



Farm Payments and Peatlands Analysis

Phase 2 Report (2023 Revision)

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Revised version 12 September, 2023



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Glossary

Acronym	Full Text	Acronym	Full Text
AECS	Agri-Environment Climate Scheme	LMO	Land Managers Options
BB	Broadband	LPIS	Land Parcel Identification System
BEIS	(Department for) Business, Energy and Industrial Strategy	NECG	New Entrant Capital Grants
BES	Beef Efficiency Scheme	NESUG	New Entrant Start Up Grant
BPS	Basic Payment Scheme	P1	Pillar 1
BRN	Business Reference Number	P2	Pillar 2
CAGS	Crofting Agricultural Grant Scheme	PGRS	Permanent Grassland
CEH	Centre for Ecology and Hydrology	RPS	Rural Priorities Scheme
FGS	Forestry Grant Scheme	SAF	Single Application Form
FPMC	Food Processing, Marketing and Co-operation	SBCS	Scottish Beef Calf Scheme
FPS	Farmland Premium Scheme	SFGS	Small Farms Grant Scheme
FWPS	Farm Woodland Premium Scheme	SFPS	Single Farm Payment Scheme
FWS	Farm Woodland Scheme	SSBSS	Scottish Suckler Beef Support Scheme
IACS	Integrated Administration and Control System	SUSSS	Scottish Upland Sheep Support Scheme
JAC	June Agricultural Census	VCS	Voluntary Coupled Support
KTIF	Knowledge Transfer and Innovation Fund	YFSUG	Young Farmers Start Up Grant
LFASS	Less Favoured Area Support Scheme		



Notes on the 2023 revised version

- The original Peatlands and Payments analysis (Phase 1) was undertaken in early 2021. This was an unpublished report for RESAS and SG policy teams. This used 2018 farm payments data and a version of the peatlands mapping that did not report the area of woodlands on peat.
- The Peatlands and Payments (Phase 2) analysis undertaken in early 2022 updated the payments to 2019 and added the woodland class, but the summary data focused only on the businesses >1000 ha. This was again an unpublished report for RESAS and SG policy teams.
- Following the 3 February 2023 ARIOB meeting where peatlands and future agriculture support were discussed, the materials from both Phase 1 and 2 analyses were reviewed and enhanced with the Phase 1 reporting also updated to use the 2019 payments and improved peatland mapping.
- In May 2023 revisions to the Phase 2 reporting were undertaken with RESAS and RPID colleagues (this document).



Executive Summary

The characteristics of the 321 businesses with >1,000 ha of peat >50cm deep

1. They have 57% of all peatlands, ~1M ha of which 781k ha may need restoration and 275k ha is near natural bog which may still need measures to increase resilience to climate change. The areas of higher emissions conditions (crops and grasslands) are estimated at ~17k ha (though this estimate is likely to be revised) and the woodland area as ~37k ha.
2. There is a wide variety of tenures and tenure mixes present though with ownership is the dominant type (1.4M of 1.7M ha).
3. They have a Land Capability for Agriculture (LCA) mix dominated by classes with limited value for agriculture (LCA6+), 1.45M ha, with a significant part of this area being peatlands.
4. They have substantial values for agricultural standard outputs and employment, but it is likely that only a small part of that is generated in the uplands.
5. A mix of livestock types are present, larger numbers of sheep than cattle but there are questions here of which animals are present in the peatland areas and a holding level analysis would be helpful in that regard.
6. There is some degree of concentration in business types (e.g., specialist sheep – 356k ha) and regions (e.g., Highland – 700k ha, and Argyll & Bute 116k ha) but there are substantial areas of peatlands associated with a wide range of business types and a majority of regions, so some care is needed in any policy formulation to cope with the diversity of combinations.
7. A substantial area of the national parks have peatlands present (CNP 94k ha and LLT 29k ha).
8. Driven grouse enterprises are present (~65k ha of burned land) but other sporting interests are unknown.
9. On-farm renewables are present on 53 of 321 businesses (as of 2016) with more likely to have interests via third parties.
10. The businesses have substantial CAP payments across both Pillar 1 (£25M) and Pillar 2 (£18.6M), noting especially forestry grants (£5.9M). The higher proportion of Pillar 2 activity compared with other businesses is also worth noting. The land is mostly BPS Region 3 land (783k ha) with Region 2 (higher stocked land) at 82k ha.
11. There are substantial areas that are either not linked to Direct Payments or have no, or null, agricultural activity (~650k ha) so that peatland restoration may not necessarily limit agricultural use.
12. They have been very active in Peatland Action funded restoration with ~17k ha out of the ~20k ha area of restoration undertaken on SIACS businesses since 2020.



Background

Introduction

- The Scottish Government are committed to restoring 250,000 hectares of peatland restoration by 2030, in order to meet the ambitious greenhouse gas emissions reductions, set out in the 2020 Climate Change Plan Update. To maximise the emissions reductions and associated co-benefits achieved as a result of peatland restoration, the Scottish Government are currently working with partners to consider the optimal mix of peatland types for restoration.
- Related to that work, the Scottish Government wish to improve their understanding of the location of different types of degraded peatland in relation to agricultural practices and agricultural support payments. This information will allow agriculture and peatland restoration policy decision makers to make more informed choices about the preferred areas for targeting peatland restoration offers.

Purpose

- The purpose of this project is to contribute to the evidence base on which policy decisions will be made by Ministers and supported by the Natural Resources Division and the Agriculture Policy Division.



Scope

Aims

The analysis sought to characterise the ~300 businesses with the largest extents of peatlands present within their land area.

This analysis built on:

- Datasets used in the Phase 1 Peatlands and Farm Payments analysis (completed in March 2021).
- The characterisations of Scotland's farming systems created for the 2014 versus 2019 farm support payments analysis for Agriculture and Rural Development stakeholders (December 2021).

Objectives

The analysis aimed to:

- Refine the mapping of peatland categories. The analysis created a new revised version of the peatlands extent and characterisations mapping based on [Aitkenhead et al. \(2021\)](#). This new version employed the National Forest Inventory 2019 mapping to improve the representation of woodlands.
- Respond to the request for business characterisation and mapping as specified by SG policy leads and RESAS analysts in the table of outputs (see next Slide).



Table of expected outputs

Request	Method/Effort	Complete
Identify those businesses with >1000 ha of peatlands	Use all peatlands area and the area identified as in need of restoration. Present as visualisations of business counts vs. area.	Yes
For the ~300 businesses - what kind of businesses are they?	Repeat characterisations in Slide 23 of the Phase 1 Analysis – payments, standard outputs, livestock units, standard labour requirements. Option - to add or extend the activity characterisations.	Yes, incl. Option
Are they sporting estates?	Use the burning and grouse butts data from Matthews et al (2020) as an indicator.	Yes
Are they in the national parks?	Calculate area per business within each of the two national parks.	Yes
Do they host renewable energy sources?	Use Farm Structure Survey to identify where renewables are part of the agricultural business - 2016. Option - Map based analysis for renewables.	Yes, not Option.
Do they have no agricultural activity?	Use IACS activity markers.	Yes
Where they are, geographically?	Map all business locations – national maps.	Yes
What is their capability for agriculture	Map extents with peatland condition and land capability for agriculture	Yes
Do all of them receive CAP support?	Per business payments breakdown by Pillar and Scheme.	Yes
Are they in receipt of forestry grants?	Per business current and legacy forestry payments (subset of above).	Yes
Have any undergone peatland restoration?	Per business any payments for peatland related work in Pillar 2 (potentially at measure/field level). Option - add Peatland Action data.	No, Yes for Option
What is the mix of tenures present in each business?	Provide the tenure types and areas per business (where known) based on the ARD stakeholders' analysis.	Yes



Data Sources and Methods

- The analysis was a desk-based study integrating existing datasets using database and geographical information systems methods. The scope was co-constructed with RESAS analysts.
- The analysis used well-established analysis and reporting protocols so was generally low risk (see Phase 1 Report).
- Where new data needed to be brought in, the Hutton analysts made suggestions for sources, but were limited to data in the public domain and accessible without delay. The main example here was the Peatland Action mapping and payments data where only the post 2020 mapping data was available within the time frame.
- Metadata defining the sources used for the analysis was provided as part of the underpinning data shared with Scottish Government.
- Interactions with SG analysis and policy teams led to requests for more sophisticated views (maps) of the integrated data and where possible these were provided including some experimental use of bivariate mapping.
- Where better options fell outside the ability of the project to deliver then they are written up as options for further analysis.



Caveats to the analysis - summary

Overall, this is a complex analysis that brings together many elements – there are both data quality and data integration issues that limit how the data can be used and remaining uncertainty.

Key issues are set out below but see also the Phase 1 Report Slide 10.

- **Coverage Space** – the analysis is for businesses submitting a SAF form – these are all the businesses that interact with farm payment systems – 5.7M ha of 7.8M ha total area.
- **Coverage Time** – this is a snapshot for 2019 for the SIACS data in terms of use/management but payments for some elements of Pillar 2 are averages over the 2015-19 period. The peatland restoration data was only available to the Hutton team for 2020 onwards and only spatial data with no attribution or payments attached.
- **Reliability** – all datasets are the best known at the time of analysis. The dataset with most potential issues is the peatland mapping.
 - **Peatland area** - there is confidence that the map is not excluding deep peats (>50cm).
 - **Peatland condition** – the woodland type was updated using NFI (2019) but there remains a small area of woodlands in the peatland mapping not confirmed by NFI. There would need further analysis to determine a peatland type for this area. There are questions over the area of the cropping/extensive/intensive grassland categories.
- **Granularity**
 - **Fully spatial** – e.g., peat extent mapping and LCA are the most flexible datasets but have uncertainty and minimum mapping units that can mean they miss details at field scale.
 - **Field**
 - The link by Hutton of IACS claims/payments data to field maps is imperfect, and ~120k ha are missing and this is being followed up with RPID/LPIS collages (and is likely a synchronisation issue between spatial and non-spatial elements).
 - Within field features are unmapped in the Hutton data – e.g., land uses or exclusions – this means uncertainty in making field to fully spatial data linkages.
 - Multiple users per field are unmapped – unless a metric can meaningfully be averaged between users over the field (e.g., £ payments) then some metrics cannot be mapped at field or business or always unambiguously linked to fully spatial data (e.g., tenure).
 - Small areas recorded per field (e.g., small ha of BPS claim in otherwise unclaimed field) when mapped using the whole field area this can give the misleading impression (e.g., of large areas being paid at higher rates).
 - **Holding** – Some businesses are made up of two or more component land holdings (i.e., entities recorded as Agricultural Holdings for the JAC). These can be separated in space across Scotland or be clustered in a single locality. This granularity can be a key scale at which to assess the impacts of land management decisions such as peatland restoration as it links more closely to enterprises and specific combinations of livestock and grazing lands. The JAC and related data are collected at this level and farm type/region classifications are also available. Linkage to farm payments can though only occur at the business level without assumptions on disaggregation having to be made. **Holding level analysis was out of scope.**
 - **Business** is the key level linking to the payment regime. The livestock and other activity data used here (with the exception of BPS activity markers) are an aggregate of holdings that may be contiguous or widely space across Scotland. This means the need for care in making inferences for businesses that draw on the mix and location of enterprises.

Questions and links to outputs

Request	Slide / other reference
Identify those businesses with >1000 ha of peatlands	Slide 18,19 maps of business extents and per field percentage peatlands.
For the ~300 businesses - what kind of businesses are they?	Slide 11-13, tabular summary of the characteristics of the businesses, 13 emphasises the very wide range of business types within which large areas of peats occur.
Are they sporting estates?	Slide 12 – driven grouse burned area small relative to business area but other sporting interests unknown, Slide 30 burning vs peatlands show only limited areas where both are present.
Are they in the national parks?	Slide 11 – small number in both, more in CNP.
Do they host renewable energy sources?	Slide 11 – yes (on farm) 53 of 321, others unknown.
Do they have no agricultural activity?	Slide 20-28 – few have no agricultural activity, but many have large areas without apparent agricultural activity. Slide 27-28 linking peatlands and activity is challenging but indicative mapping possible.
Where they are, geographically?	Slide 18/19 business maps
Do all of them receive CAP support?	Slide 12, 31 BPS payment region,
Are they in receipt of forestry grants?	Slide 12
Have any undergone peatland restoration?	Slide 13, 60 businesses since 2020 PA mapping, 16 of 19k ha. Earlier unknown. Other schemes – not quantified.
What is the mix of tenures present in each business?	Slide 11, wide variety of tenures present reflecting diversity of businesses.



Tabular summary

- A large range of characterisation options are possible based on the integrated data and can be generated in response to specific queries.
- The tables below are focused on the >1000 ha of peat per business class.

Peatland area and condition																		
All Peat area per business	Business Count	No peat	All Peat	Unrestored Peat	Grassland Cropland (39)	Grassland Intensive (30)	Grassland Extensive (19)	Woodland (10)	Extraction Domestic (8)	Eroded Drained (5)	Grass Dominated Drained (3)	Heather Dominated Drained (3)	Grass Dominated Undrained (2)	Heather Dominated Undrained (2)	Near Natural Bog (0.01)	No peatland mapping		
>1000	321	873,207	1,057,698	781,109	2	1,441	15,320	37,095	5,396	258,664	225,127	207,607	17,248	13,209	275,529	1,060		
Land Capability for Agriculture																		
All Peat area per business	Business Count	LCA 1	LCA 2	LCA3.1	LCA 3.2	LCA 4.1	LCA 4.2	LCA 5.1	LCA 5.2	LCA 5.3	LCA 6.1	LCA 6.2	LCA 6.3	LCA 7	No LCA Mapping	LCA Built Up	Uncoded Island	LCA Inland Water
>1000	321	206	699	3,149	8,639	9,848	21,151	9,827	65,204	138,585	22,145	195,983	1,281,500	168,670	1,188	539	133	3,439
Activity measures																		
All Peat area per business	Business Count	Standard Outputs (£)	Standard Labour Requirments (FTE)	JAC Staff (ct)	JAC Staff (FTE)	Grouse burned area (ha)	Onfarm Renewables? (ct)											
>1000	321	49,428,629	2,598	1,411	930	65,837	53											
Activity measures																		
All Peat area per business	Business Count	Livestock Units (DEFRA)	Livestock units (BPS)	Livestock Units (JAC)	Cattle (ct)	Sheep (ct)	Goats (ct)	Camelids (ct)	Pigs (ct)	Poultry (ct)								
>1000	321	48,779	55,517	68,547	28,661	481,988	28	14	126	96,504								
Activity Measures																		
All Peat area per business	Business Count	IACS Total Activity	IACS Arable Activity	IACS Productive Activity	IACS Mixed Activity	IACS Alt Activity	IACS Unspecified Activity	IACS No Activity	IACS Null Activity									
>1000	321	1,785,221	5,033	963,453	31,713	134,886	53	317,149	332,934									
Tenure																		
All Peat area per business	Business Count	All Tenures	Owned	Total rent	91 Act 91 Act	91 Act Ltd Part	LDT	SLDT	MLDT	Small holder	Rent Croft	Tennancy Unknown	Seasonal Rentals (In)	Seasonal Rentals (Out)				
>1000	321	1,735,131	1,431,541	303,590	130,403	46,608	31,775	67,764	3,693	-	5,478	17,870	134,138	74,026				
National Parks																		
All Peat area	Peat Area Inside C NP	Peat Area Inside LLT NP	Peat Area Outside NPs	Unrestored Peat Area Inside C NP	Unrestored Peat Area Inside LLT NP	Unrestored Peat Area Outside NPs	Non-Peat Area inside NP	Non-Peat Area inside LLT NP	Non-Peat Outside NPs	Businesses with Peat in C NP (ct)	Businesses with Peat in LLT (ct)							
>1000	94,125	13,880	949,694	58,522	12,165	711,482	169,758	23,766	679,683	45	15							
All Businesses	114,315	29,469	1,710,626	72,684	24,697	1,269,366	254,430	68,078	2,360,030	166	102							

Tabular summary (2)

Payments				
All Peat area per business	Business Count	BPS Region 1	BPS Region 2	BPS Region 3
>1000	321	41,119	82,446	782,876

All Peat area per business	Business Count	All CAP	Pillar 1	Pillar 2	Basic Payment	Greening	Financial Discipline	Beef Mainland	Beef Island	Upland Sheep	Young Farmer
>1000	321	£43.424M	£24.863M	£18.562M	£13.684M	£6.863M	£0.340M	£2.812M	£0.284M	£2.812M	£0.003M

All Peat area per business	Business Count	Beef Efficiency	Agri-Env Climate	Forestry Grant	Rural Priorities	Land Manager Options	Farmland Premium	Farm Woodland	Farm Woodland Premium	Crofting Agriculture
>1000	321	£0.057M	£1.937M	£5.063M	£4.302M	£0.074M	£0.016M	£0.001M	£0.010M	£0.111M

All Peat area per business	Business Count	Unrestored Peat	Peatland Action Site Area (post 2020)	Count of businesses with PA sites
>1000	321	1,057,698	781,109	16,586

Region for businesses with >1000 ha all peat	All Peat	Unrestored Peat	Peatland Action Site Area
Specialist sheep and Goats	356,238	256,597	4,539
Sheep and cattle combined	205,397	158,098	4,043
Specialist cattle - rearing and fattening	168,459	109,494	4,400
Graziers	153,024	122,290	728
Various grazing livestock	84,771	68,586	1,893
Non Classified	35,522	19,582	19
General Field Cropping	21,903	17,785	467
Mixed Crops - Livestock	20,998	19,105	496
Specialist cereals, oilseeds and protein crops	6,070	5,638	
Specialist granivores	1,654	1,561	
Unknown	1,496	986	
Specialist Horticulture and Permanent Cropping	1,161	497	
Specialist dairying	1,005	890	
Grand Total	1,057,698	781,109	16,586

Region for businesses with >1000 ha all peat	All Peat	Unrestored Peat	Peatland Action Site Area
Highland	700,260	525,807	11,262
Argyll & Bute	115,912	87,593	2,677
Tayside	82,326	54,309	971
NE Scotland	68,363	45,676	937
Eileanan an Iar	25,834	14,178	19
Ayrshire	21,406	16,457	99
East Central	16,853	13,593	192
Scottish Borders	10,184	9,564	5
Shetland	4,829	4,764	83
Fife	3,216	3,181	
Dumfries & Galloway	2,780	2,155	341
Clyde Valley	1,652	563	
Orkney	1,552	1,345	
Unknown	1,496	986	
Lothian	1,037	939	
Grand Total	1,057,698	781,109	16,586



Tabular Summary (3)

Restoration																
Unrestored Peat																
Ag Region <input type="button" value="v"/>																
	Highland	Argyll & Bute	Tayside	NE Scotland	Ayrshire	Eileanan an Iar	East Central	Scottish Borders	Shetland	Fife	Dumfries & Galloway	Orkney	Unknown	Lothian	Clyde Valley	All Farm Types
Farm Type for businesses with >1000 ha all peat <input type="button" value="v"/>																
Specialist sheep and Goats	166,437	18,068	33,011	14,600	5,106	780	7,293	4,572	4,764		1,404				563	256,597
Sheep and cattle combined	104,720	32,272	1,153	5,109	3,497		3,318	4,992			751	1,345		939		158,098
Graziers	102,040	9,270	2,849	1,213	5,311		1,608									122,290
Various grazing livestock	68,032		456			98										68,586
Specialist cattle - rearing and fattening	58,424	27,093		21,621	982		1,374									109,494
Mixed Crops - Livestock	9,751		7,491	1,863												19,105
General Field Cropping	7,664		8,852	1,270												17,785
Non Classified	6,283					13,299										19,582
Specialist cereals, oilseeds and protein crops	2,456									3,181						5,638
Unknown													986			986
Specialist granivores					1,561											1,561
Specialist Horticulture and Permanent Cropping			497													497
Specialist dairying		890														890
All Farm Types	525,807	87,593	54,309	45,676	16,457	14,178	13,593	9,564	4,764	3,181	2,155	1,345	986	939	563	781,109

Restoration					
All Peat area per business <input type="button" value="v"/>	Business Count	All Peat	Unrestored Peat	Peatland Action Site Area (post 2020)	Businesses with PA sites (ct)
0-100	7,544	161,313	120,077	891	87
100-200	909	127,266	91,803	385	19
200-300	412	100,317	73,297	65	8
300-400	215	74,554	53,781	451	6
400-500	151	67,567	50,004	580	3
500-600	115	63,064	46,942	272	5
600-700	93	60,590	44,608	0	1
700-800	69	51,554	37,209	194	5
800-900	60	50,432	34,764	80	4
900-1000	43	40,517	29,405		
>1000	321	1,057,698	781,109	16,586	60
Grand Total	9,932	1,854,872	1,362,999	19,504	198

Only an extra 2,416 ha of PA sites beyond the IACS business boundaries.

Distribution of Peatland

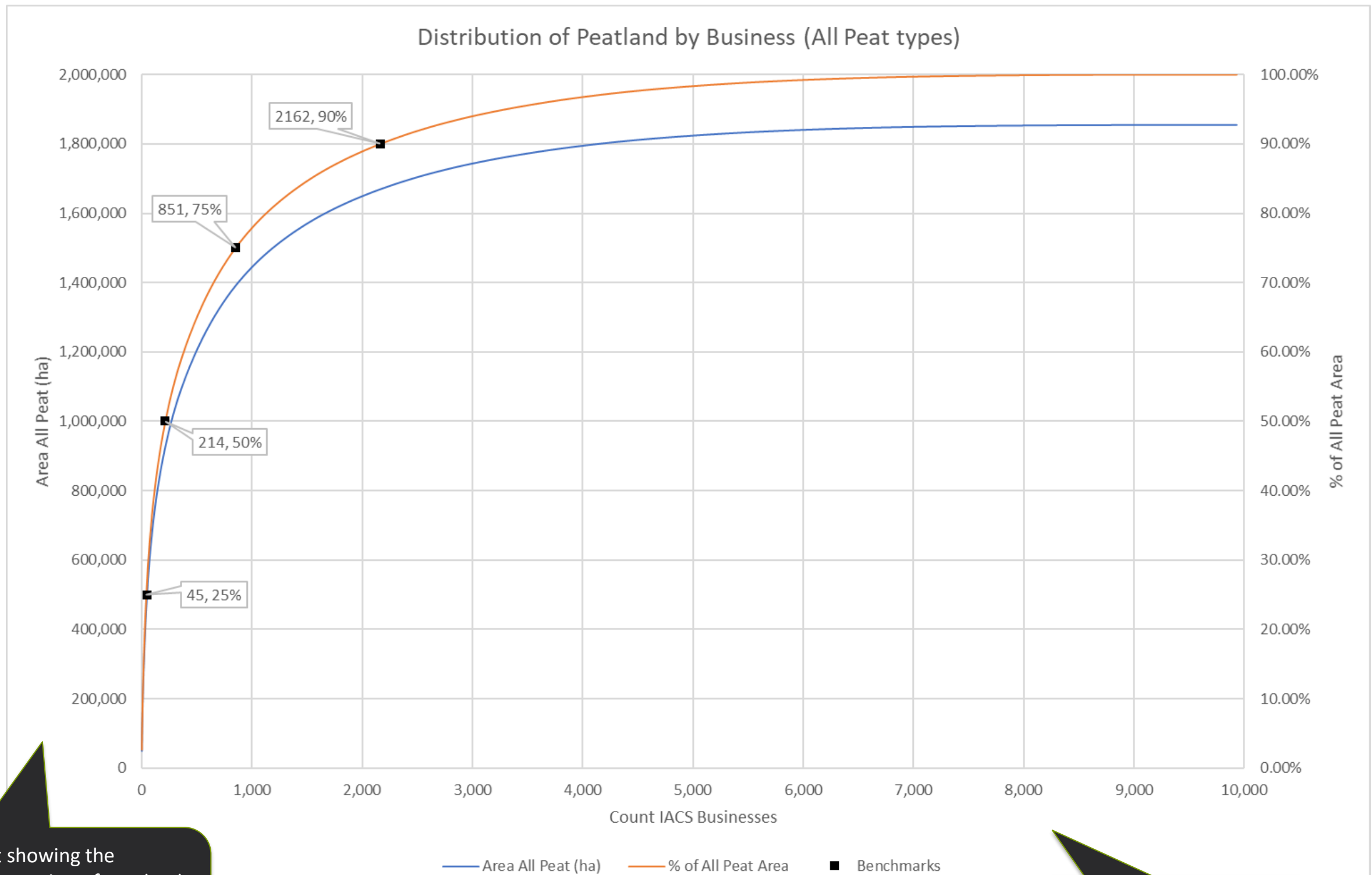


Chart showing the concentration of peatlands per business in both area (left y axis) and percentage (right y axis) terms

Chart for all businesses in IACS and all peatland types

Distribution of Peatland (top 321)

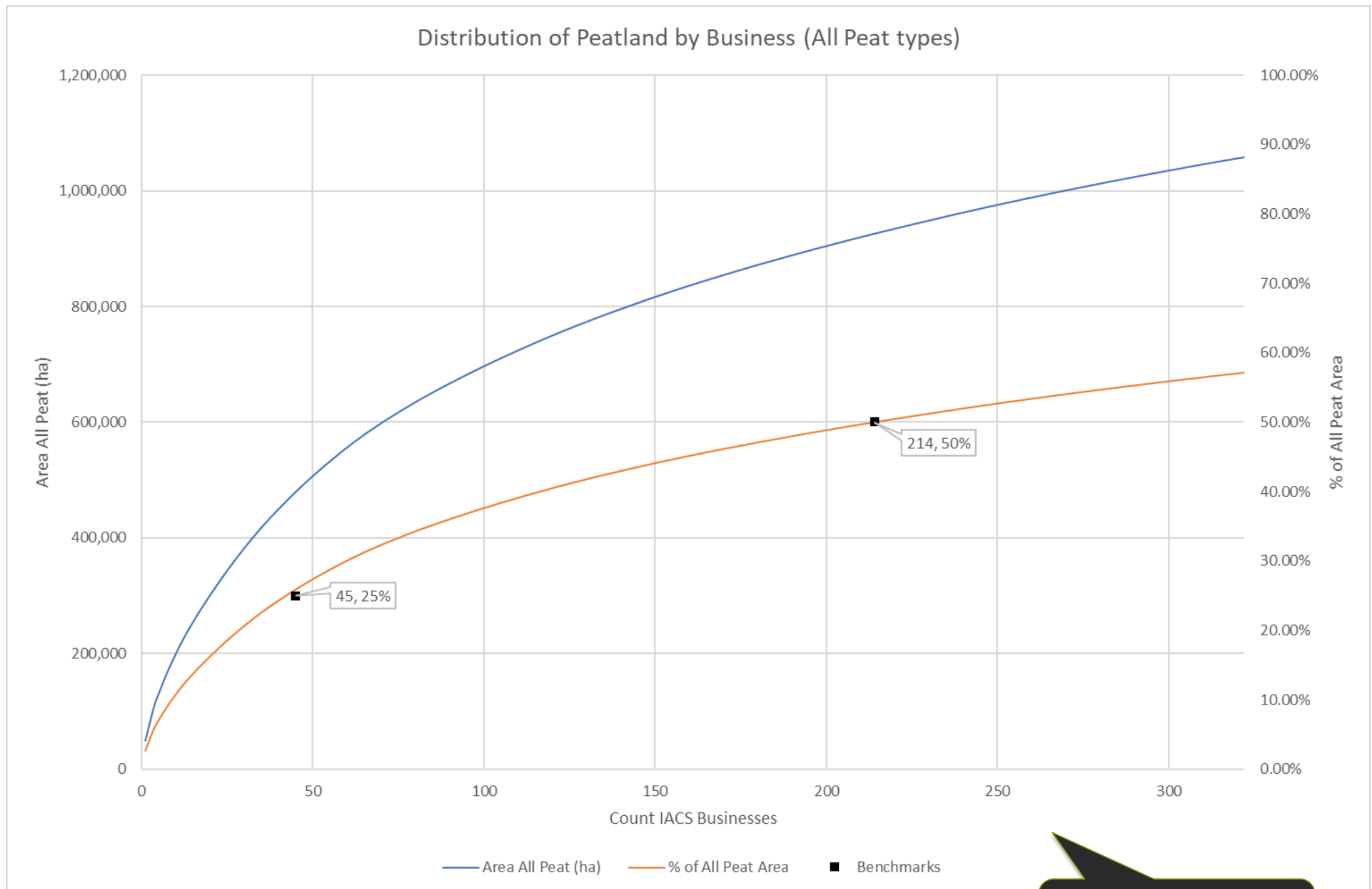
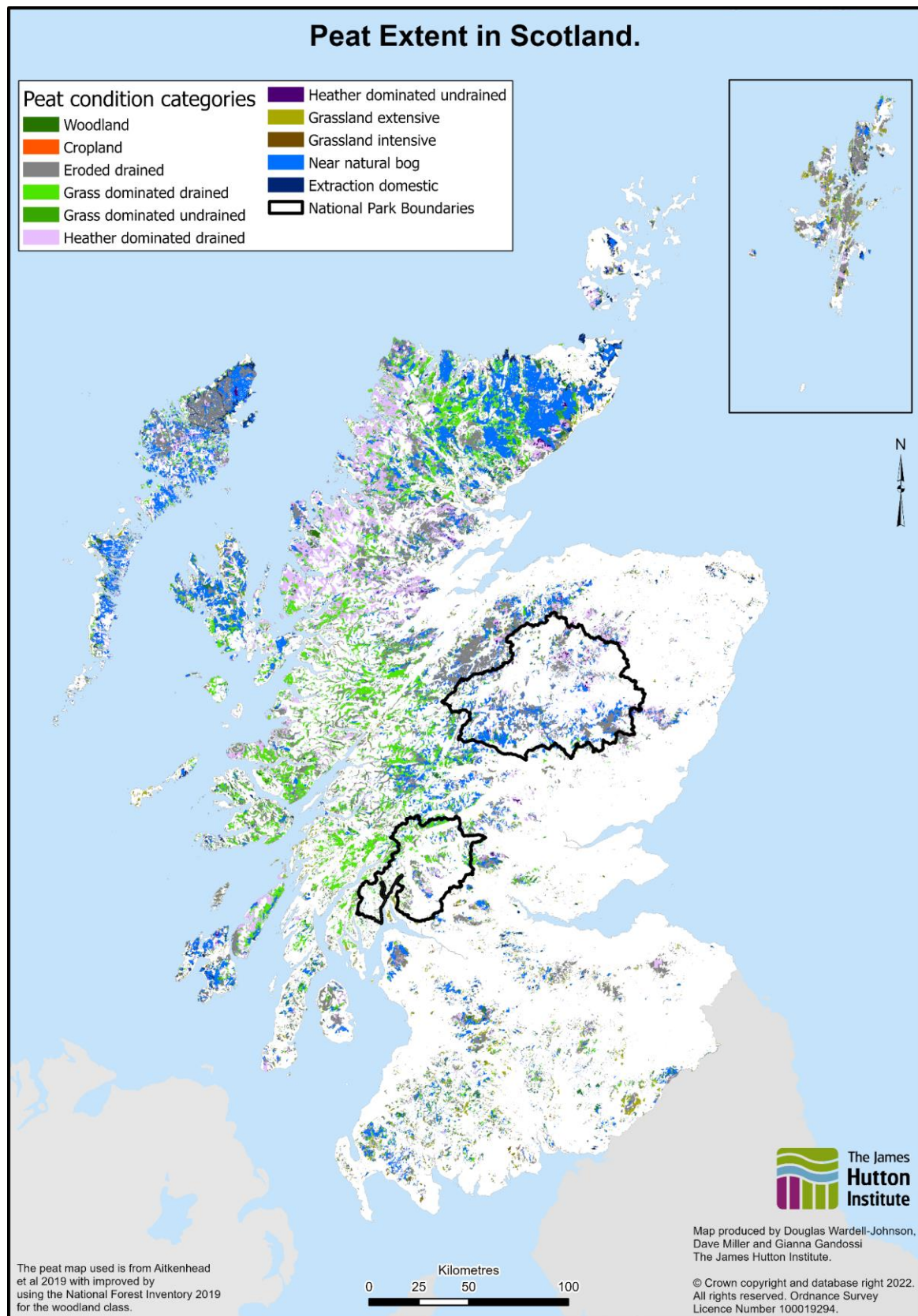


Chart for top 321 businesses by all peat area.

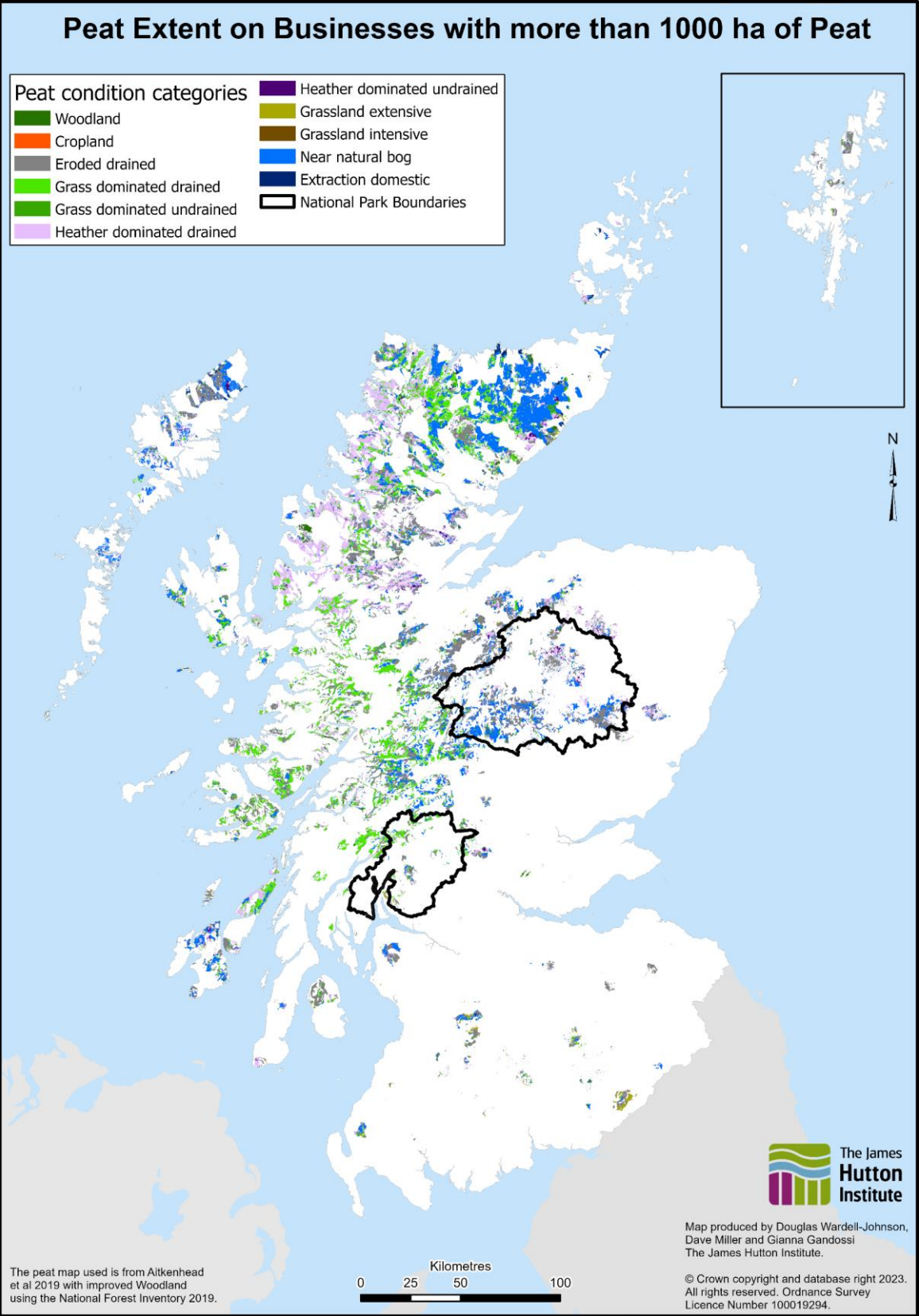
Location of Peatlands within Scotland



- This map shows the location and classification of Peat within Scotland as defined by Aitkenhead et al 2019/21.
- Peat extent is the area where 50 cm of the top 100 cm of the soil profile is determined to be peat.
- Substantial areas of near natural bog are usually assumed not to need restoration, but this probably needs more robust verification. In any case some of these areas may be vulnerable to climate or management change and may need measures to increase their resilience to avoid the need for later restoration.



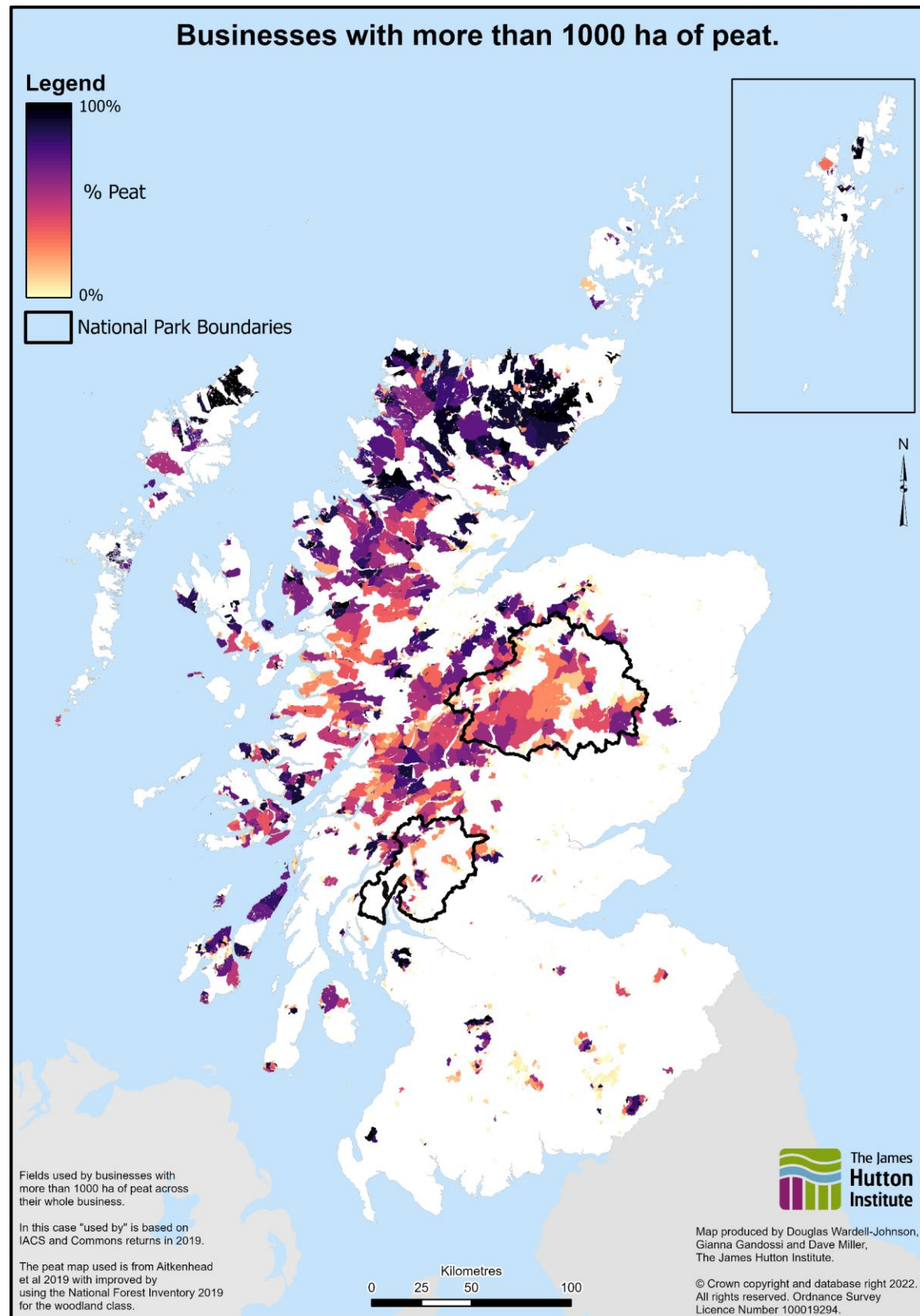
Classification of Peatlands within Businesses with more than 1000 ha of Peat



- This map shows the extent and classification of Peatlands on fields for Businesses with more than 1000 ha of Peat.



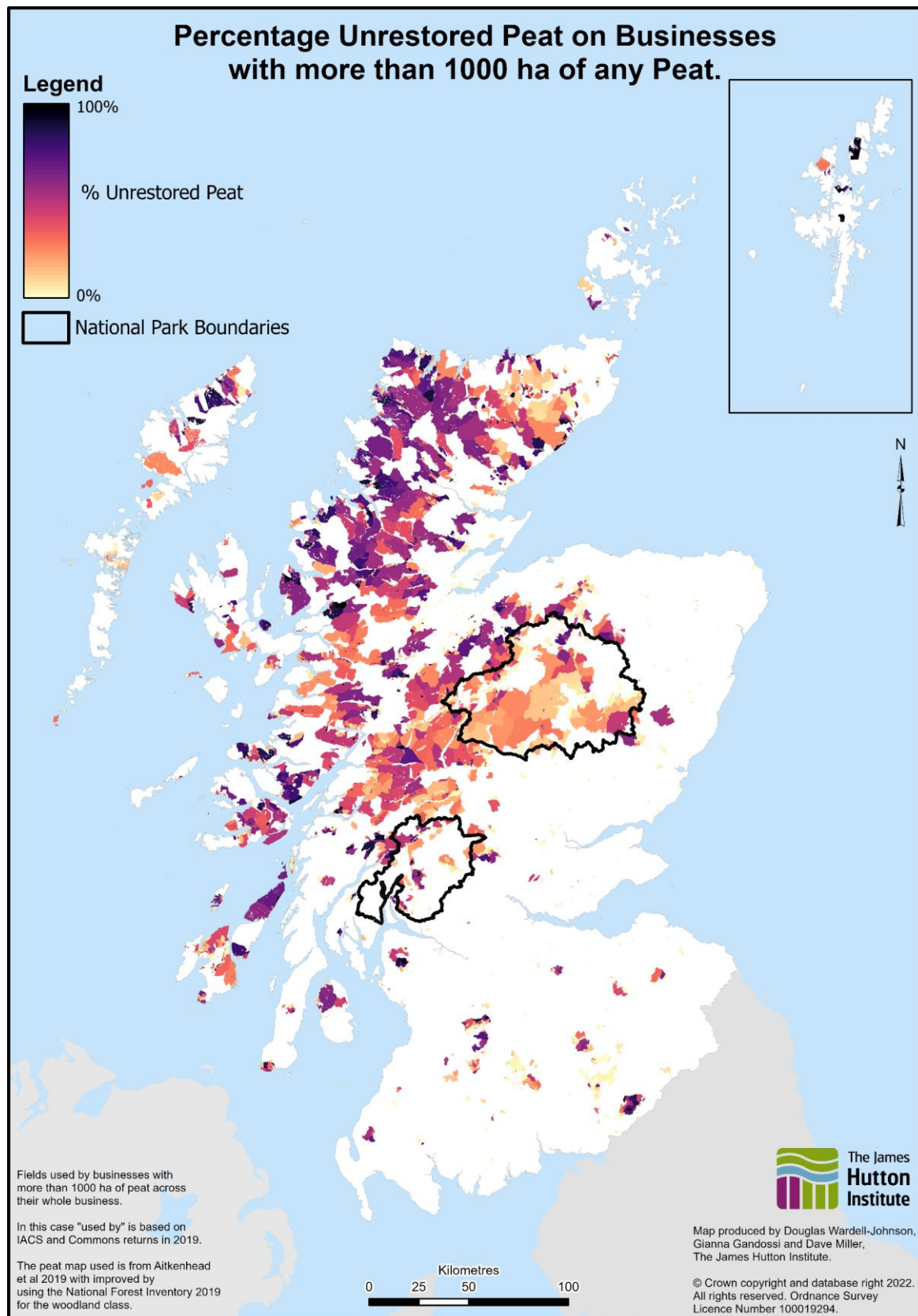
Concentration of peatlands within businesses



- The map shows the fields of the 321 businesses with more than 1000 ha of peat, with the colour indicating the % of peat with depth >50cm within each field.
- The map gives a good indication of the concentration of peatlands across regions and within land parcels.
- The map is for all peat types so is a map of “stocks” rather than only those in need of restoration but noting the same caveats as previous slide that resilience measures may also be needed not just restoration.
- Not all fields are used by their owner so the map is of the businesses that use the fields, the distinction may potentially be important for peatland restoration where tenants may not be able to undertake works or works may be undertaken by landlords.



Concentration of restoration need



- The map is the same as previous except excluding areas of near-natural bog from the calculation of percentage peat.
- Note there are few areas without some near natural bog so overall the percentage values are lower compared with Slide18.
- Higher percentages are perhaps associated with more intensive use, e.g., in coastal areas?
- There are clear differences for some locations with substantial proportions of peatlands classified as near natural bog, e.g.,
 - Caithness;
 - the north of Lewis
 - some areas of Wester Ross

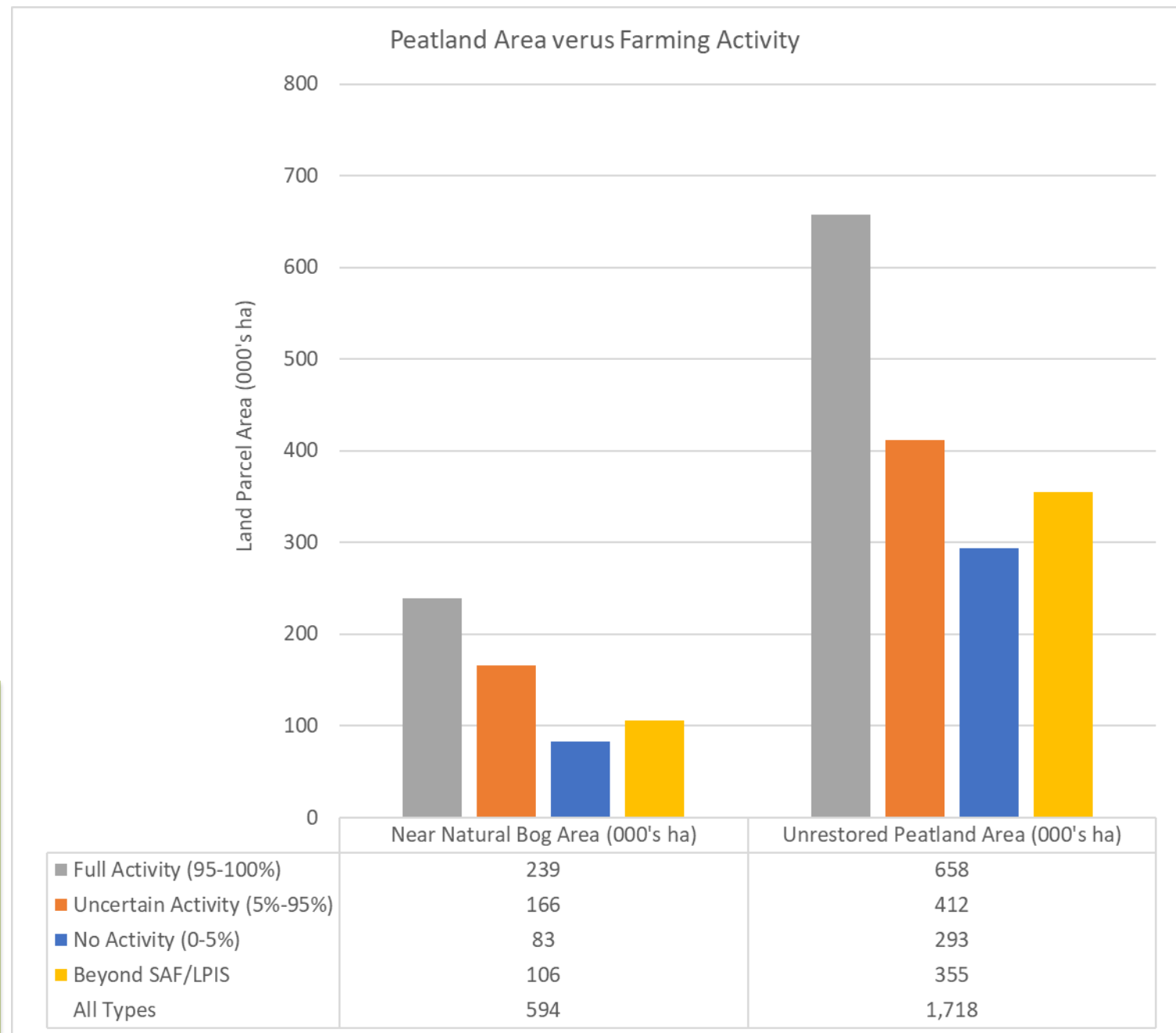


Peatlands and Farming Activity - Summary

Why this matters - potential interactions between peatland restoration and agricultural support means that knowledge is needed on which land parcels are being linked to agricultural activity.

Activity and Payment data from SG was used to define levels of agricultural activity and linkage with payments schemes (see Slide 21). Beyond these areas the types of **land use** was used as a proxy for activity (recognising that this leaves considerable uncertainty for some areas on the levels of activity present).

The chart opposite presents **Peatland Area versus Farming Activity** for both Near Natural Bog and the Unrestored Peatland area. The Unrestored Peatland versus Activity data is mapped on Slide 27&28.



Headlines

1.7M ha of peatlands are estimated to need some degree of restoration. Of this:

658k ha are declared as undertaking agricultural activity (38%)

412k ha have uncertain activity ♦ levels on peat (24%)

648k ha have either low or no agricultural activity ♦♦ (38%)

Across all classes 71k ha are woodlands (4%)

♦ **Activity** is the percentage of each land parcel declared active, see p25 for activity definition. **Uncertainty in activity** levels on peat arises when there are **multiple users** for the same land parcel, some active and others not (e.g., on Commons) or where **only part of a land parcel is claimed** in SAF so there is only partial activity data. See a map on p25 for where this occurs for all land and p27 for activity on peatlands.

♦♦ **Low or no Agricultural Activity** is made up of **No activity (0-5%)** and the **Beyond SAF/LIPS** class (possible farmland with unknown but likely very low activity, see p21).



Estimating Farming Activity - Detail

The table presents a more detailed break down and interpretation of the data on activity in Slide 20, defining rows in the table.

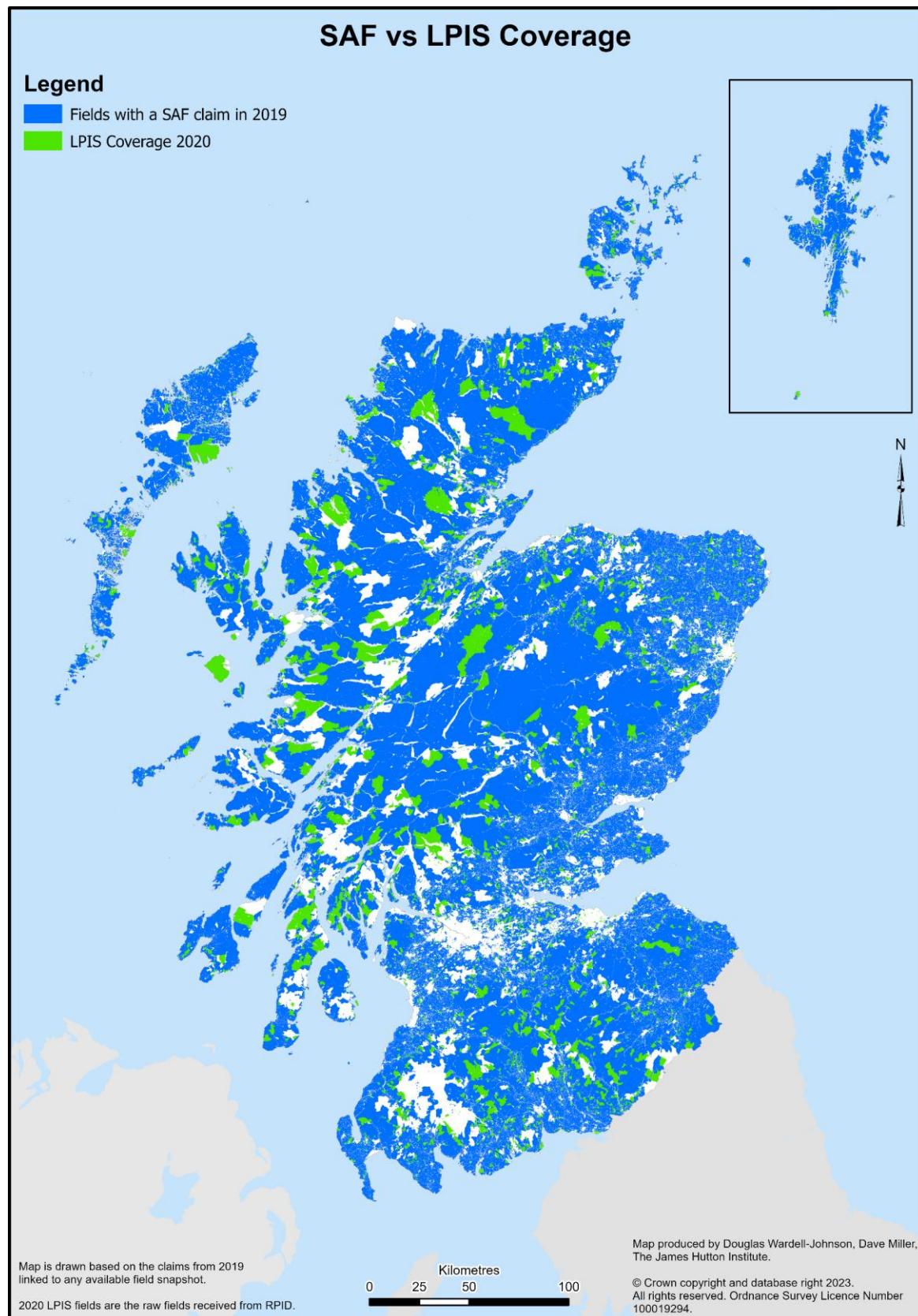
- The focus of the analysis in this report is on businesses within IACS that submit a **Single Application Form (SAF)** – these are all the businesses that interact with farm payment systems and have a total area of **5.7M ha** (row 8).
- Beyond the SAF population** there is **~2.1 M ha** of land above high-water mark (comparing rows 1 and 8)
 - For **~1.3M ha** of land beyond the SAF population (rows 2,3&4) there is **no data within SIACS** but from other sources there are **~0.6M ha of woodlands** and **~0.35M ha of definitively non-agricultural land** (inland water and urban/infrastructure), leaving **~0.35M ha** of other land, as potentially **utilisable agricultural area (UAA)**. Peatland restoration should not be limited by any farm payment regulations in this area.
 - For the remaining **~0.8M ha beyond the SAF population** (rows 6&7) there is very limited IACS data, only mapping in the **Land Parcel Identification System (LPIS)**, from other sources **~0.3M is woodlands** with **~0.5M ha of potential UAA** – again for this land area peatland restoration should not be limited by any farm payment regulations.
- Within the SAF population** there is a small area, 0.1M ha, that while submitting a SAF are not recorded as having any payments in 2019 (row 9, highlighted in the table), and are a remaining source of uncertainty in the analysis.

- Within the SAF population, there are **Pillar 2 only businesses, 0.6M ha**, row 10, where peatland restoration would be less likely to conflict with agricultural activity. Of this area, only **8,000 ha** have **LFASS payments** (row 11) where agricultural activity is a factor in determining payments.
- For the other **SAF businesses, receiving Direct Payments** (in Pillar 1) (row 12) they have a **land parcel area of ~5.0M ha**, have a **BPS declared area of ~3.9M ha** (row 13) and **Determined area of ~3.8M ha** (row 14). This means that **even within direct payments businesses** there are large areas (>1M ha) in which peatland restoration could be undertaken without having implications for agricultural activity (see p22-26 for detail).

No.	Item	Comment	Area (M ha)	Business count
1	Land Area Scotland	Land above high water	7.8	n/a
2	Non-LPIS woodlands	From National Forest Inventory	0.6	n/a
3	Inland water & Urban	Incl. transport infrastructure	0.35	n/a
4	<i>Beyond-LPIS UAA*</i>	= items 1-(2+3+5)	0.35	n/a
5	LPIS polys	Mapped in LPIS	6.5	n/a
6	LPIS woodlands	From National Forest Inventory	0.3	n/a
7	<i>LPIS mapped only UAA*</i>	=items 5 – (6+8)	0.5	n/a
8	SAF	Land parcel area – for parcels with any land use data	5.7	19,292
9	SAF no CAP payments	Land parcel area	0.1	761
10	Pillar 2 only	Land parcel area	0.6	1,049
11	of which LFASS only	Land parcel area	0.008	177
12	Direct Payments recipients (all Pillar 1)	Land parcel area	5.0	17,482
13	BPS Declared area	Claim area - limited by entitlements	3.9	
14	BPS Determined area	Paid on area - net of reduction coefficient for RGR	3.8	
15	SAF woodlands	Land parcel area within 8	0.4	
*	Estimated from other rows			

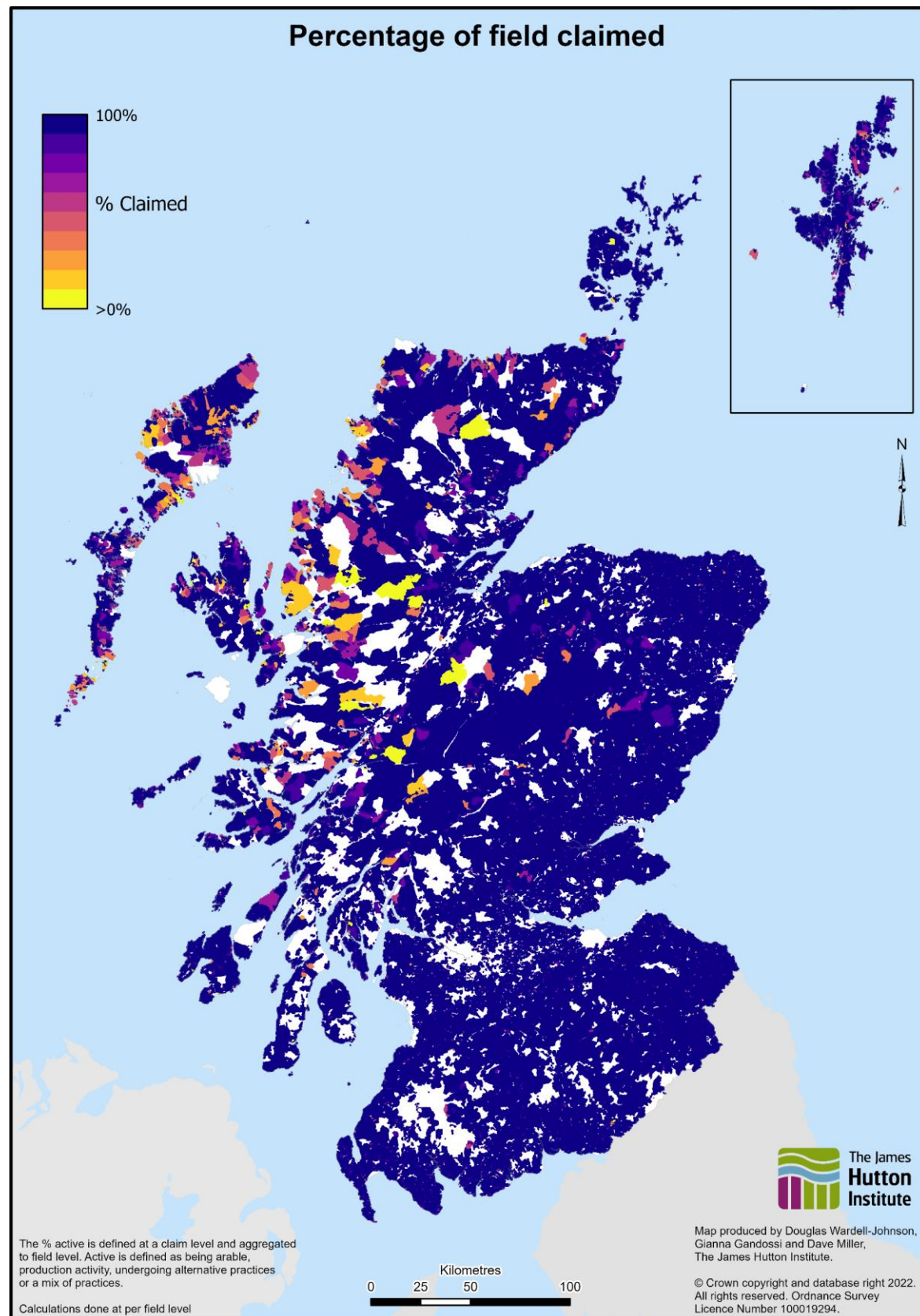


SAF Claims vs LPIS Coverage



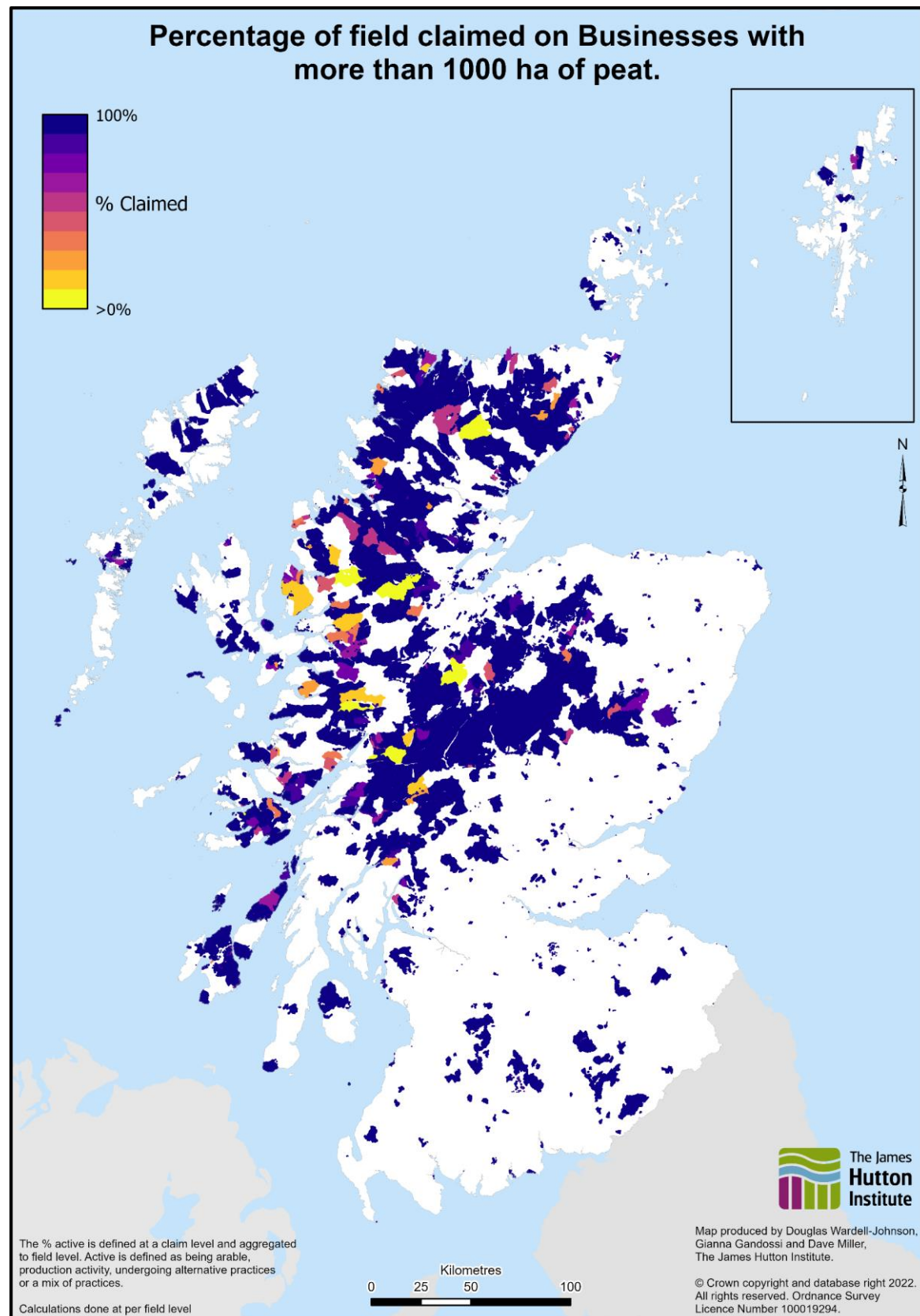
- The map on the left shows the **land parcels in SAF with at least one claim in 2019** (in blue) on top of the **total Land Parcel Identification Systems (LPIS) mapping coverage** also for 2019 (in green).
 - LPIS captures **land parcel boundaries** for land at **the disposal of businesses** (i.e., owned or rented by them), these are used as a **basis for farm payments** and for managing the **movement of livestock and animal disease**.
- For the blue area (**5.7M ha**) there is **land use data** (in some cases only partial, see Slide 24), **farm payments data** (and from this indications of activity beyond land use e.g., agri-environment actions), and **declarations of activity** being conducted (agricultural and other types, in some cases partial and in some cases no activity is declared).
- Where the green area is visible, (**0.8M ha**) this shows the part of the **LPIS mapping** coverage where there are **no claims** in the 2019 SAF. For this area we have no data from SAF but can link to JAC data via the Holding-ID provided for each land parcel.
- In the green area, since there are **no claims for farm payments**, agricultural payment regulations are much less likely to have any influence of uptake of peatland restoration actions.

Activity - Percentage of area claimed per field



- A variety of measures are possible with differing perspectives.
- One measure of linkage to agricultural support to land parcels is the percentage of each field claimed as a basis for payments via the SAF.
- In areas with low percentages, conflicts with agricultural activity could be minimal.
- The figure presents the percentage of land parcel area claimed for all fields in which there is at least one SAF claim (5.7M ha).
- The figure shows, in much of Scotland, 100% of each land parcel is claimed in SAF, but in the north and west there are substantial numbers of land parcels in which the area claimed by SAF businesses is less than 100% of the land parcel area. This unclaimed area is estimated at ~300k ha.
- Several of these areas are peatlands and any restoration in these areas would have less potential to interact with agricultural payments.

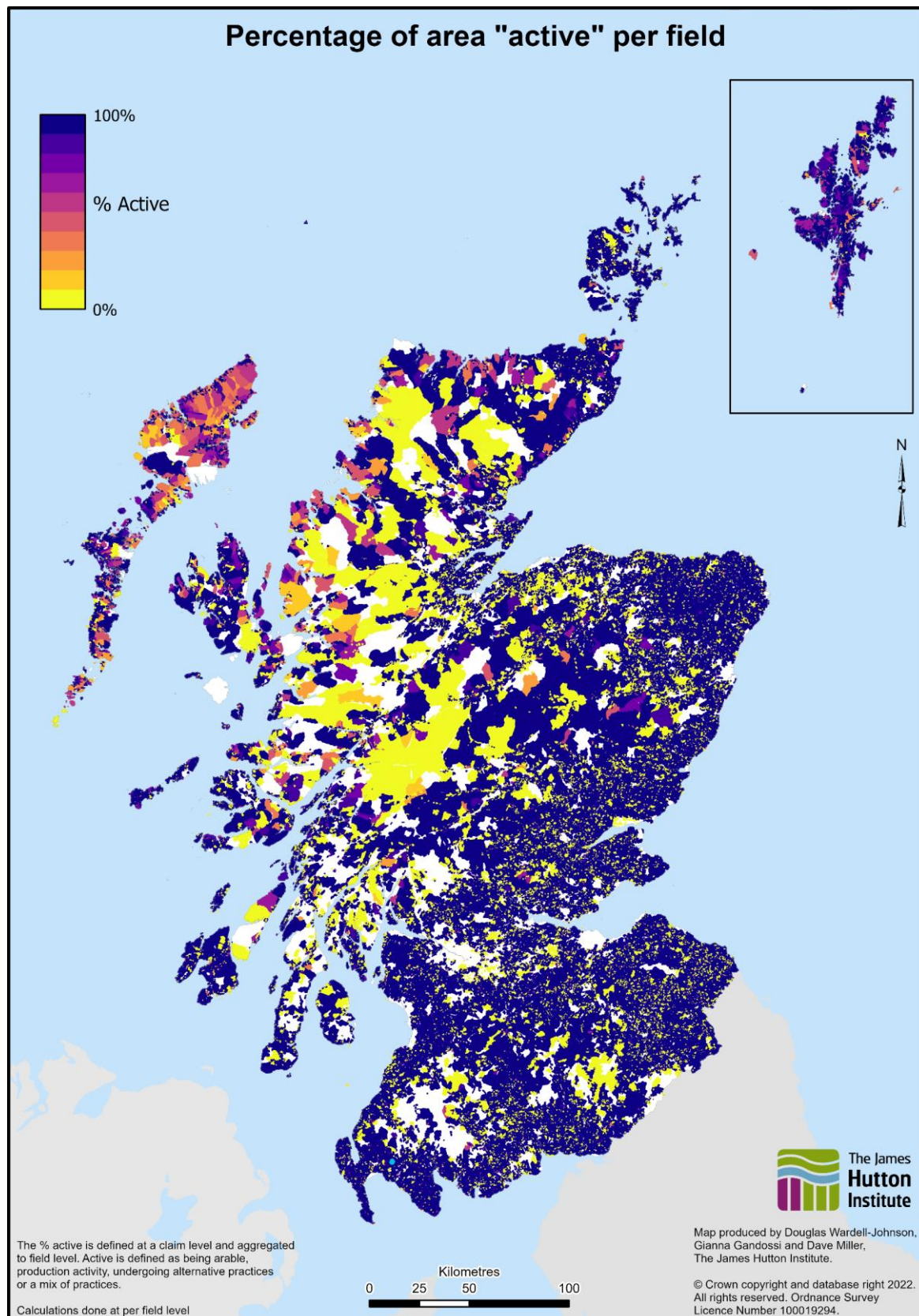
Activity - Percentage of area claimed per field, businesses >1000 ha of all peat



- The map opposite is the same percentage claimed for IACS per field but filtered to businesses with 1000ha or more of peat.
- Note that uncertainty on the location of SAF declared land uses within fields and the presence of multi-user fields can mean that, when less than 100% of a field is claimed, there is uncertainty in the degree of overlap between peatlands and SAF declared land uses.
- The lower percentage fields are, however, likely areas with the lowest potential for any proposed peatland restoration to be perceived as being limited by regulations associated with agricultural support.



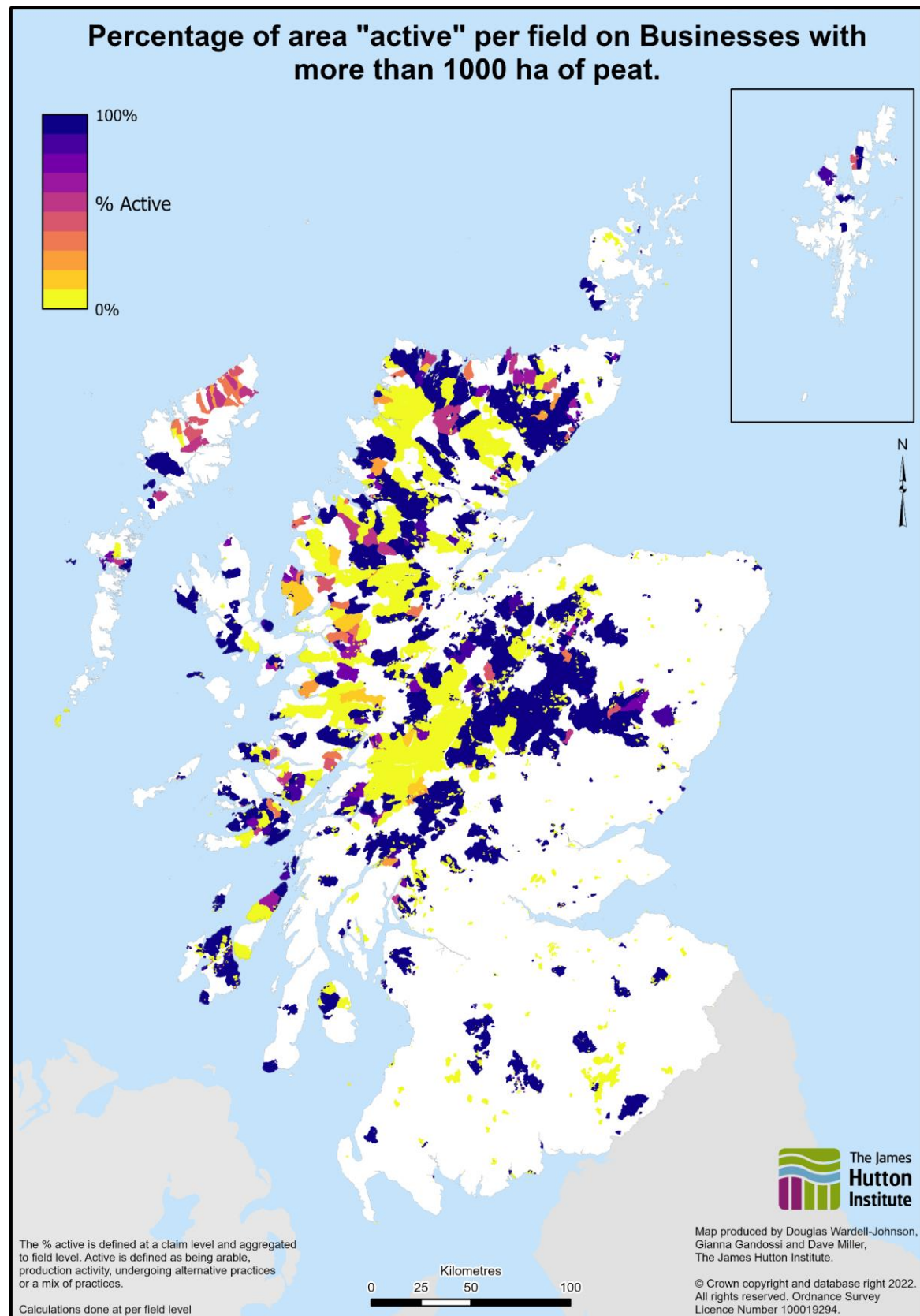
Activity - Percentage of area active per field



- Each SAF business also classifies the activity for each land parcel they are using with the classification applying to all the land uses present.
 - The classes are **Arable Cropping, Production Activity, Mix of Production and Alternative Practices, Alternative Practices, No Activity**. There are also land parcels without activity declarations recorded as **Null**.
- Where declared as *no activity* or when the activity is *null* then there is reason to infer that in such areas agricultural activity would not interfere with peatland restoration.
- The map opposite presents the percentage of the mapped area of the fields that is declared as “active” – i.e., all classes except *no activity* or *null*
- Compared with the previous maps (p23/24) the areas with low percentages of activity are considerably larger and include many areas where peatland restoration might occur (see p27).
- **The total area of no- or null- activity is 1.2M ha across 1.4M ha of land parcels.**



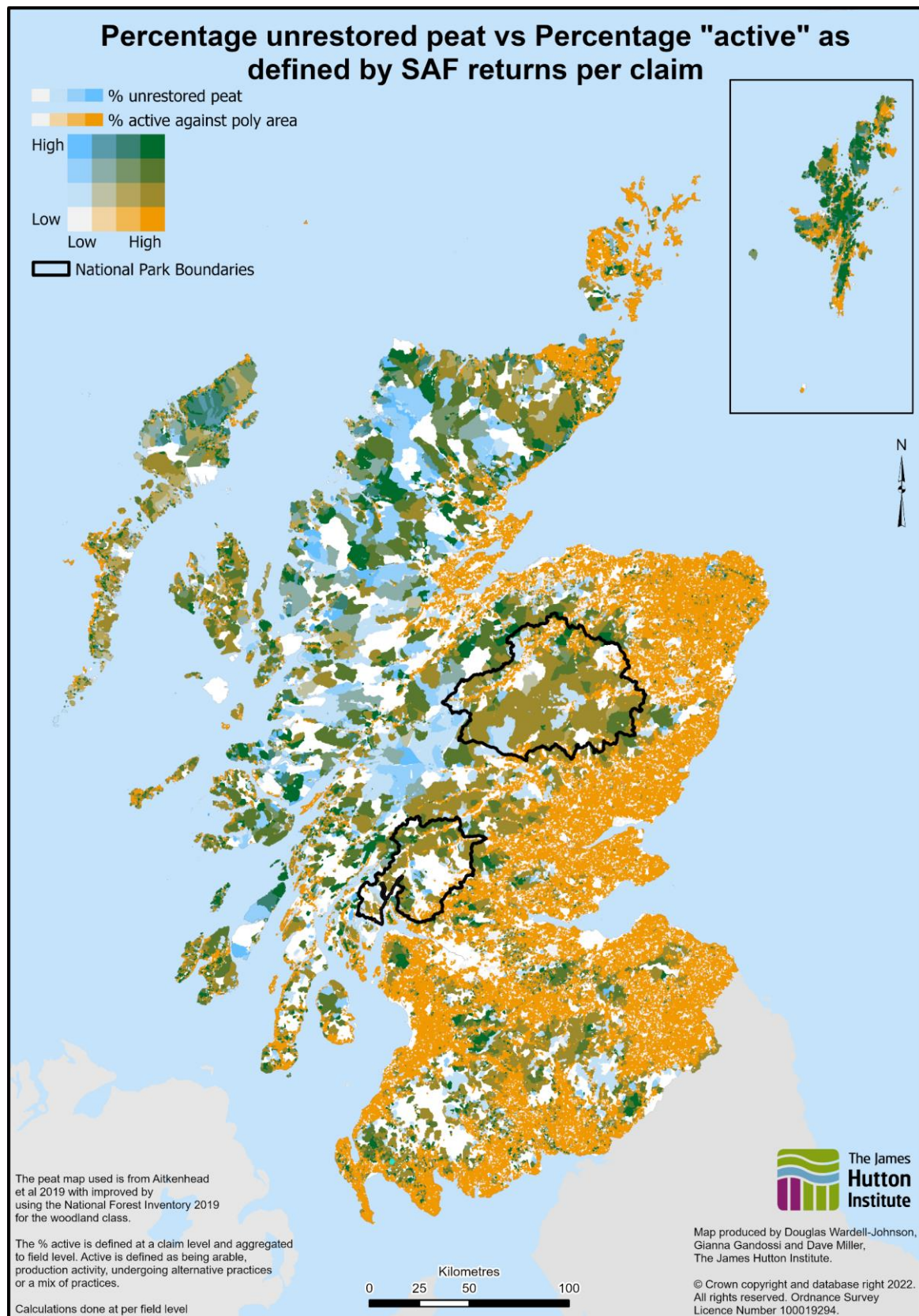
Activity - Percentage of area active per field for businesses with more than 1000 ha of peat



- The map opposite is the same percentage classified as active for IACS per field but filtered to businesses with 1,000 ha or more of peat.
- The total area of no- or null- activity is 0.65 M ha across 0.7 M ha of land parcels.



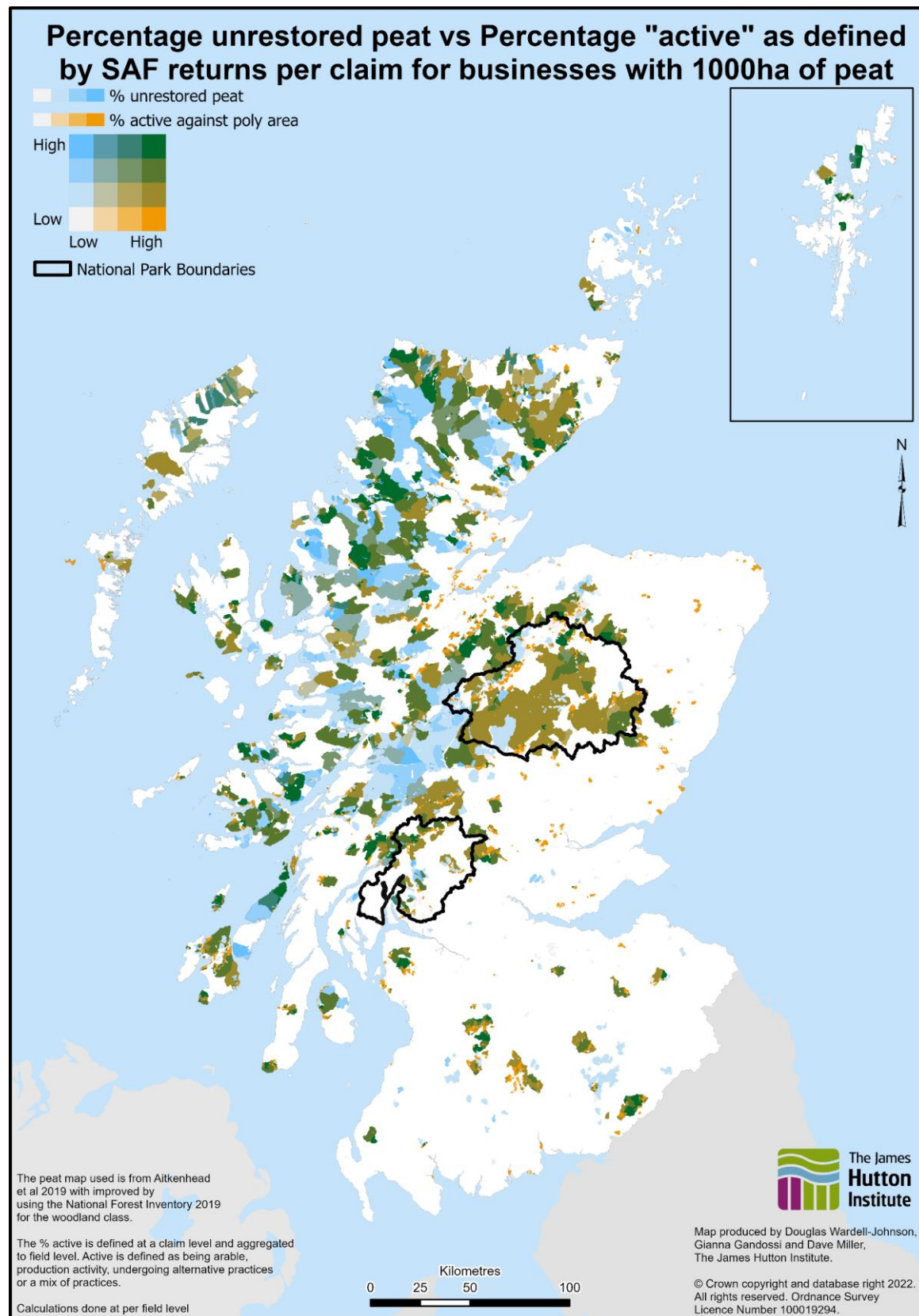
Activity vs Peat - Bivariate Mapping



- The area of unrestored peat on land parcels with SAF declared Activity is as follows:
 - 293k** ha on fields less than **5% active**
 - 412k** ha on fields between **5% and 95% active**
 - 658k** ha on fields greater than **95% active**
- The bivariate choropleth map displays the ratios of two metrics – in this case percentage Activity per field based on SAF declarations versus percentage Unrestored Peat:
 - Green areas are areas of high activity percentage and high unrestored peat
 - Blue areas indicate areas of low activity percentages along with high levels of unrestored peat.
 - Orange areas have high activity percentages but little unrestored peat.
- This is particularly effective in differentiating land in the NW Highlands.
- The map differentiates Low-Low and High-High cases that would otherwise be mapped as the same ratio value.



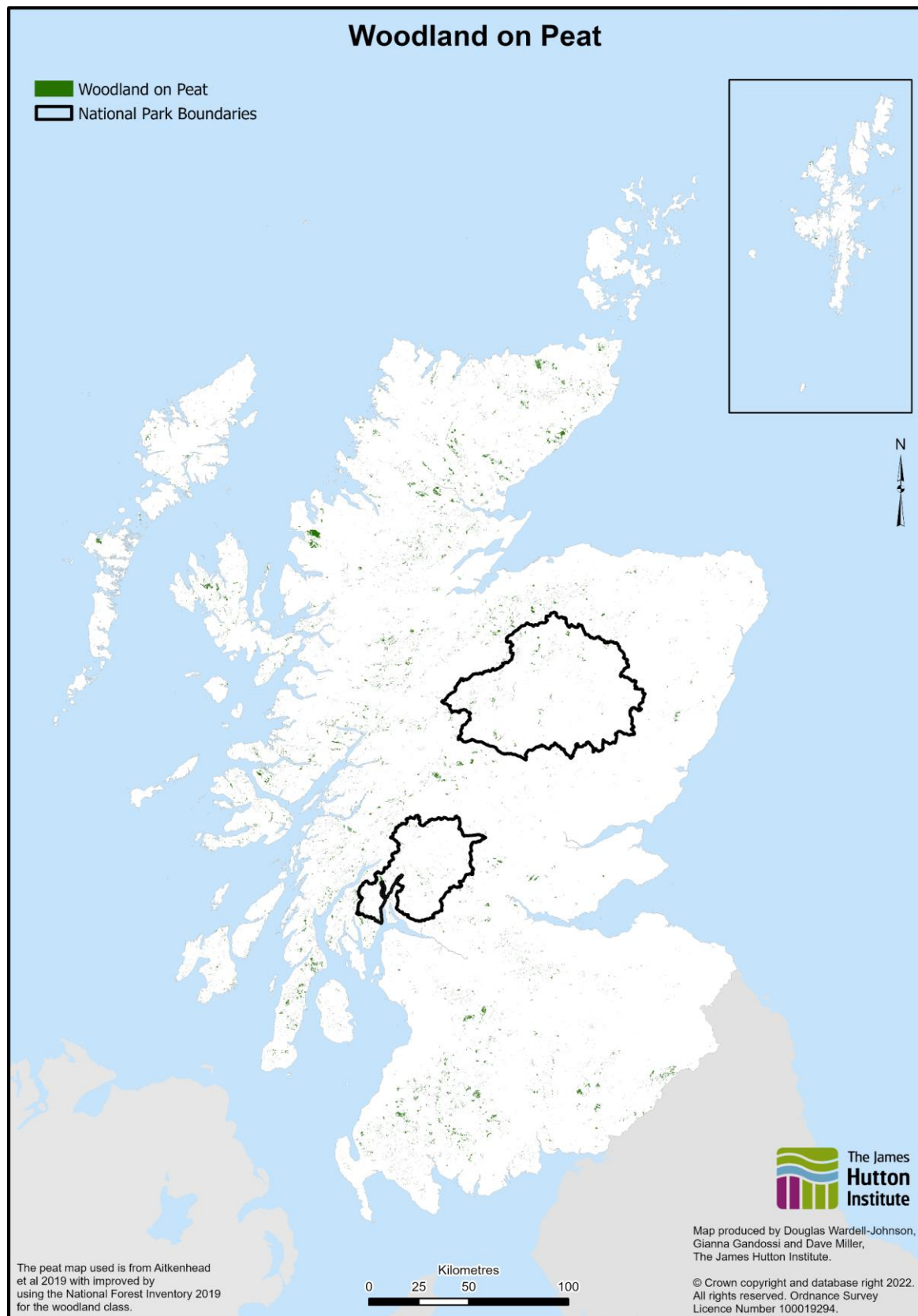
Activity vs Peat – businesses with >1000 ha of peat



- The map opposite is the same bivariate map of activity versus unrestored peatland percentage but filtered to businesses with 1000 ha or more of peat.
- The blue areas highlight areas within the businesses with >1000 ha of peat present where there may be greatest need for restoration (% unrestored peat) and greatest opportunity (since there is limited agricultural activity (or payments) that might serve as a disincentive).



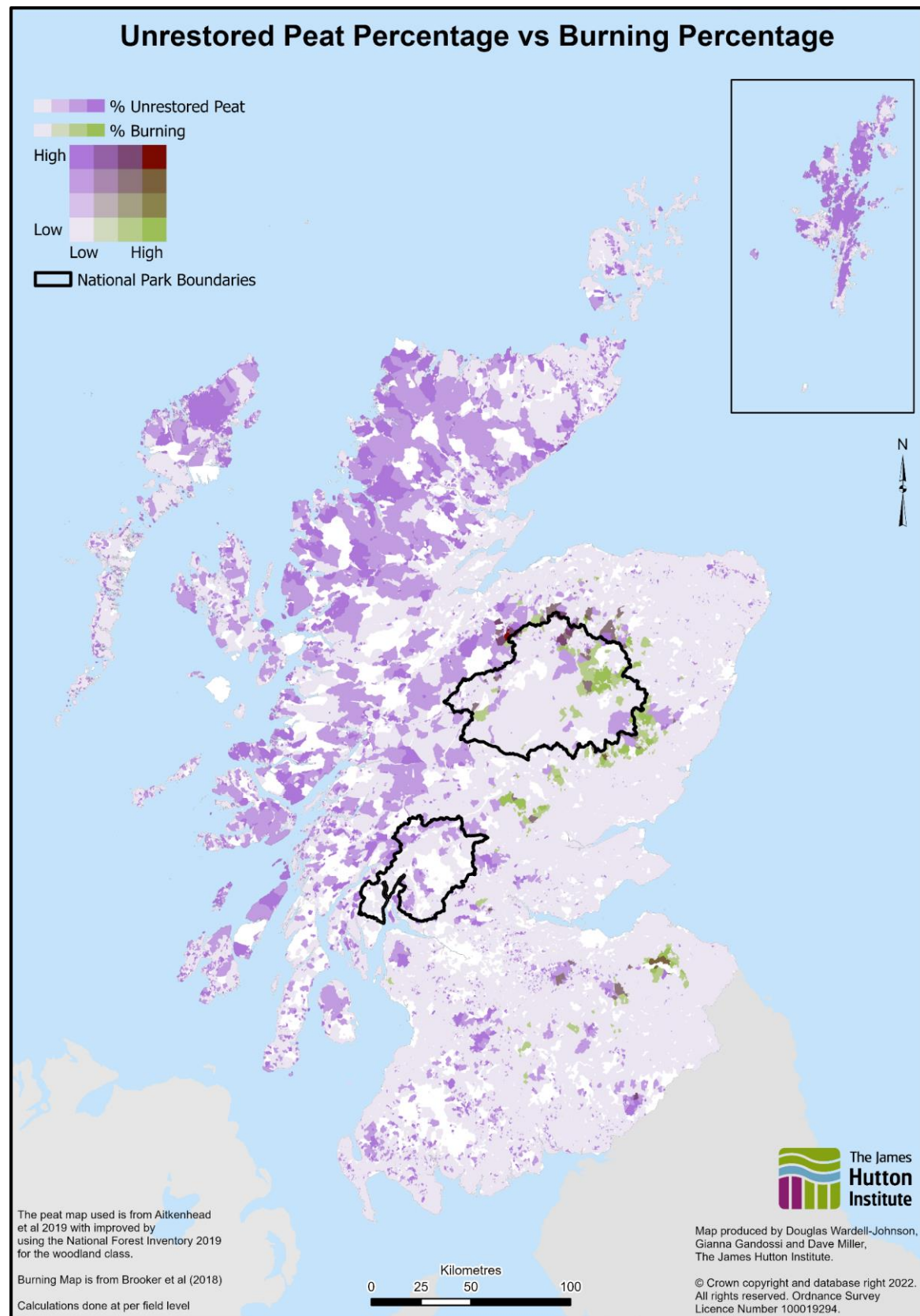
Woodlands on Peat



- There are limited amounts of woodland on peat in Scotland (~71k ha with 37k ha of that on businesses with >1000 ha of peat).
- There are limited areas of extensive woodlands, and more generally small isolated stands.
- What the map does not show is where woodlands have been established on shallower peats (<50 cm) or other higher carbon soils.
- Issues in these cases are illustrated by the authors in [online mapping](#) and an open access journal [paper](#).



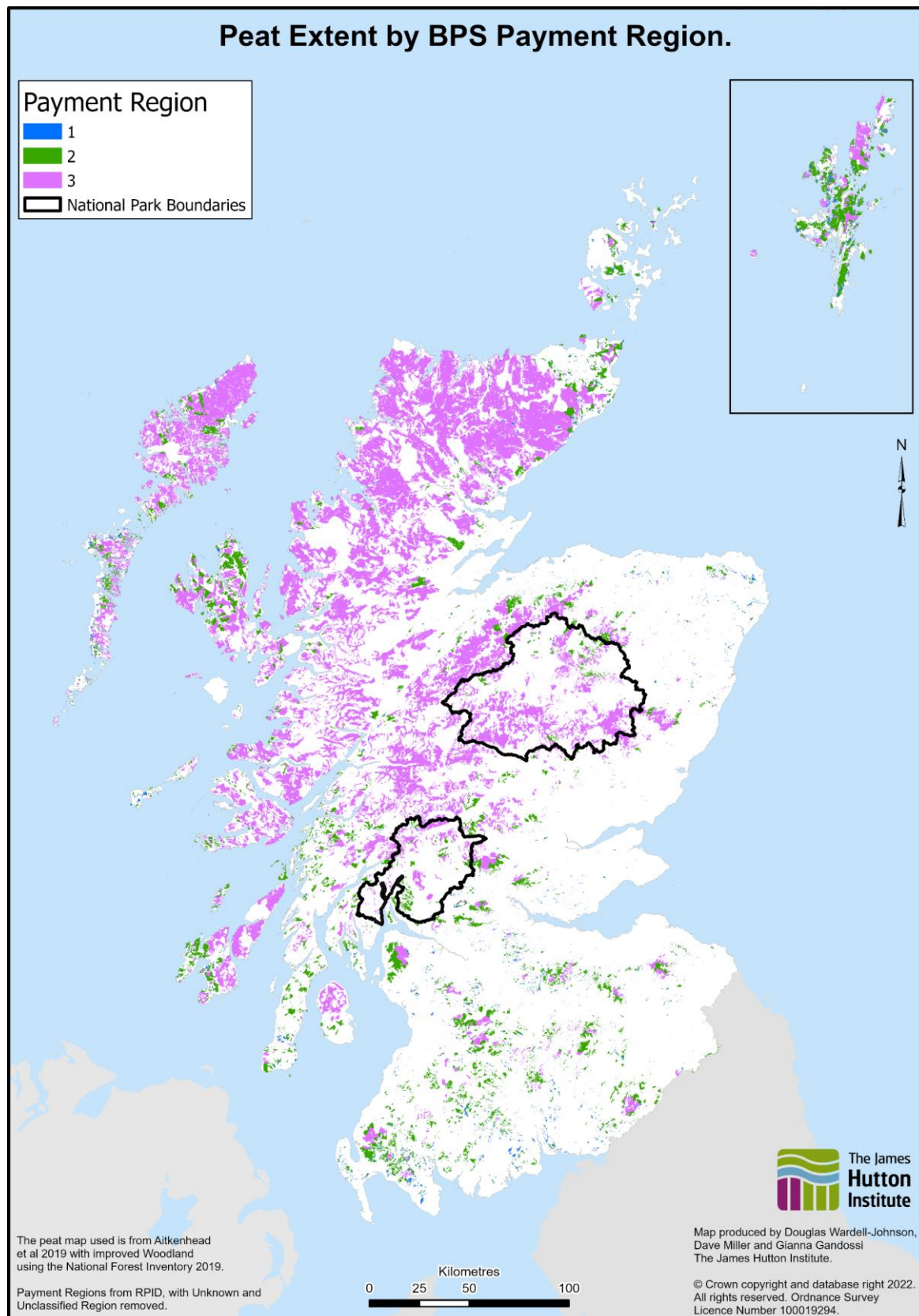
Bivariate mapping – Peat vs Burning



- This bivariate choropleth map displays the ratios of two metrics.
- In this example, Unrestored peat is in the Purples, % Burning for grouse is in the Greens.
- The intersection of these produces browns and reds showing areas where there are high values of both variables.
- The bivariate map distinguishes where higher burning % and higher proportions of unrestored peat occur from low amount of burning and low amount of peat that would otherwise be mapped the same ratio.
- There are few areas of high values in both, the Pentlands and northern edge of the Cairngorms NP are the exceptions
- If peatlands were defined a $>30\text{cm}$ there overlap would likely be larger.



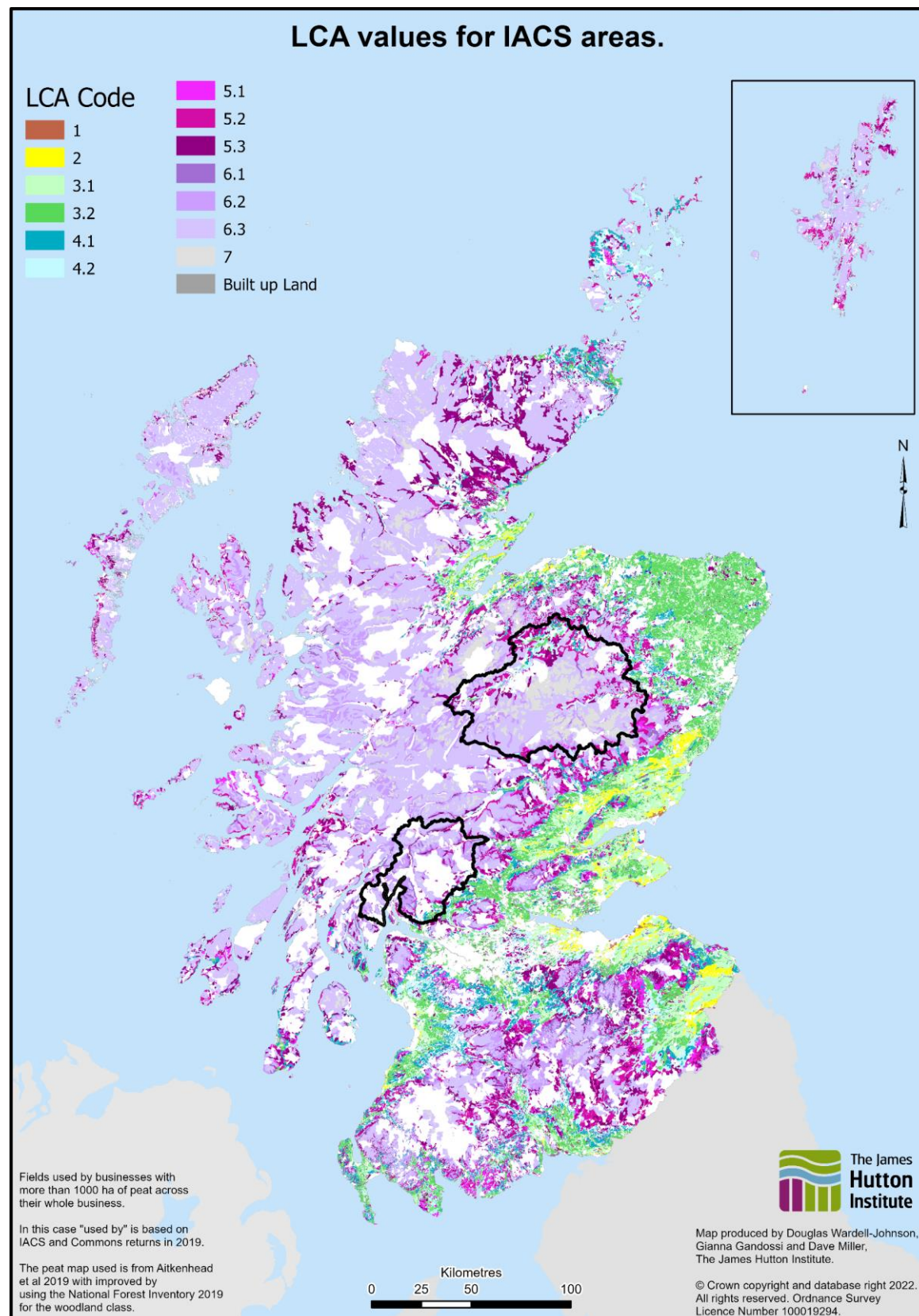
Peat by Basic Payment Scheme Region



- The BPS Payment Regions give an indication of the level of support per ha available.
- Most of the peat area in Scotland is in Region 3 (~1.48M ha).
- Region 3 has the lowest level of direct support.
- Region 3 and 2 were rough grazing when the regions were defined with Region 2 differentiated by having higher stocking rates (in LFASS).
- Region 1 gets higher levels of support and included cropland and permanent grassland when the regions were defined.
- There is a small amount of Region 1 peatlands (54k ha) with little of this being in businesses with over 1000 ha of peat.
- This map should not be used as a direct proxy for overall levels of support since it doesn't show all payments e.g., Pillar 1 VCS or Pillar 2 LFASS. The map does show what the implications might be for loss of BPS eligibility, but see earlier slides for caveats linked to the presence of unclaimed areas within businesses.



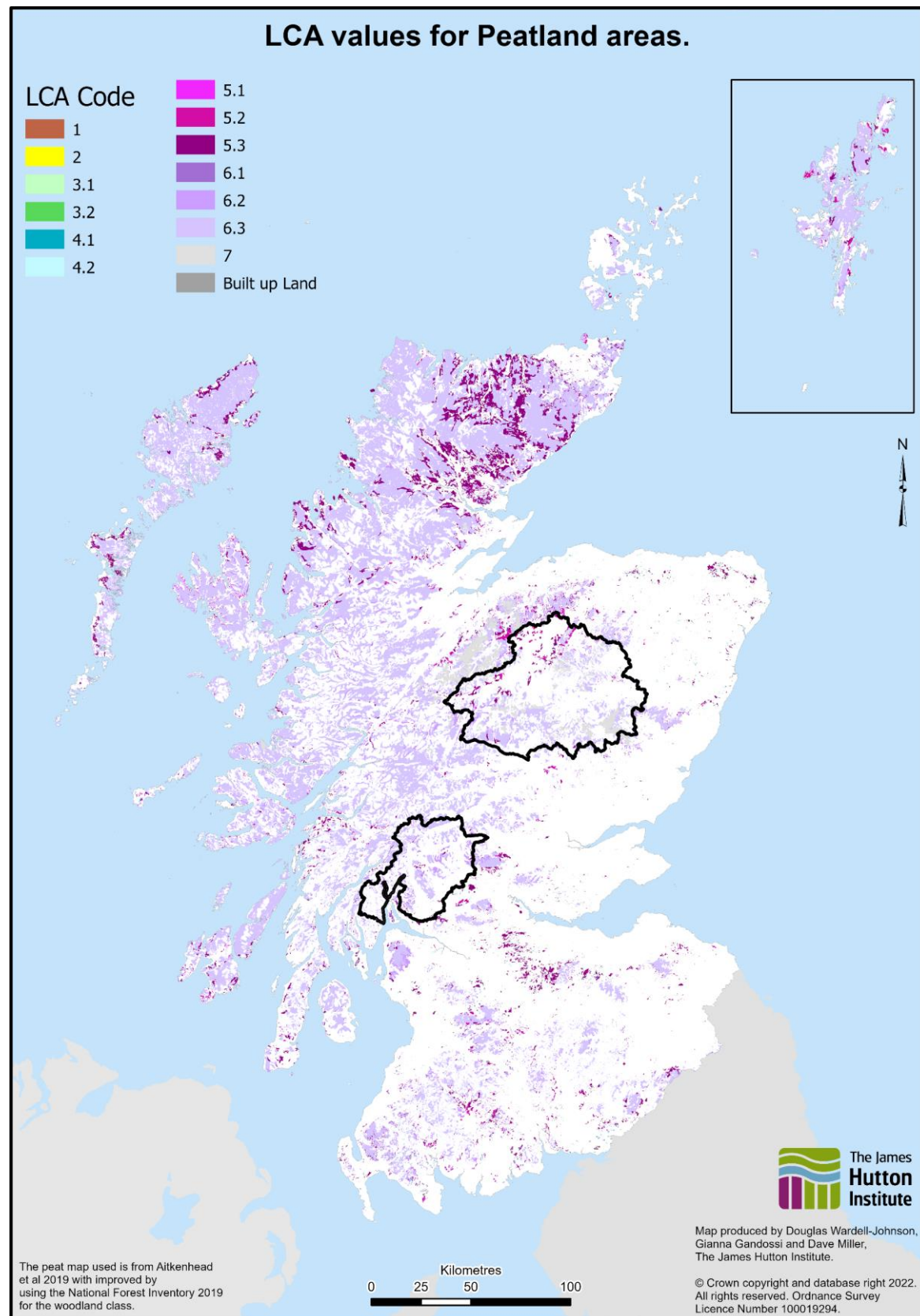
LCA Values across the IACS areas of Scotland



- Land Capability for Agriculture (LCA) presents the range of agricultural activities that can typically be undertaken.
- The map presents the LCA for all the land mapped within IACS for 2019.
- Higher LCA classes tend to have more limited potential and are less productive per ha, though links with land use are complex and localised.
- Significant areas of the LCA class 6.x and above are not used for agriculture.
- The available LCA mapping has several limitations – but the main one being the climatic component is based on 1958-78 data.
- The LCA is being updated by Hutton staff (in 2023).



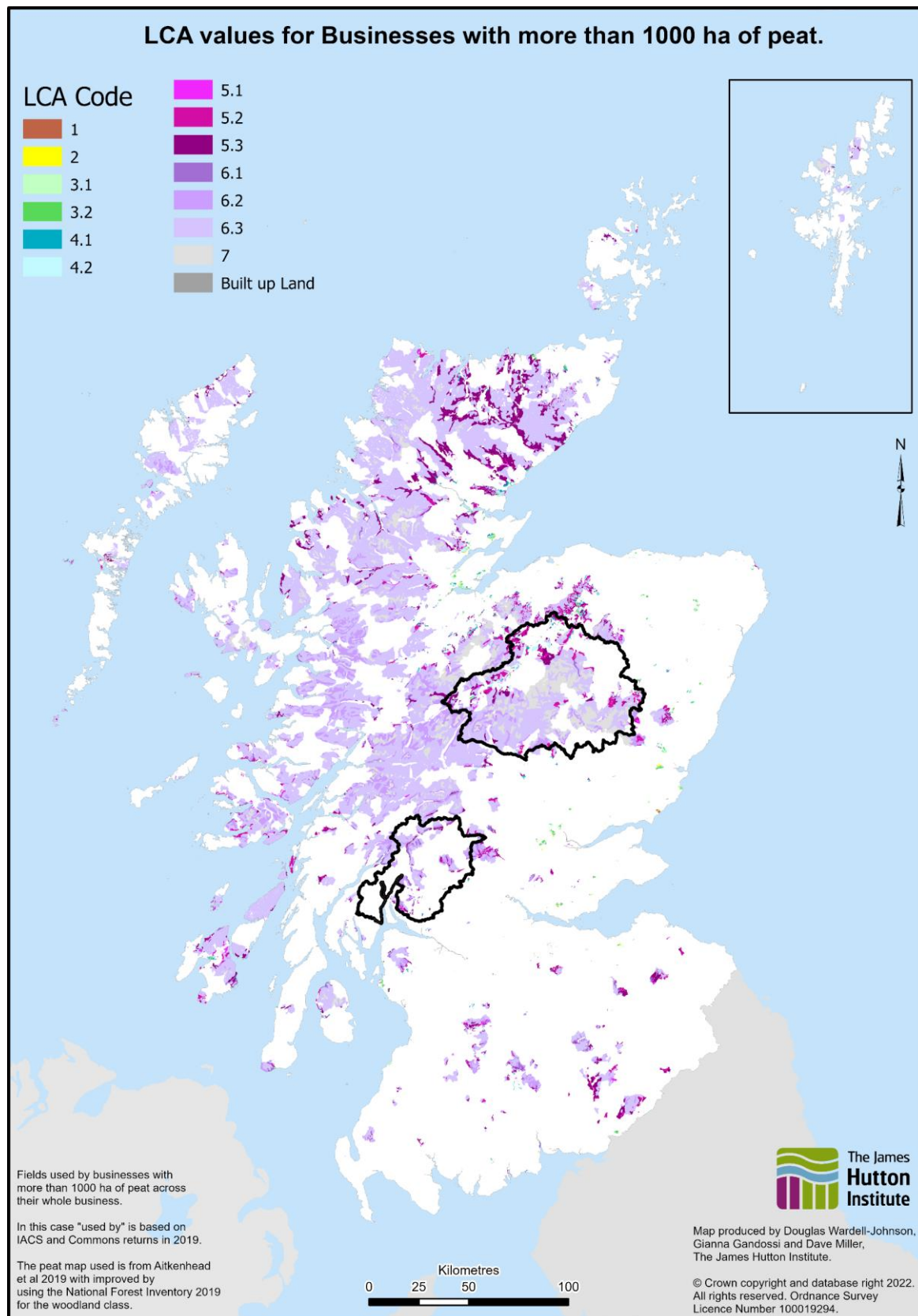
LCA of peatlands



- The map opposite shows the LCA of peatlands.
- This is dominated by LCA class 6 and above.
- Lower numbered classes, where present, are likely an artefact of differences in the area defined as peats in the Peatland Extent and LCA maps (the latter using being the 1:250,000 scale soils mapping).



LCA Values for businesses with 1000ha of Peat



- The map opposite is the Land Capability for Agriculture (LCA) mix for businesses with 1,000 ha or more of peat.
- This is dominated by LCA class 5 (214k ha) and 6 (1,500k ha) with limited or very limited agricultural potential.
- The scale of mapping does however hide that these businesses also have at their disposal ~44k ha of LCA1-4.2 land often in associated lowland holdings.

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The full set of slides and maps generated by the CAP 2014-19 analysis is available from - <https://ics.hutton.ac.uk/research/land-systems-research-team/cap-analysis/>

Previous related analyses are also available from the Hutton Land Systems Research Team website - <https://ics.hutton.ac.uk/research/land-systems-research-team/>

For woodland expansion analysis see - [online mapping](#) and [paper](#).

Further research in the RESAS Strategic Research Programme 2022-27, in the [Land Use](#) (JHI-C3-1) and [Land Reform](#) (E3) Topics and others across the SRP Themes.

[Story map](#) of land use transformation for net zero and other objectives

The James Hutton Institute is supported by the Scottish Government's Rural and Environment Science and Analytical Services Division (RESAS)

