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The River Ericht
CATCHMENT RESTORATION INITIATIVE

Bioregioning Tayside

River Ericht Catchment Restoration Project

Baseline Assessment

September 2023

Introduction

This report is the first of five deliverables forming part of the Design Phase of the River Ericht Catchment Restoration Project.

This Baseline Assessment presents a brief introduction to natural capital markets in Scotland, takes stock of the current land uses and condition within the catchment and identifies opportunities to generate tradeable ecosystem services through nature restoration.

The next deliverable will present the Restoration Vision for the catchment. This will be informed by the findings of the Baseline Assessment and developed with extensive community engagement.

Content

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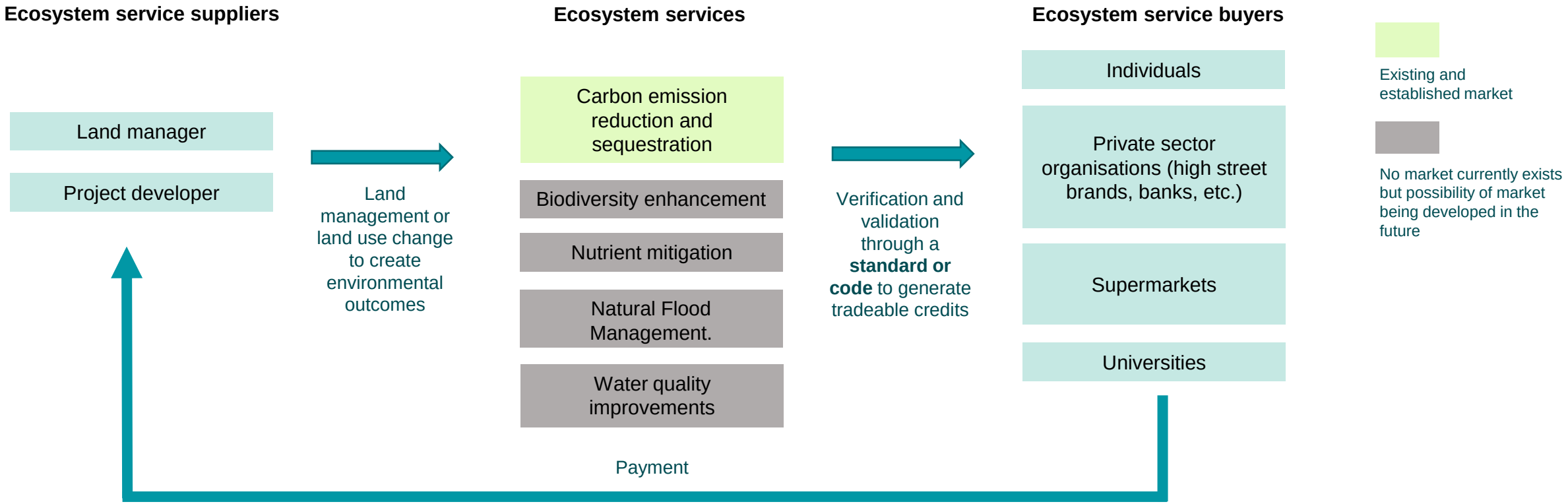
1

Overview of payments for ecosystem service opportunities in Scotland

Ecosystem service markets allow land managers to trade units of environmental outcomes, often represented via credits, that are validated and verified by a standard or code



Ecosystem services standards and codes

Carbon emission reduction	Carbon emission sequestration	Biodiversity Net Gain (England only)	Nutrient Neutrality (England only)	Carbon and Biodiversity *(example)*

NB. The Peatland and Woodland Carbon Codes as well as emerging codes (ie. Wilder Carbon) are currently part of voluntary markets. There is currently no legal requirement for individuals or companies to partake. In England, Biodiversity Net Gain and Nutrient Neutrality have now been made legal requirements.

Restoring Scotland's natural capital will generate ecosystem services at scale and provide significant benefits to society which can be valued in economic terms

Outcome	Benefits provided	Market mechanism to calculate a financial value
Woodland carbon sequestration	Woodland carbon sequestration is the process of removing carbon dioxide from the atmosphere via photosynthesis. The carbon sequestered by the tree is accumulated and stored in the biomass and the soil, creating a natural reservoir called a carbon sink, contributing to the decrease of Green House Gases in the atmosphere.	**Woodland Carbon Code** The Woodland Carbon Code (WCC) is the quality assurance standard for woodland creation projects in the UK and generates independently verified carbon units. Woodland carbon credits can be sold based on the ongoing carbon sequestration from new woodland. Buyers include the UK government and the private market.
Peatland carbon emissions mitigation	Peatlands are among the most carbon-rich ecosystems on earth. In their natural condition, peatlands have a cooling effect on the climate and reduce flood risk, purify water and support biodiversity. When degraded, peatland releases carbon naturally built up over centuries and becomes a net source of carbon emissions.	**Peatland Carbon Code** The Peatland Carbon Code (PCC) is the quality assurance standard for peatland restoration projects in the UK and generates independently verified carbon units. Peatland carbon credits can be sold based on the ongoing carbon emission mitigation from restored peatland. Buyers include the UK government and the private market.
Biodiversity enhancement	The UK is facing a biodiversity crisis having lost nearly half of its wildlife and plant species as a result of human and land development since the Industrial Revolution. Across Scotland, landscape strategies and management plans are set objectives to create bigger, better and more joined-up habitats, with nature-rich wildlife corridors extending beyond private landholding boundaries	**Biodiversity Net Gain** In England, developers are required to incorporate a 10% biodiversity gain on new developments for successful planning approval. Scotland does not currently have equivalent policy. The aim is to deliver biodiversity through the national planning framework (NPF) with goals of biodiversity enhancement as opposed to 'net gain'. A Scottish standard for BNG may be developed in the coming years.
Nutrient management	Agricultural runoff and sedimentation directly contributes to nutrient pollution, biodiversity loss and ecosystem damage in water bodies. Objectives to improve water quality will focus on reducing sources of diffuse pollution.	**Nutrient Neutrality** The Water Framework Directive (WFD) introduced the need for a broader, more holistic approach to monitoring and classifying Scotland's aquatic environment to secure drinking water supplies and protect aquatic ecosystems. Water quality is being monitored and classified annually by the Scottish Environment Protection Agency (SEPA).
Natural flood management	Extreme weather and storms are becoming more frequent and less predictable in the UK. Millions of homes are at risk of severe flooding each year and improving the ability of our landscapes to hold water can significantly reduce the risk and severity of flood events.	**Flood risk reduction** Flood risk management stakeholders such as SEPA, water utilities, local council and flood risk insurance companies are willing to invest in natural flood management projects that have a demonstrable impact on reducing flood risk for people and communities.

We carried out an opportunity assessment of the revenue potential of ecosystem service markets: Carbon, Biodiversity Net Gain and Nutrient Neutrality in Scotland.

Outcome	Natural capital market presence and sale opportunity in Scotland	
Woodland carbon sequestration	**The carbon market is the most established in Scotland and the sale of carbon credits offers the most accessible source of additional revenue streams to landowners.** The voluntary market for carbon is growing rapidly and there are a considerable number of interested buyers within the UK. UK-based native woodland creation projects are very popular with buyers due to their high integrity and traceability of outcomes.	Existing and trading ecosystem service market
Peatland carbon emissions mitigation	**As for woodland creation, the carbon market from peatland restoration is well established in Scotland** and the sale of carbon credits offers accessible sources of additional revenue streams to landowners.	Existing and trading ecosystem service market
Biodiversity enhancement	**At present, there is no national policy mechanism or formal marketplace to access payments for biodiversity outcomes in Scotland** – however one is likely to be developed in the coming years. Until then, biodiversity can be valued when combined with other environmental outcomes for example with woodland carbon credits. The carbon credits from establishing a biodiverse woodland with significant additional biodiversity impacts (such as deer or INNS control) can be sold at a premium compared to those without an extra biodiversity component. This is called **'carbon +'.**	Currently no market in Scotland but potential to be developed in the next years
Nutrient management	**Opportunities to unlock private finance to support improvements in water quality remains low**, as the marketable value of water quality is limited to the improvement of nitrate and phosphate levels. The level of these nutrients in both ground and surface water is currently classified as Good-High quality by SEPA.	Currently no market in Scotland but potential to be developed in the next years
Natural flood management	**Payments for NFM outcomes are not an immediate option within the River Ericht catchment.** Currently the Flood Risk Management Strategy for Blairgowrie states flood risk if caused mainly from surface water (75%) and river flooding (25%) with 30 residential properties at risk of flooding and annual average damages of £120,000. NFM could become a viable revenue stream should future development take place in areas at risk of flooding or if a private company or an insurance company is interested in paying for outcomes to stimulate a market. If no property development occurs in the vulnerable areas, it is unlikely that private buyers would pay to support habitat creation for flood management services.	Currently not accessible, and market not likely to be developed in the next years

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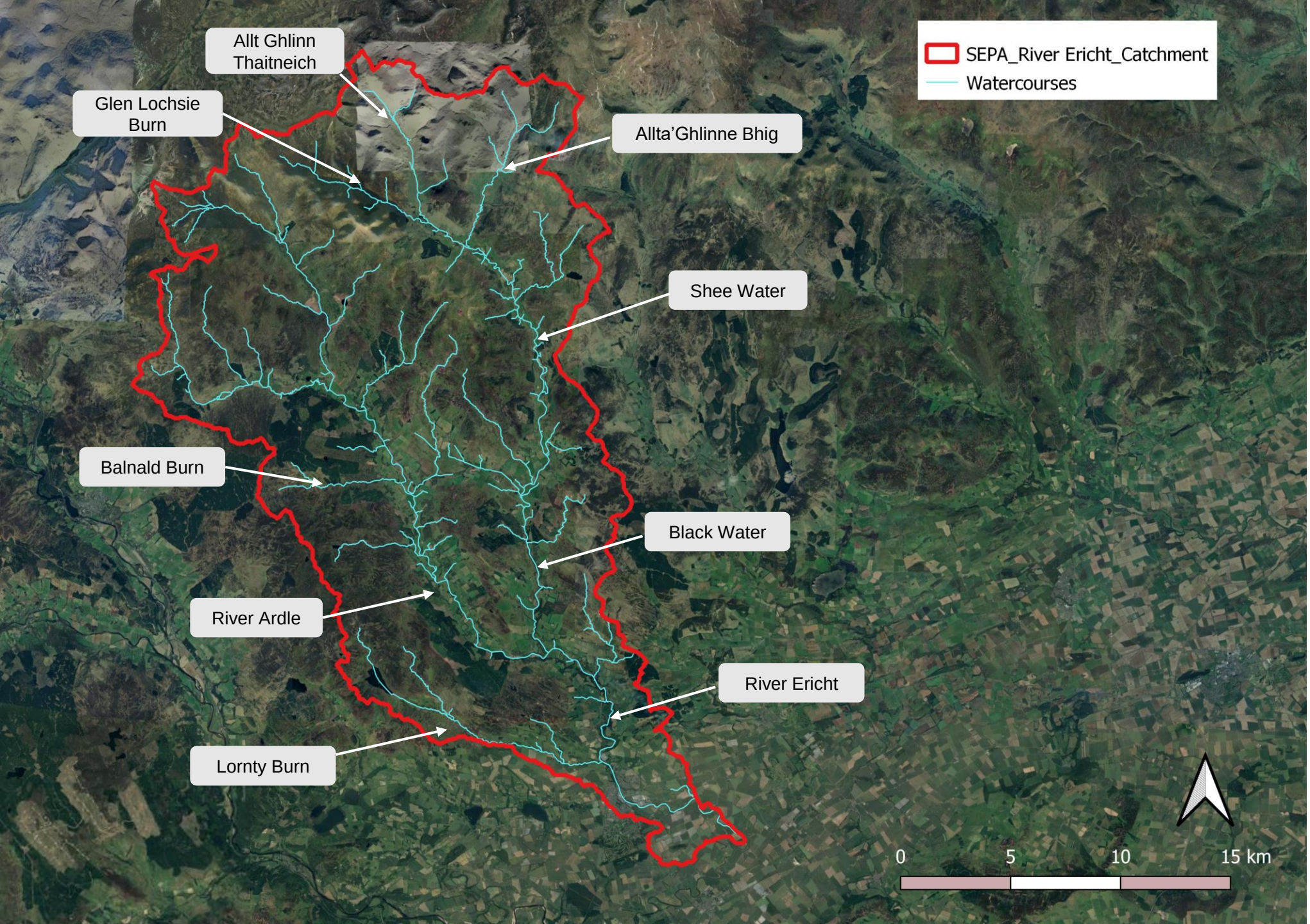
Baseline land uses and current condition in the River Ericht Catchment

2

Current land uses

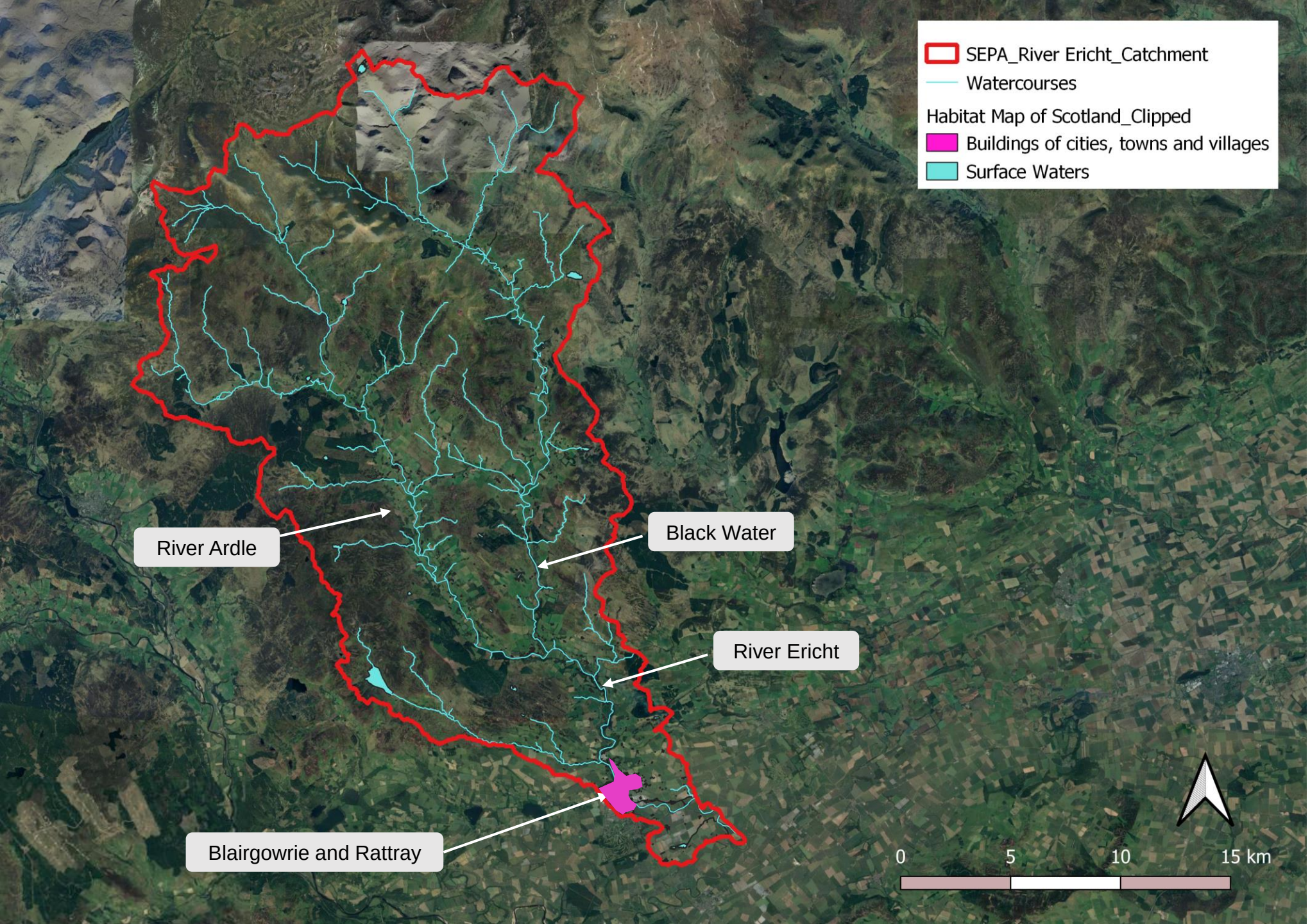
2.1



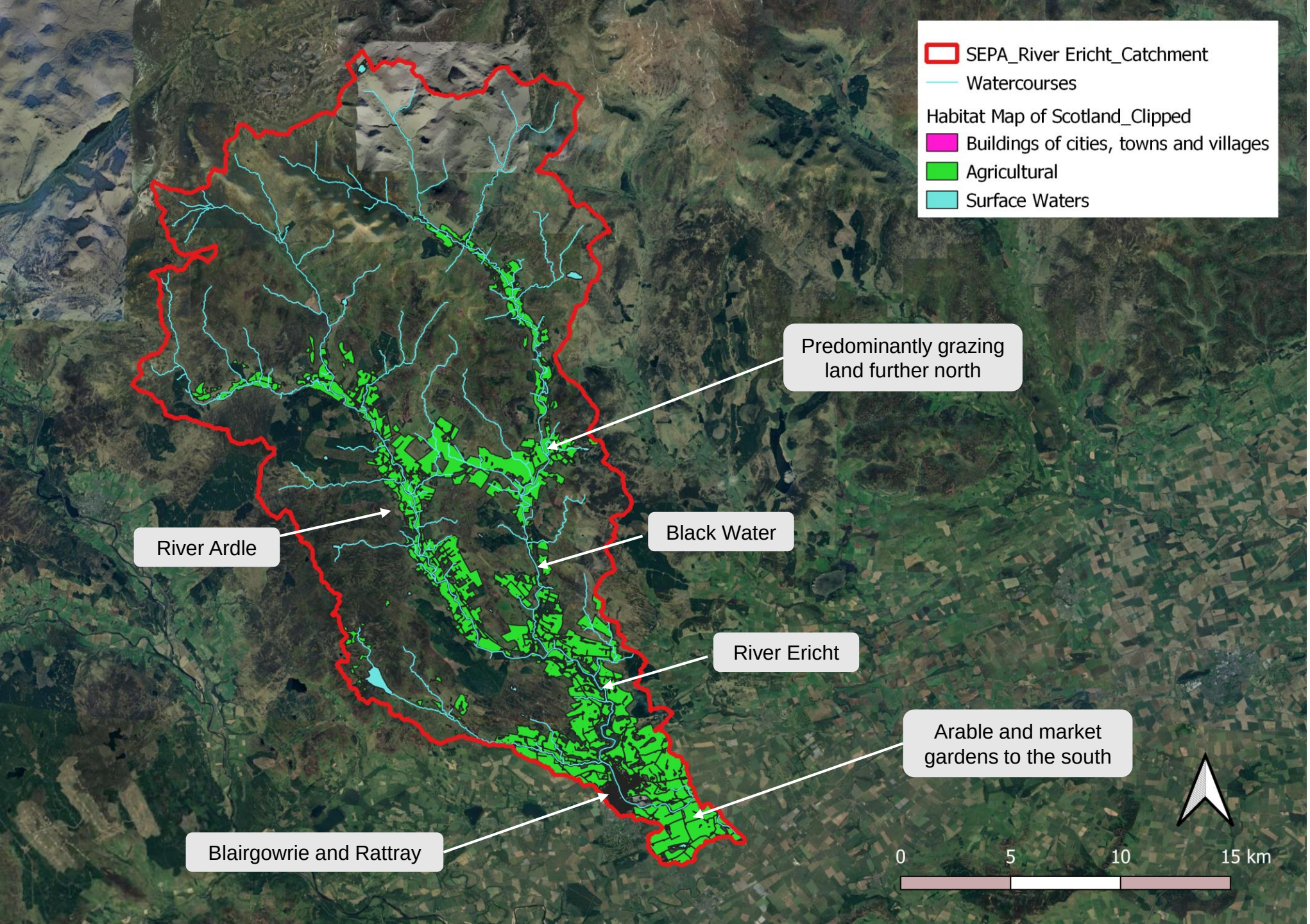
Watercourse Map of the Ericht Catchment

The River Ericht catchment extends over **49,612 hectares** and includes numerous waterways, namely the River Ardle and the Black Water which both join in Bridge of Cally and become the River Ericht.

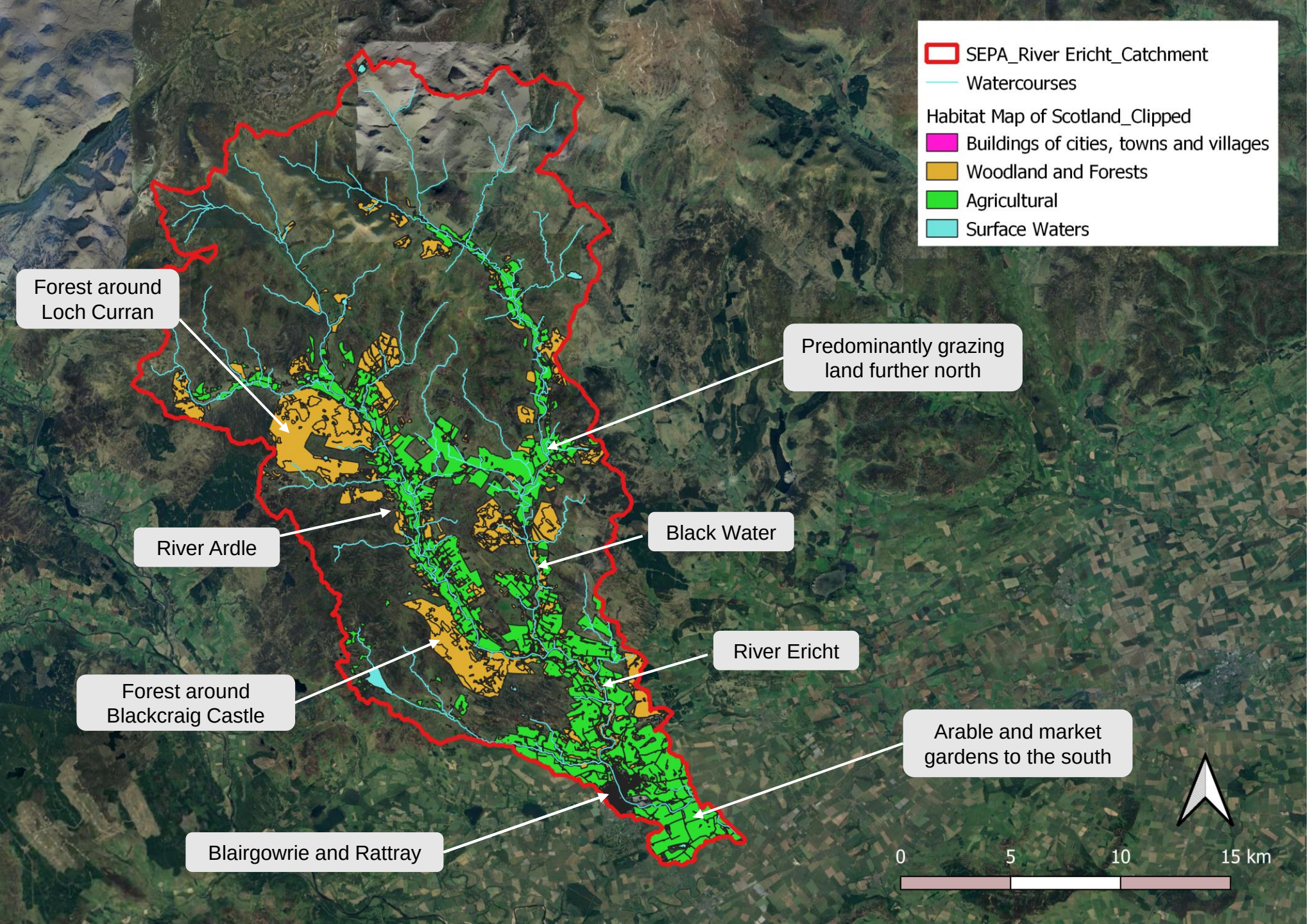
Habitat Map of the Ericht Catchment (1)



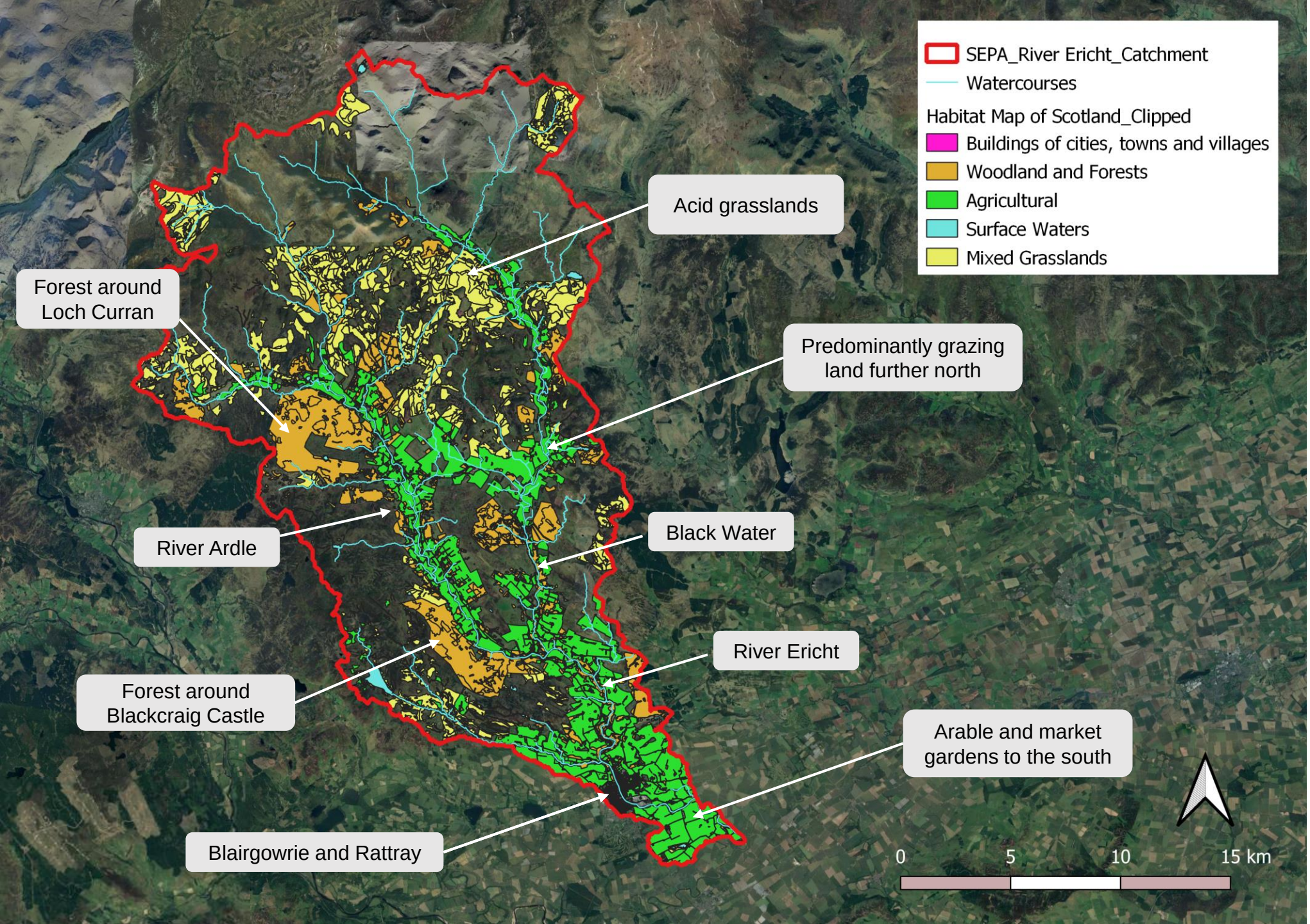
Habitat Map of the Ericht Catchment (2)



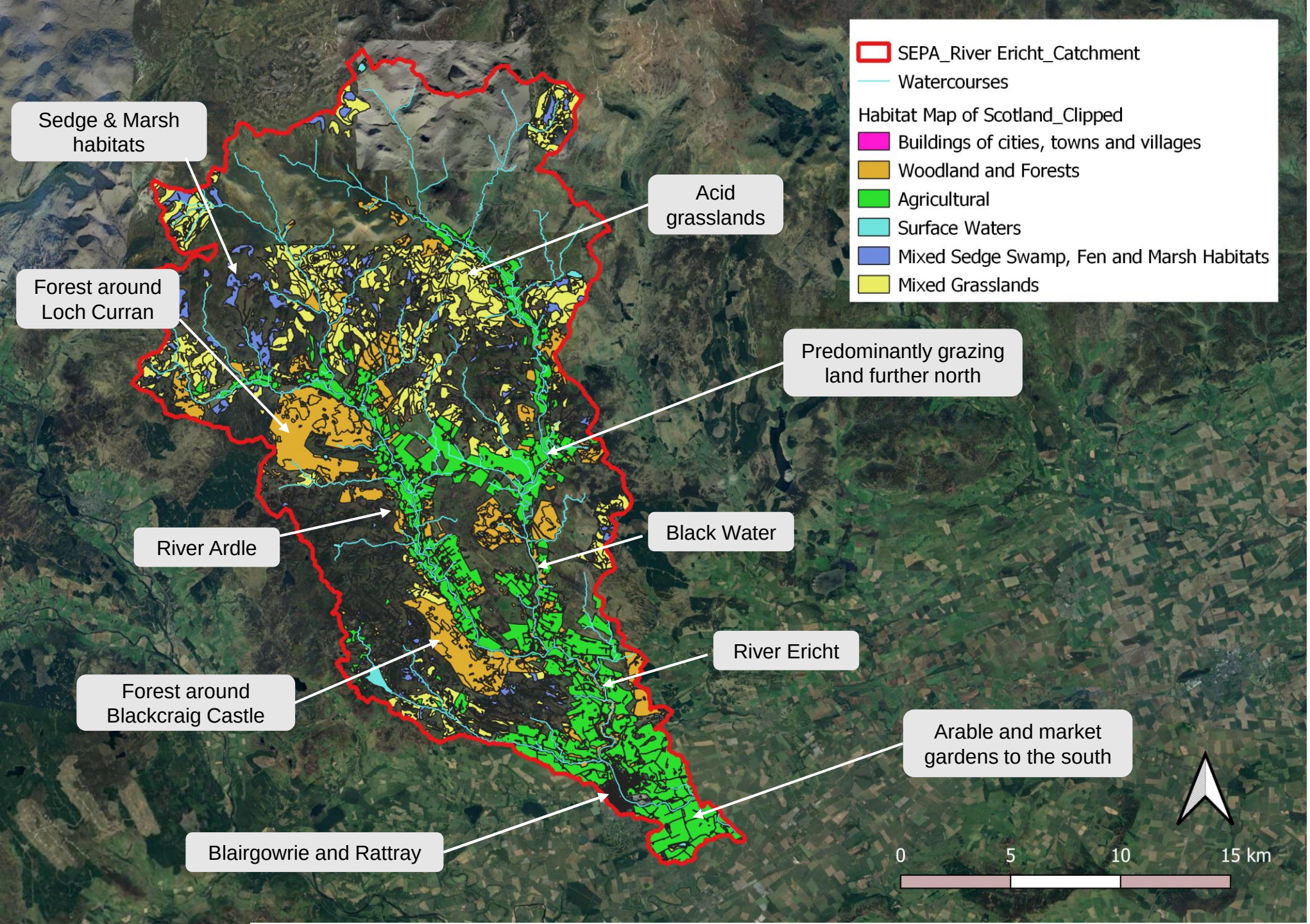
Habitat Map of the Ericht Catchment (3)



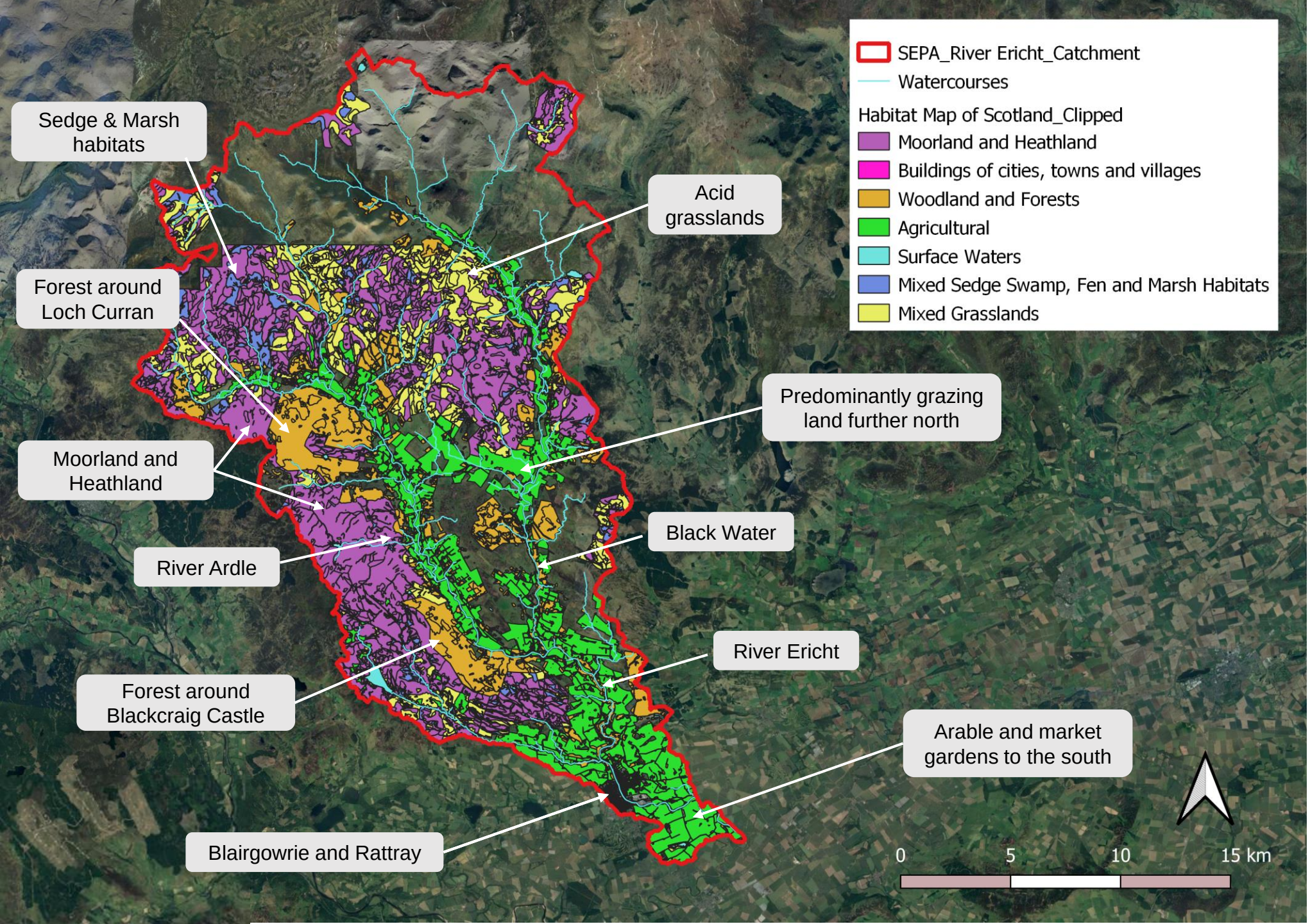
Habitat Map of the Ericht Catchment (4)



Habitat Map of the Ericht Catchment (5)

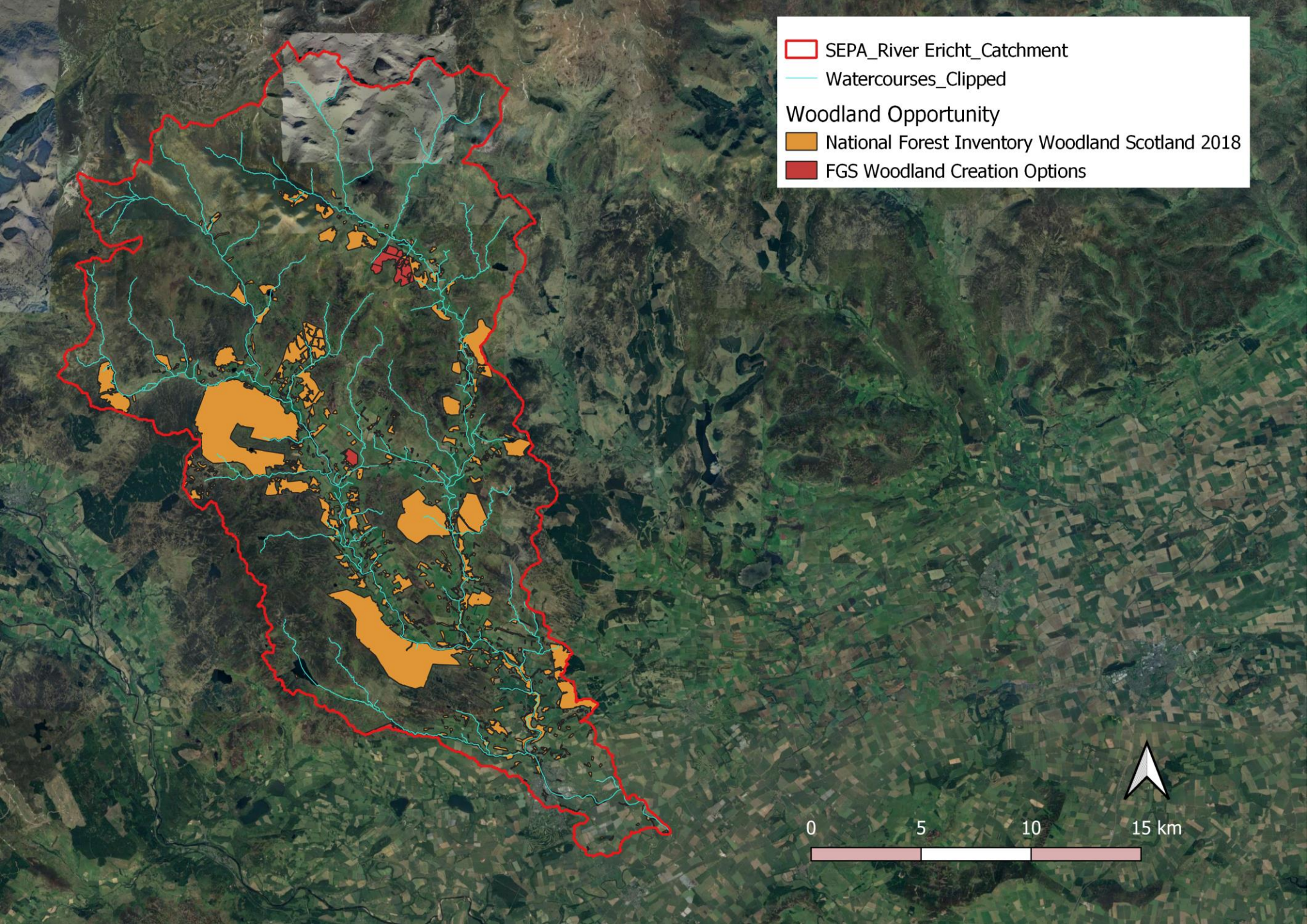


Habitat Map of the Ericht Catchment (6)



Woodland baseline and condition

2.2

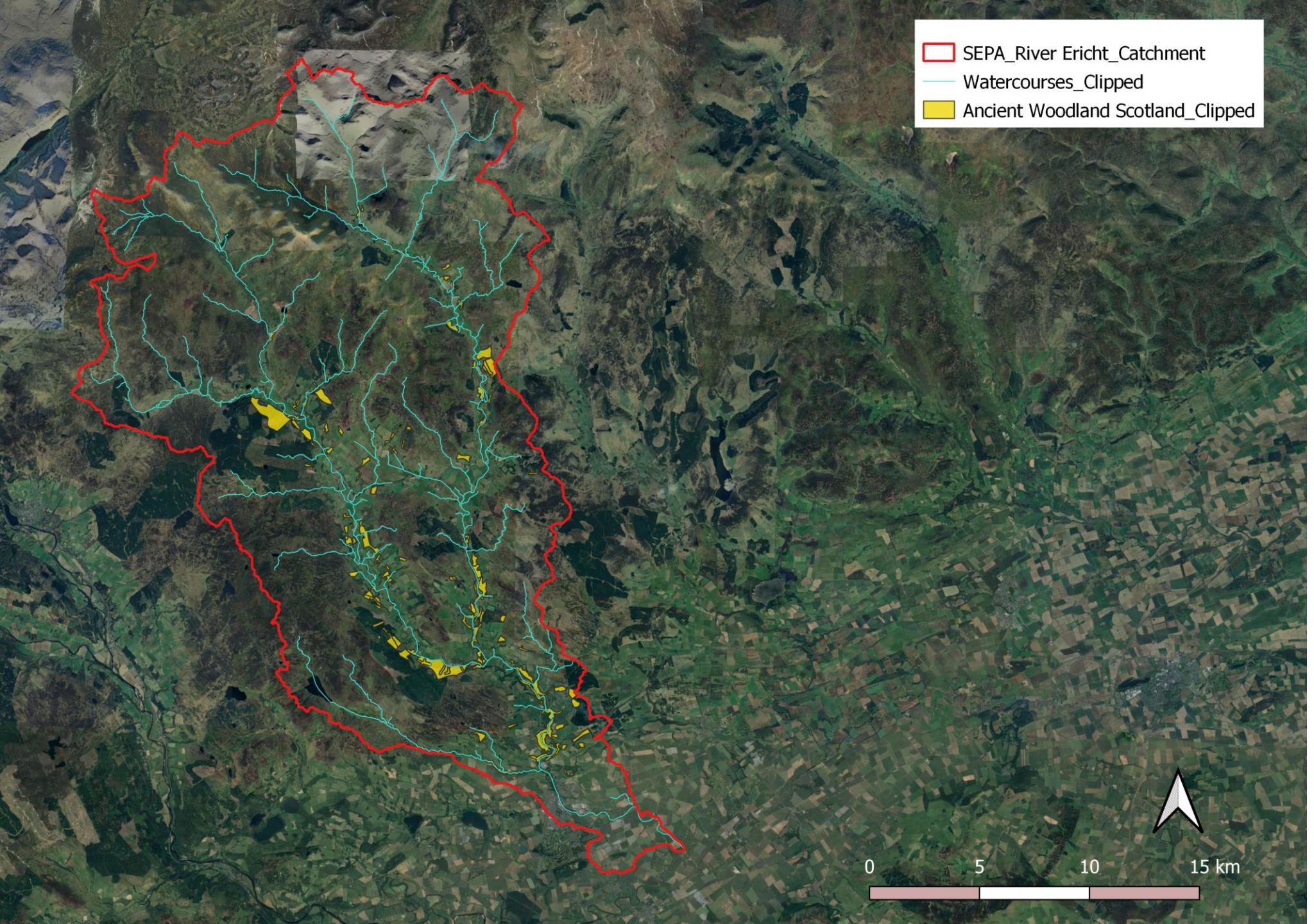


Woodland classifications

There are currently **6,086 hectares of existing woodland habitat within** the river Ericht.

The existing woodland is **predominantly commercial forestry blocks** which has a lower biodiversity value compared to native naturally occurring woodlands. **The condition of the existing woodland in terms of biodiversity and habitat is low.**

There are a further **428 ha** earmarked for FGS woodland creation options, but these have not yet been planted.



Ancient woodland classifications

There are **1,085.5 hectares of ancient woodland habitat** along the river Ericht.

This includes :

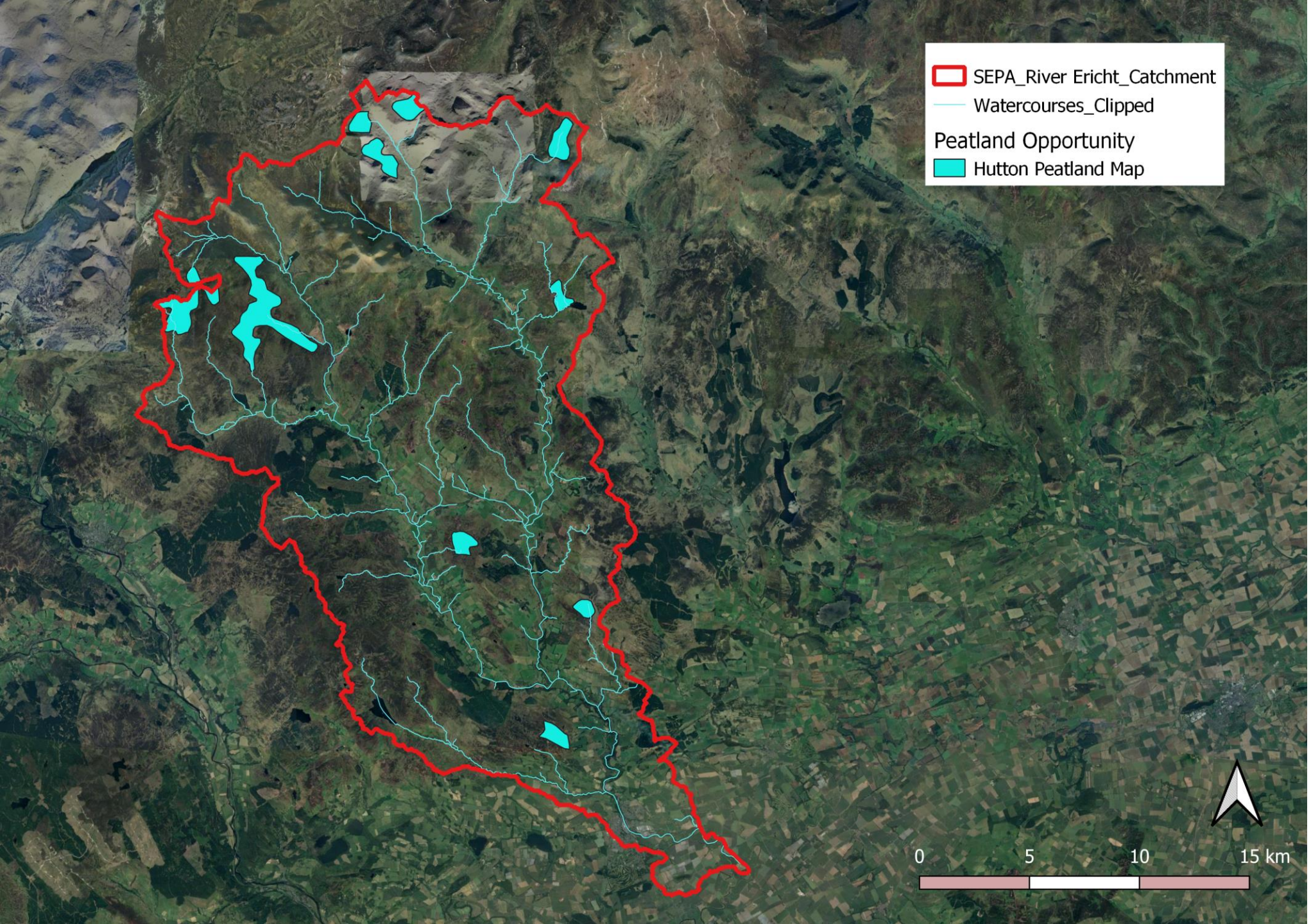
- Ancient (of semi-natural origin)
- Long established (of plantation origin)

These areas are often **in decline due to the lack of regeneration** but should be highlighted as species rich habitats that can be used to kick start natural regeneration in neighbouring areas.

By mapping these areas, we are able to target new woodland creation for the linking and connectivity between these ancient habitats.

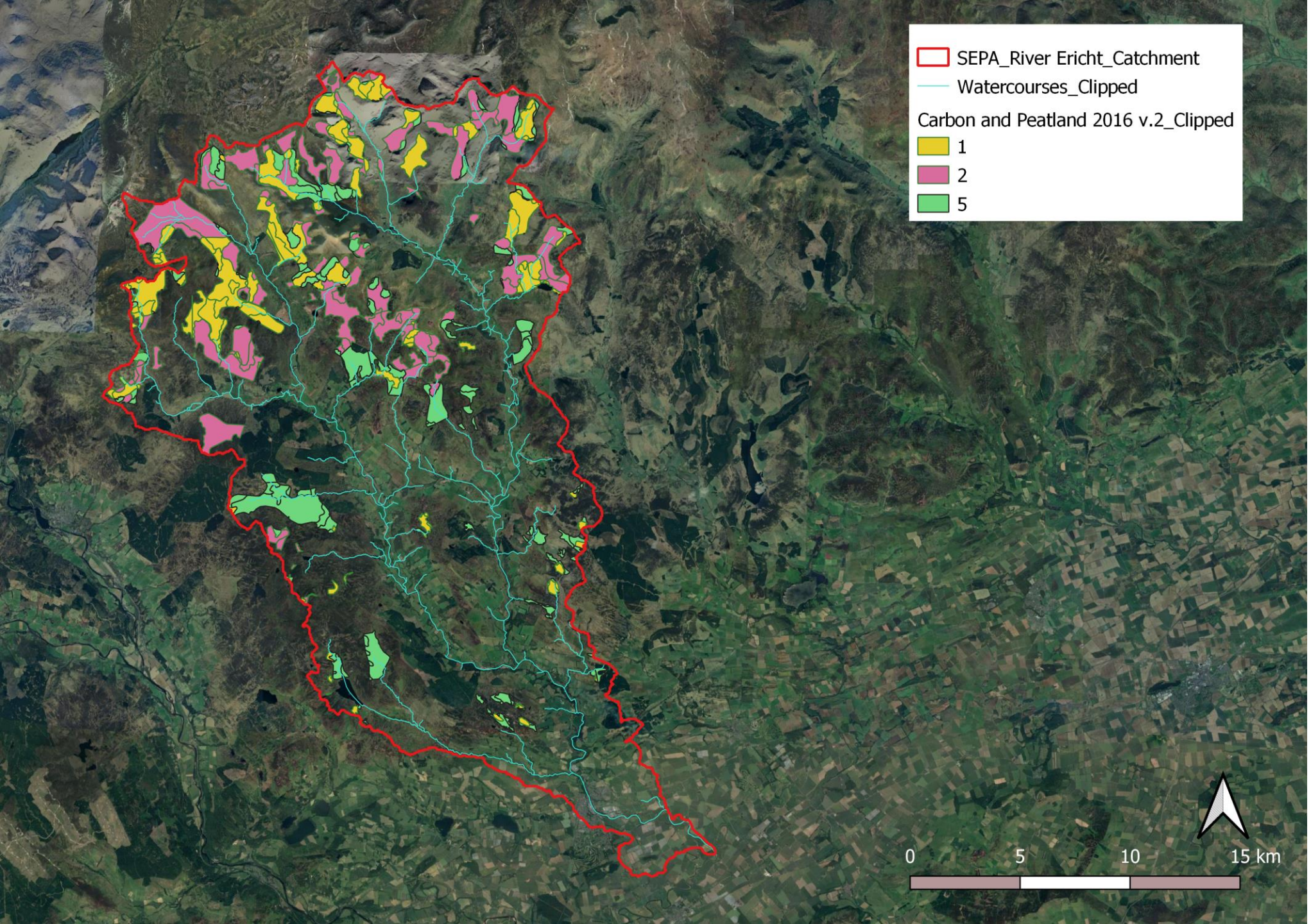
Peatland baseline and condition

2.3



Map of areas with identified presence of peat

The James Hutton Peatland Map identifies **1,641 hectares of peatland** with potential deep peat within the Ericht catchment.



Map of areas with identified presence of peat (2)

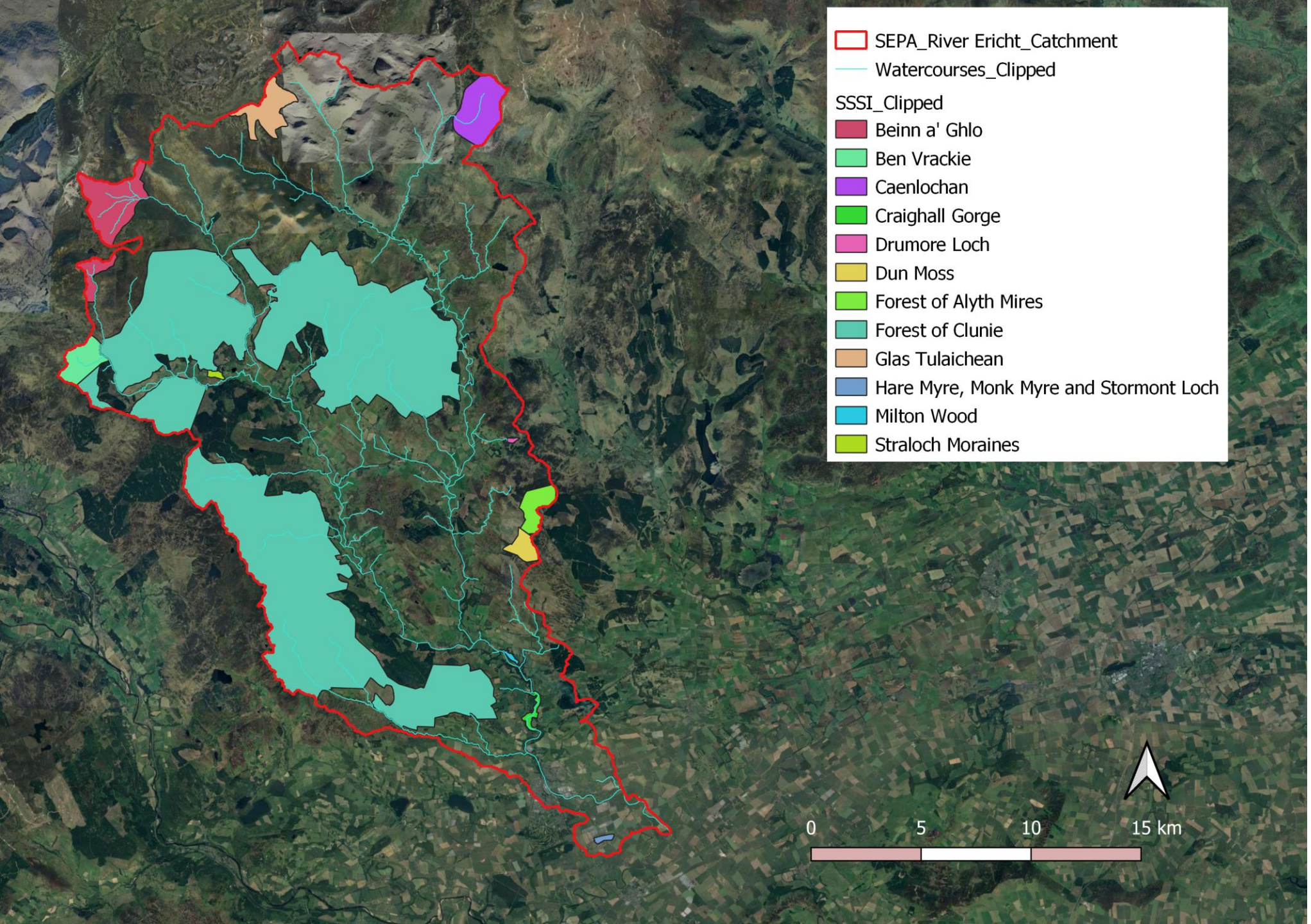
The Scotland's Soils Carbon and Peatland 2016 map identifies **2,938 hectares of Class 1 peat soils,** 4,059 hectares of Class 2 and 5,393 hectares of Class 5 peat soils within the Ericht catchment.

Surveys are required to assess the condition of these peatlands.

Class 1 = Nationally important carbon-rich soils with peatland as indicative vegetation.
Class 2 = Nationally important carbon-rich soils with peatland or areas with high potential to be restored to peatland as indicative vegetation.
Class 5 = No peatland vegetation recorded. May include areas of carbon-rich soils and deep peat.

Biodiversity baseline and condition

2.4



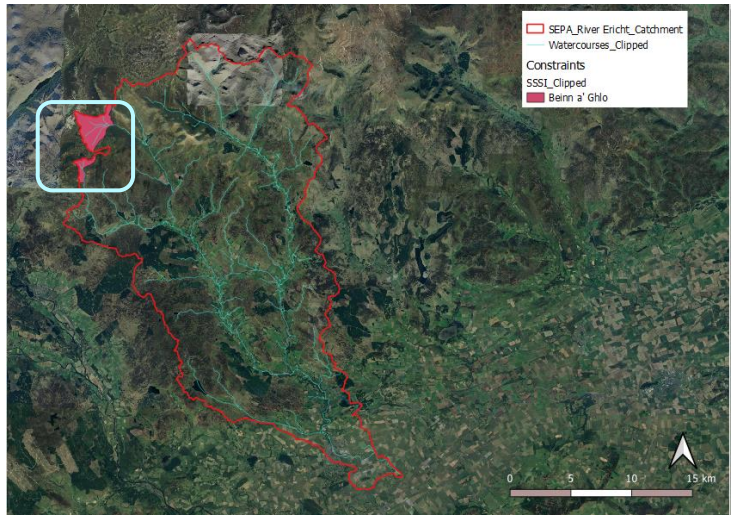
Designated sites across the catchment

There are **15,876 hectares of designated sites** within the river Ericht catchment. These are split across 12 different sites.

The condition of the whole ecosystem of each designated site is difficult to assess however some defined ‘features’ for each site are assessed in the following slides.

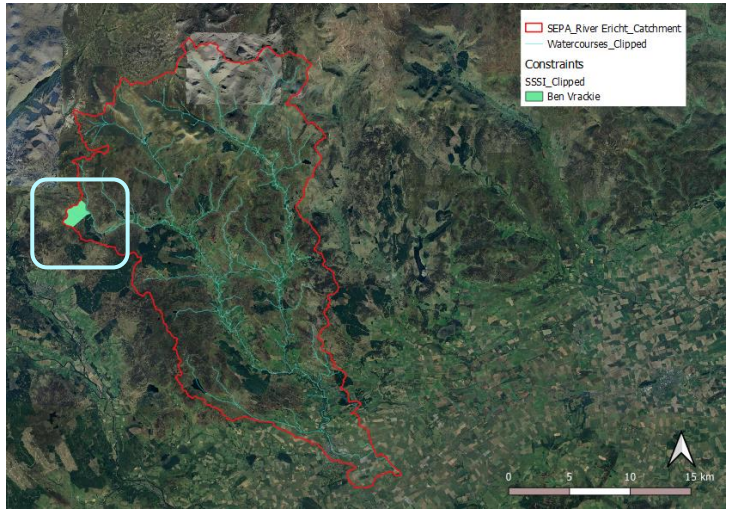
Assessing the condition of the ‘features’ for each designated site within the catchment

Beinn a’ Ghlo – SSSI, SAC



8197	Beinn a' Ghlo	SAC	Acidic scree	Upland habitat	Favourable	Favourable Maintained	03/07/2017
8197	Beinn a' Ghlo	SAC	Alpine and subalpine heaths	Upland habitat	Favourable	Favourable Maintained	03/07/2017
8197	Beinn a' Ghlo	SAC	Base-rich fens	Upland habitat	Favourable	Favourable Recovered	26/08/2015
8197	Beinn a' Ghlo	SAC	Blanket bog	Upland habitat	Favourable	Favourable Recovered	22/07/2010
8197	Beinn a' Ghlo	SAC	Dry grasslands and scrublands on chalk or...	Upland habitat	Favourable	Unfavourable Recovering	22/07/2010
8197	Beinn a' Ghlo	SAC	Dry heaths	Upland habitat	Recovering	Unfavourable No change	19/08/2004
8197	Beinn a' Ghlo	SAC	Geyer's whorl snail (Vertigo geyeri)	Invertebrates	Favourable	Favourable Maintained	03/07/2017
8197	Beinn a' Ghlo	SAC	Hard-water springs depositing lime	Upland habitat	Favourable	Unfavourable Recovering	26/08/2015
8197	Beinn a' Ghlo	SAC	High-altitude plant communities associate...	Upland habitat	Favourable	Favourable Maintained	03/07/2017
8197	Beinn a' Ghlo	SAC	Montane acid grasslands	Upland habitat	Favourable	Favourable Recovered	03/07/2017
8197	Beinn a' Ghlo	SAC	Plants in crevices on acid rocks	Upland habitat	Favourable	Favourable Maintained	03/07/2017
8197	Beinn a' Ghlo	SAC	Plants in crevices on base-rich rocks	Upland habitat	Favourable	Favourable Maintained	03/07/2017
8197	Beinn a' Ghlo	SAC	Round-mouthed whorl snail (Vertigo genes...	Invertebrates	Favourable	Favourable Maintained	19/06/2017
8197	Beinn a' Ghlo	SAC	Species-rich grassland with mat-grass in u...	Upland habitat	Favourable	Favourable Recovered	22/07/2010
161	Beinn a' Ghlo	SSSI	Breeding bird assemblage	Birds	Favourable	Favourable Maintained	20/06/2013
161	Beinn a' Ghlo	SSSI	Bryophyte assemblage	Non-vascular...	Favourable	Favourable Maintained	17/08/2013
161	Beinn a' Ghlo	SSSI	Caledonian Igneous	Earth sciences	Favourable	Favourable Maintained	24/11/2010
161	Beinn a' Ghlo	SSSI	Dalradian	Earth sciences	Favourable	Favourable Maintained	21/06/2016
161	Beinn a' Ghlo	SSSI	Upland assemblage	Upland habitat	Favourable	Unfavourable Recovering	22/07/2010
161	Beinn a' Ghlo	SSSI	Upland birch woodland	Woodland	Favourable	Favourable Maintained	15/06/2016
161	Beinn a' Ghlo	SSSI	Vascular plant assemblage	Vascular plants	Favourable	Favourable Declining	24/08/2014

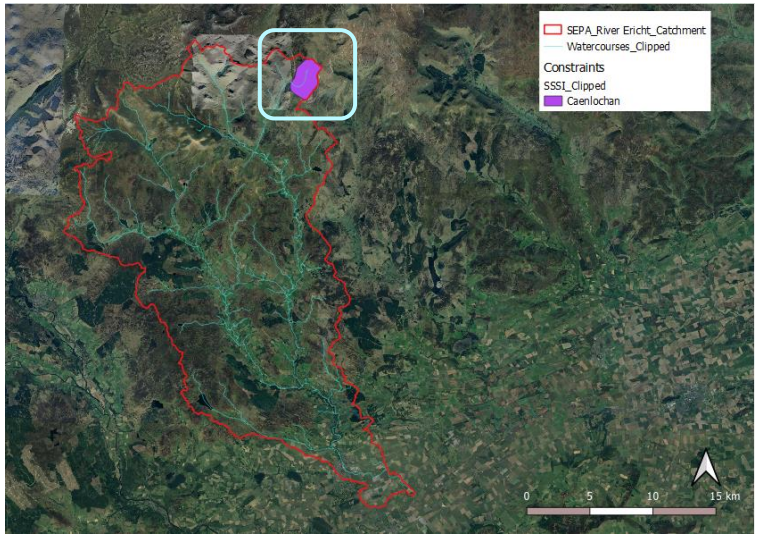
Ben Vrackie – SSSI, SAC



194	Ben Vrackie	SSSI	Breeding bird assemblage	Birds	Favourable	Favourable Maintained	15/05/2003
194	Ben Vrackie	SSSI	Upland assemblage	Upland habitat	Favourable	Favourable Maintained	23/10/2012
194	Ben Vrackie	SSSI	Vascular plant assemblage	Vascular plants	Favourable	Favourable Maintained	22/07/2008
8205	Ben Wyvis	SAC	Acidic scree	Upland habitat	Favourable	Favourable Maintained	07/08/2003

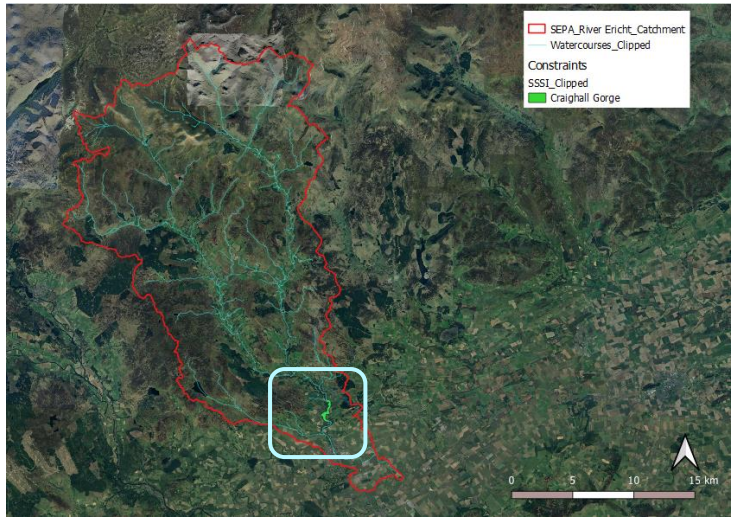
Assessing the condition of the ‘features’ for each designated site within the catchment

Caenlochan - SSSI, SAC, SPA



8216	Caenlochan	SAC	Acidic scree	Upland habitat	Unfavourable	Unfavourable Declining	30/08/2012
8216	Caenlochan	SAC	Alpine and subalpine heaths	Upland habitat	Unfavourable	Unfavourable No change	17/10/2018
8216	Caenlochan	SAC	Base-rich fens	Upland habitat	Unfavourable	Unfavourable No change	04/10/2018
8216	Caenlochan	SAC	Base-rich scree	Upland habitat	Favourable	Favourable Maintained	16/07/2006
8216	Caenlochan	SAC	Blanket bog	Upland habitat	Unfavourable	Unfavourable No change	17/10/2018
8216	Caenlochan	SAC	Dry heaths	Upland habitat	Unfavourable	Unfavourable Declining	17/10/2018
8216	Caenlochan	SAC	Grasslands on soils rich in heavy metals	Upland habitat	Favourable	Favourable Maintained	16/07/2006
8216	Caenlochan	SAC	High-altitude plant communities associate...	Upland habitat	Favourable	Favourable Recovered	18/09/2012
8216	Caenlochan	SAC	Montane acid grasslands	Upland habitat	Unfavourable	Unfavourable Declining	05/05/2023
8216	Caenlochan	SAC	Mountain willow scrub	Upland habitat	Unfavourable	Unfavourable No change	23/08/2012
8216	Caenlochan	SAC	Plants in crevices on acid rocks	Upland habitat	Favourable	Favourable Maintained	16/07/2006
8216	Caenlochan	SAC	Plants in crevices on base-rich rocks	Upland habitat	Favourable	Favourable Maintained	18/09/2012
8216	Caenlochan	SAC	Species-rich grassland with mat-grass in u...	Upland habitat	Unfavourable	Unfavourable No change	16/07/2006
8216	Caenlochan	SAC	Tall herb communities	Upland habitat	Favourable	Favourable Maintained	18/09/2012
8474	Caenlochan	SPA	Dotterel (Charadrius morinellus), breeding	Birds	Unfavourable	Unfavourable Declining	04/07/2011
8474	Caenlochan	SPA	Golden eagle (Aquila chrysaetos), breeding	Birds	Favourable	Favourable Maintained	04/12/2009
282	Caenlochan	SSSI	Breeding bird assemblage	Birds	Favourable	Favourable Maintained	01/07/2003
282	Caenlochan	SSSI	Bryophyte assemblage	Non-vascular...	Favourable	Favourable Maintained	31/12/2005
282	Caenlochan	SSSI	Dystrophic loch	Freshwater h...	Favourable	Favourable Maintained	02/07/2004
282	Caenlochan	SSSI	Invertebrate assemblage	Invertebrates	Favourable	Favourable Maintained	26/07/2017
282	Caenlochan	SSSI	Lichen assemblage	Non-vascular...	Favourable	Favourable Maintained	03/10/2010
282	Caenlochan	SSSI	Montane assemblage	Upland habitat	Unfavourable	Unfavourable No change	16/07/2006
282	Caenlochan	SSSI	Quaternary of Scotland	Earth sciences	Favourable	Favourable Maintained	26/07/2011
282	Caenlochan	SSSI	Vascular plant assemblage	Vascular plants	Unfavourable	Unfavourable No change	12/08/2017

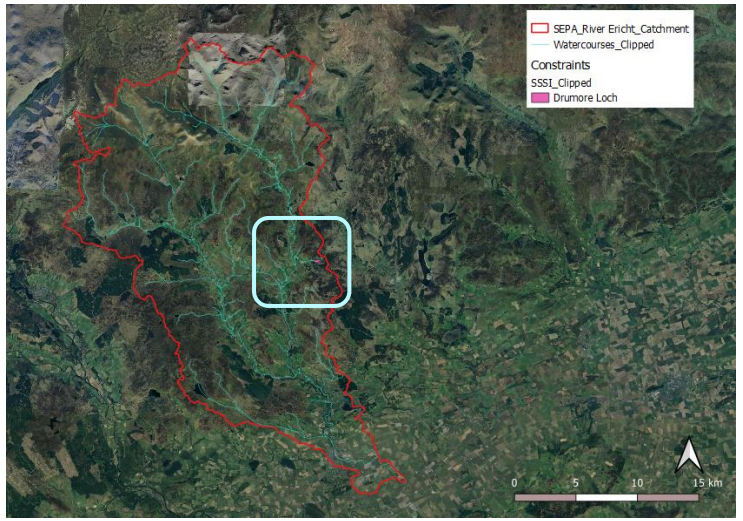
Craighall Gorge - SSSI



432	Craighall Gorge	SSSI	Lichen assemblage	Non-vascular...	Unfavourable	Unfavourable No change	26/07/2013
432	Craighall Gorge	SSSI	Upland mixed ash woodland	Woodland	Favourable	Unfavourable Recovering	20/08/2004
432	Craighall Gorge	SSSI	Vascular plant assemblage	Vascular plants	Favourable	Favourable Declining	16/06/2015

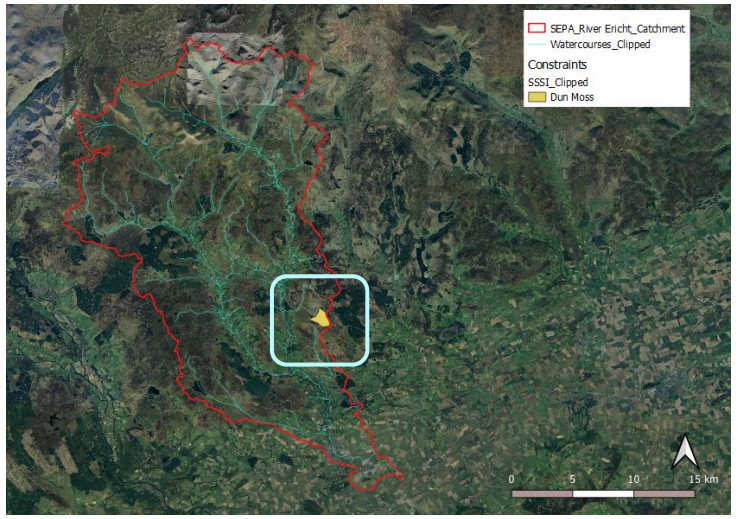
Assessing the condition of the ‘features’ for each designated site within the catchment

Drumore Loch - SSSI



542	Drumore Loch	SSSI	Mesotrophic loch	Freshwater h...	Favourable	Favourable Maintained	04/09/2013

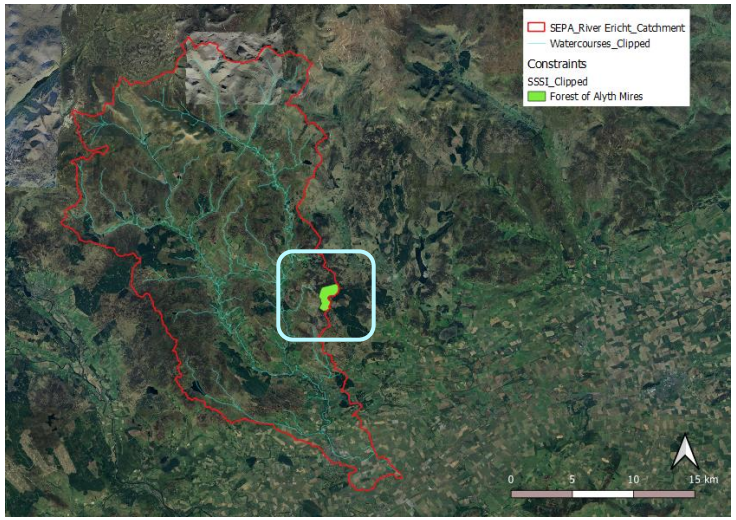
Dun Moss - SSSI



555	Dun Moss	SSSI	Saddle mire	Upland habitat	Favourable	Favourable Maintained	26/07/2011
8244	Dun Moss and Forest o...	SAC	Active raised bog	Wetlands	Favourable	Favourable Maintained	22/06/2016

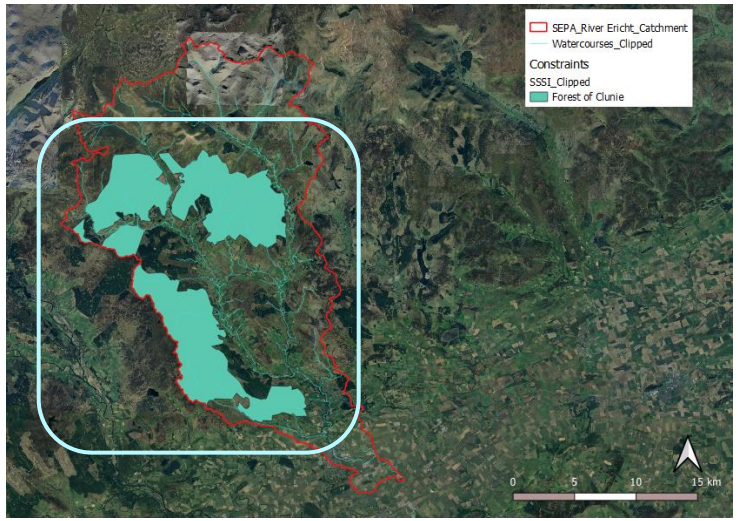
Assessing the condition of the ‘features’ for each designated site within the catchment

Forest of Alyth Mires - SSSI



649	Forest of Alyth Mires	SSSI	Raised bog	Wetlands	Favourable	Unfavourable Recovering	12/08/1999

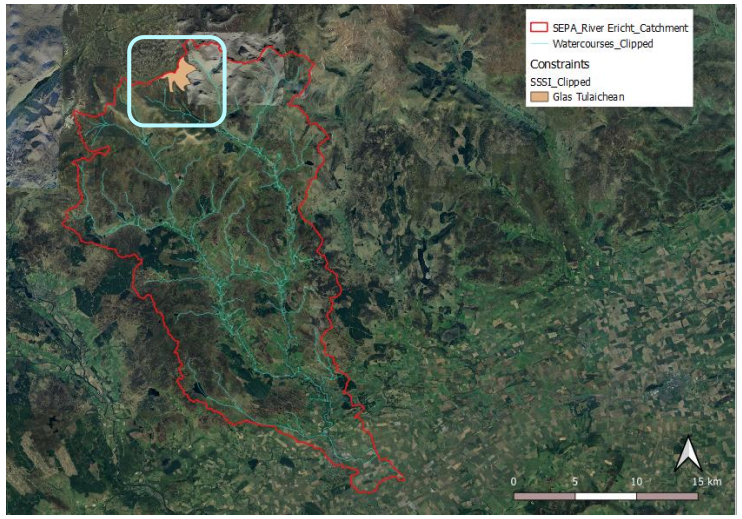
Forest of Clunie – SSSI, SPA



8503	Forest of Clunie	SPA	Hen harrier (Circus cyaneus), breeding	Birds	Unfavourable	Unfavourable Declining	05/05/2015
8503	Forest of Clunie	SPA	Merlin (Falco columbarius), breeding	Birds	Unfavourable	Unfavourable No change	01/06/2015
8503	Forest of Clunie	SPA	Osprey (Pandion haliaetus), breeding	Birds	Unfavourable	Unfavourable Declining	01/06/2015
8503	Forest of Clunie	SPA	Short-eared owl (Asio flammeus), breeding	Birds	Unfavourable	Unfavourable No change	01/06/2015
1709	Forest of Clunie	SSSI	Black grouse (Tetrao tetrix), breeding	Birds	Favourable	Favourable Maintained	15/05/2015
1709	Forest of Clunie	SSSI	Breeding bird assemblage	Birds	Favourable	Favourable Maintained	29/05/2009
1709	Forest of Clunie	SSSI	Hen harrier (Circus cyaneus), breeding	Birds	Unfavourable	Unfavourable Declining	29/05/2009
1709	Forest of Clunie	SSSI	Osprey (Pandion haliaetus), breeding	Birds	Favourable	Favourable Declining	01/08/2010
1709	Forest of Clunie	SSSI	Short-eared owl (Asio flammeus), breeding	Birds	Unfavourable	Unfavourable Declining	29/05/2009

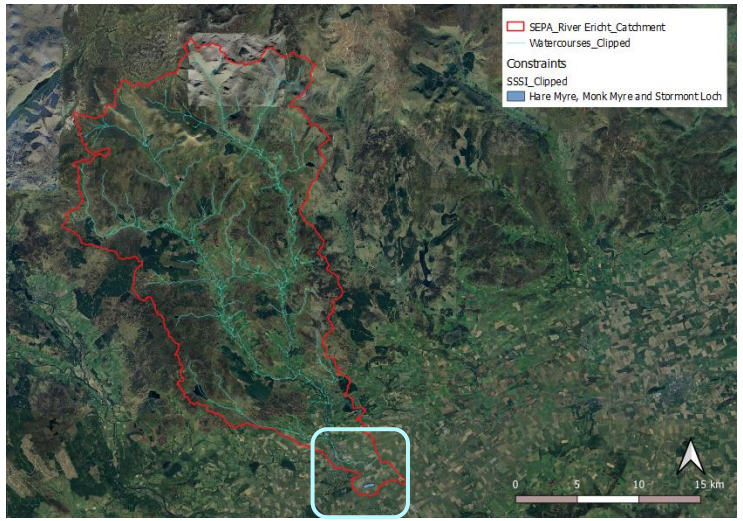
Assessing the condition of the ‘features’ for each designated site within the catchment

Glas Tulaichean - SSSI



693	Glas Tulaichean	SSSI	Vascular plant assemblage	Vascular plants	Favourable	Favourable Recovered	13/07/2010

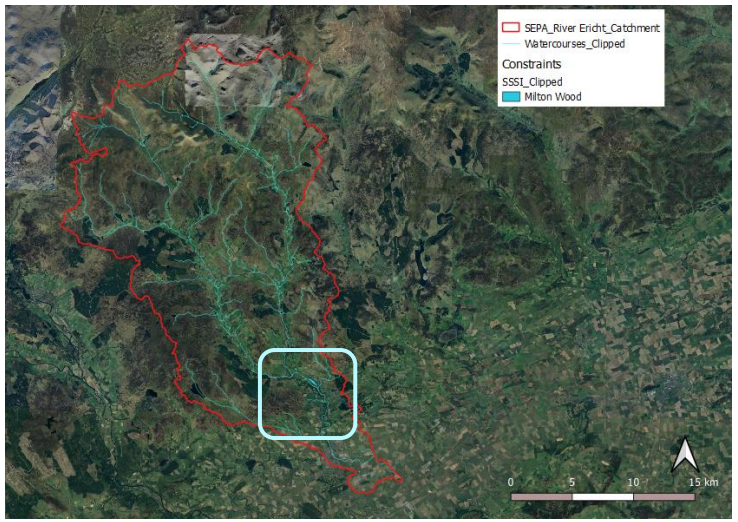
Hare Myre, Monk Myre - SSSI



765	Hare Myre, Monk Myre...	SSSI	Greylag goose (Anser anser), non-breeding	Birds	Unfavourable	Unfavourable Declining	01/03/2014
765	Hare Myre, Monk Myre...	SSSI	Open water transition fen	Wetlands	Favourable	Favourable Maintained	29/08/2006
765	Hare Myre, Monk Myre...	SSSI	Quaternary of Scotland	Earth sciences	Favourable	Favourable Maintained	23/06/2010
765	Hare Myre, Monk Myre...	SSSI	Vascular plant assemblage	Vascular plants	Favourable	Favourable Maintained	15/08/2012

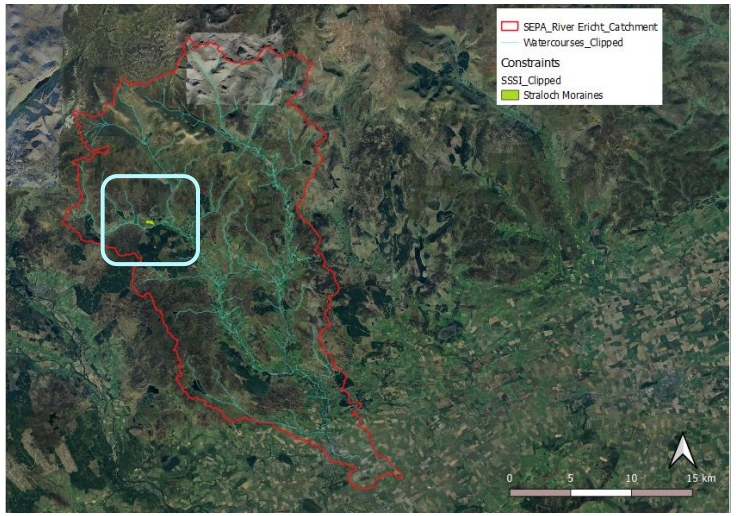
Assessing the condition of the ‘features’ for each designated site within the catchment

Milton Wood - SSSI



1163	Milton Wood	SSSI	Lichen assemblage	Non-vascular...	Unfavourable	Unfavourable Declining	14/03/2016
1163	Milton Wood	SSSI	Wet woodland	Woodland	Favourable	Favourable Declining	19/06/2014
1163	Milton Wood	SSSI	Whorled Solomon's-seal (Polygonatum ver...	Vascular plants	Favourable	Favourable Maintained	23/07/2014

Straloch - SSSI



1485	Straloch Moraines	SSSI	Lowland calcareous grassland	Lowland gras...	Favourable	Unfavourable Recovering	19/08/2020
1485	Straloch Moraines	SSSI	Lowland dry heath	Lowland heath	Favourable	Unfavourable Recovering	19/08/2020

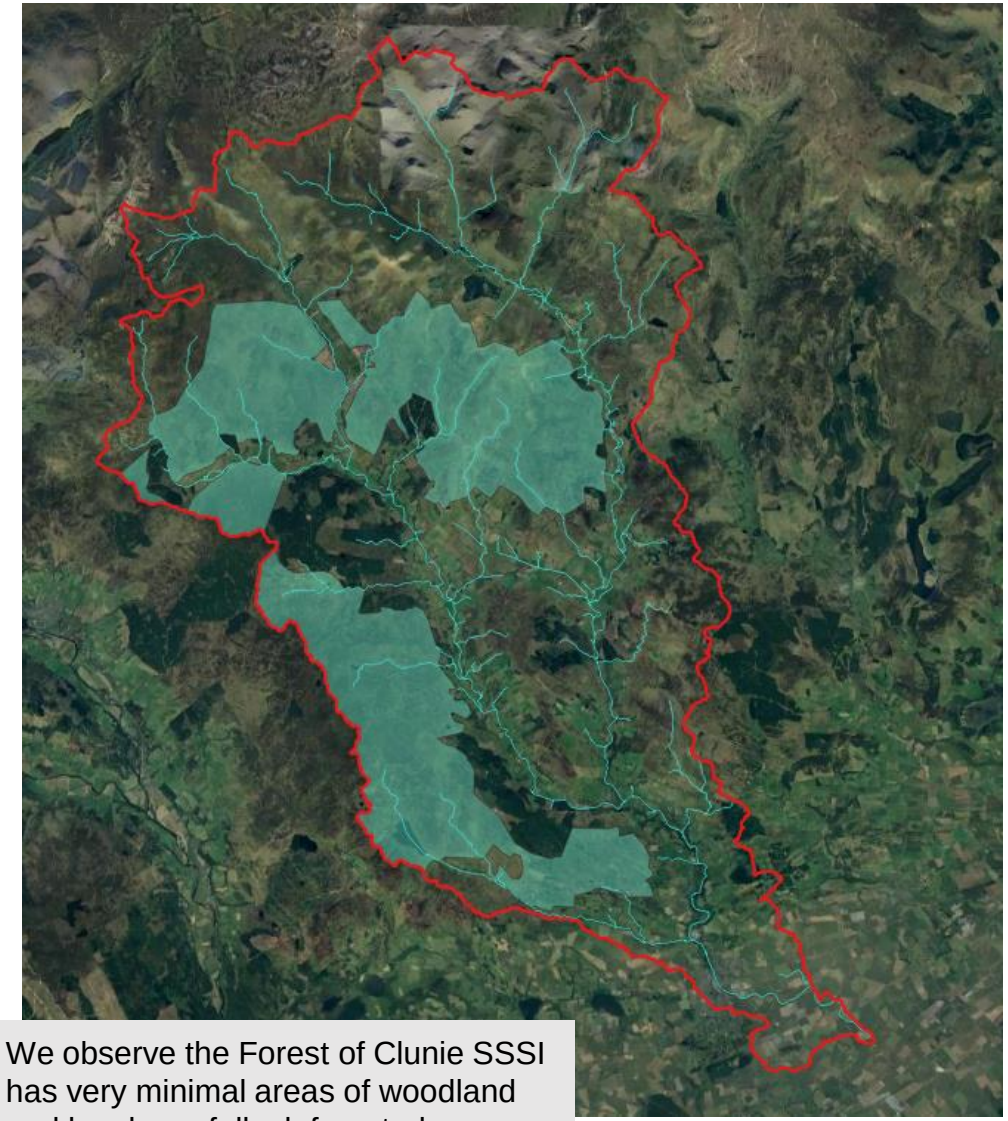
Assessing the condition of biodiversity across the catchment

Out of the 75 features measured across the 12 designated sites, **20 are classified as 'unfavourable'**, 1 as 'recovering' **and 54 as 'favourable**'.

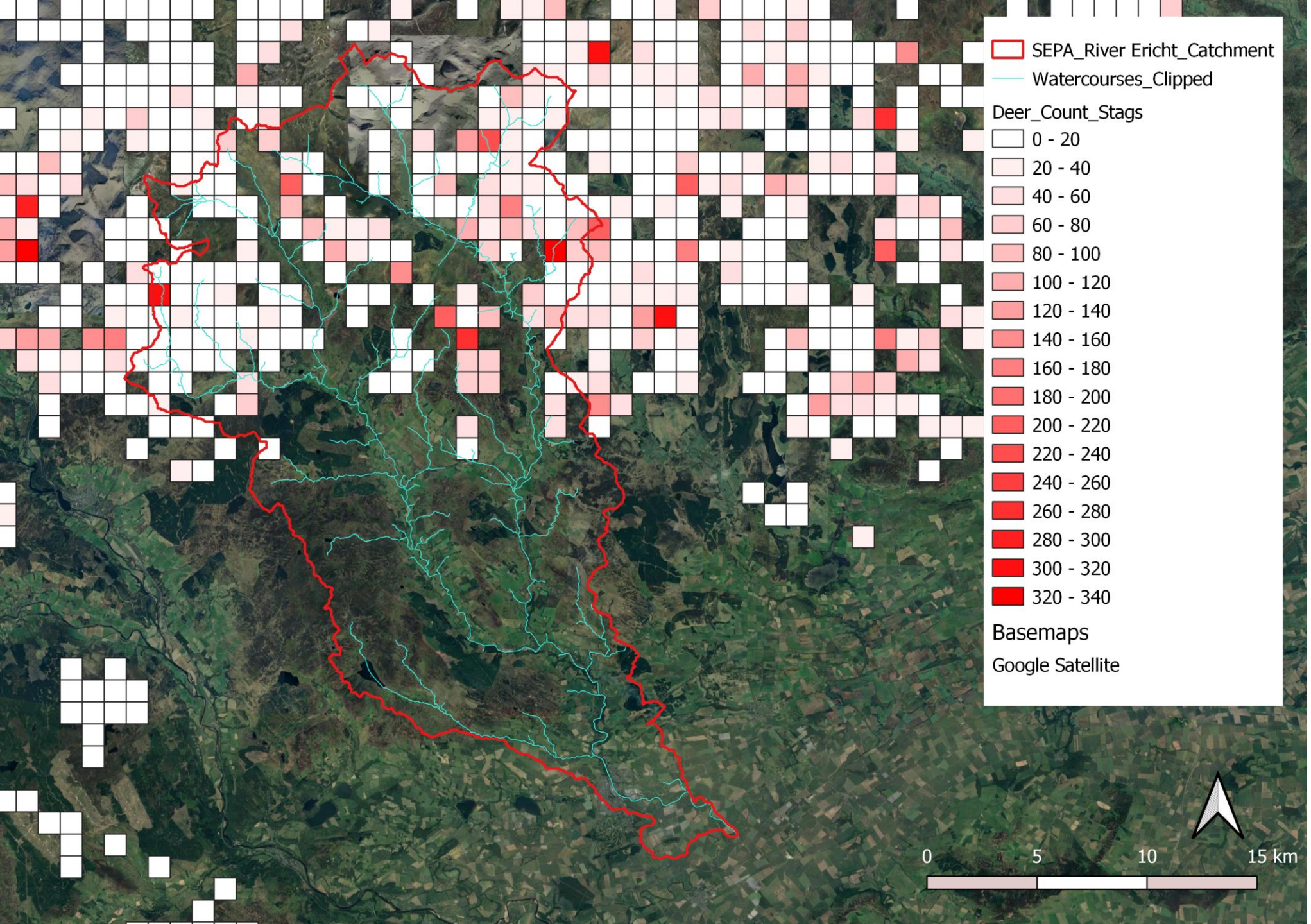
These features refer to specific and standalone fauna or flora categories and do not represent the whole ecosystem. Additionally, some sites only measure one or two indicators, again limiting the full understanding of the condition of the site as a whole.

The **Forest of Clunie SSSI**, which is by far the largest site in the catchment – covering **13,519 ha** of the total 49,612 ha of the catchment (27.2%) – has the most features classed as unfavourable. What more nearly the entirety of the Forest of Clunie SSSI is deforested, with only very minimal areas of woodland. Although it is now registered as a designated site for its habitat provided to bird species additional reforestation could be beneficial for mixed habitat creation and improving biodiversity.

Forest of Clunie – SSSI (transparent layer)



We observe the Forest of Clunie SSSI has very minimal areas of woodland and has been fully deforested.



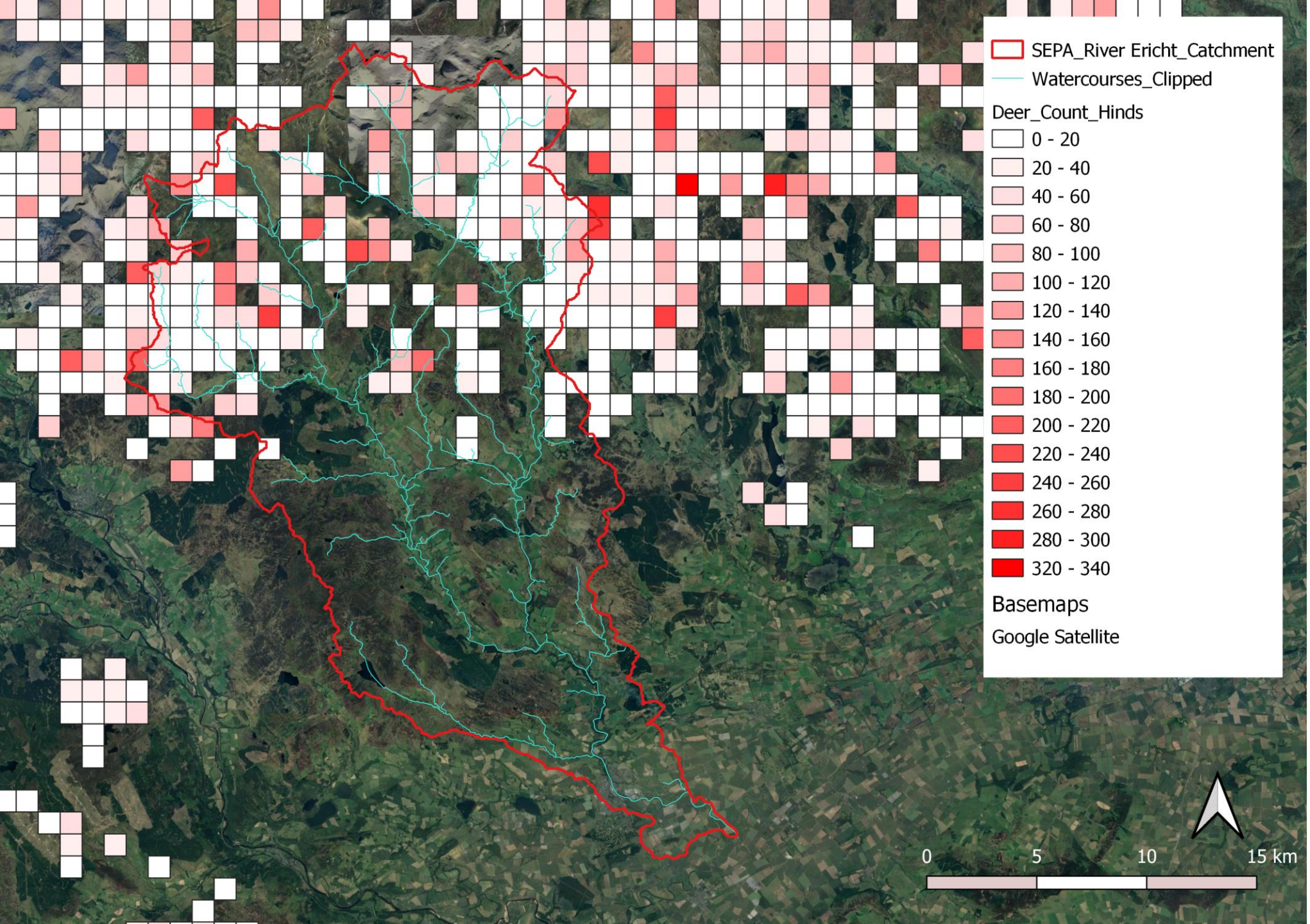
The River Ericht Deer Count – Stags

High deer levels can significantly impact biodiversity by overgrazing native vegetation, limiting the availability of food and habitat for other species leading to a decline in plant diversity and disrupting the balance of the ecosystem.

The browsing pressure from deer can also hinder forest regeneration, affecting the overall health of woodlands and reducing the diversity of tree species.

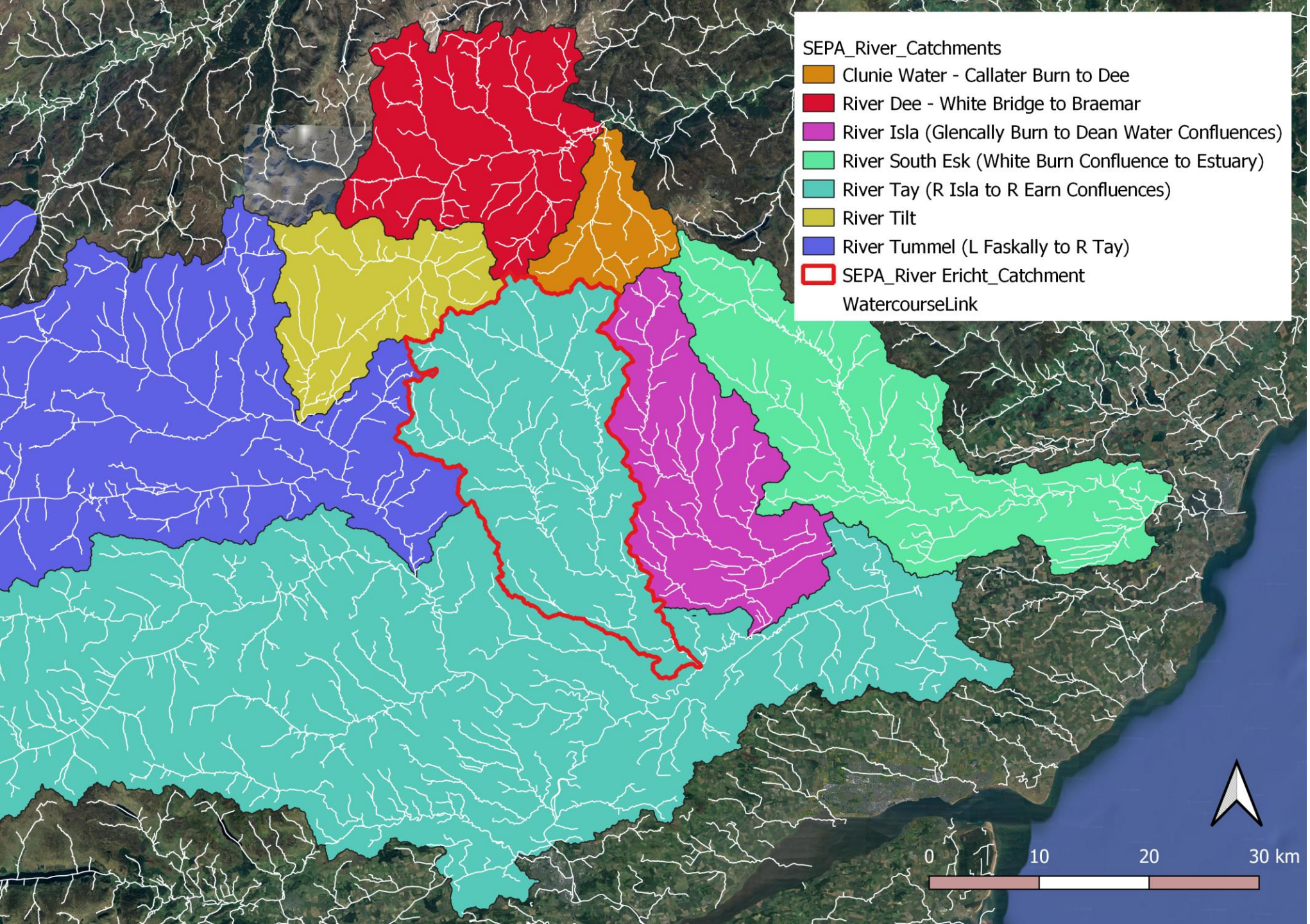
As a result, addressing and managing deer populations will be crucial for preserving and restoring biodiversity in the river Ericht catchment.

The River Ericht
Deer Count - Hinds



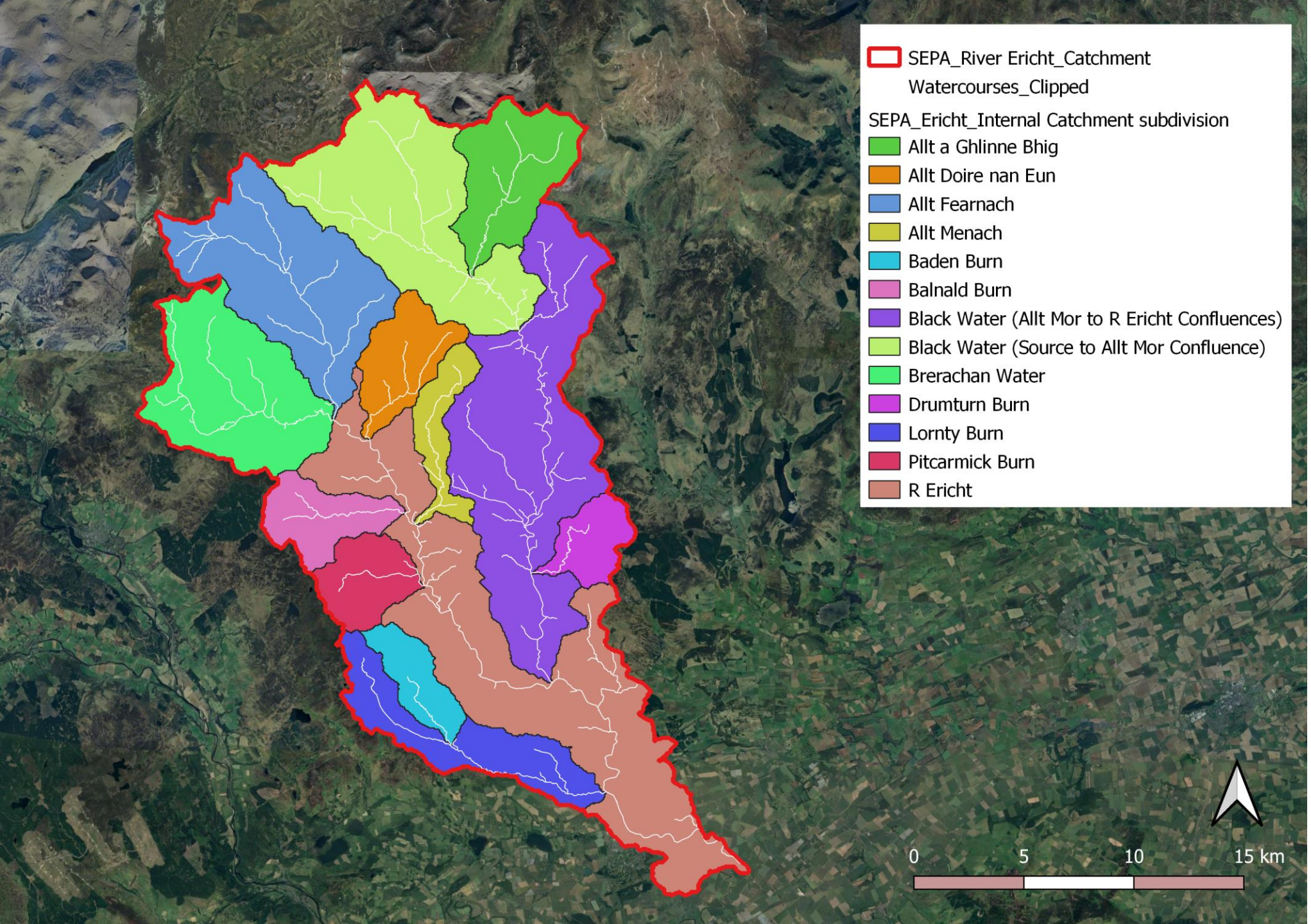
Water quality baseline and condition

2.5



The River Ericht catchment and other neighbouring catchments

The River Ericht catchment is directly surrounded by six other catchments, including the River Dee, Isla, South Esk, Tay, Tilt and Tummel.

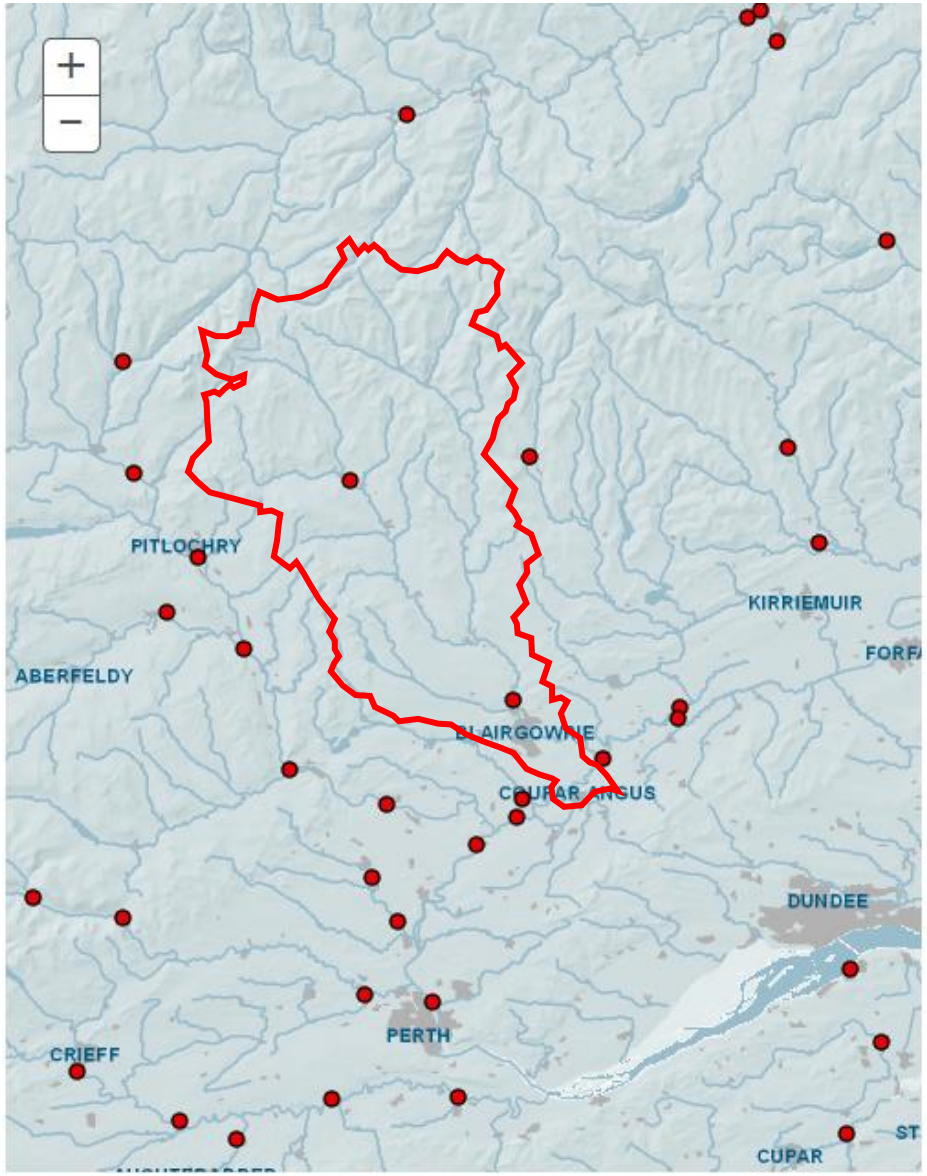


The River Ericht internal catchments

The River Ericht catchment is subdivided into 12 secondary catchments.

SEPA water level testing stations within the Ericht catchment

SEPA stations



SEPA has two operating stations within the catchment.

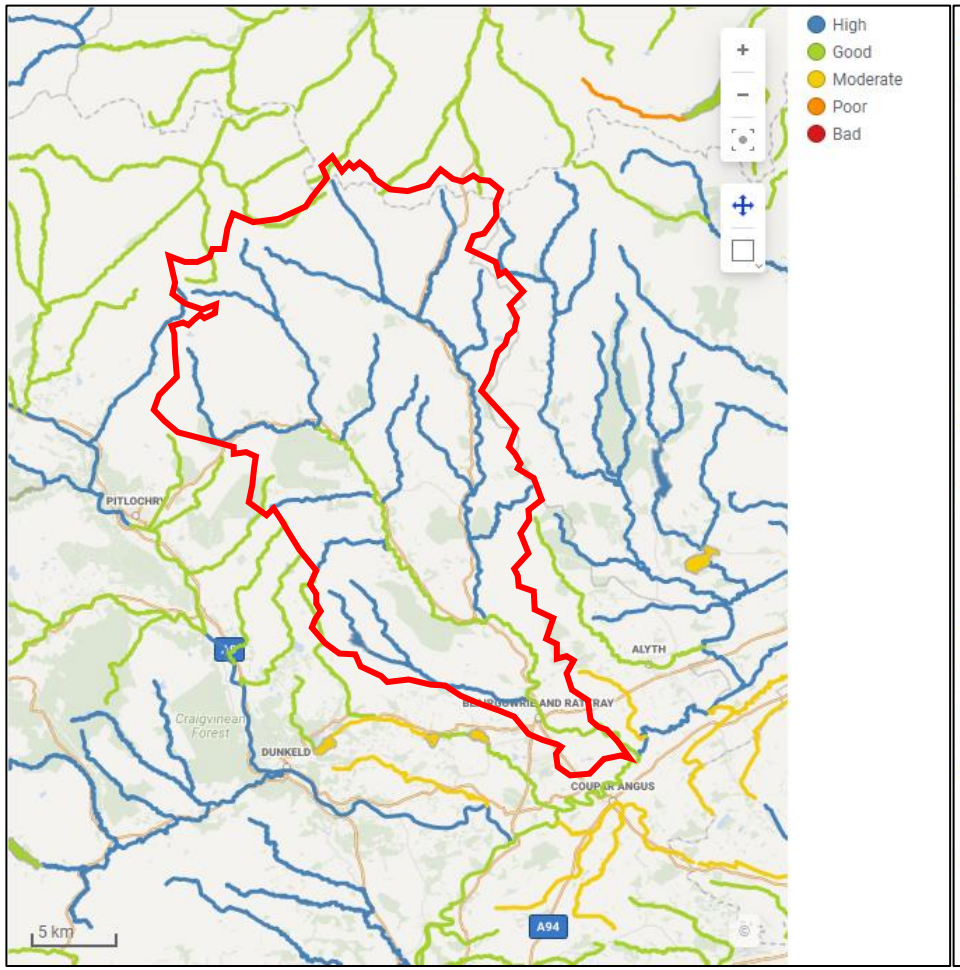
The first on the river Ardel – Kindrogan. Records began in 1991

The second on the river Ericht – Craighall. Records began in 1990.

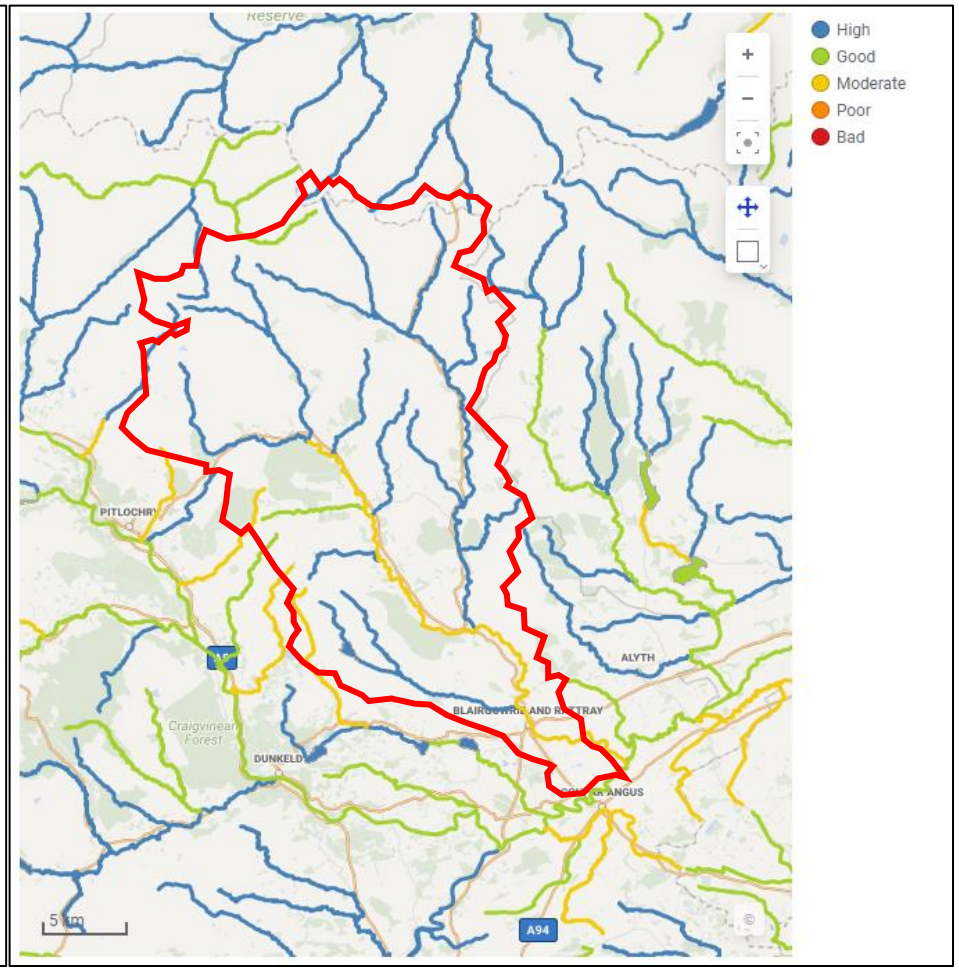
Source: Data from SEPA Water Environment Hub

SEPA water quality maps (2015)

Surface water - Water quality



Surface water - Water flows and levels



Source: Data from SEPA Water Environment Hub

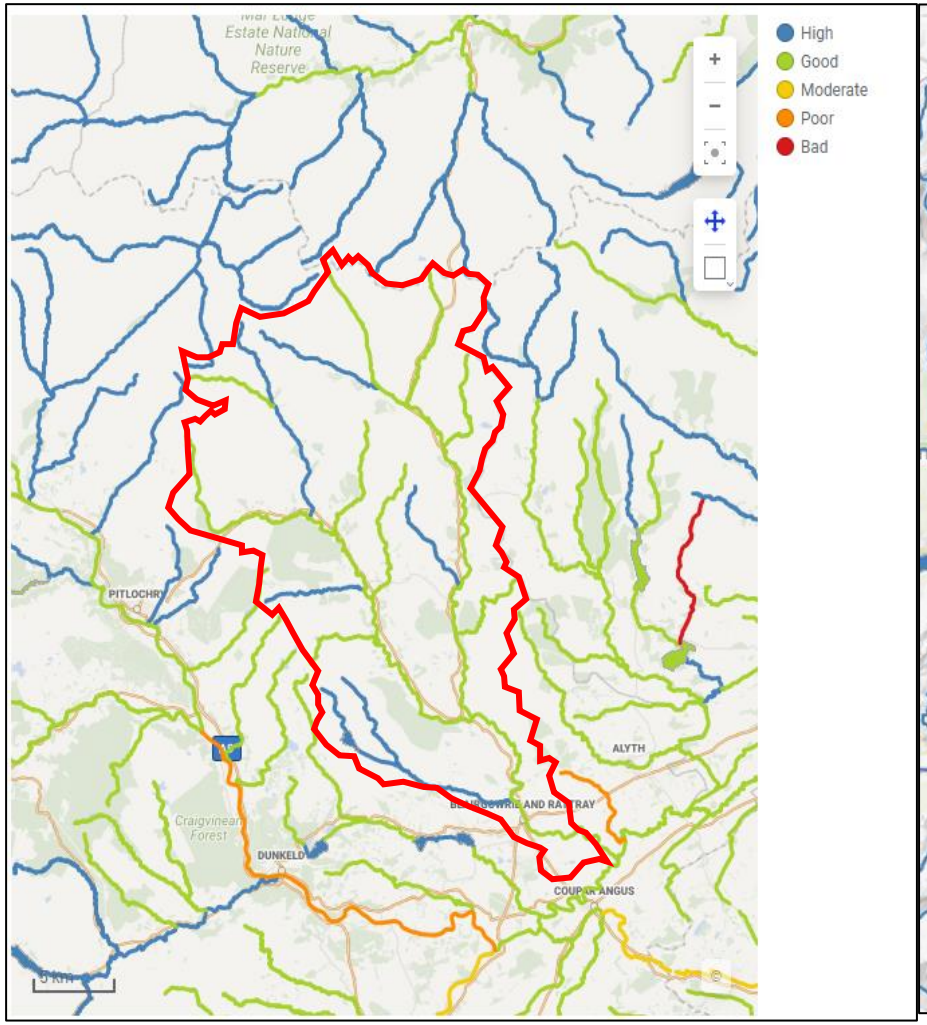
Surface water measures the impact of environmental pressures including diffuse and point source pollution, alterations to beds, banks and shores, alterations to water levels and flows and the presence of invasive non-native species.

Water flows and levels data is collected at river gauging stations in order to effectively manage the stocks of that water – for instance, when issuing licenses for water abstractions and the control of pollution.

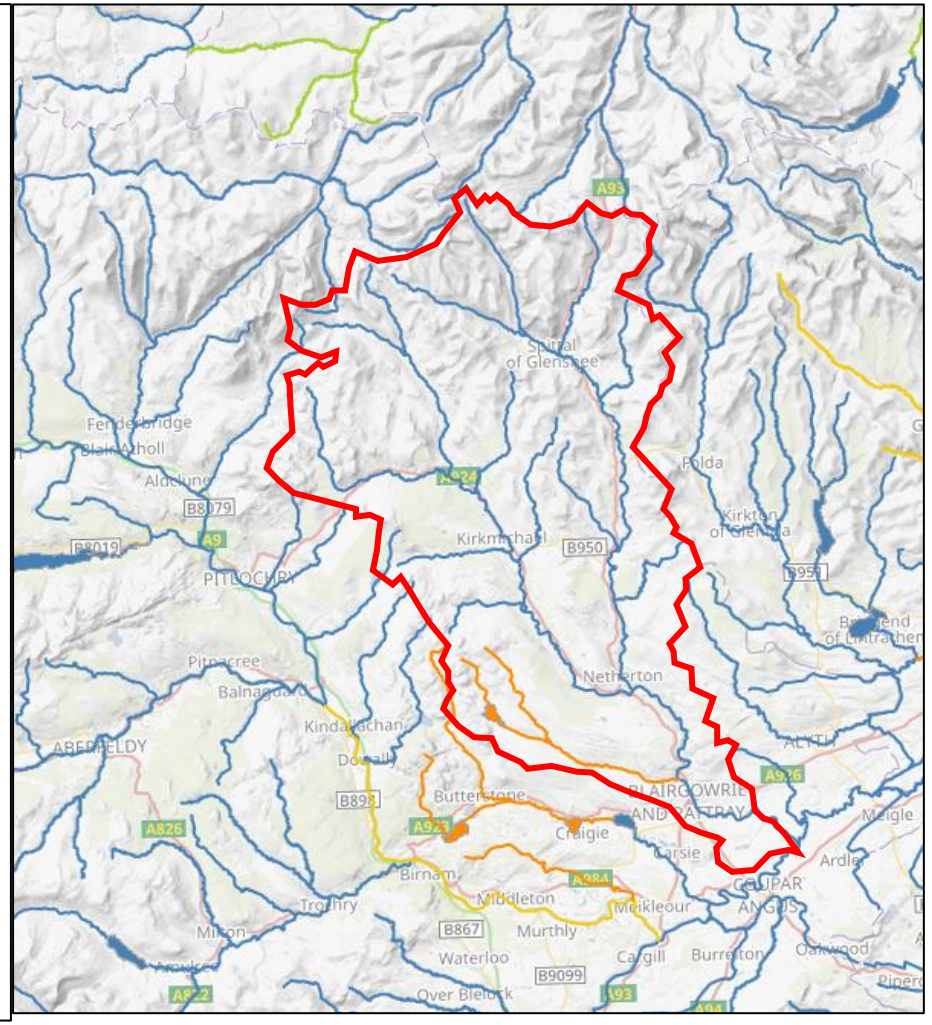
For both surface water and water flows and levels all River Ericht tributaries (upstream) are given the **highest rating** except for the River Ardle and the River Ericht itself. **The River Ardle and the River Ericht are classified as 'good' for surface water and 'moderate' for water flows.**

SEPA water quality maps (2015)

Surface water - Physical condition



Surface water - Access for fish migration



The **physical condition** measures the impact and extent of alterations to the beds, banks and shores of rivers made by historic alterations through engineering for urban development and rural land management. These include changes such as straightening, culverting, impoundment and alteration of bankside vegetation.

Access for fish migration assesses the impact of man-made barriers to fish migration and access. In Scotland, man-made barriers to fish migration cut-off access to over 4,000km of rivers.

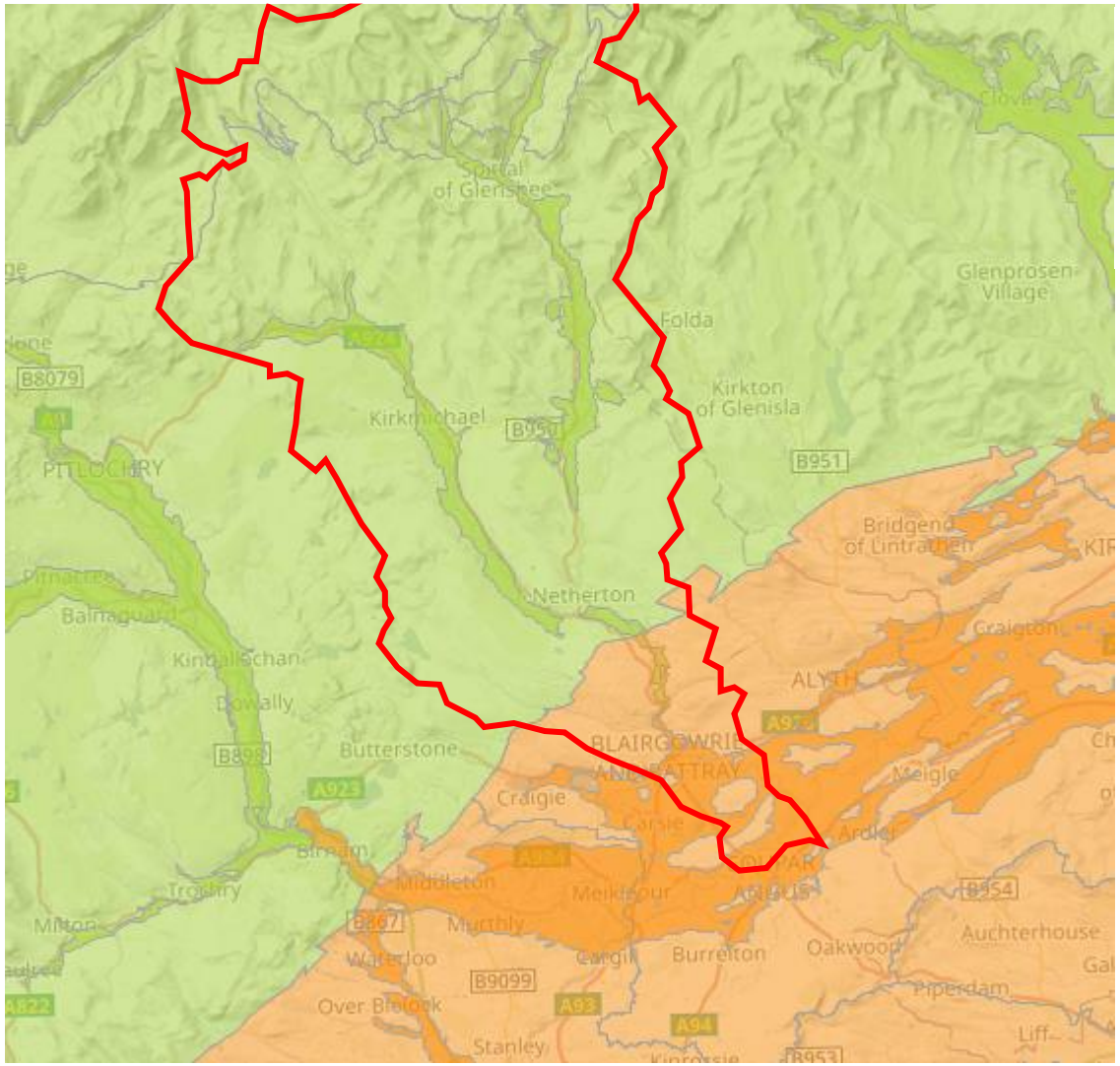
The entirety of the river Ericht is classified as 'high' and 'good' for physical condition and 'high' for fish migration.

However certain physical barriers to exist along the river, for example the weir at Blairgowrie. Removing these barriers is a priority for the river basin management plans.

Source: Data from SEPA Water Environment Hub

SEPA water quality maps (2014)

Water quality - groundwater



In general, the classification of water bodies, including groundwater, describes by how much their condition or status differs from near natural conditions.

Groundwater can be adversely affected by a range of activities including abstraction, agriculture, contamination, discharges, waste, energy etc. Groundwater is classified by SEPA as either Good or Poor.

The majority of the River Ericht catchment's groundwater is classified in 'good' condition. The classification changes from 'good' to 'poor' in the southern section of the catchment, just south of Bridge of Cally.

Source: Data from SEPA Water Environment Hub

SEPA Flood Risk Maps

There is some flood risk along the river Ardle with the areas at risk including Kirkmichael, Ballinluig, Balmyle, and Ballintuim.

The areas at highest risk of flooding are located south of Blairgowrie which extends beyond the Ericht catchment.

Palladium
MAKE IT POSSIBLE

Opportunities to generate ecosystem services

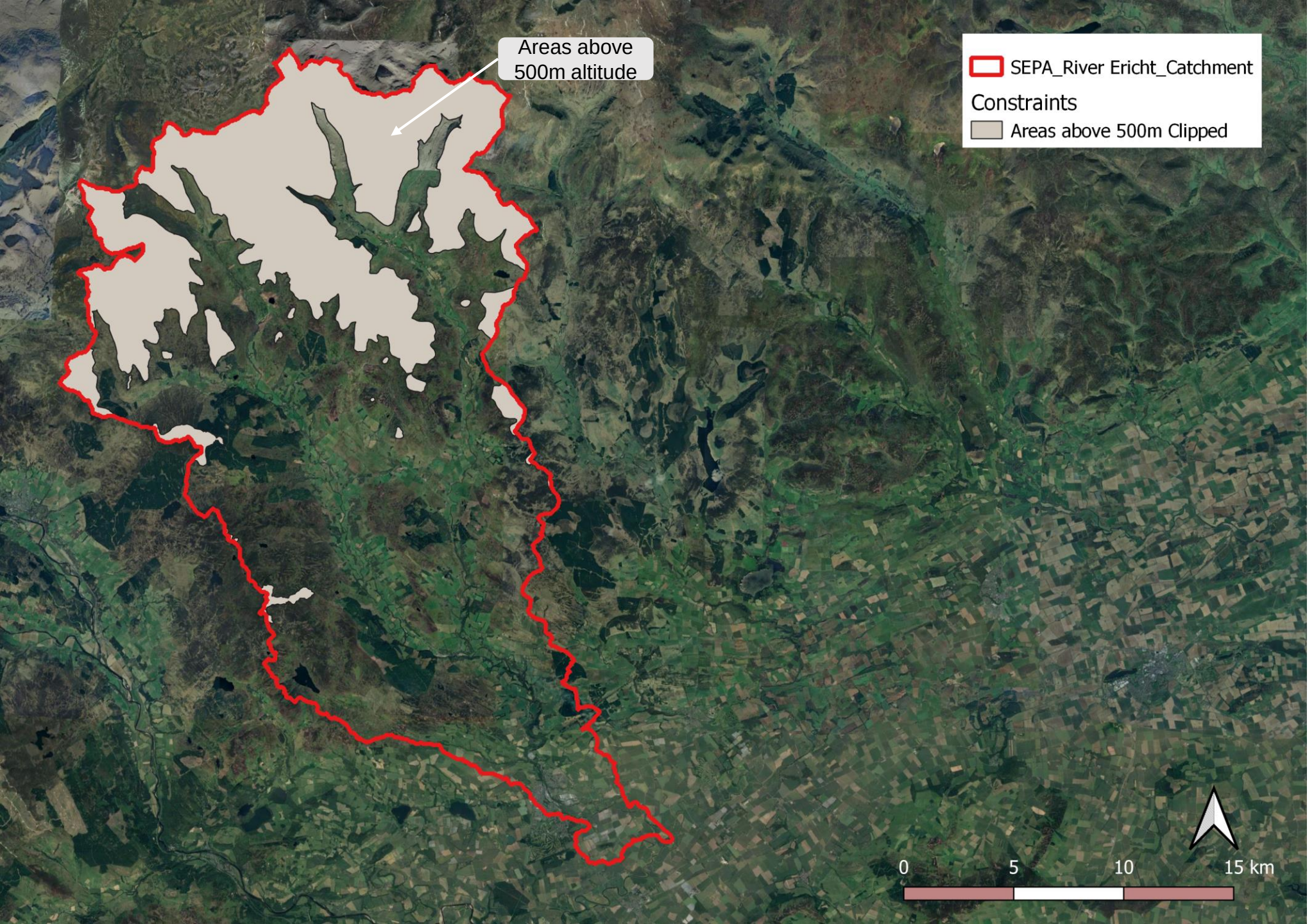
3

Opportunities to generate woodland carbon

3.1

Areas of constraints for woodland carbon

3.1.1

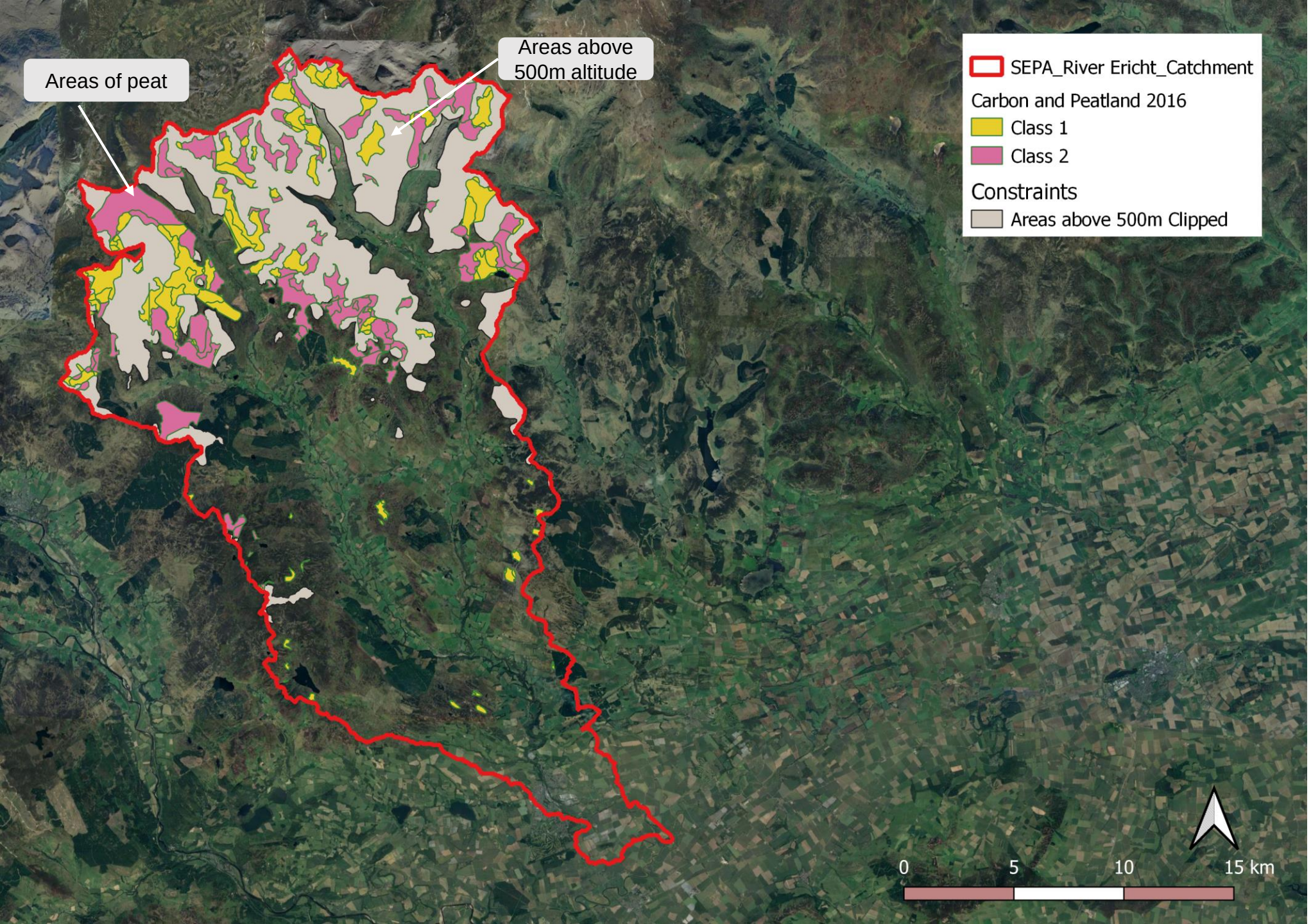


Map of planting constraint layers (1)

As seen in section 1, the ecosystem service with the most established marketplace in Scotland is woodland carbon sequestration through the Woodland Carbon Code.

Within the context of this project, new revenue streams for nature restoration are most likely to be generated from woodland carbon. Additional biodiversity outcomes can be combined, making the carbon credits ‘carbon +’.

As a first step to understand which areas are suitable for woodland creation, we first mapped all the areas where woodland planting would not be suitable for legal or ecological reasons.



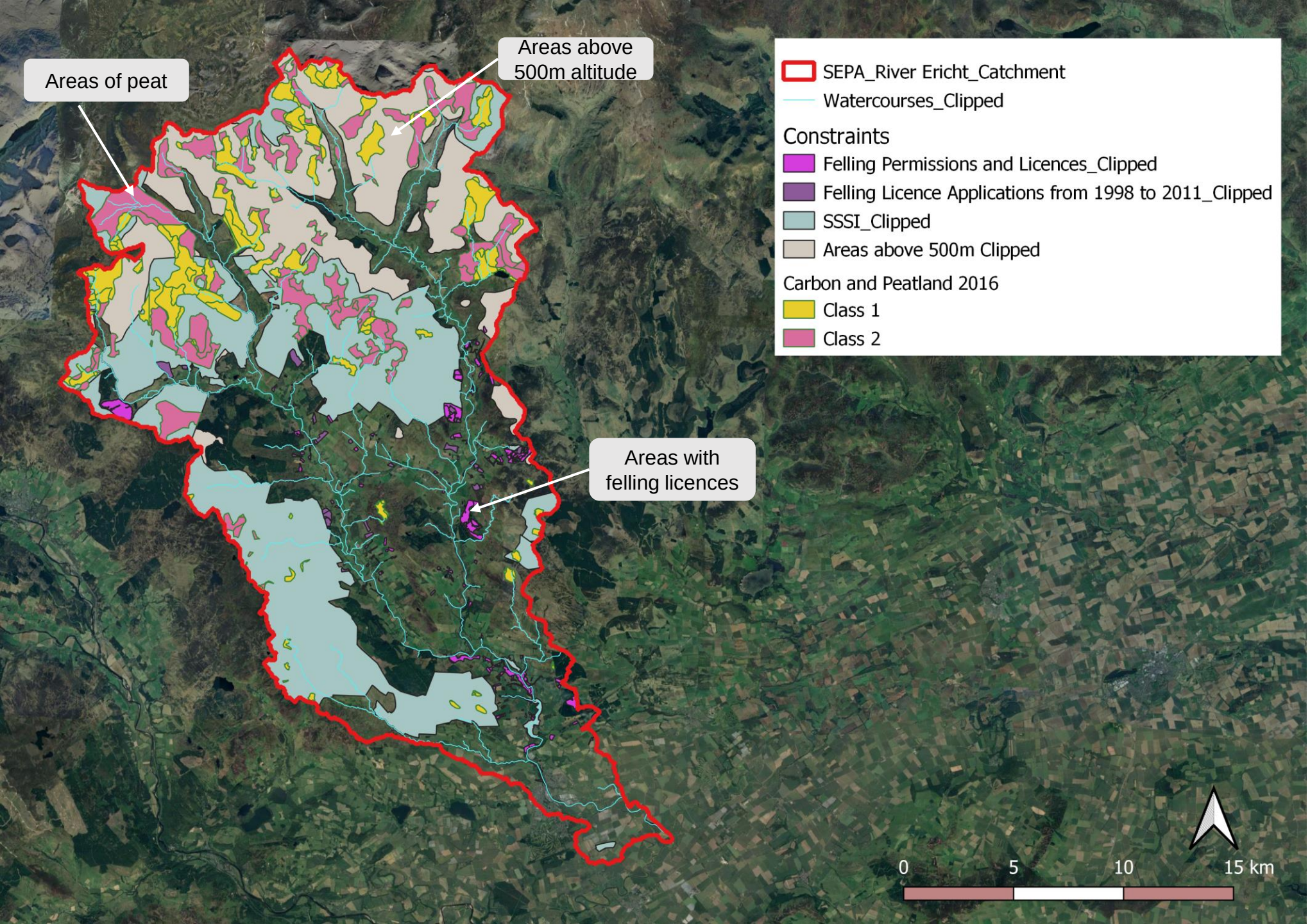
Map of planting constraint layers (2)

We assume woodland creation is unsuitable above 500m altitude.

The Woodland Carbon Code (WCC) eligibility criteria does not allow for planting on areas of peat.

Data from Scotland's Environment – Carbon and Peatland Map, 2016.

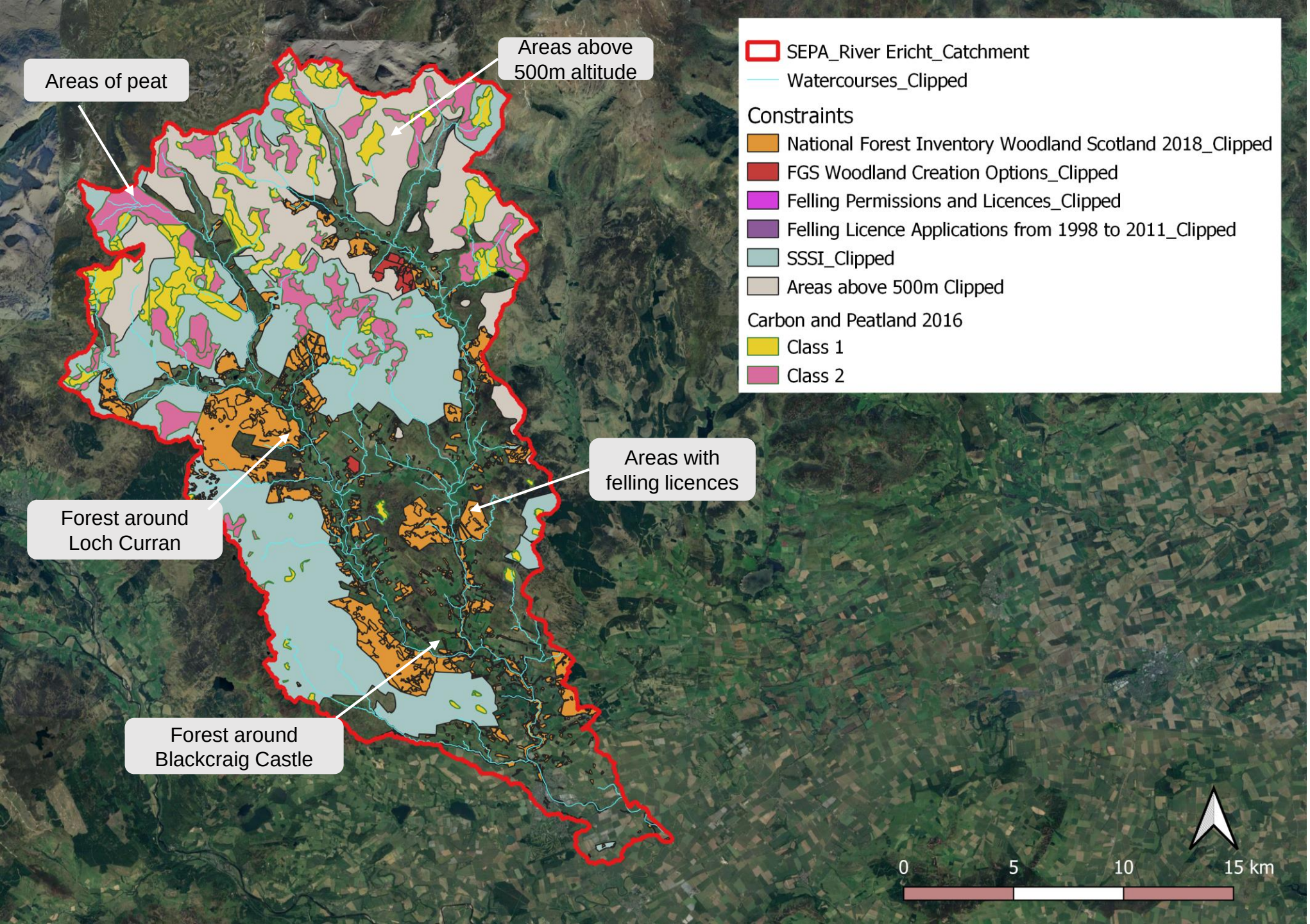
Map of planting constraint layers (3)



Designated areas such as SSSIs and SAC require additional **approval from Nature Scot for any woodland creation** or tree planting activities.

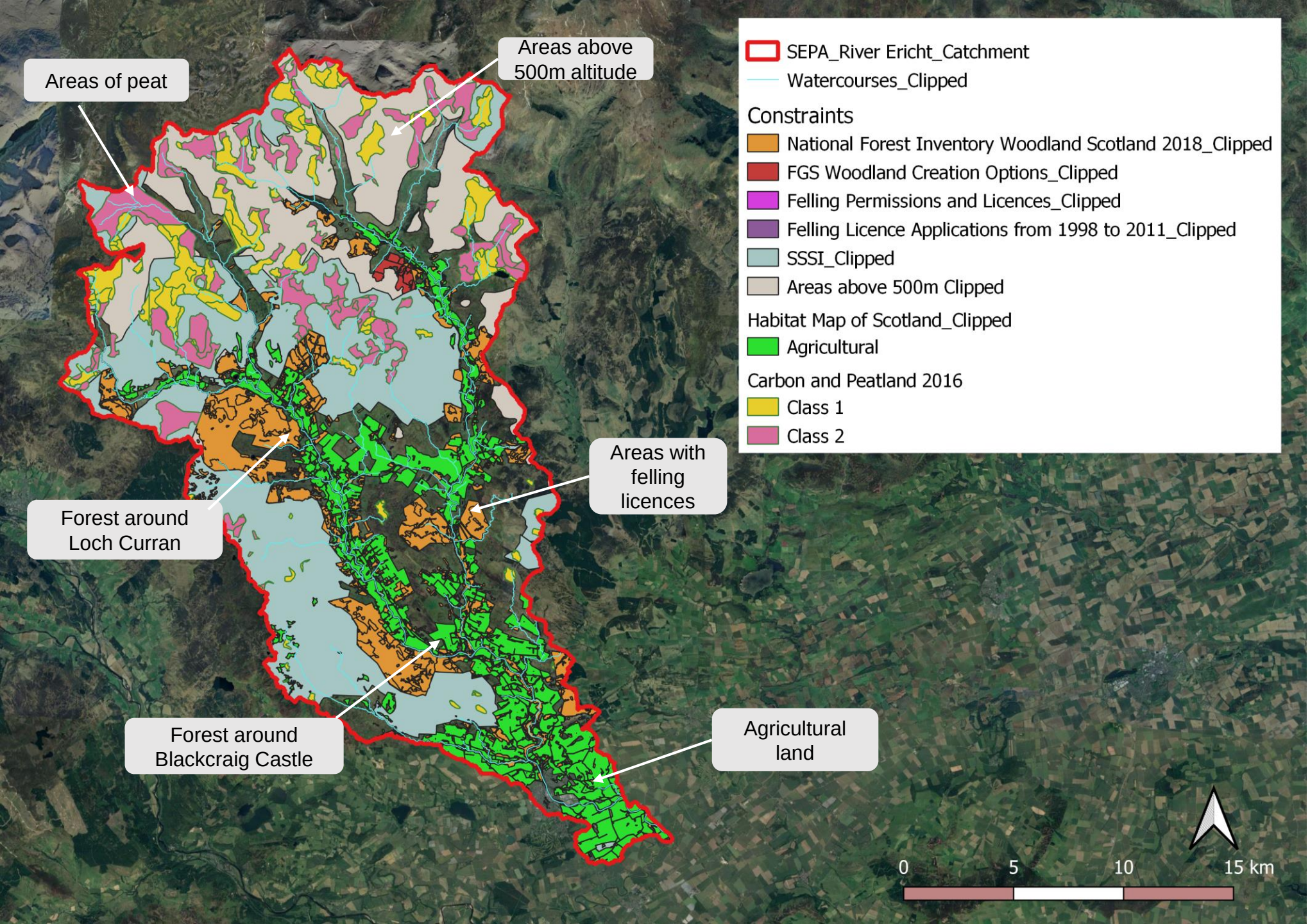
The River Ericht Catchment is covered in large part by the **Forest of Clunie SSSI**. This is not a hard constraint but conversations with Nature Scot are required to assess their appetite for woodland creation within this SSSI.

Map of planting constrain layers (4)



Areas of existing forestry or woodland, areas that have been felled within the last 25 years, and areas with active felling licences are not eligible to the WCC.

Map of planting constraint layers (5)



Areas of agricultural land are suitable for woodland creation however this would entail a permanent land use change.

We are not proposing any areas of productive agricultural land be used for woodland creation.

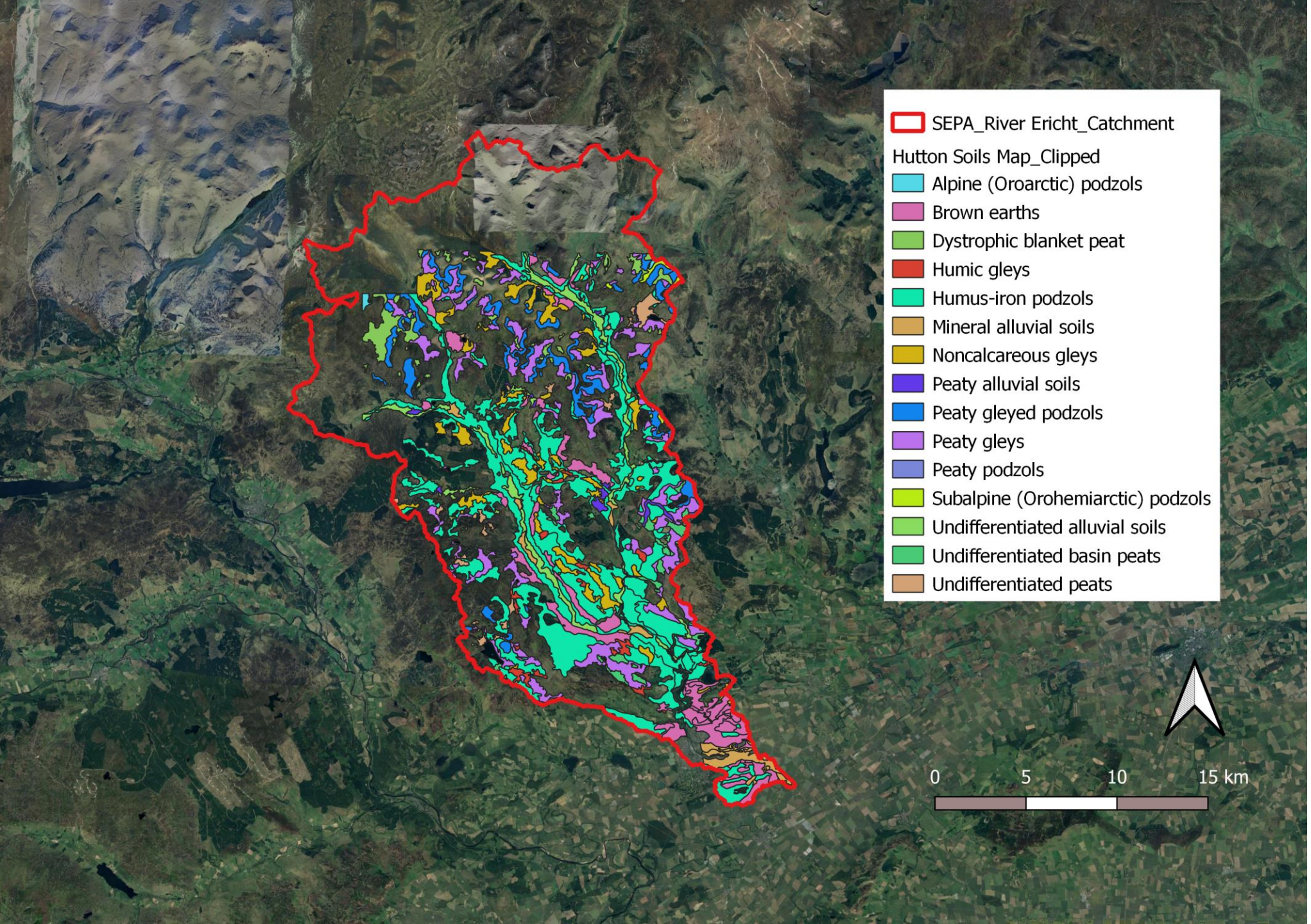
However marginal areas or least productive areas will be considered for new woodland creation.

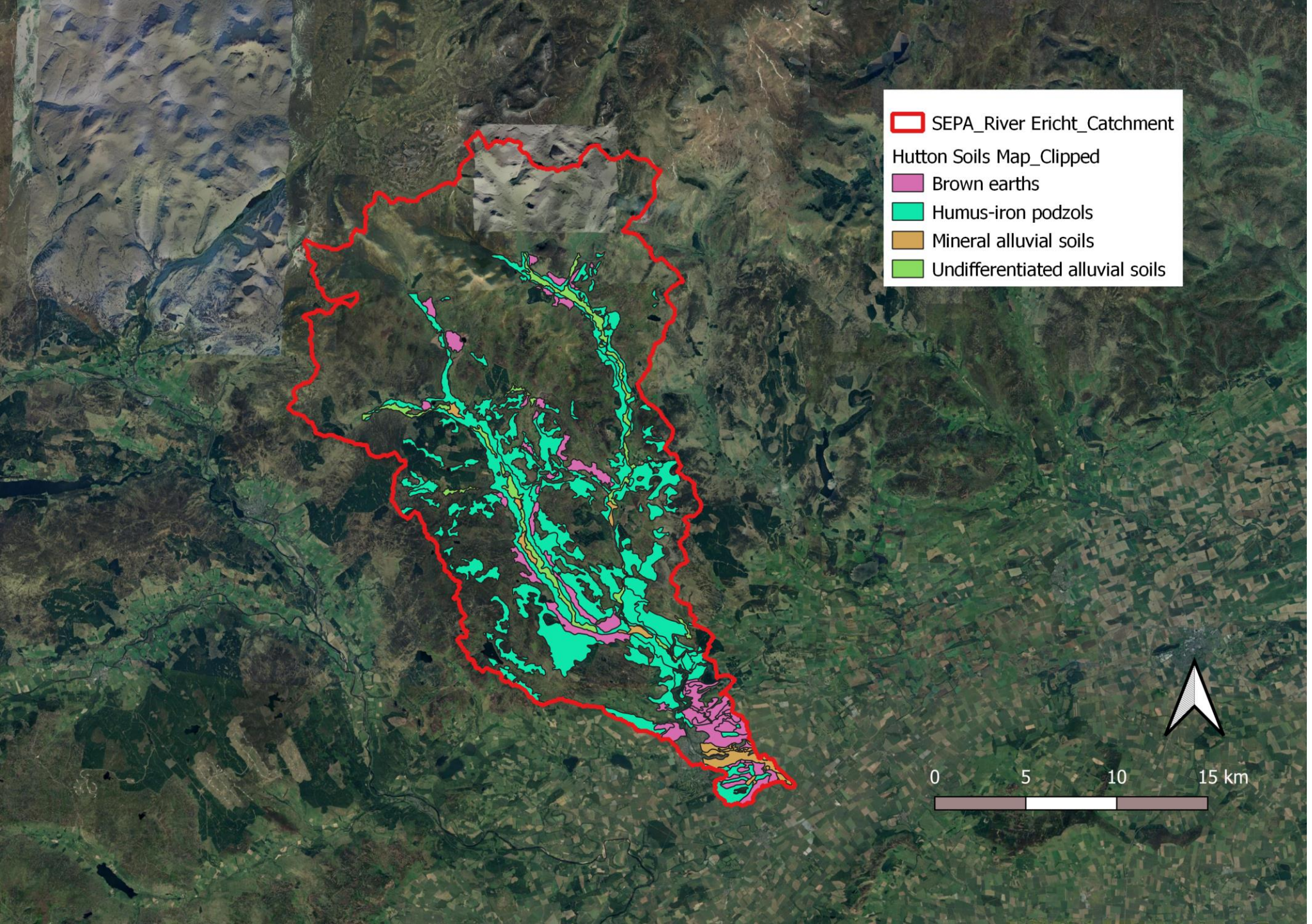
Soil assessment constraints for woodland carbon

3.1.2

Soil map within the River Ericht Catchment

This map uses Hutton Institute data to show the soil typology within the Ericht catchment.





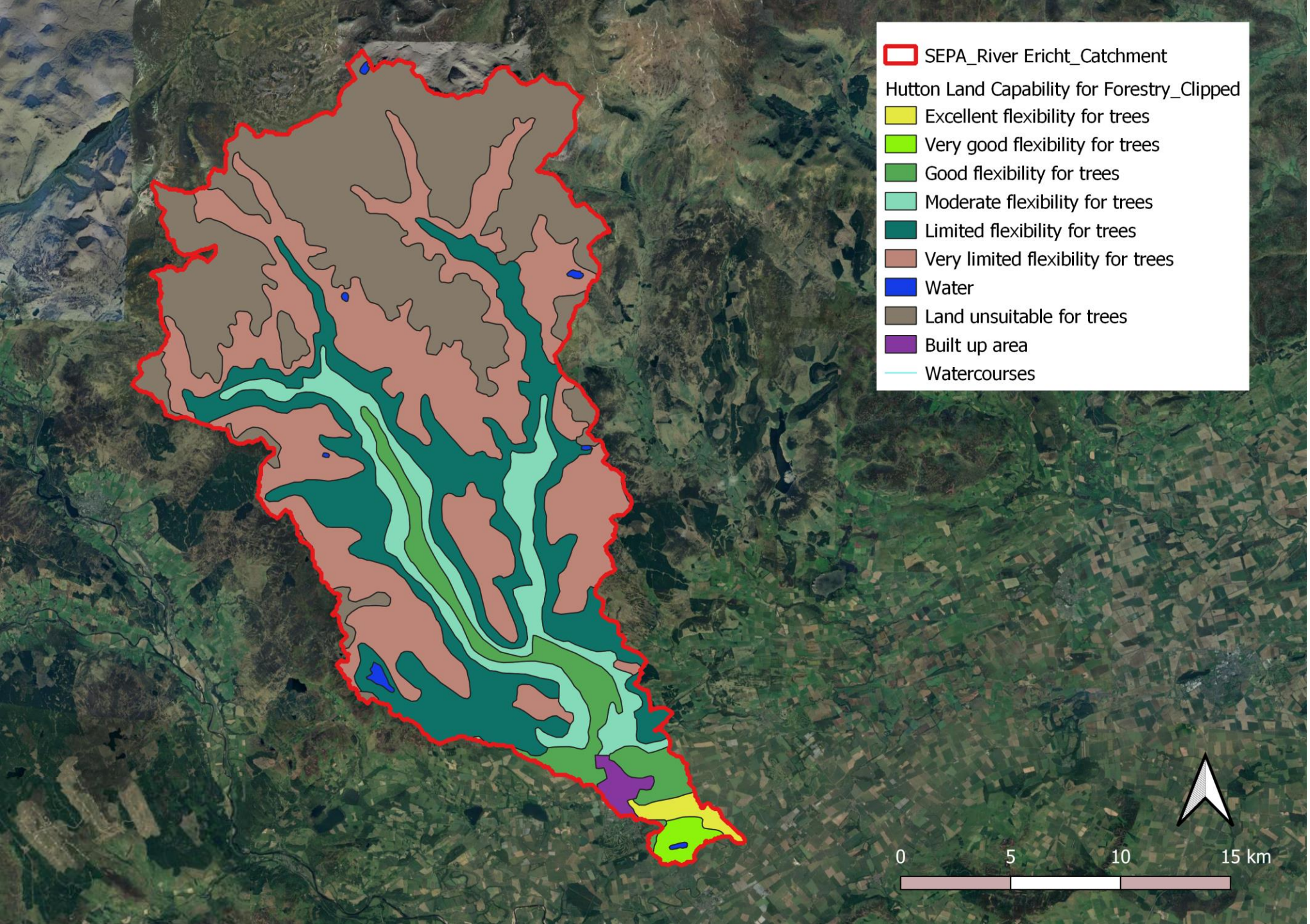
Map of soils suitable for woodland planting within the catchment

Areas with a high presence of peat are not suitable for tree planting under the Woodland Carbon Code and have been removed from the opportunity mapping.

Removing areas where the soil is unsuitable for tree planting, we observe that the most suitable areas run along the waterways within the catchment.

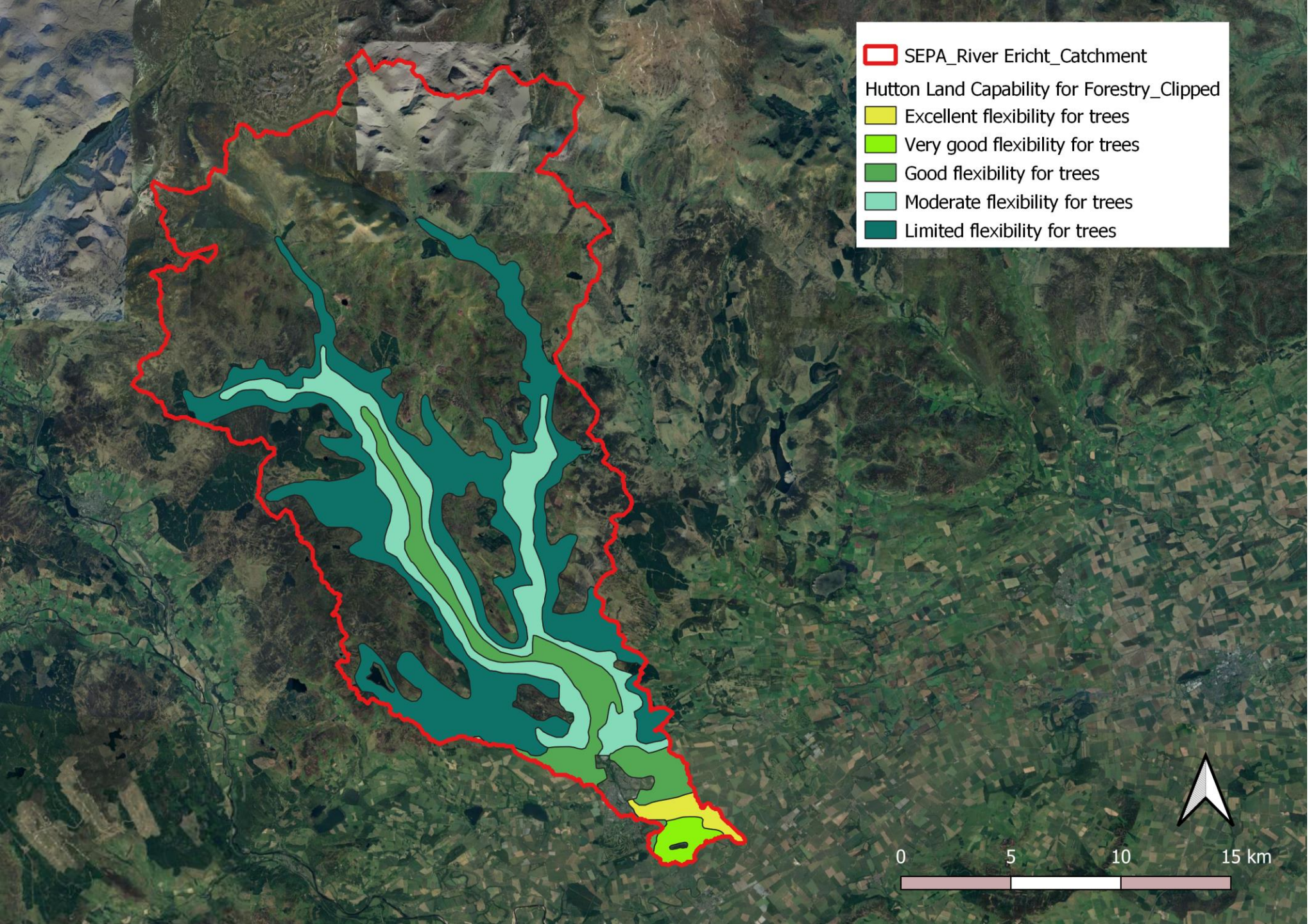
Areas of opportunity for woodland creation

3.1.3



Map of land capability for forestry

This map uses James Hutton Institute data to rank the areas within the Ericht catchment boundaries based on their suitability for tree planting.



Map of areas suitable for forestry

This map shows a guide to priority areas for woodland creation but other areas outside this will still be considered.

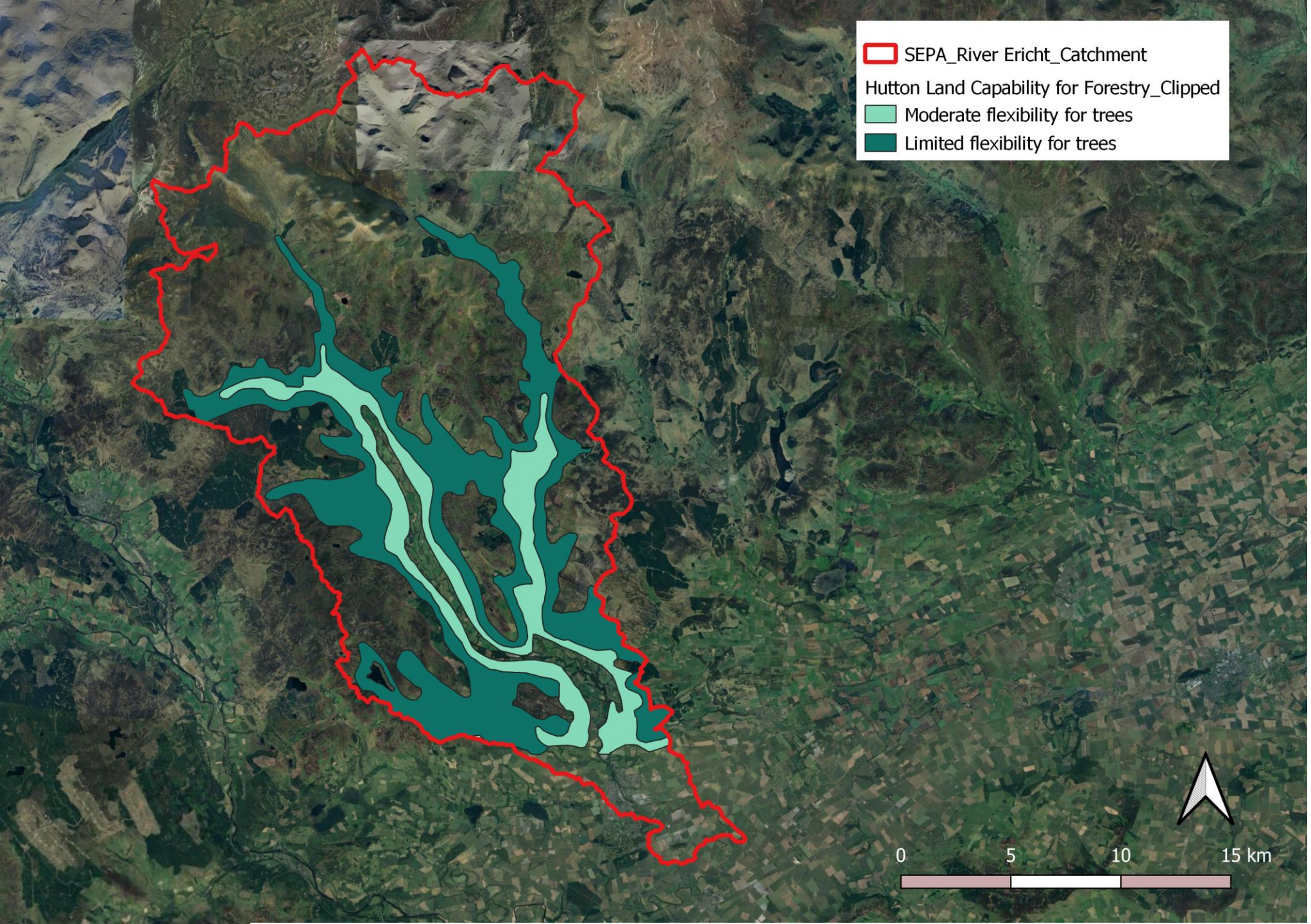
To understand which areas are suitable for planting, we have removed all areas unsuitable or with very limited flexibility for tree planting.

This leaves a total of **17,755 ha** across the river Ericht catchment, which is distributed as follows:

Excellent = 419 ha
Very good = 414 ha
Good = 2,573 ha
Moderate = 4,296 ha
Limited = 10,053 ha

Areas of opportunity minus areas of constraints

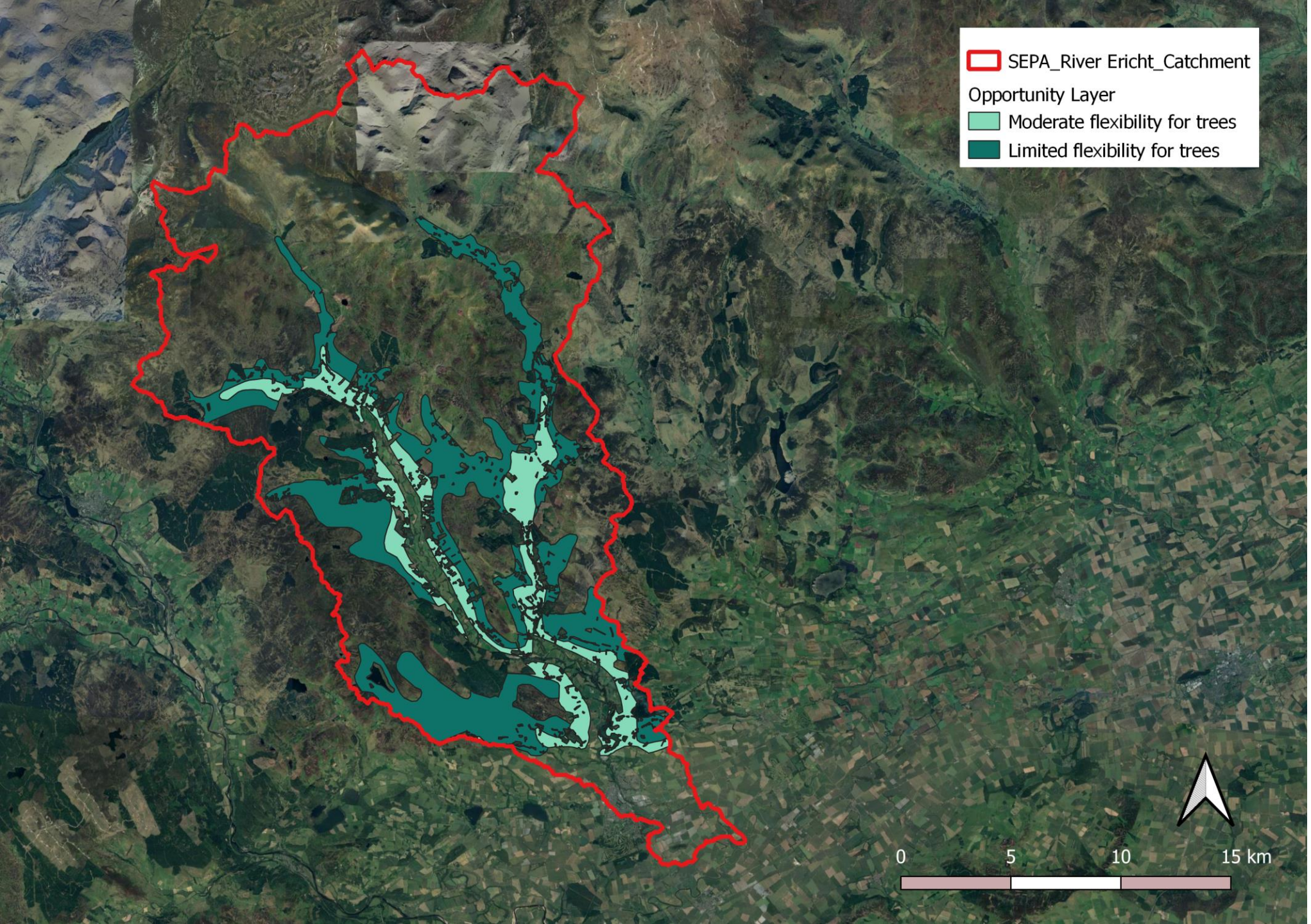
3.1.4



Map of areas suitable for forestry most likely to be planted

For an understanding of where **we could expect the greatest woodland creation to take place**, we have removed the areas with excellent, very good and good flexibility for tree planting.

The areas at the southern point of the catchment and into Strathardle are the most suitable for planting. These are also some of the most **productive agricultural lands** which include market gardens and arable fields. **It is likely that only small pockets of land are put forward for new woodland**.



Map of areas suitable for new woodland creation

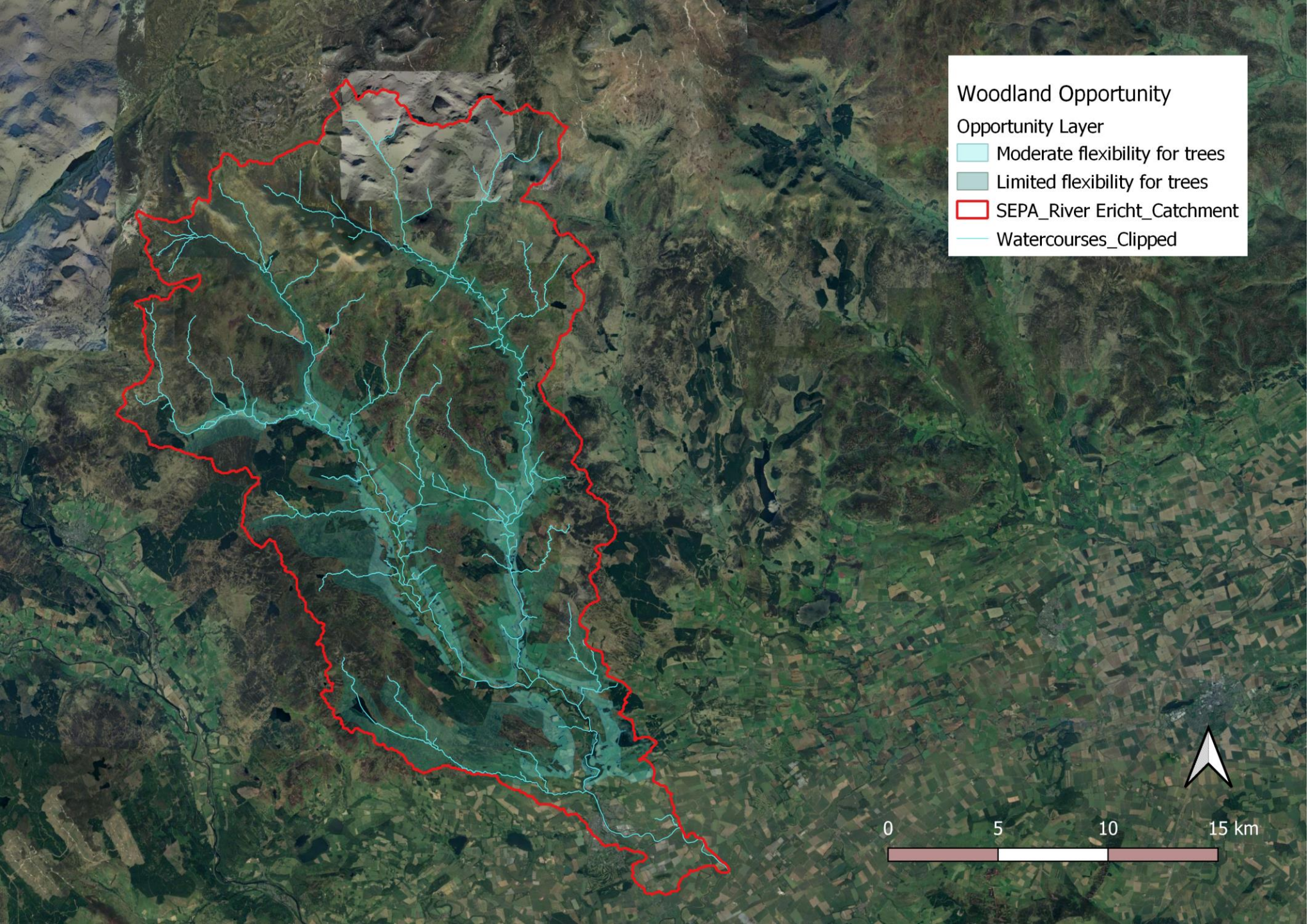
By removing any constraint areas from the opportunity map we are left with the total area most suitable for woodland creation.

Opportunity areas for highest woodland creation in the River Ericht catchment are:

- **3194 ha Moderate flexibility**
- **7941 ha Limited Flexibility**

Overall, a total of 11,135 ha have been identified as suitable for woodland planting.

N.B The Forest of Clunie SSSI has not been removed as a constraint layer.



Map of areas suitable for new woodland creation

Transparent layer for easier identification of landholdings within the opportunity area.

Carbon quantification

3.1.4

We have defined a standard woodland mix suitable to the Ericht Catchment and have assigned a conservative yield class to each group of trees

Characteristics of the defined woodland mix for the areas

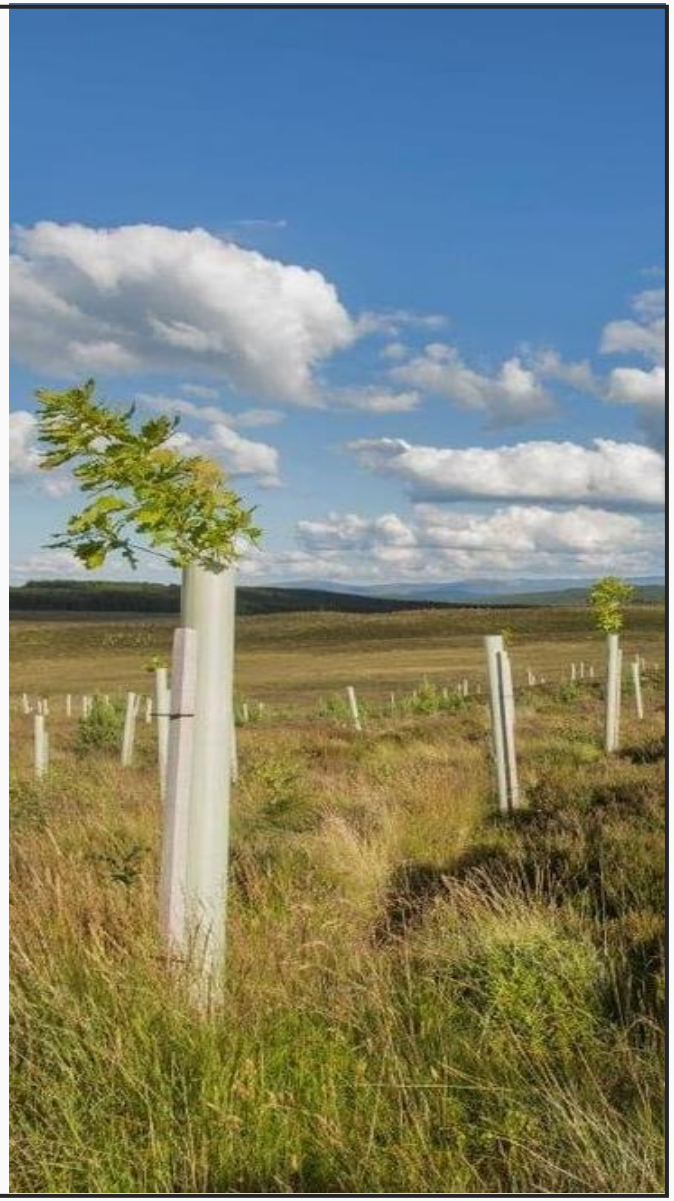
Based on ecological characteristics, we have created a woodland mix from a selection of native broadleaved species suitable for the context of the Ericht Catchment.

Species	Percentage	Yield class
Oaks	10%	2
Mix broadleaved species including Birch, Alder, Aspen, Hazel, Willows, Hawthorn species, Holly, Crab apple, Rowan, Sycamore	20%	6
	60%	4
Mix broadleaved species including Elm, Beech and Hornbeam	5%	2
Scots pine	5%	6

Woodland creation assumptions

- Planting a mix of native broadleaved species as defined in the table above.
- Planting density of 1,600 saplings per hectare, equivalent to 2.5m spacing.
- Assuming ~30% mounding and 70% hand screefing.
- Following a minimal intervention approach, with a non-thinning management regime.
- It will be necessary to prepare the delivery of the project in collaboration with landowners, ecologists and foresters to define the best approach regarding fencing, tree protection, herbivore management, weed control, and fertiliser requirements.
- Ongoing deer fencing and management will be required to reduce pressure on young trees to ensure higher chances of establishing successfully.

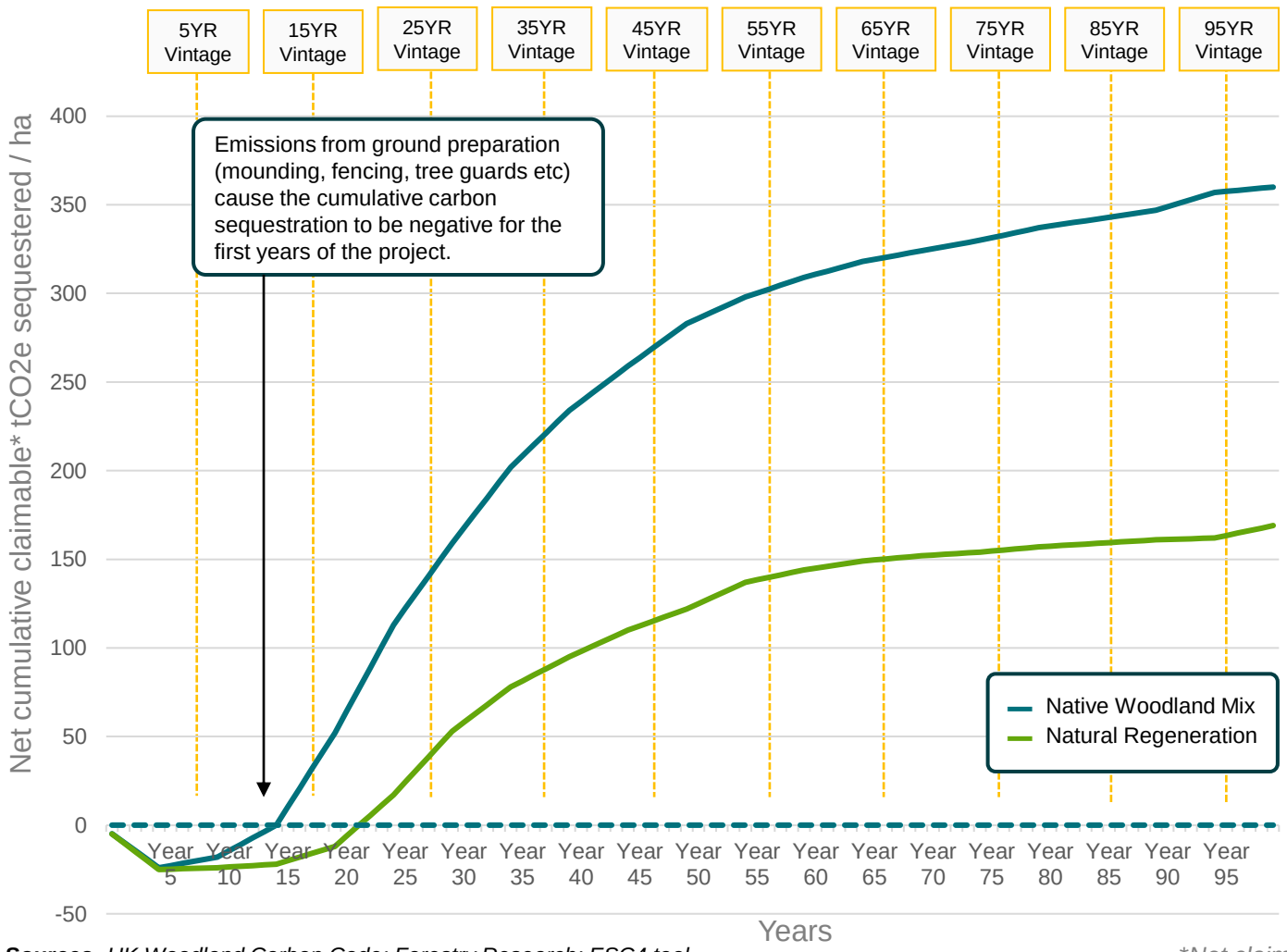
Sources: *UK Woodland Carbon Code; Forestry Research: ESC4 tool.*



Source: The Scotsman

Based on the proposed species mix and yield classes, we project that planted native woodland would sequester approximately 360 tCO2e / ha over a 100-year period

Net Cumulative Carbon Yield Curves per hectare for the defined woodland mix



Sources: *UK Woodland Carbon Code; Forestry Research: ESC4 tool.*

A new woodland will sequester 360 tCO2e per hectare over 100 years

Native Woodland Mix

We have modelled the carbon sequestration rates using the species mix and yield classes detailed in slide 58 and with no thinning regime

The net claimable carbon* credit generation for a planted Native Mix (without thinning) is **360 tCO2e/ha** after 100 years

These sequestration rates can vary as the forecast yield classes of each selected species are refined with field data and/or input from locally operating forestry consultants.

Natural Regeneration

For natural regeneration planting, the carbon sequestration rates are lower initially due to the length of time it takes for the trees to establish. The net claimable* credit generation for natural regeneration is forecast to be **169 tCO2e/ha** after 100 years – though this estimate comes with higher levels of uncertainty compared to planted woodland.

Carbon Credit Vintages

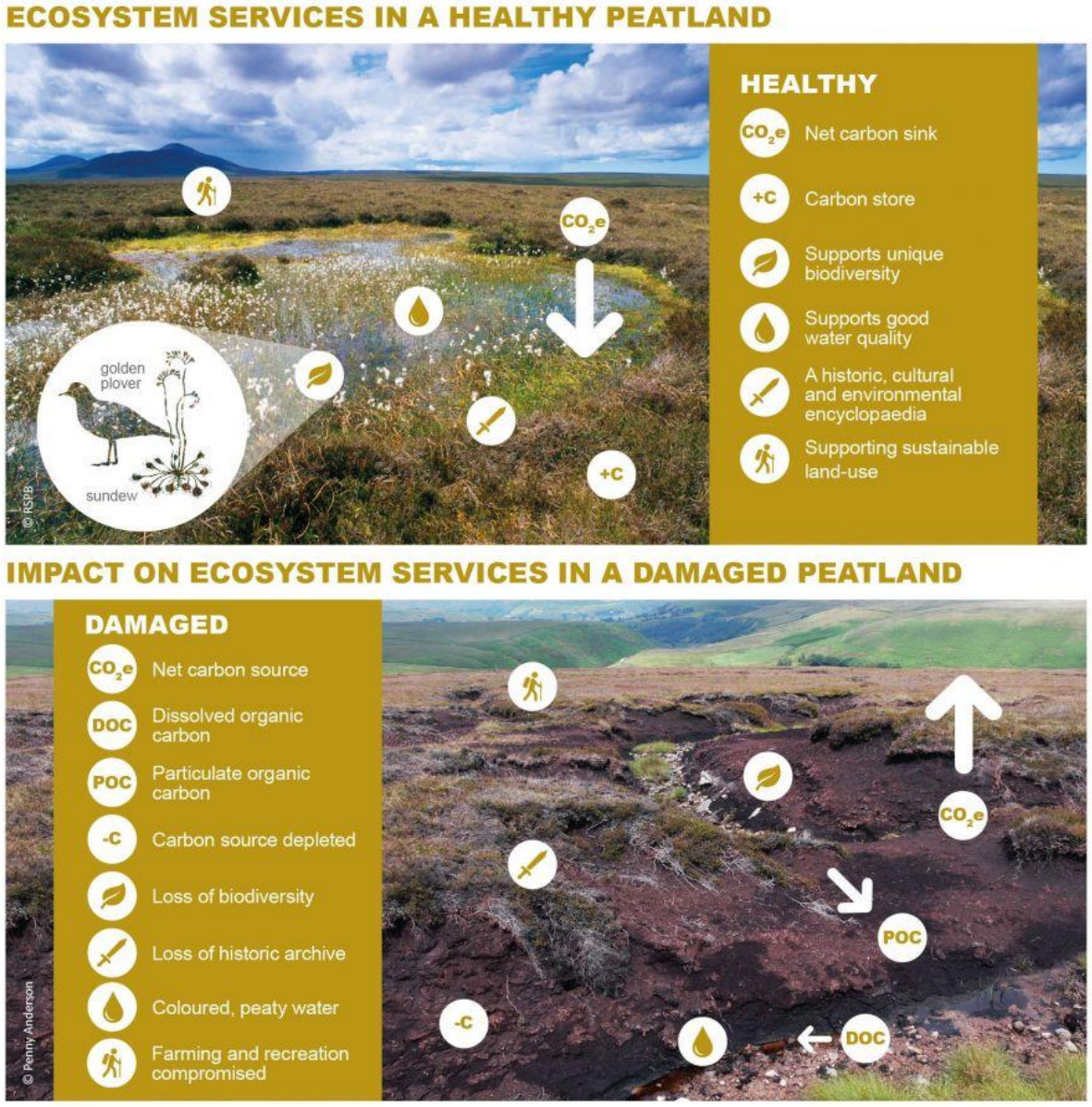
Woodland carbon credits are reviewed at key auditing intervals called verification assessments (often once per decade). The credits confirmed at these points are called Woodland Carbon Units and are grouped together into '**vintages**'.

**Net claimable carbon = after deducting the 20% WCC risk factor and the 20% WCC buffer*

Opportunities to generate peatland carbon

3.2

Healthy peatlands act as a net carbon sink as well as supporting wildlife and improving water quality and water storage



Source: Peatland Code Field Protocol, 2017

Healthy peatlands provide numerous ecosystems services including storing carbon, supporting biodiversity, and improving water quality.

Through the UK's Peatland Code, it is possible to sell carbon reduction credits to national buyers.

Carbon quantification through peatland restoration is dependent on meeting the Peatland Code eligibility requirements and the current condition of the peatland

To meet the eligibility of the **Peatland Code (PC)**, activities must relate to the restoration of **blanket or raised bog**; a **minimum of 75%** of the peat depths recorded across the 'restoration site' have to be **greater or equal to 50cm;** restoration activities must not include forestry removal; restoration must not be legally or contractually required; and the project must be able to enter into a 30-year minimum contract.

Carbon reductions are measured based on the reduction of emissions from the current condition to the restored condition. For there to be a significant carbon reduction potential, the 'condition category' of the peatland has to be either '**actively eroding' or 'drained'**.

The depth of peat cannot be assessed without **on-site surveys** with peat probes. However, peatland condition is generally identifiable above ground. (See photos).

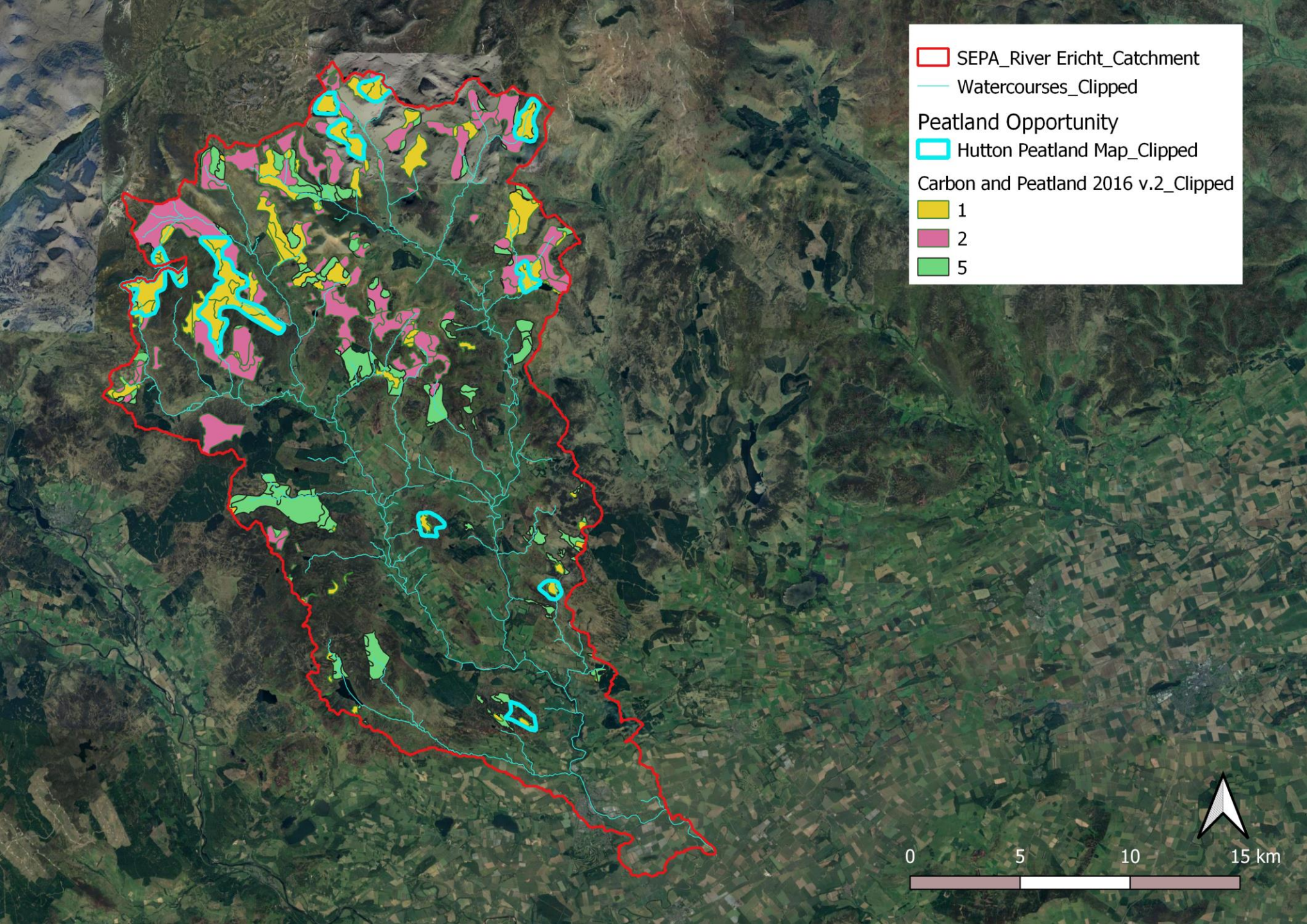
- Restoring **1 ha of actively eroding peatland** back to a modified condition will **reduce emissions by 21.3 tCO2e/ha** (before PC buffers are deducted).

- Restoration **1 ha of drained peatland** back to modified condition will **reduce emissions by 2 tCO2/ha** (before PC buffers are deducted).

We will discuss the opportunities of restoring peatland with relevant landowners.

Example of drained peatland:

Example of actively eroding peatland:



Map of areas with identified presence of peat (3)

The areas of peatland within the catchment will need to be surveyed firstly for condition to identify if any peatland requires restorative action. And secondly for depth, as peatland restoration under the **peatland code requires a peat depth of at least 50cm.**

The next step would be to engage with landowners to understand if there is presence of peat on their land and the condition of it. If there is actively eroding peat or drained peat (condition categories defined under the PC) then further **peat depth surveys can be contracted**.

Opportunities for biodiversity improvements

3.3

Biodiversity improvements could be generated through the ecological richness of the planted woodlands and their locations for habitat creation and connectivity.

As shown in section 1, there are currently no universal or government backed metrics or standards to measure and quantify biodiversity uplift in Scotland. Biodiversity is set to be protected through the National Planning Framework 4 (NPF4) which sets policies to protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature network. However, biodiversity metrics and subsequent markets may be developed in the future. Until then biodiversity improvements can be ‘bundled’ into carbon + credits.

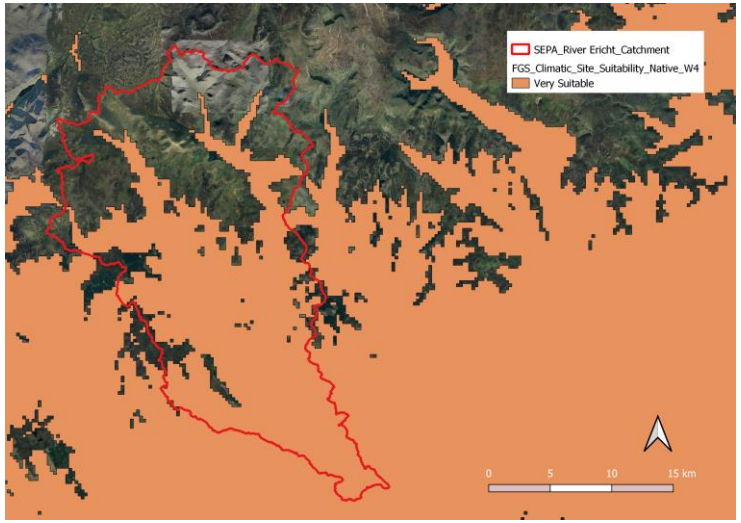
Within the project, biodiversity improvements could be generated by:

- The creation of new ecologically rich woodland (i.e native broadleaves species suitable to the local context as opposed to commercial monoculture).
- The considered location of planting prioritising habitat creation, habitat connectivity and habitat transitions (i.e the project will focus on the creation of new riparian corridors, linking areas of ancient woodland, and montane scrub regeneration)
- The benefit of tree planting and riparian buffers on fish populations and aquatic ecology.
- Beyond woodland planting, biodiversity can be improved by new habitat creation along the water ways using in water large woody structures, gravel bank creation, riparian planting, and wetland habitat creation. See illustrative photos below:

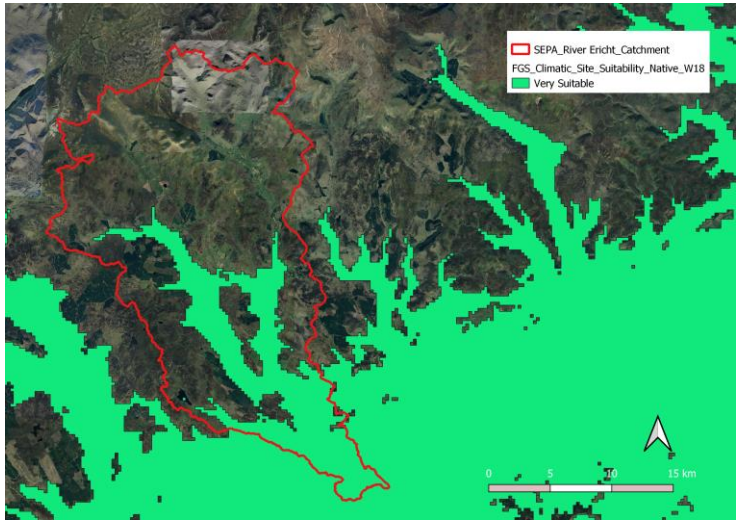



Maps of all suitable FGS woodland classifications across the Ericht catchment

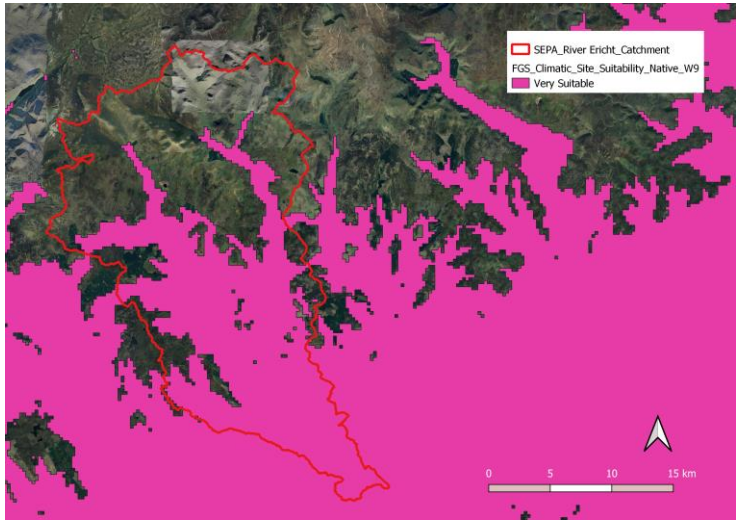
W4 Birch woodland with purple moor-grass



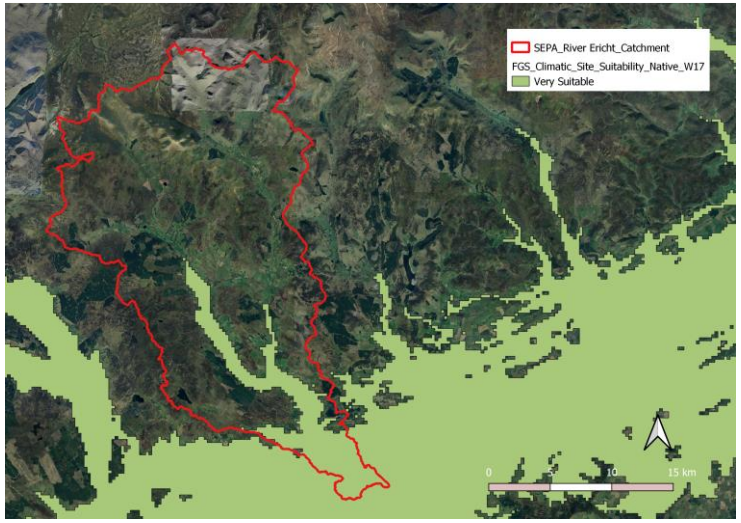
W18 Scots pine woodland with heather



W9 Upland mixed broadleaved woodland with dog's mercury

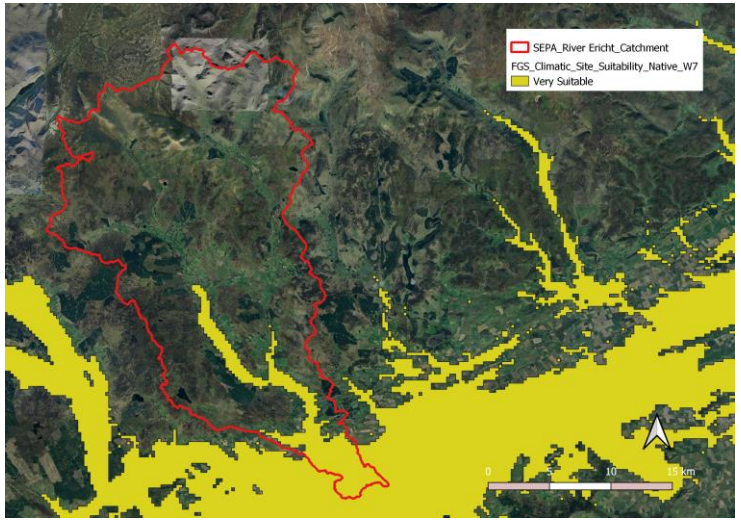


W17 Upland oak-birch woodland with bilberry

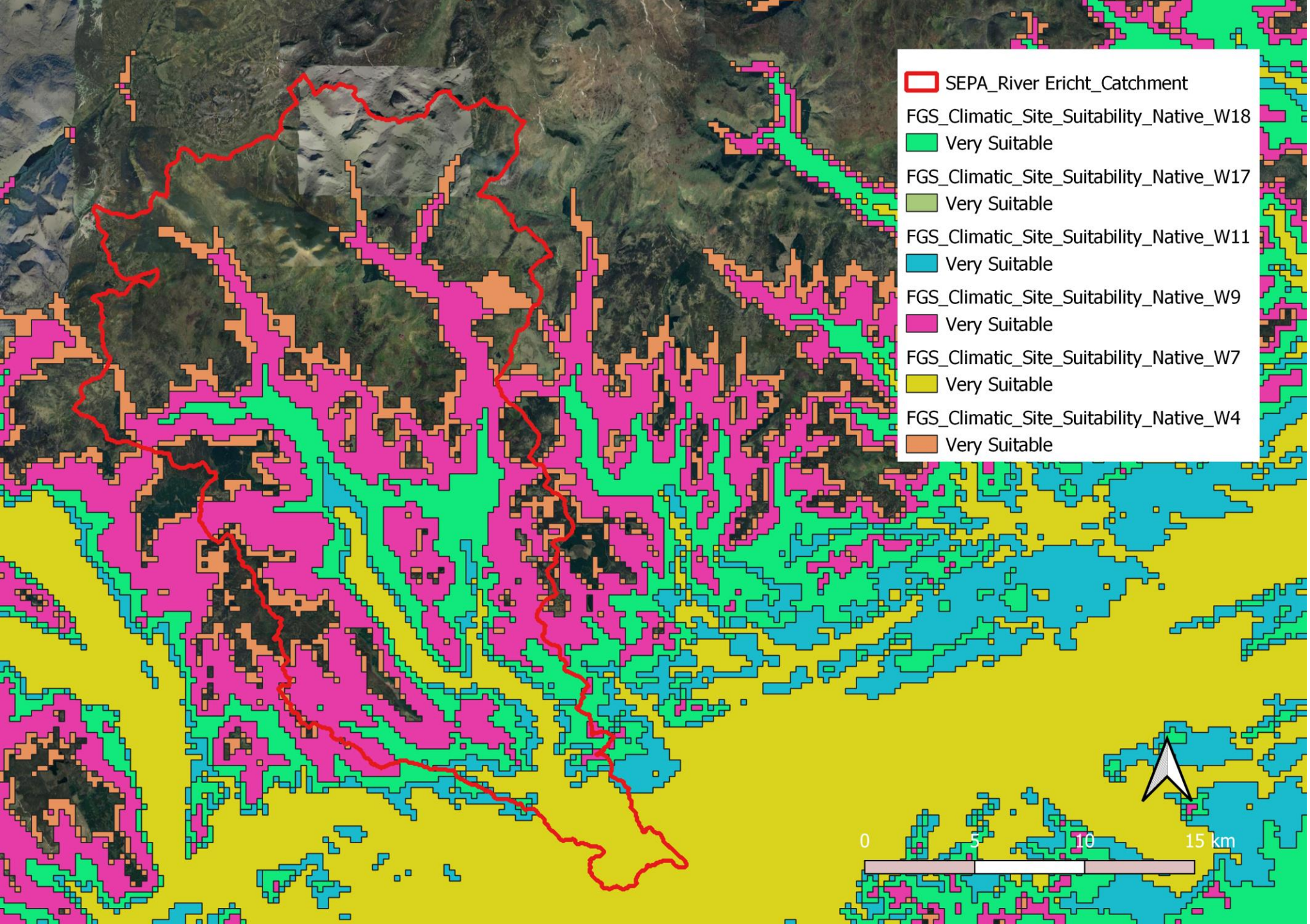


W11 Upland oak-birch woodland with bluebell

W7 Alder-ash woodland with yellow pimpernel



Sources: FGS Climatic Site Suitability, Forestry Research: ESC4 tool.



Map of all suitable FGS woodland classifications across the catchment

All tree species selected will be informed by data from the FGS Climatic Site Suitability mapping as well as other forestry tools such as the Forest Research ESC 4 tool.

Opportunities for water quality improvements

3.4

Water quality improvements will be generated through various activities including the creation of new woodland and the restoration of damaged peatlands.

As shown in section 1, there are currently no defined metrics or standards to generate tradeable ecosystem services for water quality uplift in Scotland. Metrics and subsequent markets around water quality may be developed in the future, for which this project will be a pilot site.

Within the project, water quality improvements should be focused primarily along the river Ardle as this is currently where water quality is the ranked the lowest for the catchment (see section 2.5). Water quality improvements could be generated by:

- **Woodland creation**: Planting trees and restoring forests in watershed areas helps regulate water flow, prevent soil erosion, and filter pollutants. Trees play a crucial role in capturing and absorbing pollutants, while their root systems stabilize soil, preventing runoff into nearby water sources.
- **Riparian Buffer Zones**: Planting and restoring vegetation along the banks of rivers and streams create riparian buffer zones. These buffers help filter runoff, reducing the flow of sediments, nutrients, and contaminants into water bodies. The vegetation also stabilizes banks, preventing erosion and further enhancing water quality.
- **Wetland Restoration**: Wetlands act as natural water filters, trapping sediment and absorbing pollutants. Restoration projects that focus on re-establishing wetland ecosystems help improve water quality by providing a habitat for plants and microbes that break down pollutants and excess nutrients.
- **Riverbank Stabilization with Native Vegetation**: Reinforcing riverbanks with native vegetation helps stabilize soil, preventing erosion and reducing the transport of sediments and pollutants into rivers. The establishment of a diverse plant community also contributes to the overall health of the ecosystem.
- **Peatland Restoration**: The restoration of peatlands reducing any peaty run-off into the waterways as well as holding water for longer into the spring and summer, allowing for a more consistent and regular flow of the tributaries of the river Ericht.
- **Engaging farmers and exploring environmentally sensitive farming.**

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Next steps

4

Building a coherent narrative that enables clear engagement with landowners and is supported with quantified data

Current activities that are causing damage to the water ways

- **Increasing water temperatures** (climate change, direct sunlight etc)
- **Reduced consistency of flow** of water (no longer being held in snow/ice, or in healthy peatland)
- Agricultural use of **fertiliser, pesticide**, and herbicide right up to the riverbanks
- Impact of **weirs and other barriers** on fish populations
- **Water abstraction** and pollution from fish farming industry

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What we can do to mitigate them

- **Plant riparian woodland** to shade the river surface, and reduce erosion
- **Restore damaged peatland** to slow the flow of water (acting as a sponge) and limit peaty particles in the waterways
- **Increase regulation** on fishery and abstraction licenses
- Incentivise farmers to create riparian buffers and adopt **environmentally sensitive farming**
- Create **new wetland habitats** and flood planes
- Build in water habitat such as **large woody structures**
- **Natural regeneration**
- **Wet woodland** planting
- Create **montane scrub** habitats – improvement for habitat creation and biodiversity but no direct link to the river

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How to talk about the benefits

- Research the **impact these interventions** will have on the river health.
- Mix of publicly available scientific data potentially supported through the **findings of a hydrologist or ecologist.**
- We won’t be able to work of 5 years of baseline assessment, so our narrative will not be 100% irreproachable, but we want to build a **high-level narrative to increase awareness and engagement** in the project.

Building a coherent narrative that enables clear engagement with landowners and is supported with quantified data

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Who is best to deal with these

- **Our project**
- **Government Agencies i.e SEPA**
- **Regulating bodies**
- **Farmers and Landowners**

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How best to fund these interventions

- **Public grants**
- **Carbon revenues**
- **Windfarm revenues**
- **Philanthropic funding or donations**

Next steps for landowner engagement

Developing our narrative as a visual document.

Sharing narrative with landowners and farmers in initial conversations and measuring their interest to take part.

Assessing what interventions would be most suitable on their land, and how they fit within the wider project. (This is led by the landowners)

Developing high level implementation plans for each intervention.

Assessing how best to fund these activities and landowner appetite to engage in natural capital projects. This will inform off if the project is viable.

If project is viable – we proceed to the delivery phase of the project developing detailed implementation plans and procuring contractors.

Next Steps and Milestones

Project Milestones

- **31st September 2023**
- Submission of the first milestone, the “Final natural capital baseline assessment (Assessment of current land use and condition across the catchment).

- **31st Dec 2023 (Postponed to 29th February)**
- Working with Steering Group on restoration vision and ecosystem service generation calculations across the catchment (Agreeing vision for nature restoration and evaluating the scale of ecosystem services that could be generated)

- **30th January 2024 (Postponed to 29th March)**
- Financial model and identifcation of offtakers (Model covering costs, revenues, gross margins - Letters of interest from offtakers of ecosystem services)

- **31st Mar 2024 (Postponed to 30th April)**
- Working with Steering Group on the proposed Investment structure (Model including community ownership options, cashflow, and debt, equity / mix scenarios and community investment options)

- **31st May 2024**
- Delivery plan (Delivery team set up and resourcing plan agreed)

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The River Ericht
CATCHMENT RESTORATION INITIATIVE

Bioregioning Tayside

Insights into the next milestone – the Restoration Vision

Satellite image over the River Ardle

Currently the landscape is defined by a central waterway in the valley, bordered by fields of improved grassland and pockets of woodland. Beyond these is moorland, some of which are currently managed for grouse shooting.

Satellite image over the River Ardle showing potential areas for woodland creation

This map shows an illustrative example of what river restoration and woodland creation in the Ericht catchment might look like.

The less productive grazing fields and areas bordering the moor could be planted with new woodland whilst agricultural activities continue in the more productive areas.

Additional riparian planting along the waterway could also take place.

Habitat connectivity can be mapped once the priority habitats are defined and specific landholdings are defined.

Habitat connectivity, wildlife corridors and developing nature networks

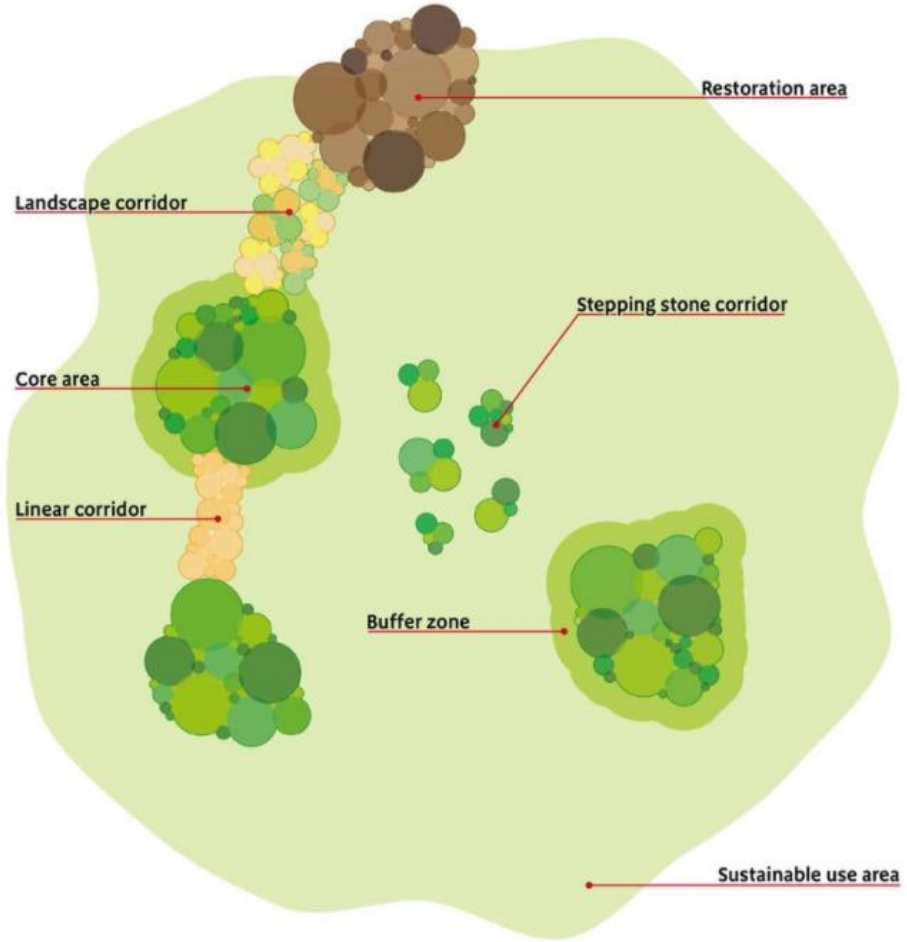
According to Nature Scot, Scotland is one of the most nature-depleted countries in the world. One of the key drivers for past biodiversity loss has been land-use change where, through activities such as farming or urban sprawl, habitats have been lost and increasingly fragmented over time.

This fragmentation is present in the river Ericht catchment, leading to the remaining habitats (i.e ancient woodlands) being isolated and unconnected. As a result, they are less resilient, often declining in health, and struggling to support healthy populations of the species that rely on them.

To create new biodiversity improvements, it is important we address this issue by developing wildlife corridors and nature networks throughout the catchment, focusing on connecting existing healthy habitats.

Nature Networks are embedded throughout the fourth National Planning Framework (NPF4) as a key means of ensuring positive effects for biodiversity from development.

Nature-rich are connected through a series of networks linking them all together.



Sources: *Nature Scot. Nature Networks Explained*

Visualisation of a restoration vision for the Esk Valley project (North York Moors)

As part of a previous project, we undertook within the North York Moors, a restoration vision for the landscape was created by the project steering committee. This vision is illustrated in the following slide.

This first image shows the landscape as it is now. It is primarily agricultural with small pockets of woodland and occasional tree lines.

Hedges and field margins are kept back and the boundary with the moor is very harsh and linear.

Visualisation of a restoration vision for the Esk Valley project (North York Moors)

This second image shows the restoration vision for the landscape.

The landscape remains predominantly agricultural however allows for more space for nature.

New pockets of woodland are planted creating connected woodland habitats across the landscape and along riverways. Field margins and hedging are planted and expanded. The border with the moor is softened with additional planting, creating a transitional area between moorland and fields.

Some environmentally friendly farming practices are taken on including herbal leys, and more wildlife is visible within the landscape.