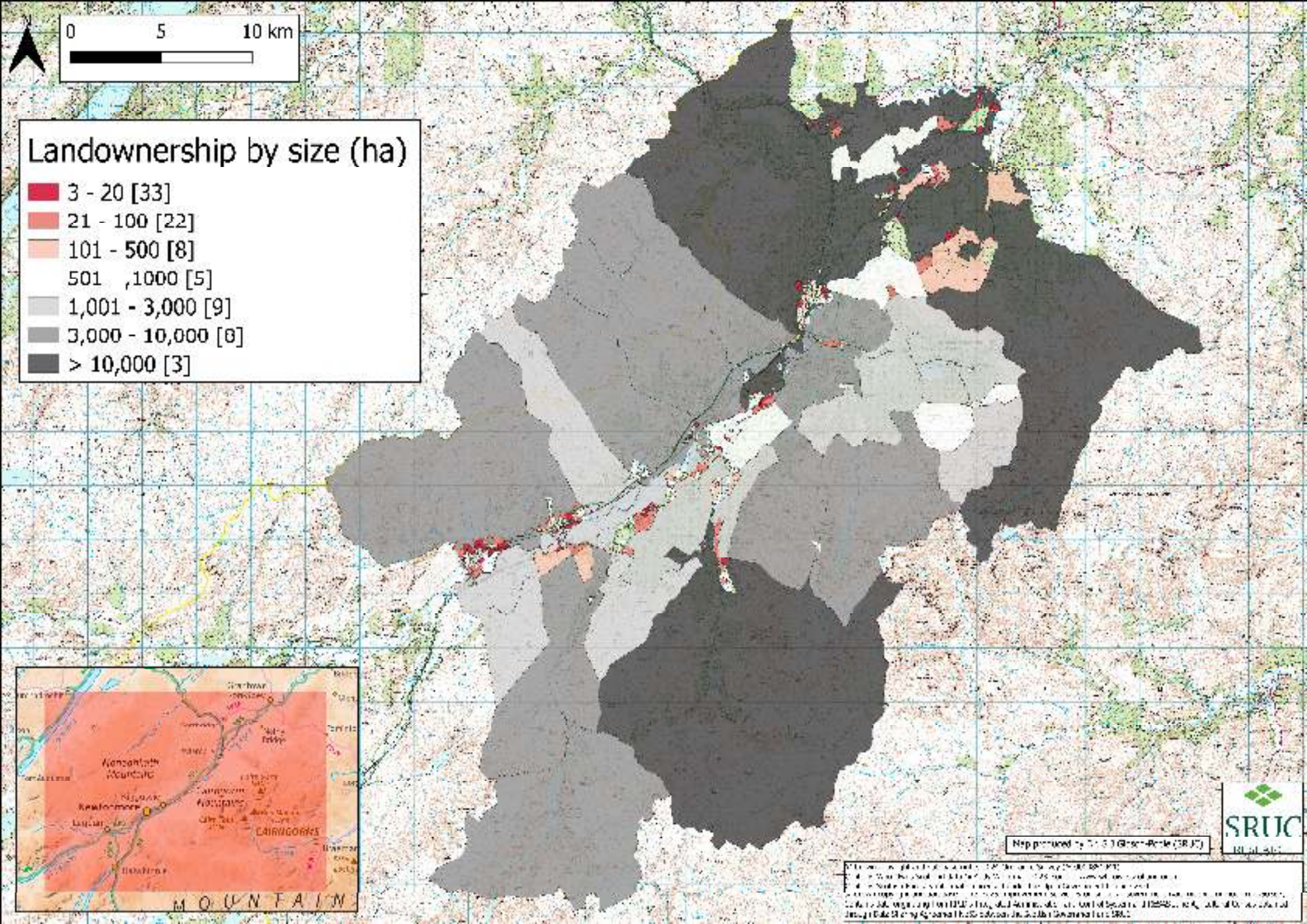
Land Character Assessment (NS)

UKCEH Land Cover (CEH)

Open Data Local (OS)

**(e.g. A small farm situated in a lowland area with predominately high-quality land)**

SRUC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5
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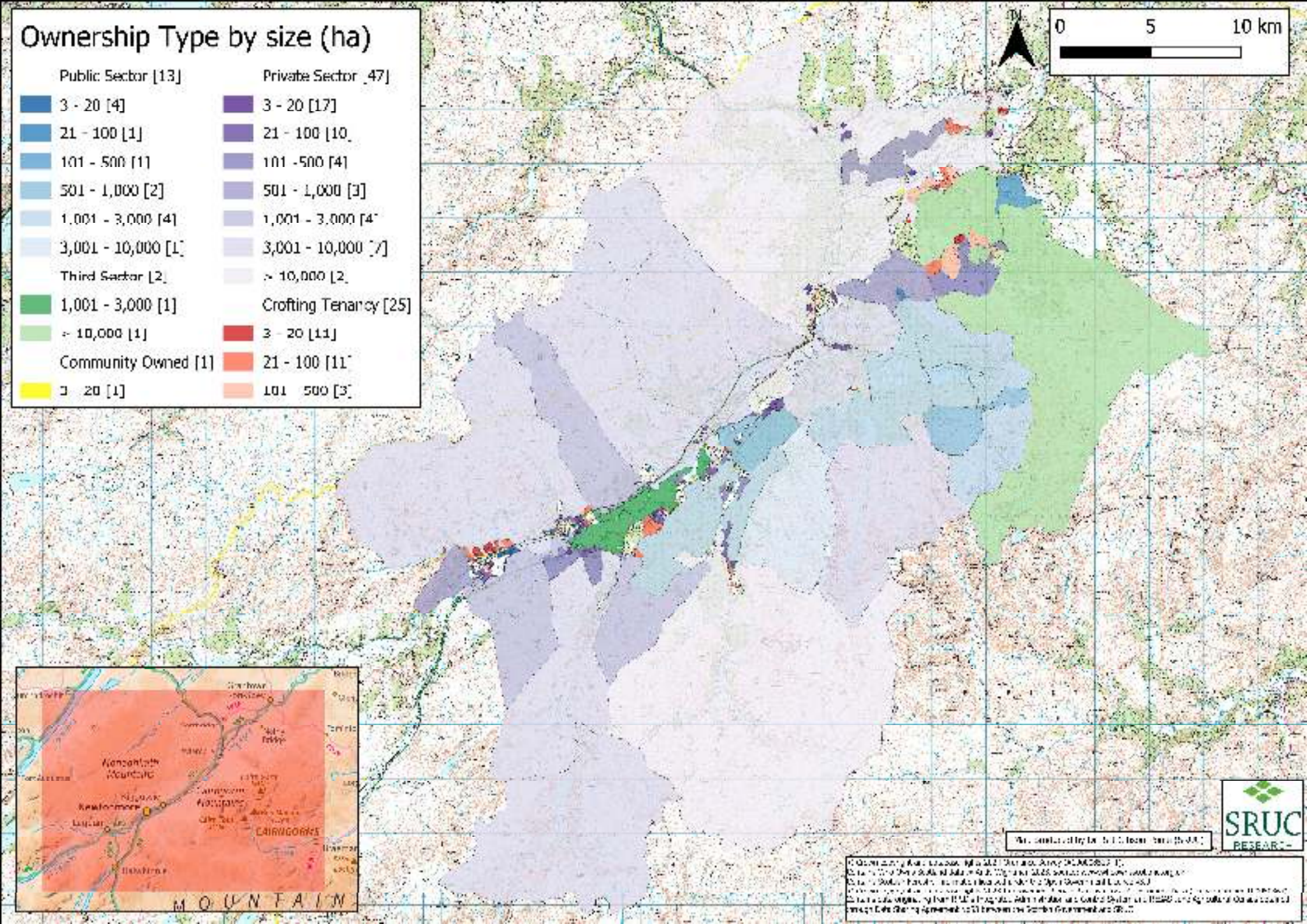
21 - 100 [22]
101 - 500 [8]
501 ,1000 [5]
1,001 - 3,000 [9]
3,000 - 10,000 [6]
> 10,000 [3]
CAIRNGORMS
MOUNTAIN
SRUC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> 10,000 [1]
Community Owned [1]
3 - 20 [1]
Private Sector [47]
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21 - 100 [10]
101 - 500 [4]
501 - 1,000 [3]
1,001 - 3,000 [4]
3,001 - 10,000 [7]
> 10,000 [2]
Crofting Tenancy [25]
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21 - 100 [11]
101 - 500 [3]
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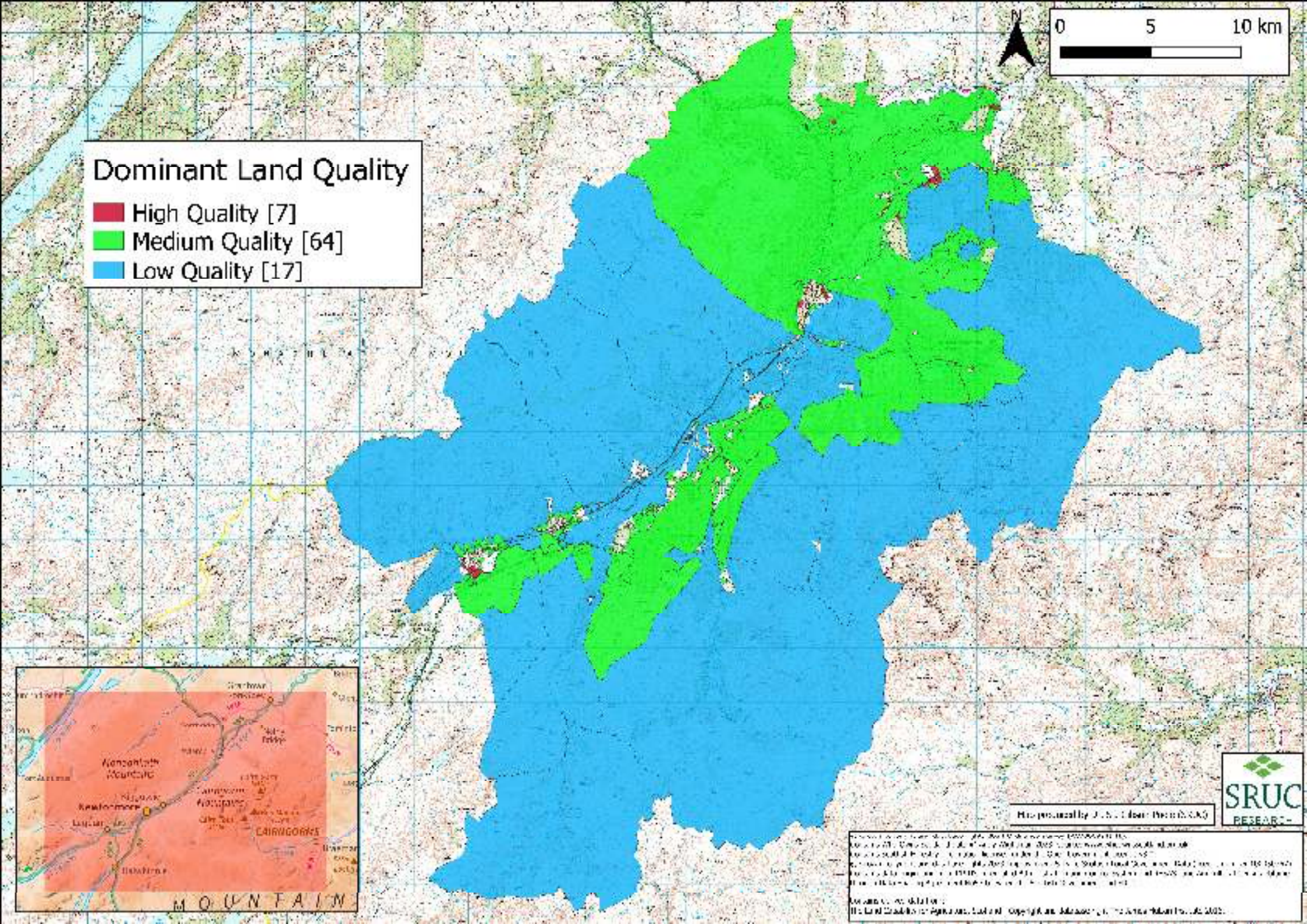
0
5
10 km
SRUC
RESEARCH
CAIRNGORMS
MOUNTAIN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Medium Quality [64]
Low Quality [17]
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5
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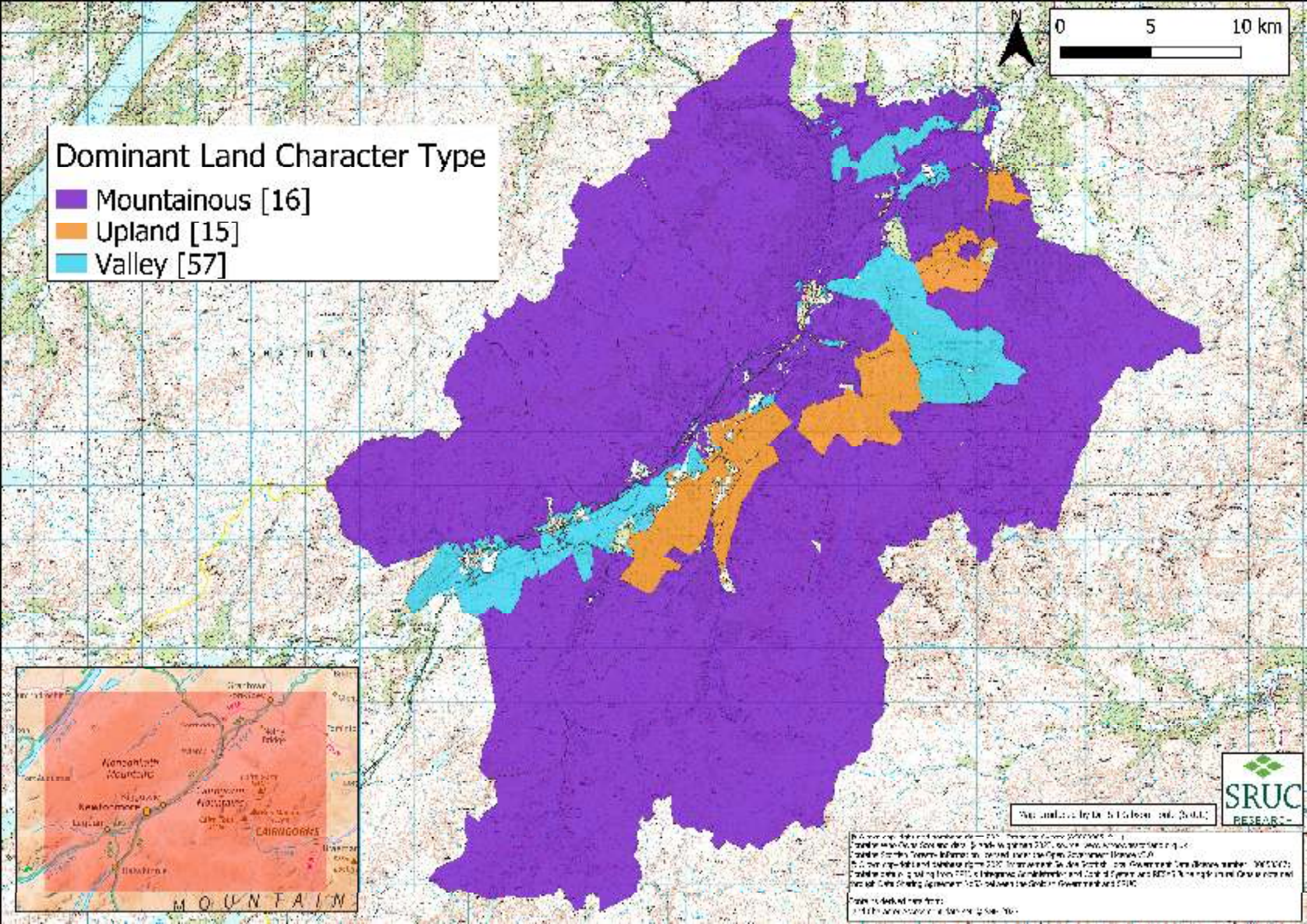
SRUC
RESEARCH
CAIRNGORMS
MOUNTAIN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Upland [15]
Valley [57]
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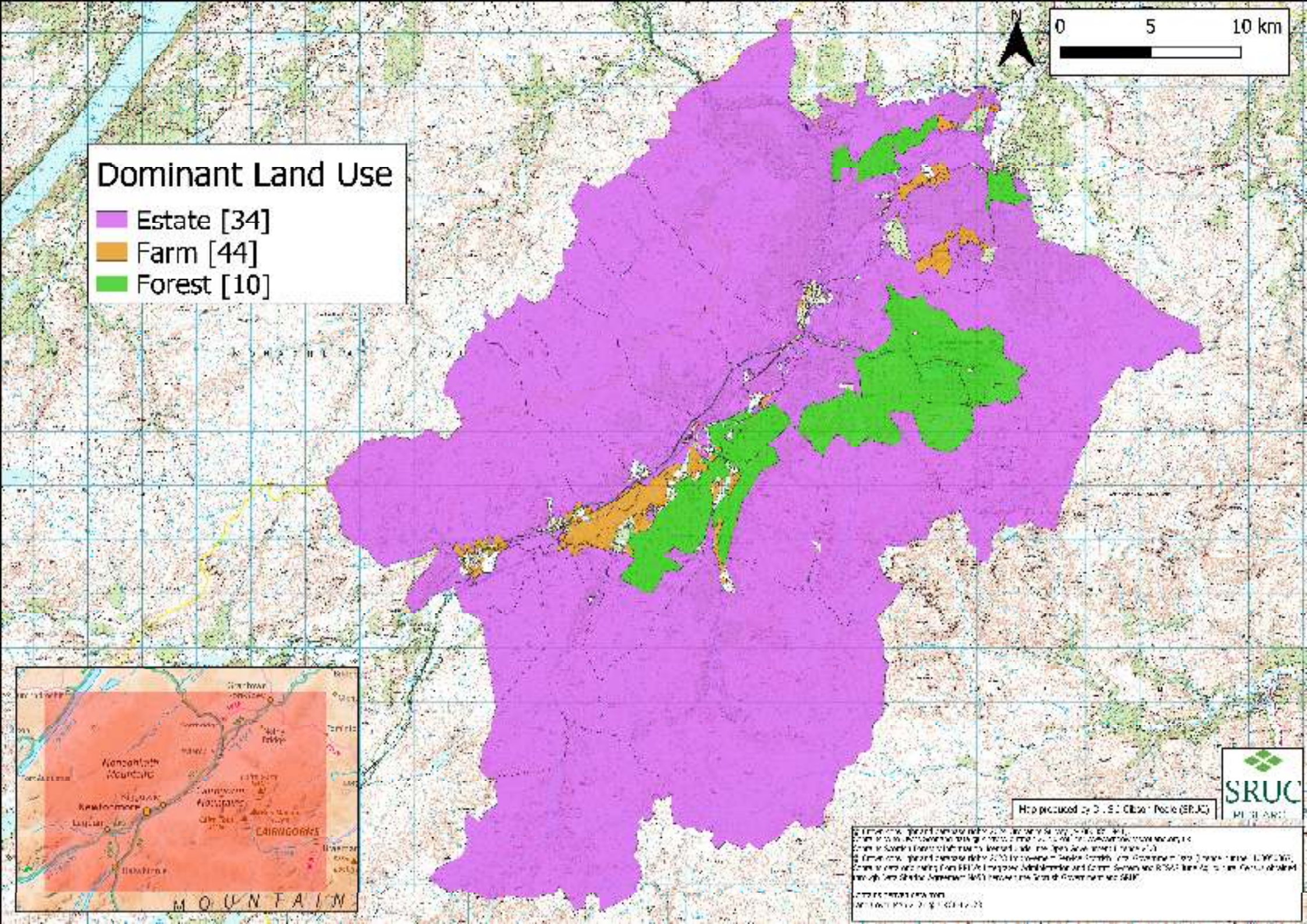
5
10 km
SRUC
RESEARCH
MOUNTAIN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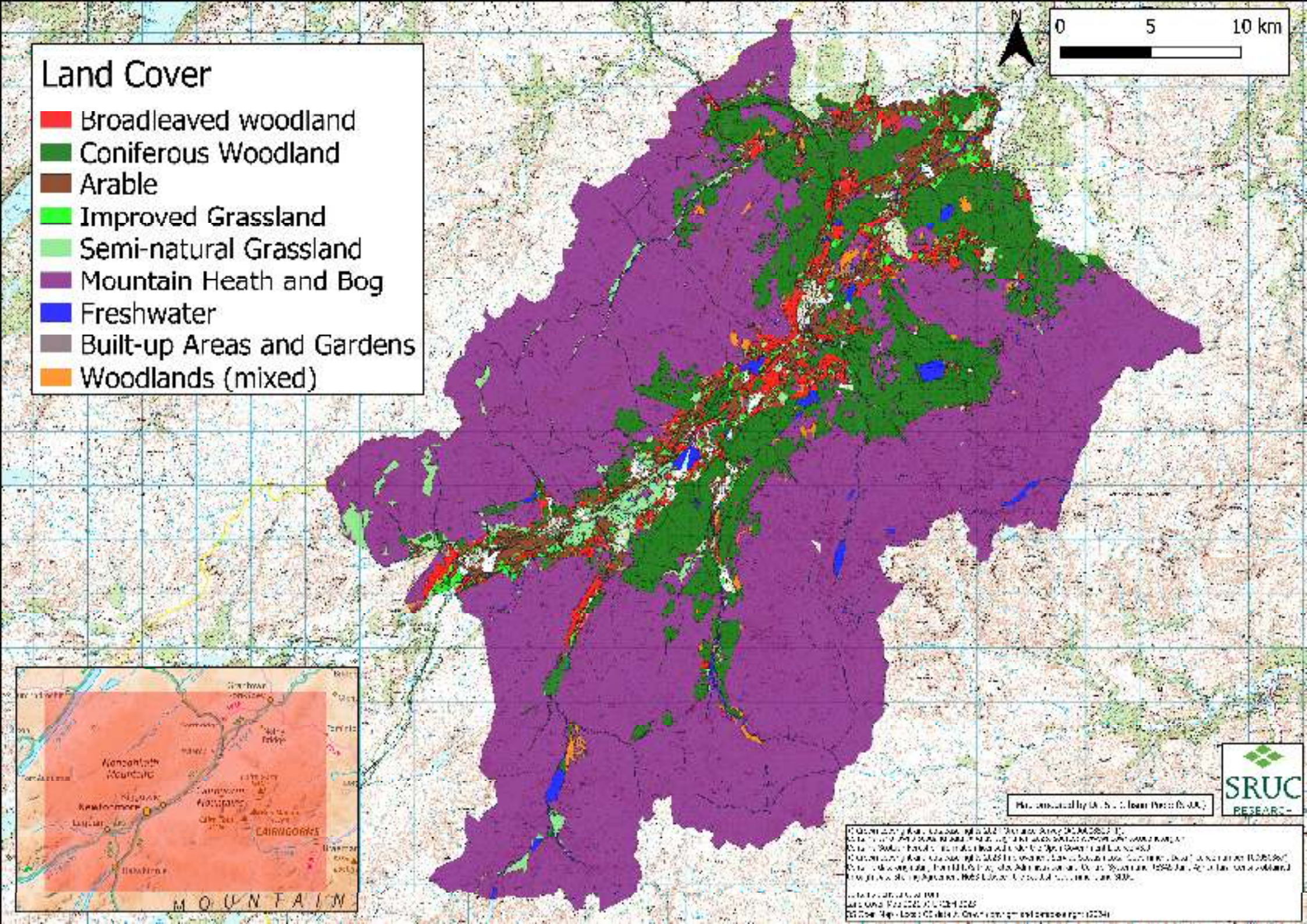
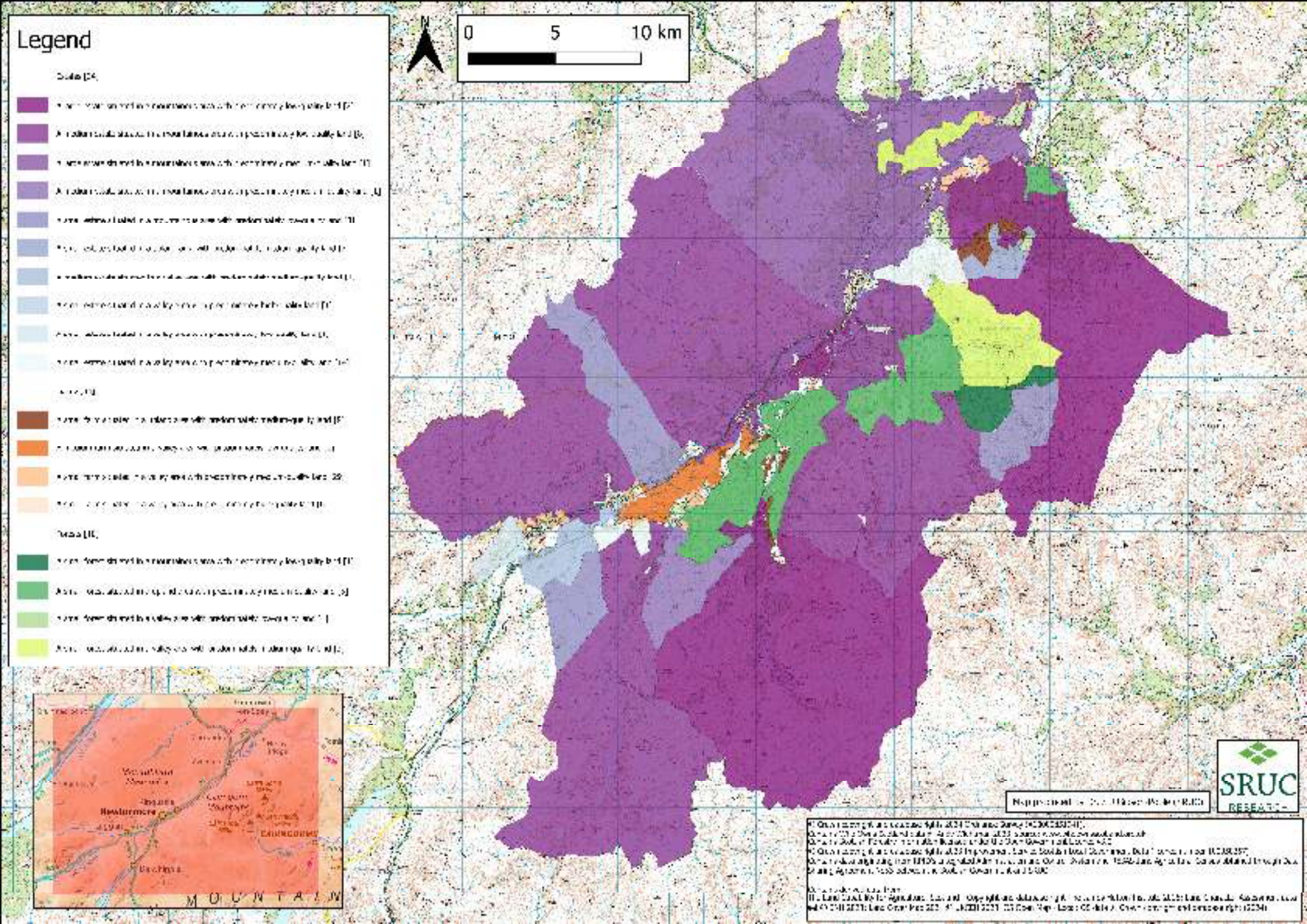
CAIRNGORMS
MOUNTAIN


Land Cover
Broadleaved woodland
Coniferous Woodland
Arable
Improved Grassland
Semi-natural Grassland
Mountain Heath and Bog
Freshwater
Built-up Areas and Gardens
Woodlands (mixed)
N
0
5
10 km
SRUC
RESEARCH
CAIRNGORMS
MOUNTAIN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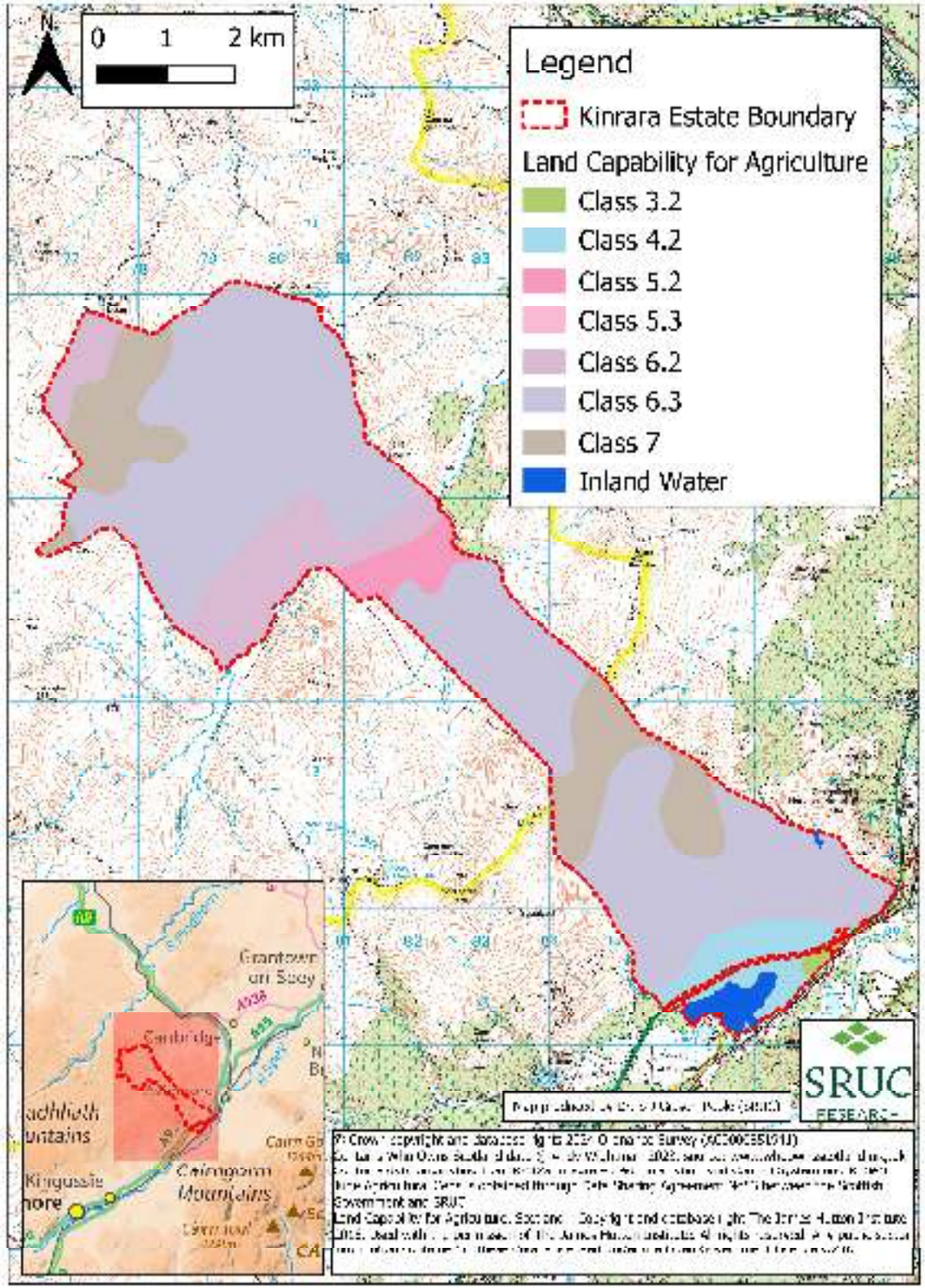
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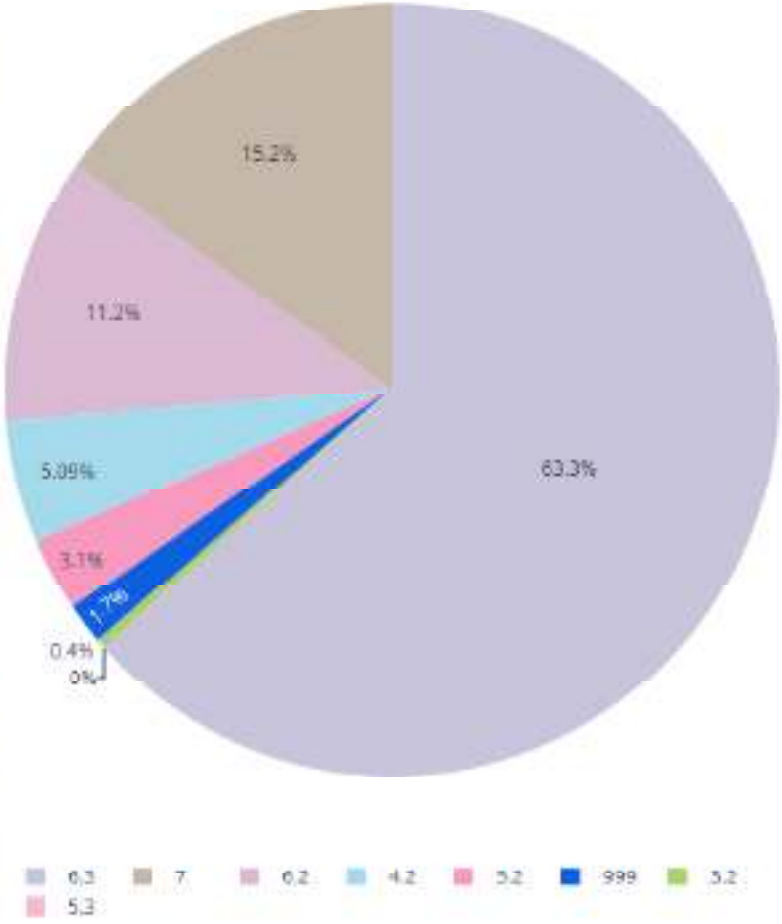
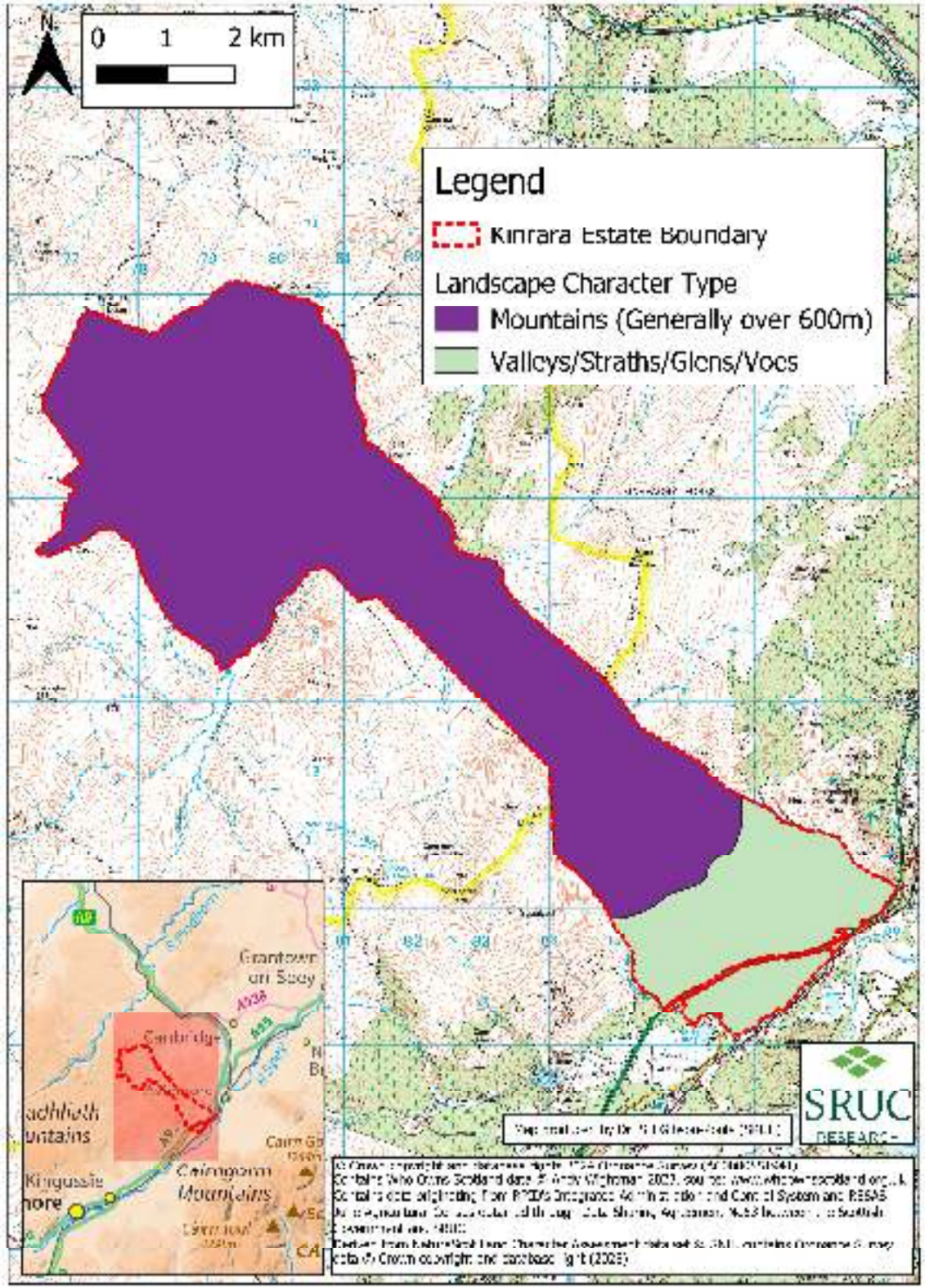
Kinrara Estate Boundary
Land Capability for Agriculture
Class 3.2
Class 4.2
Class 5.2
Class 5.3
Class 6.2
Class 6.3
Class 7
Inland Water
Grantown on Spey
A938
A95
Cairngorm Mountains
SRUC


15.2%
11.2%
5.09%
3.1%
1.7%
0.4%
0%
63.3%
6.3
7
6.2
4.2
5.2
999
3.2
5.3


N
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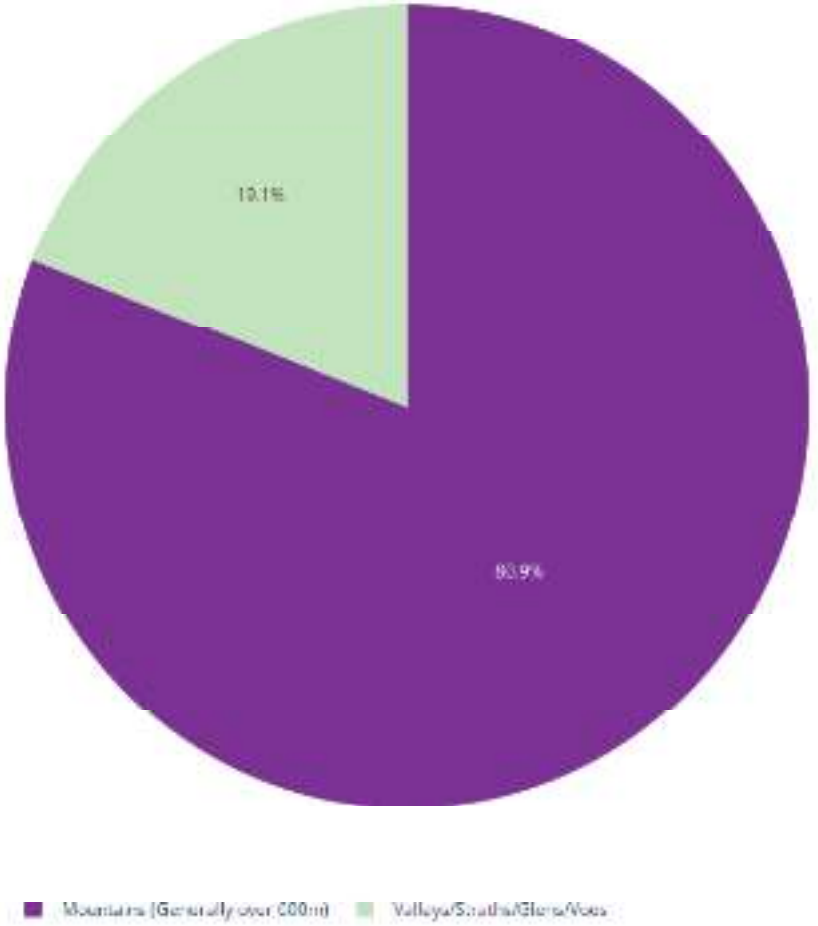
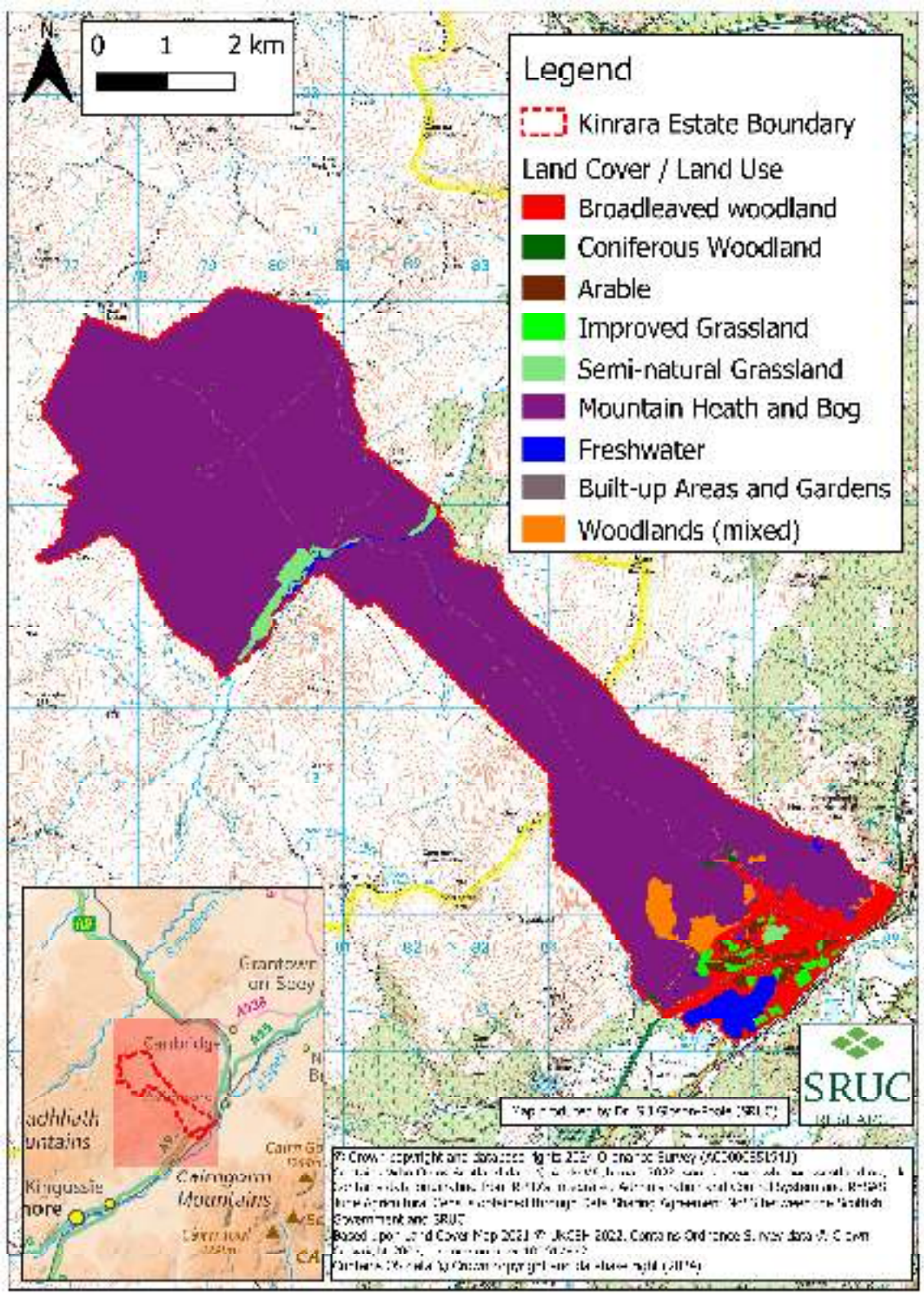
Legend
Kinrara Estate Boundary
Landscape Character Type
Mountains (Generally over 600m)
Valleys/Straths/Glens/Vocs
Grantown on Spey
A938
A95
Cairngorm Mountains
SRUC
RESEARCH


16.1%
83.9%
Mountains (Generally over 600m)
Valleys/Straths/Glens/Vocs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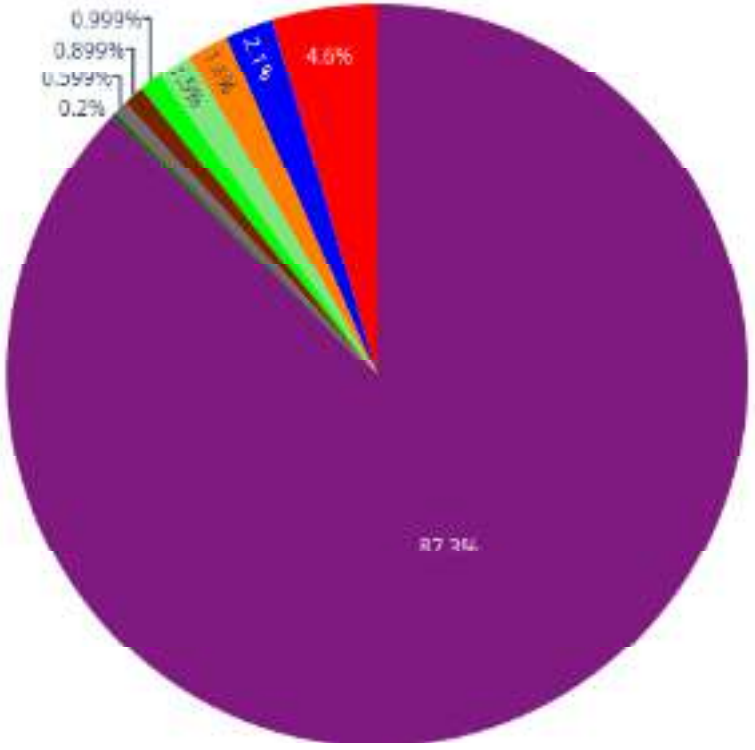
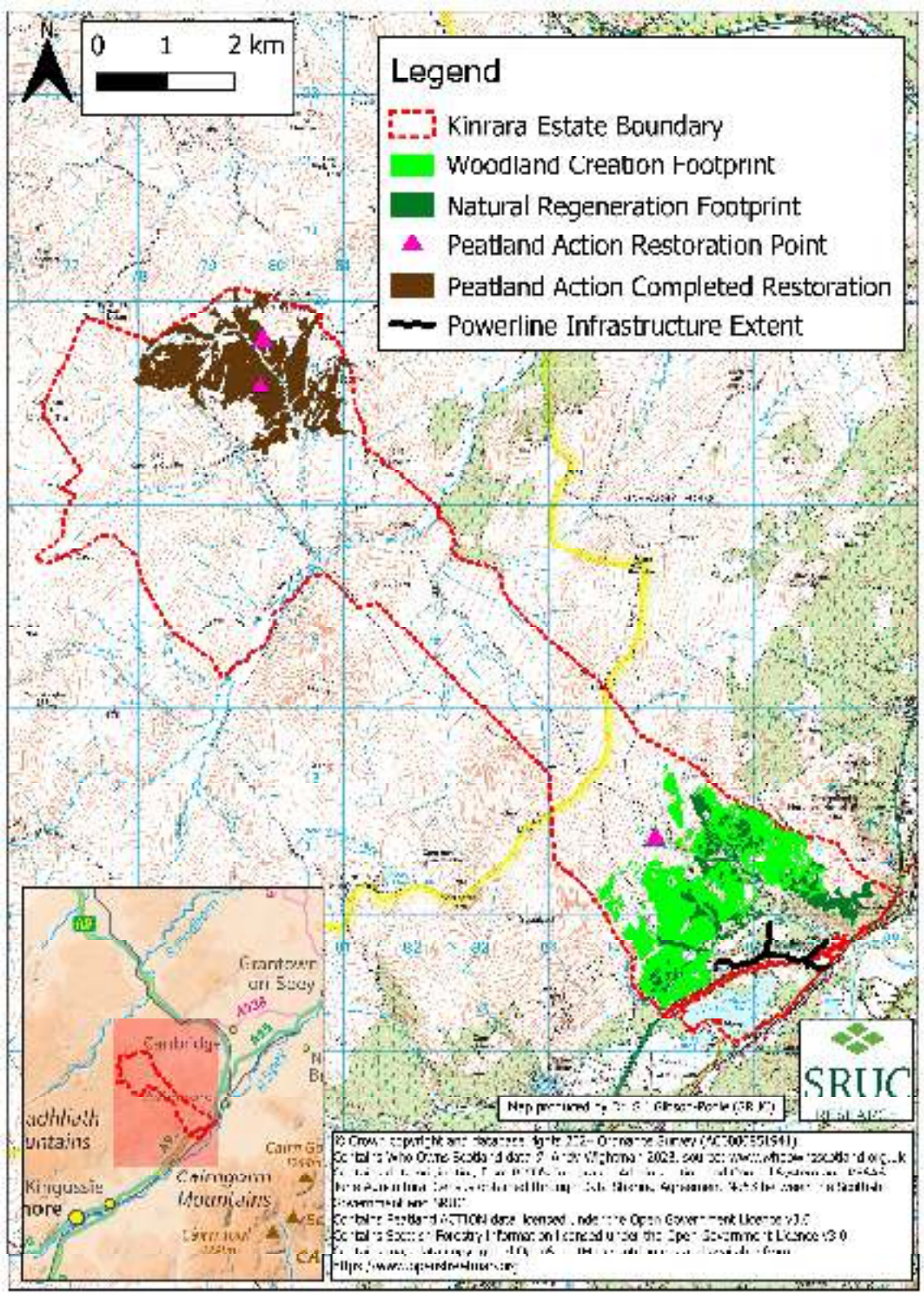
Legend
Kinrara Estate Boundary
Land Cover / Land Use
Broadleaved woodland
Coniferous Woodland
Arable
Improved Grassland
Semi-natural Grassland
Mountain Heath and Bog
Freshwater
Built-up Areas and Gardens
Woodlands (mixed)
SRUC
Grantown on Spey
Cairngorm Mountains


0.999%
0.899%
0.599%
0.2%
4.6%
Mountain, heath and bog
Freshwater
Semi-natural grassland
Arable
Coniferous woodland
Broadleaf woodland
Woodlands (mixed)
Improved grassland
Built-up areas and gardens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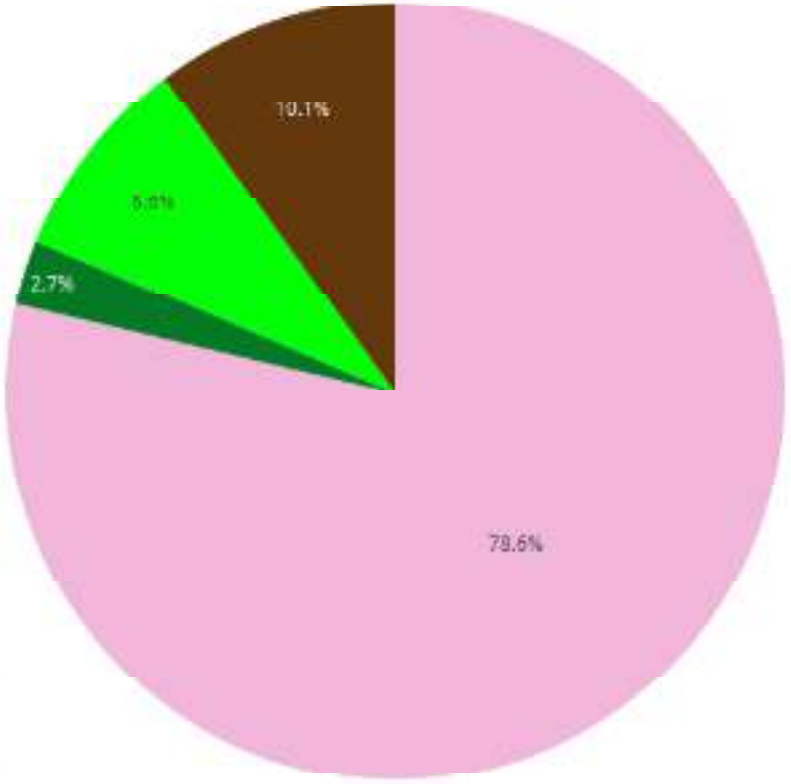
Legend
Kinrara Estate Boundary
Woodland Creation Footprint
Natural Regeneration Footprint
Peatland Action Restoration Point
Peatland Action Completed Restoration
Powerline Infrastructure Extent
Grantown on Spey
Cairngorm Mountains
SRUC


19.1%
2.7%
79.6%
Not Under Grant Scheme
Woodland Creation
Peatland Action
Natural Regeneration