



**Cyfoeth
Naturiol**
Cymru
**Natural
Resources**
Wales

LANDMAP and the Clwydian Range and Dee Valley AONB maps and statistics

Robert Berry

Report No 472

About Natural Resources Wales

Natural Resources Wales' purpose is to pursue sustainable management of natural resources. This means looking after air, land, water, wildlife, plants and soil to improve Wales' well-being, and provide a better future for everyone.

Evidence at Natural Resources Wales

Natural Resources Wales is an evidence-based organisation. We seek to ensure that our strategy, decisions, operations and advice to Welsh Government and others are underpinned by sound and quality-assured evidence. We recognise that it is critically important to have a good understanding of our changing environment.

We will realise this vision by:

- Maintaining and developing the technical specialist skills of our staff;
- Securing our data and information;
- Having a well-resourced proactive programme of evidence work;
- Continuing to review and add to our evidence to ensure it is fit for the challenges facing us; and
- Communicating our evidence in an open and transparent way.

This Evidence Report series serves as a record of work carried out or commissioned by Natural Resources Wales. It also helps us to share and promote use of our evidence by others and develop future collaborations. However, the views and recommendations presented in this report are not necessarily those of NRW and should, therefore, not be attributed to NRW.

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1. Crynodeb Gweithredol

Mae llifogydd a sychder, tywydd eithafol mwy rheolaidd, erydu arfordirol, tanau gwyllt, heintiau sy'n effeithio ar orchudd coed, newidiadau mewn gorchudd tir, heriau i gynefinoedd a chwmpas rhywogaethau yn enghreifftiau o sut y gall y dirwedd newid yn y tymor byr neu hir.

Gall newidiadau i'r dirwedd hefyd fod i'w gweld yn sgil mesurau lliniaru, fel cynhyrchu ynni adnewyddadwy, rheoli adnoddau dŵr ac ymaddasu drwy gynlluniau i ehangu coetir.

Bydd yr hinsawdd sy'n newid yn effeithio'n uniongyrchol ac yn anuniongyrchol ar y tirweddau yr ydym yn byw, yn gweithio, ac yn profi ein bywydau ynddynt, gan beri goblygiadau o ran cymeriad, hynodrwydd lleol ac ansawdd y dirwedd. Mae newid, pu'n a yw am ennyd yn unig, yn fyrhoedlog neu'n para'n hir, yn anochel a bydd angen i dirweddau addasu.

Gellir defnyddio cymeriad y dirwedd i gyfleu'r newidiadau hyn. Gellir defnyddio delweddau, mapiau, ystadegau a disgrifiadau o'r newid i gymeriad tirwedd i bortreadu, esbonio a chodi proffil y camau gweithredu a all fod yn ymateb i'r newid yn yr hinsawdd a'r gwaith o gynllunio rhwydweithiau natur gwydn, er budd cymunedau lleol a'r cyhoedd yn gyffredinol.

Mae Cyfoeth Naturiol Cymru ac Ardal o Harddwch Naturiol Eithriadol (AHNE) Bryniau Clwyd a Dyffryn Dyfrdwy (BCDD) yn cydweithio i ddatblygu cynllun hinsawdd sy'n seiliedig ar leoedd a thirwedd ar gyfer AHNE BCDD. Y cynulleidfaoedd mewn golwg fydd defnyddwyr cynllun rheoli AHNE BCDD, rheolwyr tir, cynllunwyr a'r rhai sy'n gwneud penderfyniadau, cynllunwyr amaeth-amgylcheddol a choetiroedd, y cyhoedd a'r rhai sydd â buddiant.

Bydd y cynllun hinsawdd seiliedig ar leoedd a thirwedd yn canolbwyntio ar naw math o dirwedd sy'n deillio o wybodaeth LANDMAP, a elwir yn LMP09. Mae'r adroddiad hwn yn cynnwys mapiau ac ystadegau ar gyfer y cynllun hinsawdd seiliedig ar leoedd a thirwedd sy'n helpu i gyfleu'r newid i gymeriad tirwedd yn sgil mesurau penodol i addasu i'r newid yn yr hinsawdd a'i liniaru.

2. Executive Summary

Flooding and drought events, more frequent extreme weather, coastal erosion, wildfires, diseases affecting tree cover, changing land cover, challenges for habitats and species ranges are examples of how the landscape may change in the short or long term. Landscape changes may also be evident from mitigation measures, such as renewable energy generation, water resource management and adaptation through the planned expansion of woodland.

The changing climate will directly and indirectly impact on the landscapes in which we live, work and experience life, with implications for landscape character, local distinctiveness and quality. Change, whether ephemeral, short-lived or long lasting, is inevitable and landscapes will need to adapt.

Landscape character can be used to convey these changes. Visualisations, maps, statistics and descriptions of changing landscape character can be used to portray, explain and raise the profile of actions that may be in response to climate change and the planning of resilient nature networks to benefit local communities and the wider public.

Natural Resources Wales and the Clwydian Range and Dee Valley (CRDV) Area of Outstanding Natural Beauty (AONB) are working together to develop a place and landscape-based climate plan for the CRDV AONB. The intended audiences will be users of the CRDV AONB management plan, land managers, planners and decision makers, agri-environment and woodland planners, public and interested parties.

The place and landscape-based climate plan will be based upon 9 landscape types derived from LANDMAP information, known as LMP09. This report contains maps and statistics for the place and landscape-based climate plan that aid the communication of changing landscape character from specified climate change adaptation and mitigation measures.

3. Report Structure and Methods

3.1. Report structure

The remainder of the report is structured into two main sections. Core maps and statistics (data tables and bar plots) for the Clwydian Range and Dee Valley AONB (CRDV AONB) on the following themes are presented in **Section 4**:

- LMP09 landscape types
- Flooding (Flood Zone 3 and LMP09 landscape types)
- Predominant boundary type (data from column “VS_7” of the LANDMAP Visual and Sensory data layer).
- Overall landscape value (data from column “VS_26” of the LANDMAP Visual and Sensory data layer).

Section 5 contains a series of additional “focus” maps, each highlighting the spatial extent of specific LMP09 landscape types within the CRDV AONB. Note that LMP09 landscape types that either do not exist within the CRDV AONB (i.e. “Coast”) or have a very small spatial extent (i.e. “Amenity” and “Inland Water”) are not mapped in this section.

3.2. Methods

Maps were produced using QGIS v3.14.15 (Pi) GIS software. The spatial data used for the mapping is all open data, and the various datasets are summarised in the metadata table (Section 6.2, p. 31). The QGIS style files containing the classification/colour schemes of the LANDMAP-derived map layers can be accessed online via the project’s GitHub site [here](#).

The bar charts and data tables were produced using R – an open source statistical programming language. The full R code is available on the project’s GitHub site [here](#).

4. Core Maps and Statistics

4.1. LMP09 Landscape Types

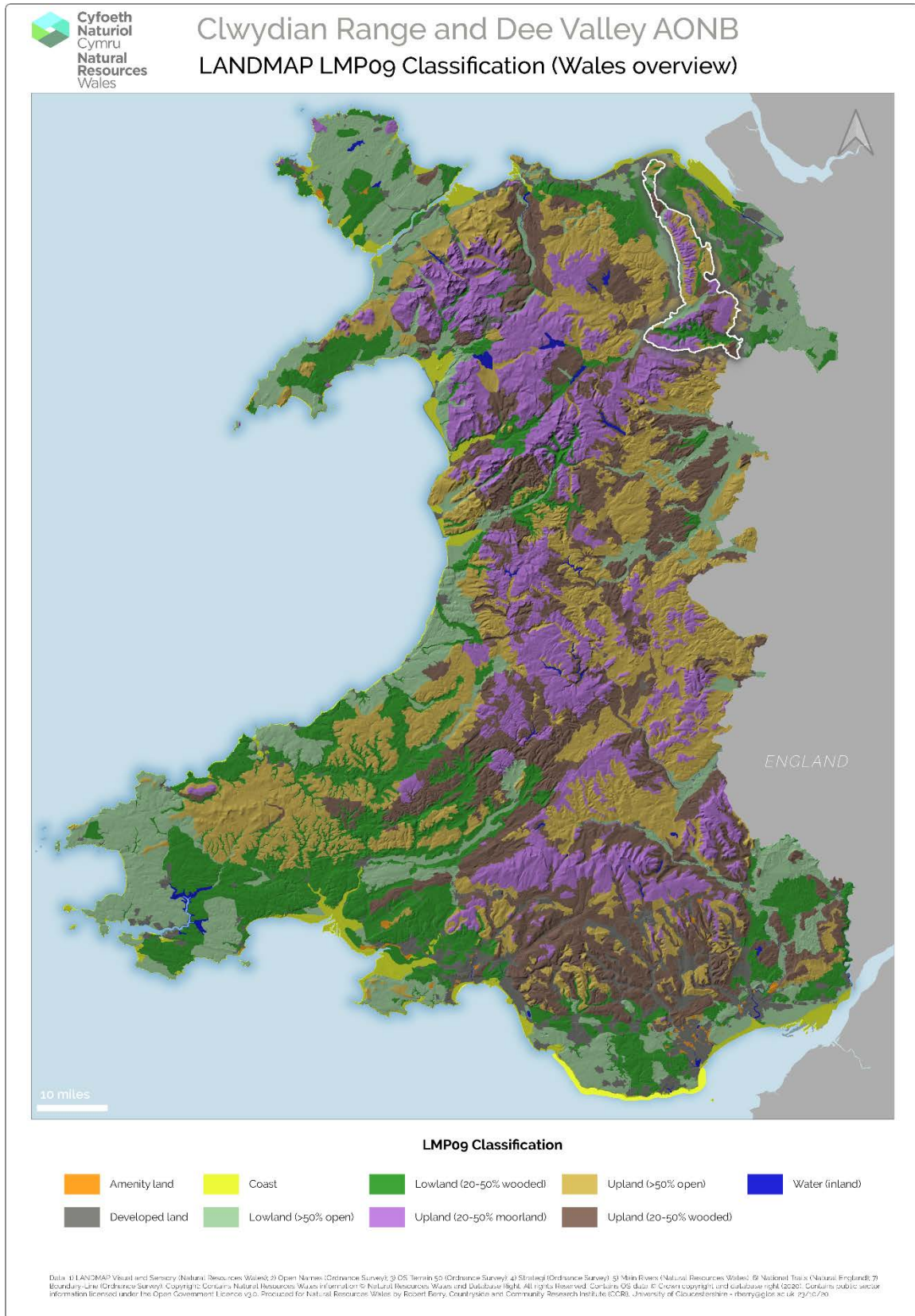


Figure 1. LANDMAP LMP09 landscape types: all-Wales

Table 1. Area statistics for LMP09 landscape types (all-Wales)

LMP09 Landscape Type	Area (km ²)	Area (% Total)
Upland (open)	4924.91	23.17
Upland (wooded)	4036.33	18.99
Lowland (wooded)	3698.53	17.4
Lowland (open)	3525.22	16.59
Upland (moorland)	3241.11	15.25
Built land	1042.9	4.91
Coast	627.81	2.95
Water (inland)	106.29	0.5
Amenity land	50.21	0.24

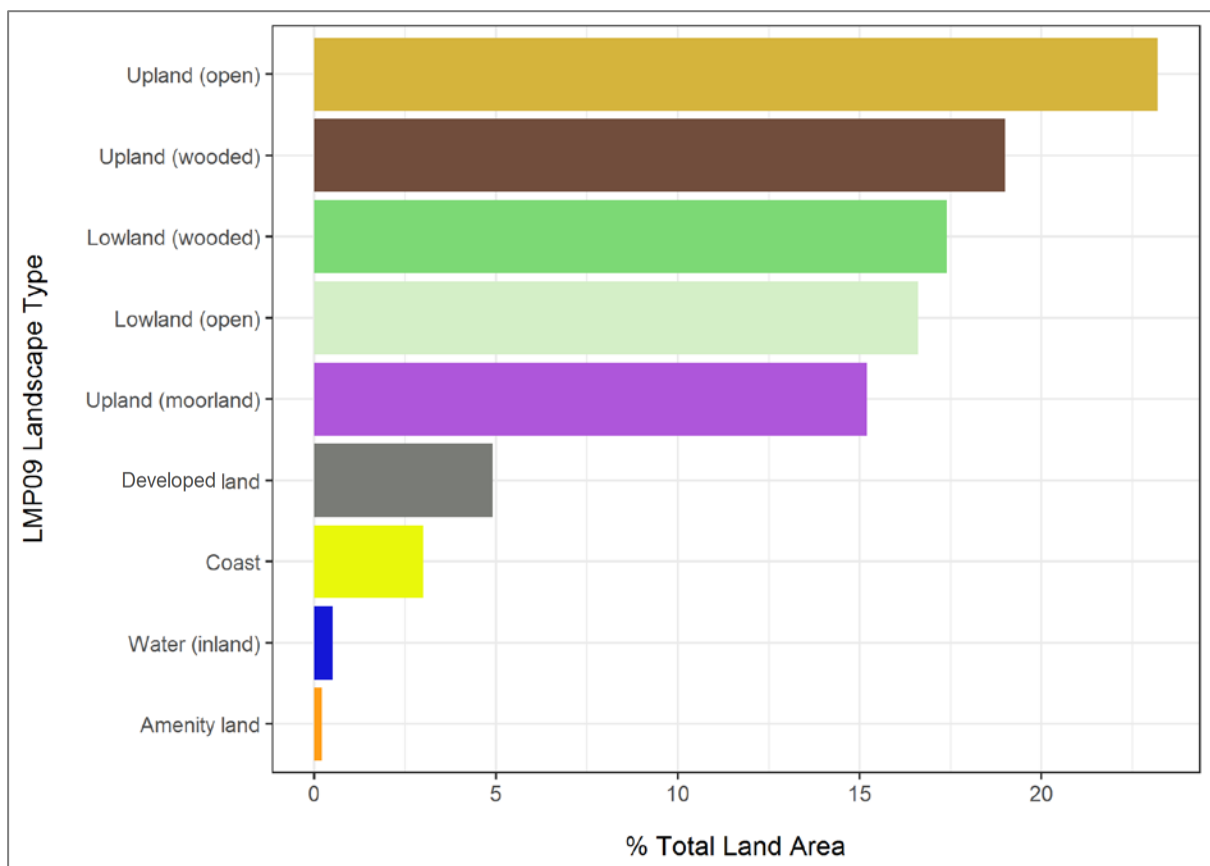
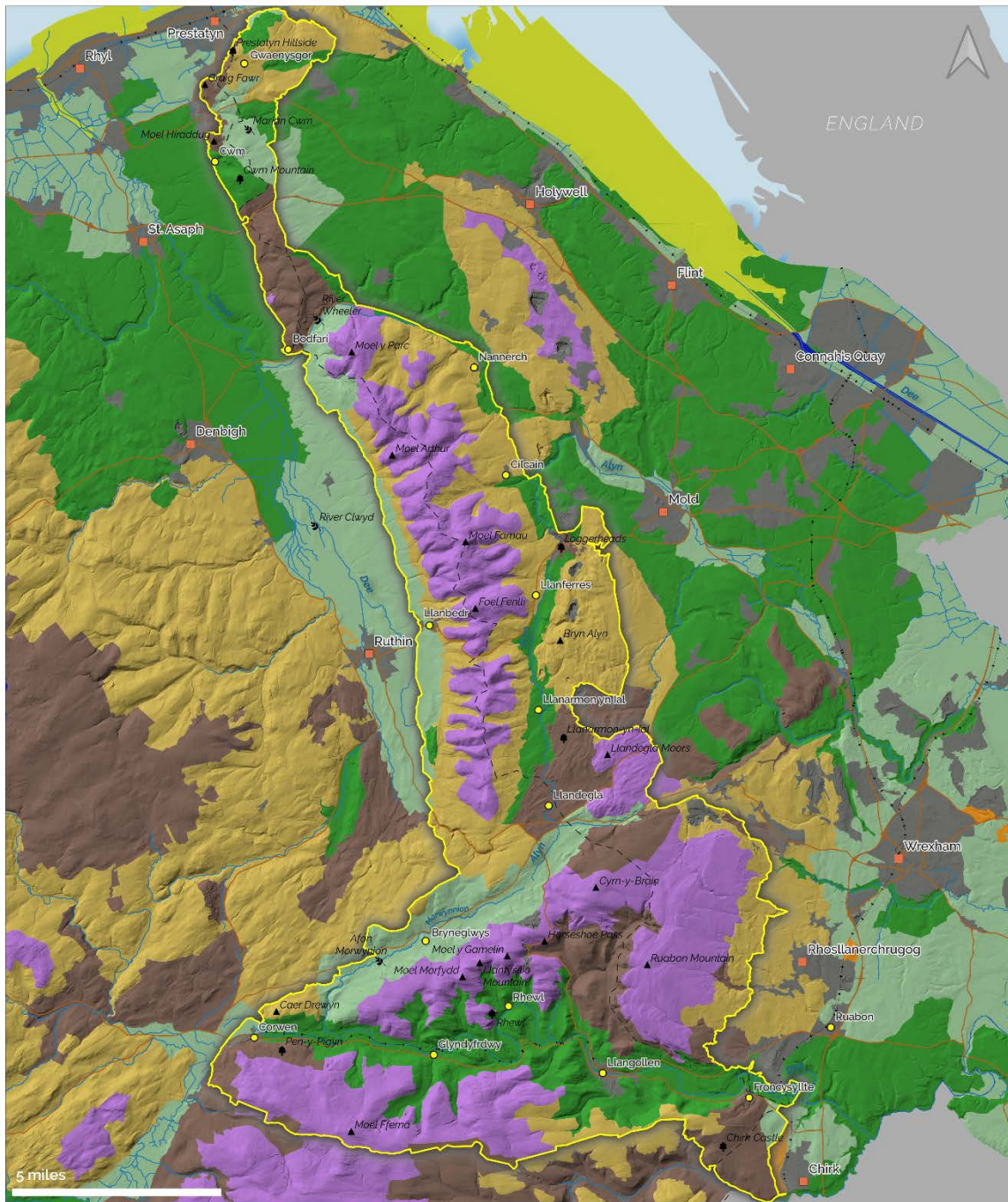


Figure 2. Area statistics for LMP09 landscape types (all-Wales)

Clwydian Range and Dee Valley AONB

LANDMAP LMPog Classification



LMPog Classification		Key AONB Features		Other Features	
Developed	Upland (20-50% moorland)	Lowland sites	Settlement (smaller)	Offa's Dyke Path	
Lowland (>50% open)	Upland (>50% open)	Woodland	Settlement (larger)	Main road	
Lowland (20-50% wooded)	Upland (20-50% wooded)	Upland	River/stream	Railway line	

Data: 1) LANDMAP Visual and Sensory (Natural Resources Wales); 2) Open Names (Ordnance Survey); 3) OS Terrain 50 (Ordnance Survey); 4) Strategic (Ordnance Survey); 5) Main Rivers (Natural Resources Wales); 6) National Trails (Natural England); 7) Boundary-Line (Ordnance Survey). Copyright: Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights Reserved. Contains OS data © Crown copyright and Database right (2020). Contains public sector information licensed under the Open Government Licence v3.0. Produced for Natural Resources Wales by Robert Barry, Countryside and Community Research Institute (CCRI), University of Gloucestershire - rbarry@ccri.ac.uk, 22/10/20

Figure 3. LANDMAP LMP09 landscape types: CRDV AONB

Table 2. Area statistics (km²) for LMP09 landscape types (CRDV AONB)

LMP09 Landscape Type	Area (km ²)
Amenity land	0.01
Coast	0
Developed land	4.6
Lowland (open)	41.46
Lowland (wooded)	66.82
Upland (moorland)	133.45
Upland (open)	76.88
Upland (wooded)	65.86
Water (inland)	0.18
Total	389.26

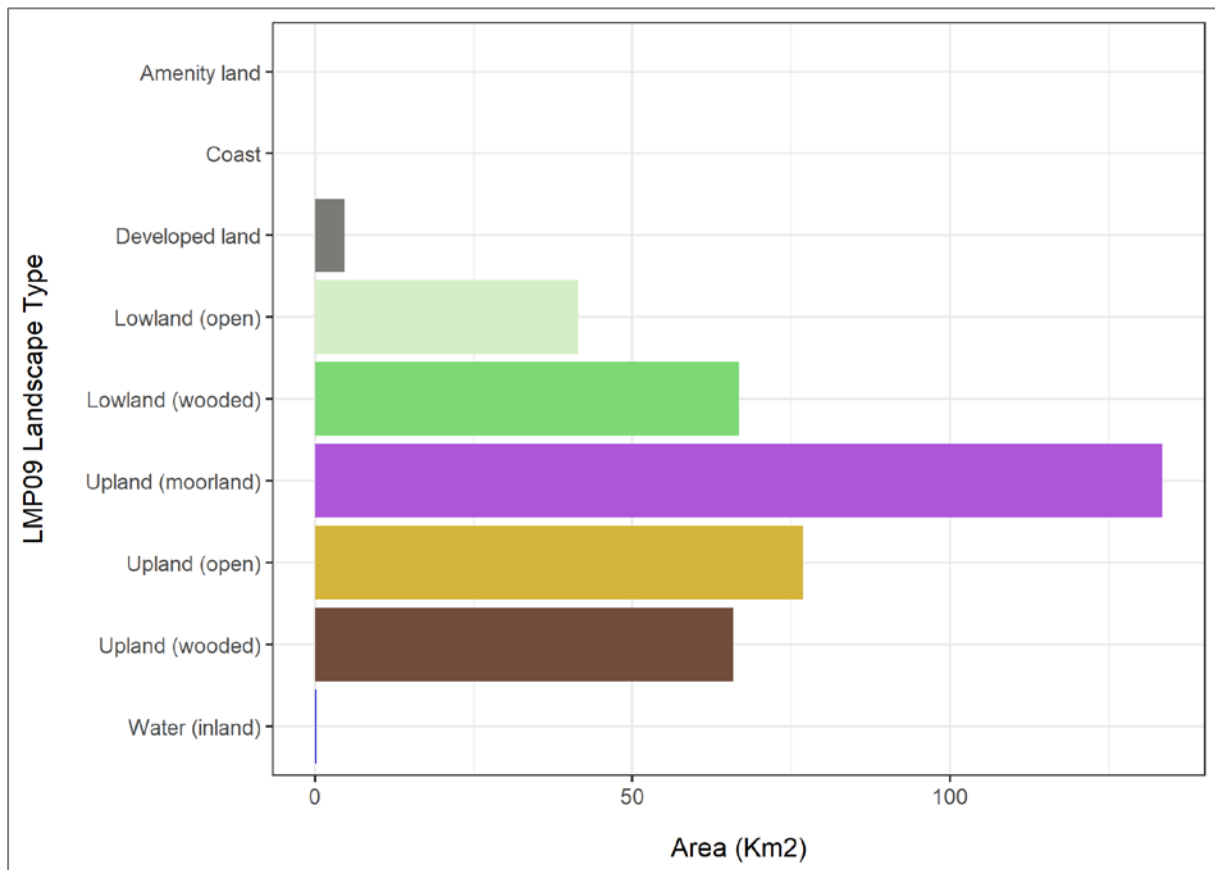


Figure 4. Area statistics for LMP09 landscape types (CRDV AONB)

Table 3. Area statistics (% total land area) for LMP09 landscape types (CRDV AONB)

LMP09 Landscape Type	% Total Land Area
Amenity land	0.00
Coast	0.00
Developed land	1.18
Lowland (open)	10.65
Lowland (wooded)	17.17
Upland (moorland)	34.28
Upland (open)	19.75
Upland (wooded)	16.92
Water (inland)	0.05

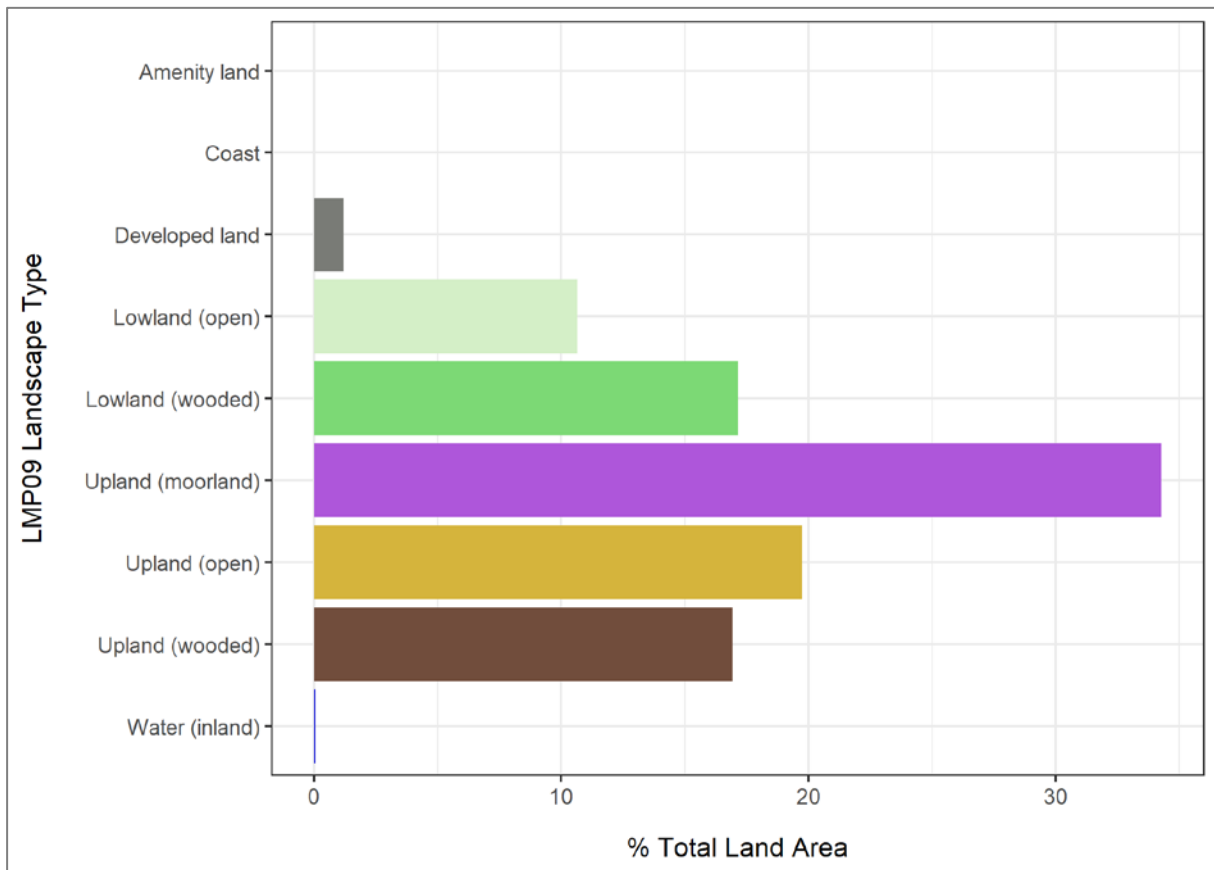


Figure 5. Area statistics for LMP09 landscape types (CRDV AONB)

4.2. Flood Zone 3

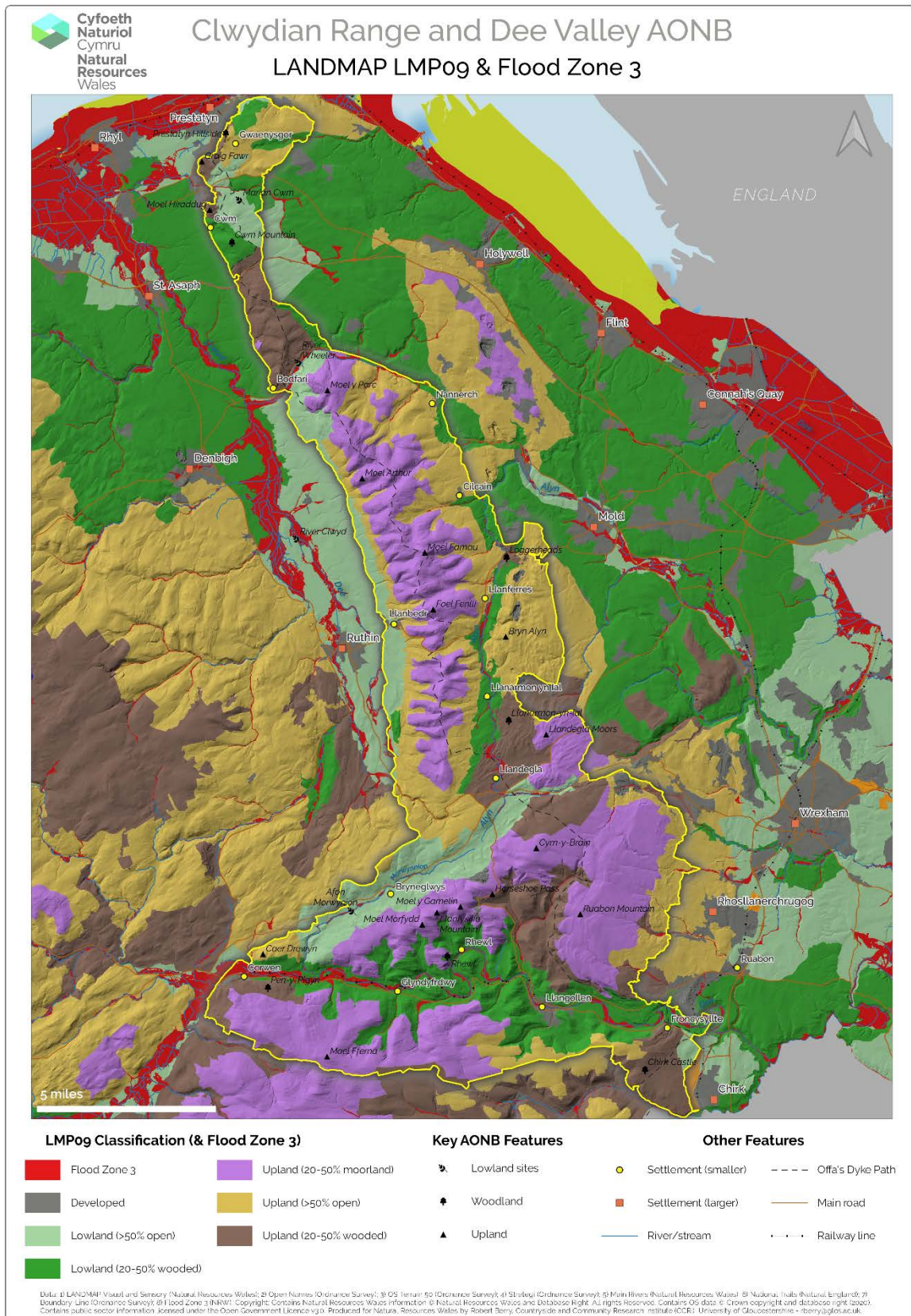


Figure 6. LANDMAP LMP09 landscape types and Flood Zone 3

Table 4. Flood Zone 3 area (%) by LMP09 landscape types

LMP09 Landscape Type	Area (km ²)
Amenity land	0.00
Coast	0.00
Developed land	0.18
Lowland (open)	1.75
Lowland (wooded)	6.08
Upland (moorland)	0.13
Upland (open)	0.51
Upland (wooded)	0.93
Water (inland)	0.17
Total	9.75

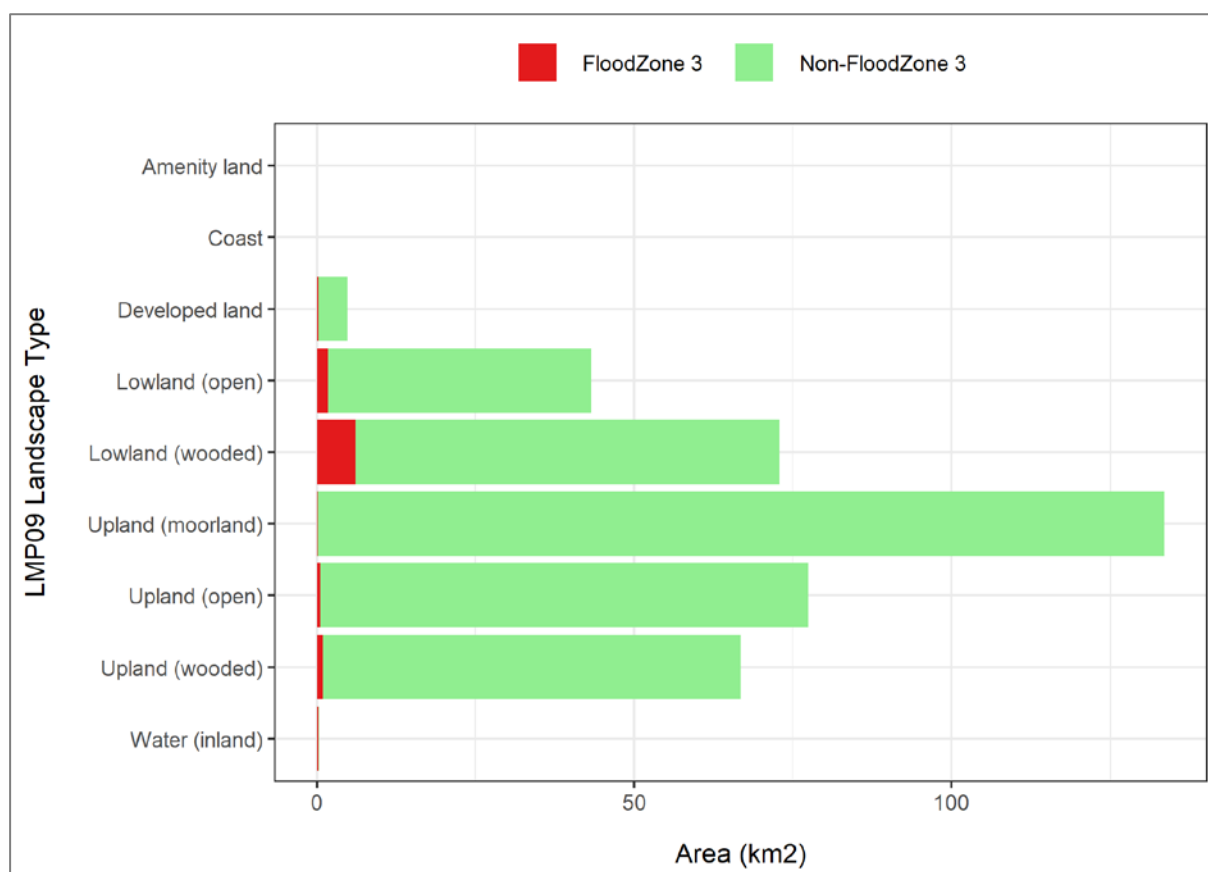


Figure 7. Flood Zone 3 area as a proportion (km²) of LMP09 landscape area

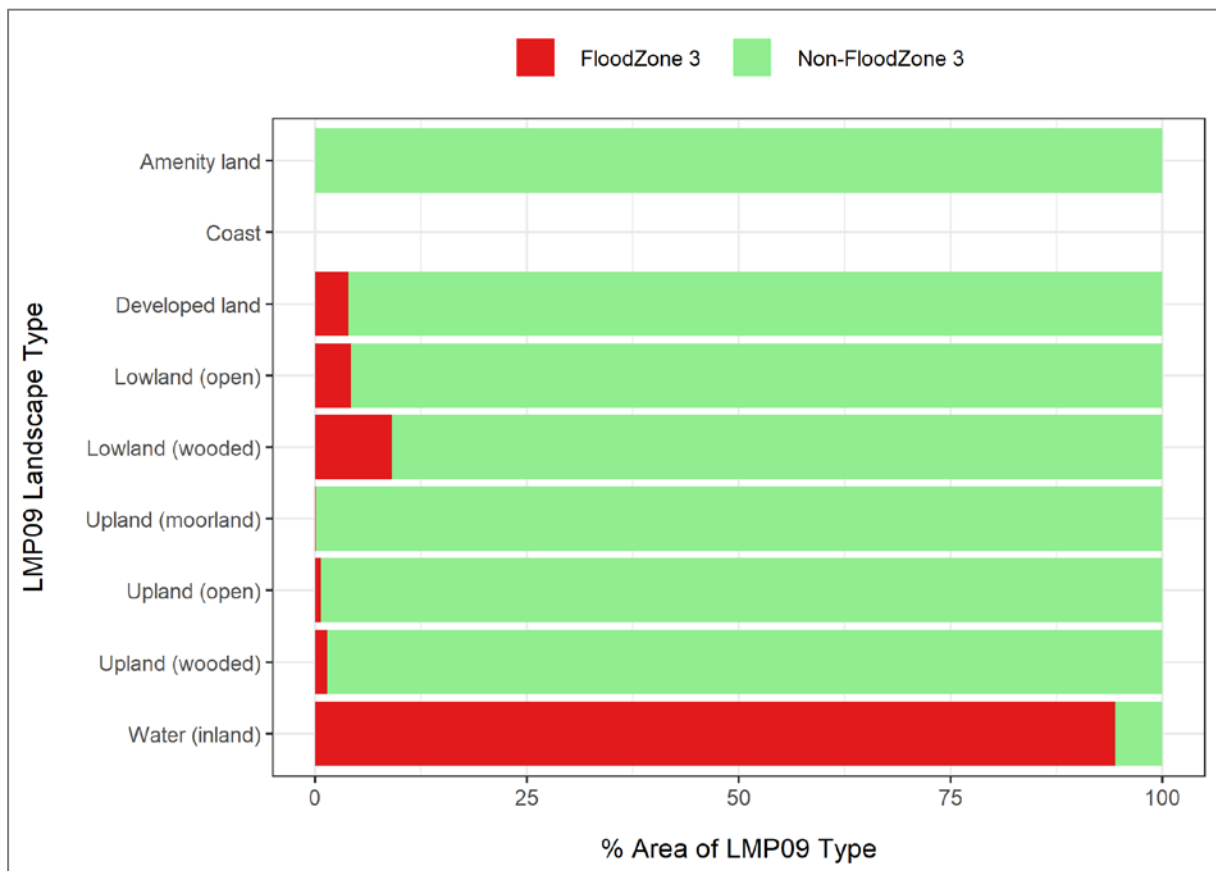


Figure 8. Flood Zone 3 area as a proportion (%) of LMP09 landscape area

4.3. Boundary Type

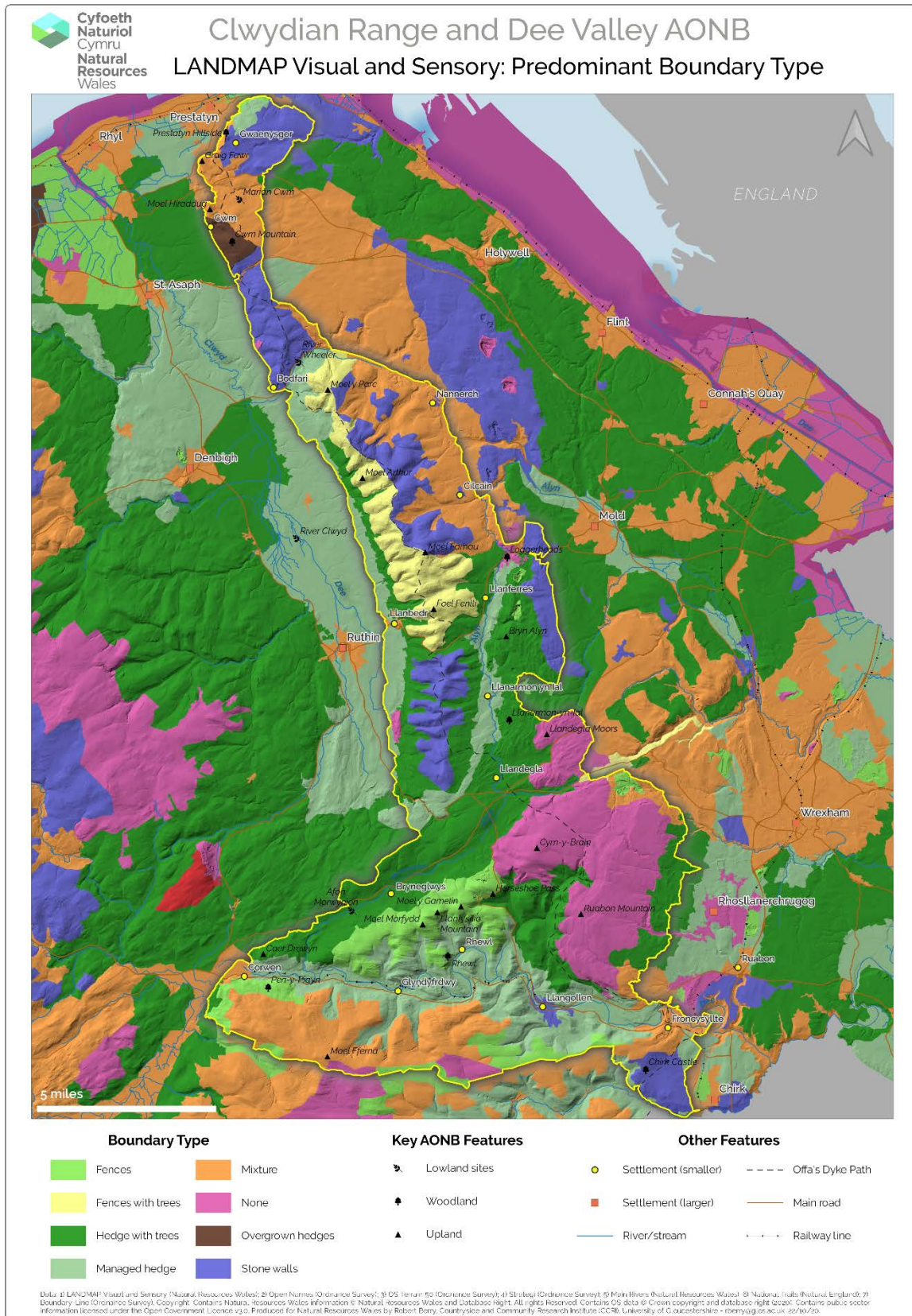


Figure 9. Predominant LANDMAP Visual and Sensory boundary types

Table 5. Predominant boundary type area (km²) by LMP09 landscape type

	Clawdd/ Hedge - banks	Fences	Fences with Trees	Hedge with Trees	Managed Hedge	Mixture	None	Overgrown Hedges	Slate Fences	Stone Walls
Amenity land	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Coast	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Developed land	0.00	1.96	0.00	0.00	0.00	1.22	0.02	0.00	0.00	1.40
Lowland (open)	0.00	0.25	0.00	22.78	13.15	5.28	0.00	0.00	0.00	0.00
Lowland (wooded)	0.00	0.00	0.00	0.13	53.73	8.67	0.52	2.53	0.00	1.24
Upland (moorland)	0.00	16.15	22.23	0.00	0.00	27.38	44.53	0.00	0.00	23.16
Upland (open)	0.00	4.28	0.16	35.49	2.66	21.68	0.00	0.00	0.00	12.61
Upland (wooded)	0.00	5.21	0.00	32.20	0.91	4.92	7.59	0.00	0.00	15.03
Water (inland)	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00

Table 6. Predominant boundary type area (% overall land area) by LMP09 landscape type

	Clawdd/ Hedge - banks	Fences	Fences with Trees	Hedge with Trees	Managed Hedge	Mixture	None	Overgrown Hedges	Slate Fences	Stone Walls	Total (%)
Amenity land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coast	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Developed land	0.00	0.50	0.00	0.00	0.00	0.31	0.01	0.00	0.00	0.36	1.18
Lowland (open)	0.00	0.06	0.00	5.85	3.38	1.36	0.00	0.00	0.00	0.00	10.65
Lowland (wooded)	0.00	0.00	0.00	0.03	13.80	2.23	0.13	0.65	0.00	0.32	17.16
Upland (moorland)	0.00	4.15	5.71	0.00	0.00	7.03	11.44	0.00	0.00	5.95	34.28
Upland (open)	0.00	1.10	0.04	9.12	0.68	5.57	0.00	0.00	0.00	3.24	19.75
Upland (wooded)	0.00	1.34	0.00	8.27	0.23	1.26	1.95	0.00	0.00	3.86	16.91
Water (inland)	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.05

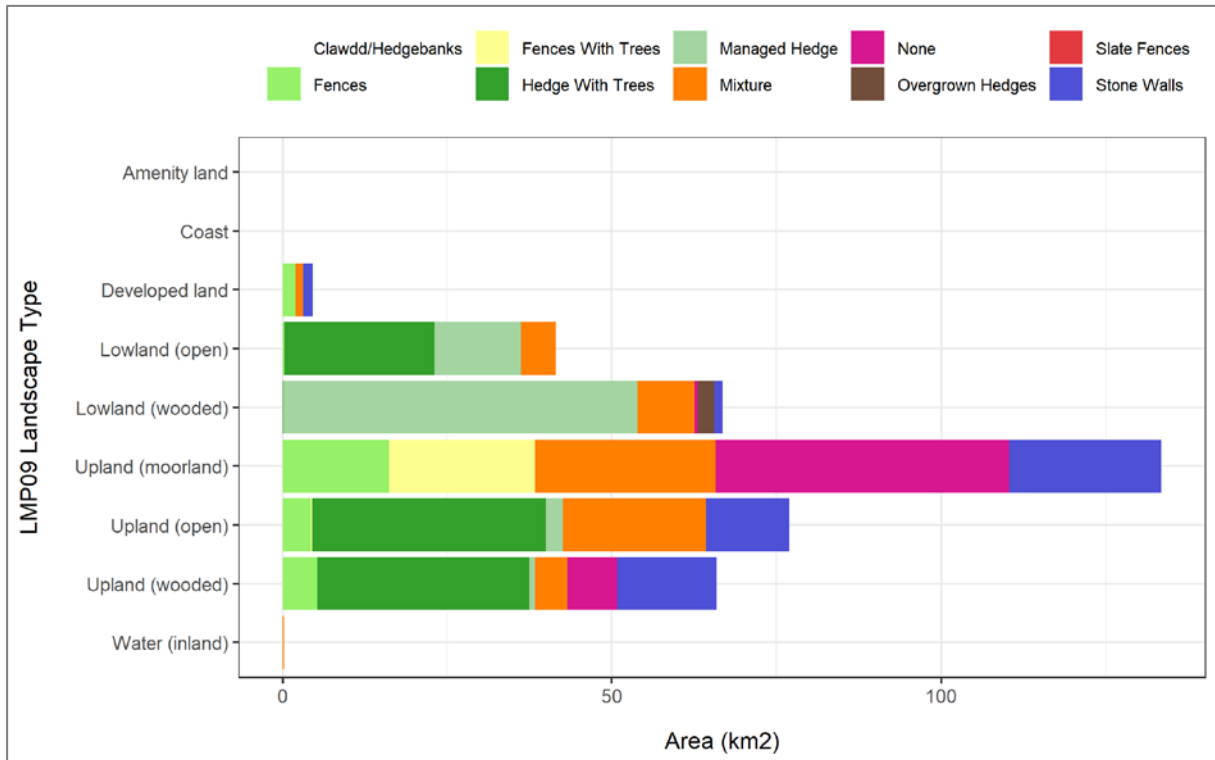


Figure 10. Predominant boundary type area (km²) by LMP09 landscape type

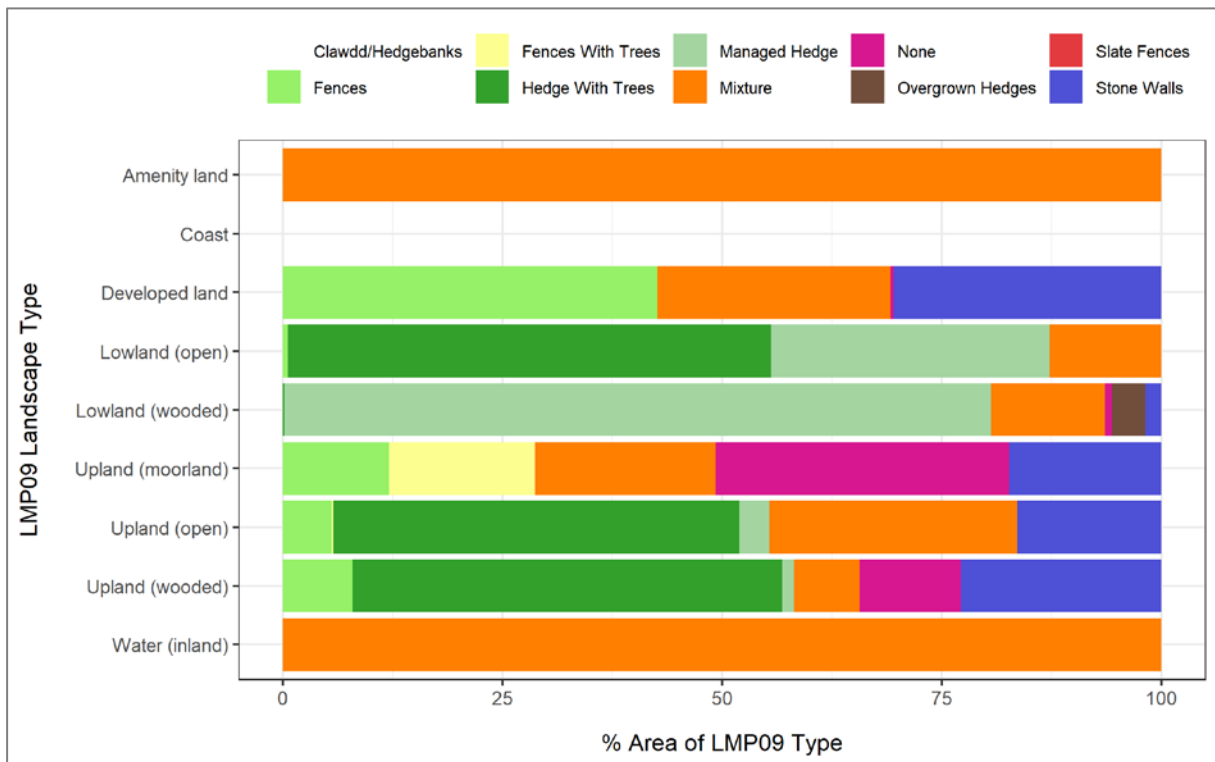


Figure 11. Predominant boundary type area as a proportion (%) of LMP09 landscape type

4.4. Overall Landscape Value

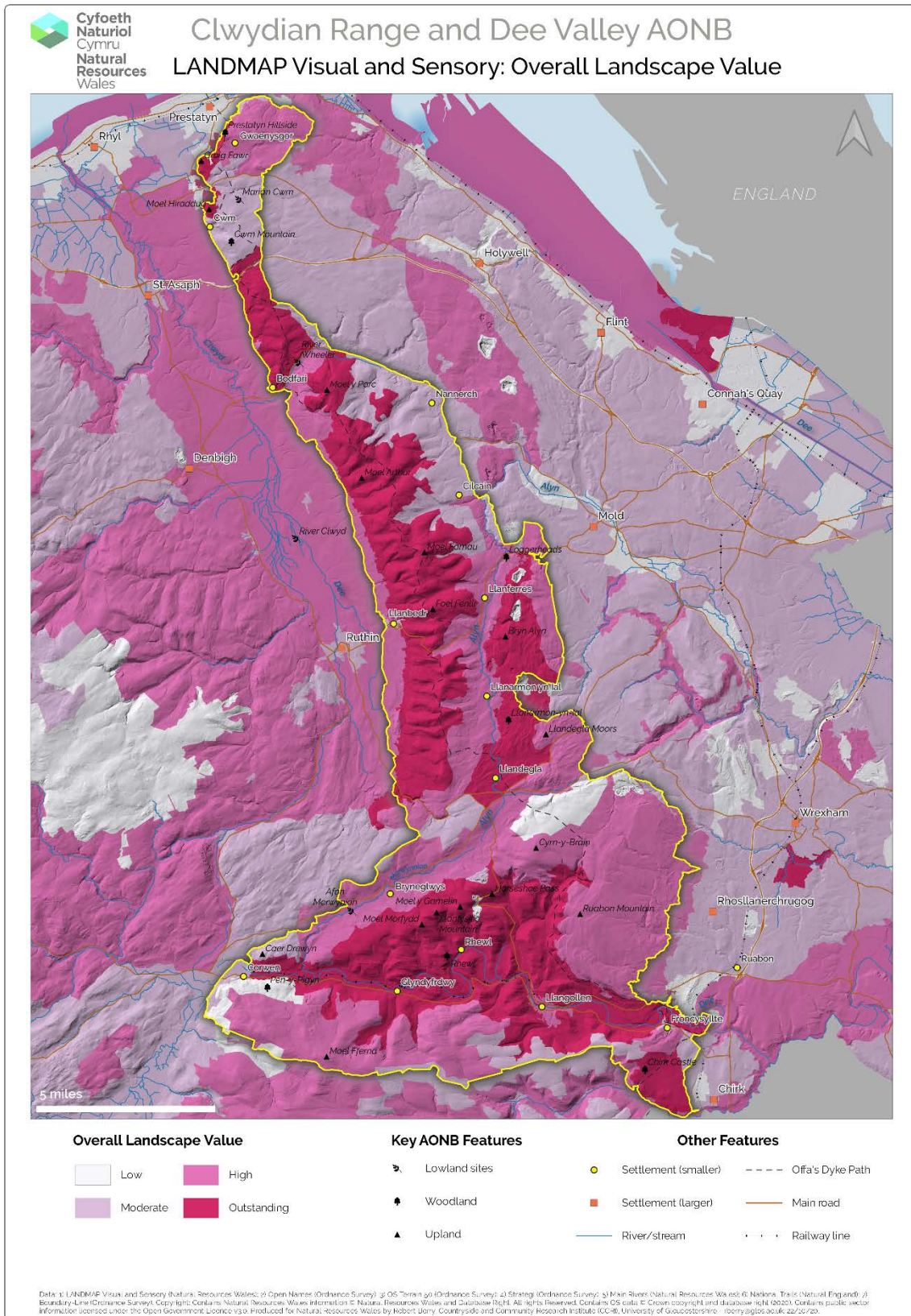


Figure 12. Overall landscape value

Table 7. Overall landscape value area (km2) by LMP09 landscape

	Outstanding	High	Moderate	Low	Total
Amenity land	0.00	0.00	0.01	0.00	0.01
Coast	0.00	0.00	0.00	0.00	0.00
Developed land	0.00	1.11	1.71	1.78	4.60
Lowland (open)	0.00	34.81	6.65	0.00	41.46
Lowland (wooded)	47.24	11.71	7.87	0.00	66.82
Upland (moorland)	61.54	71.91	0.00	0.00	133.45
Upland (open)	11.76	35.19	29.93	0.00	76.88
Upland (wooded)	48.36	5.19	1.97	10.34	65.86
Water (inland)	0.00	0.18	0.00	0.00	0.18

Table 8. Overall landscape value area (% overall land area) by LMP09 landscape

	Outstanding	High	Moderate	Low	Total
Amenity land	0.00	0.00	0.00	0.00	0.00
Coast	0.00	0.00	0.00	0.00	0.00
Developed land	0.00	0.29	0.44	0.46	1.19
Lowland (open)	0.00	8.94	1.71	0.00	10.65
Lowland (wooded)	12.14	3.01	2.02	0.00	17.17
Upland (moorland)	15.81	18.47	0.00	0.00	34.28
Upland (open)	3.02	9.04	7.69	0.00	19.75
Upland (wooded)	12.42	1.33	0.51	2.66	16.92
Water (inland)	0.00	0.05	0.00	0.00	0.05

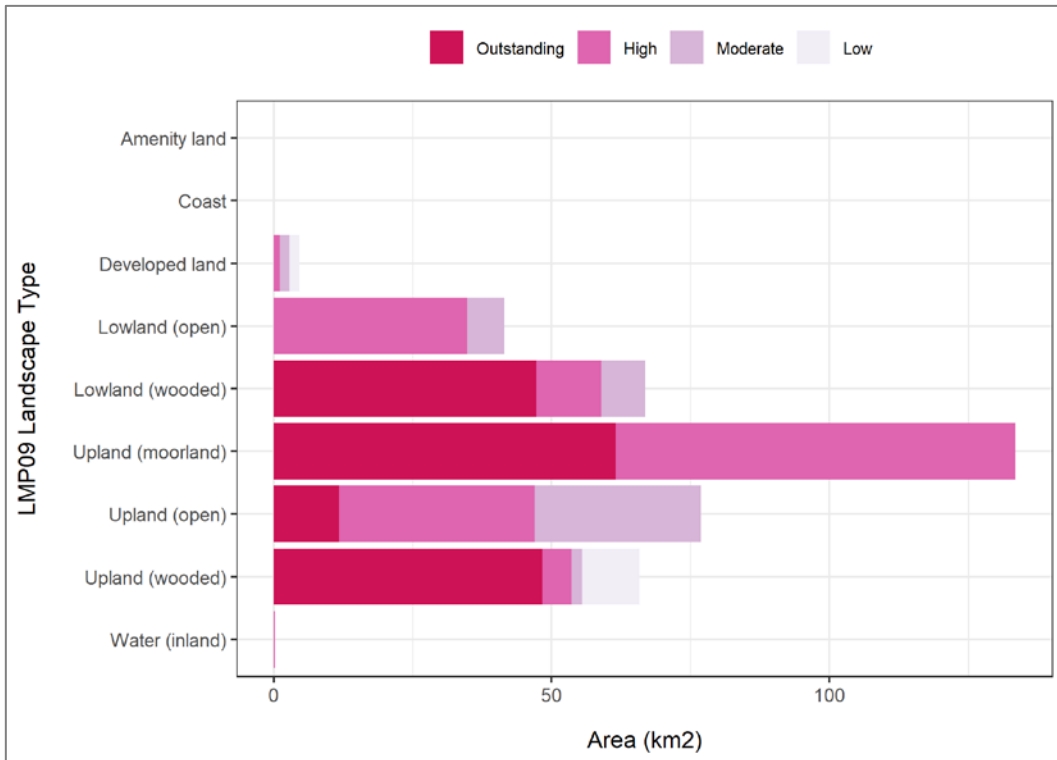


Figure 13. Overall landscape value area (km2) by LMP09 landscape

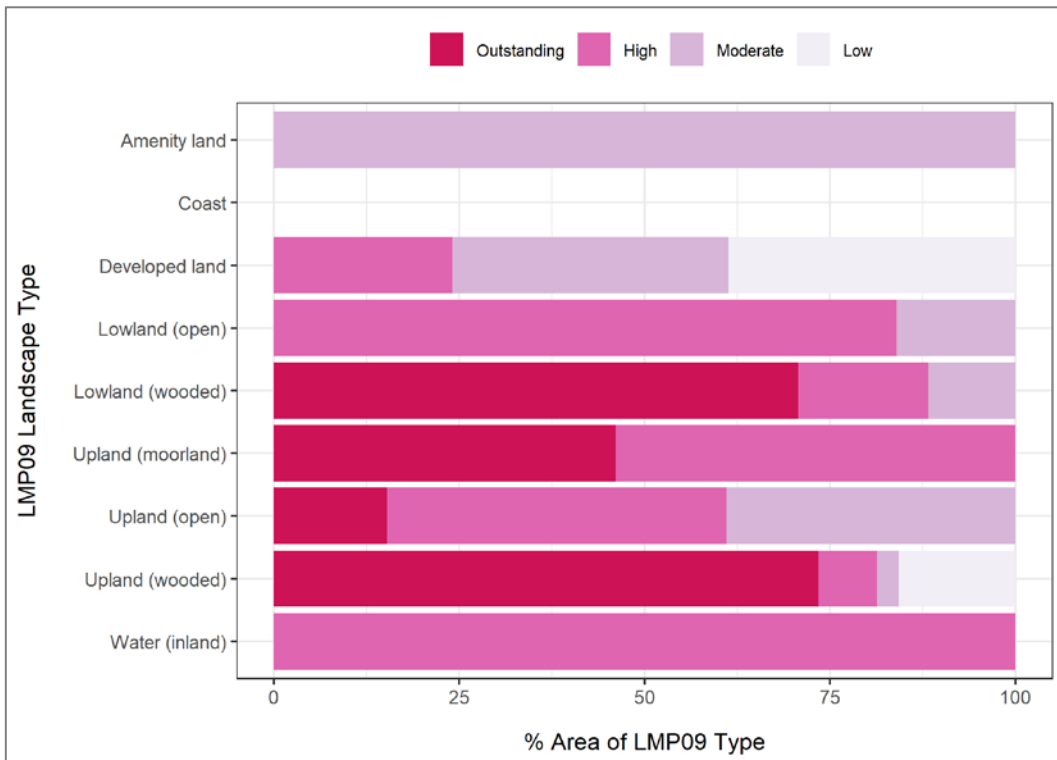


Figure 14. Overall landscape value area as a proportion (%) of LMP09 landscape type

5. LMP09 Landscape “Focus” Maps

5.1. Upland (Moorland)

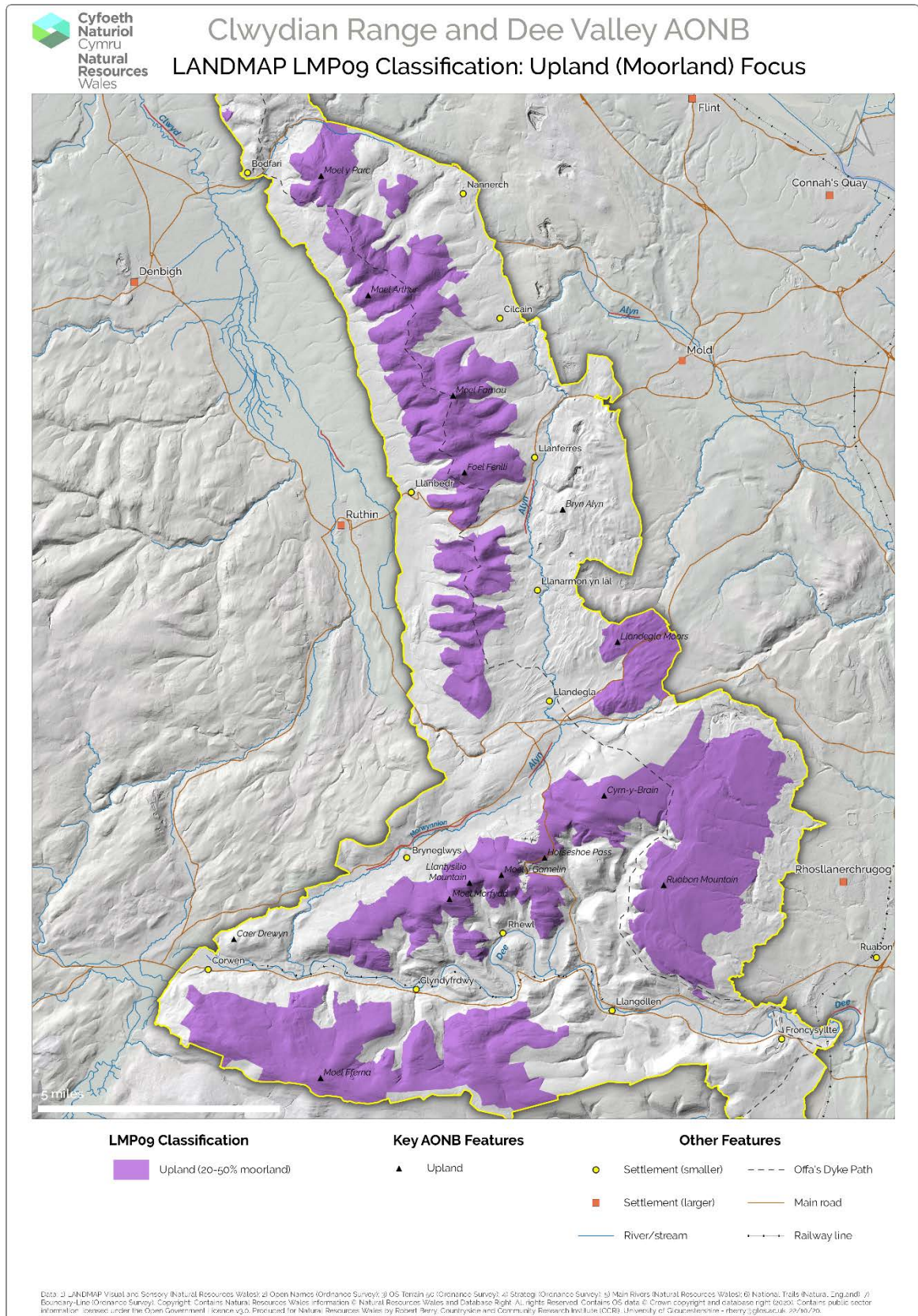


Figure 15. Upland (20-50% moorland) focus map

5.2. Upland (Open)

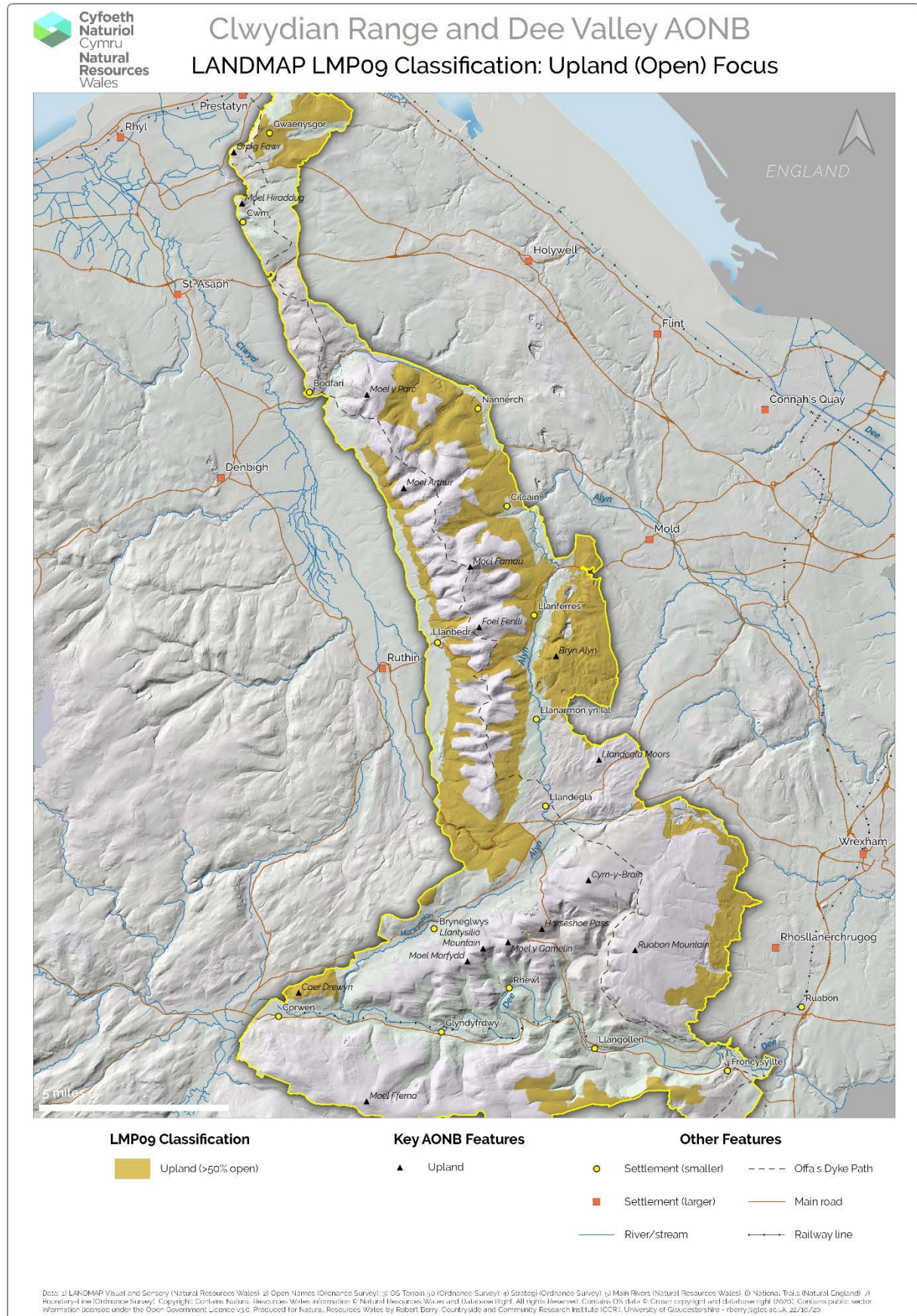


Figure 16. Upland (>50% open) focus map

5.3. Upland (Wooded)

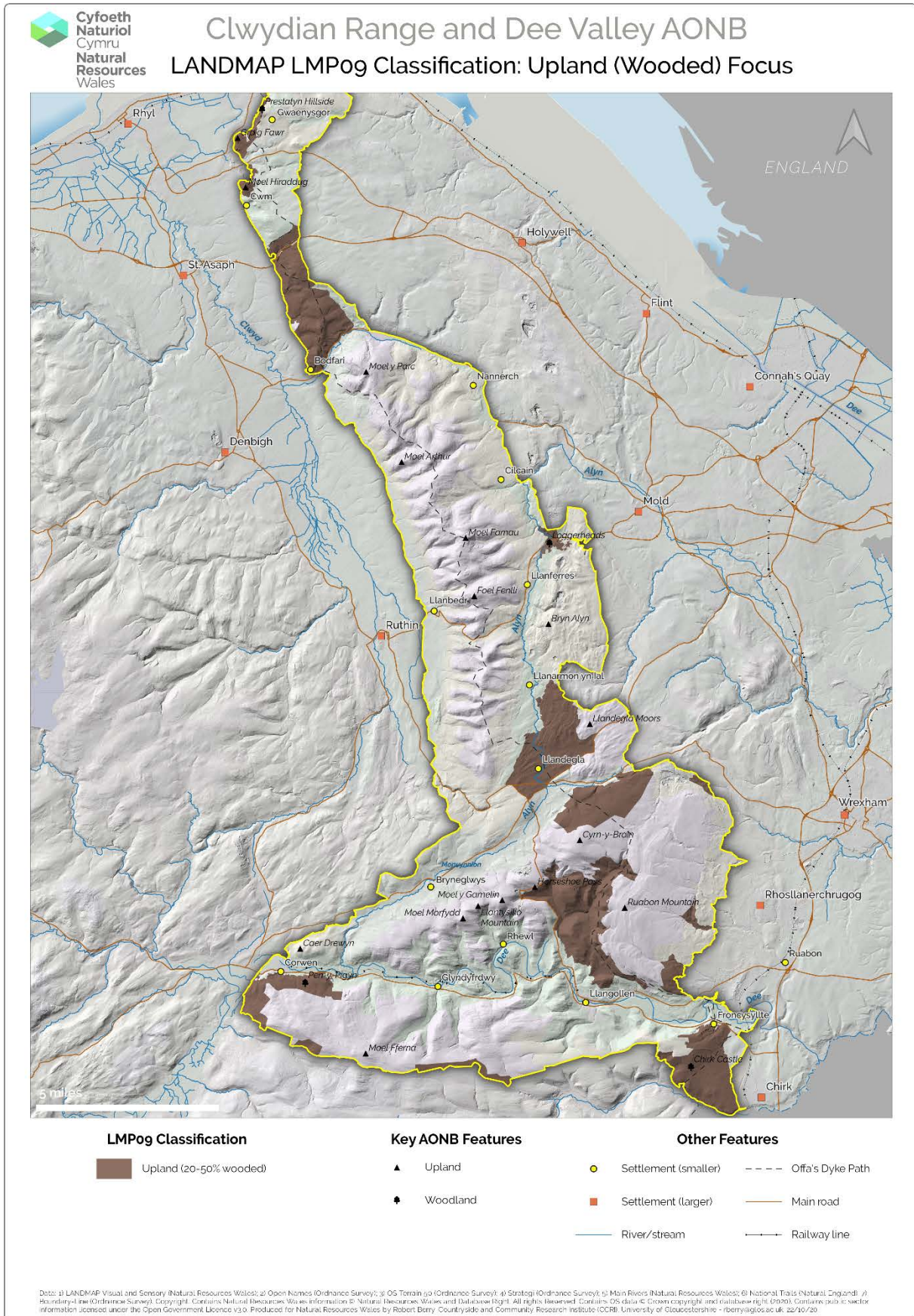


Figure 17. Upland (20>50% wooded) focus map

5.4. Lowland (Wooded)

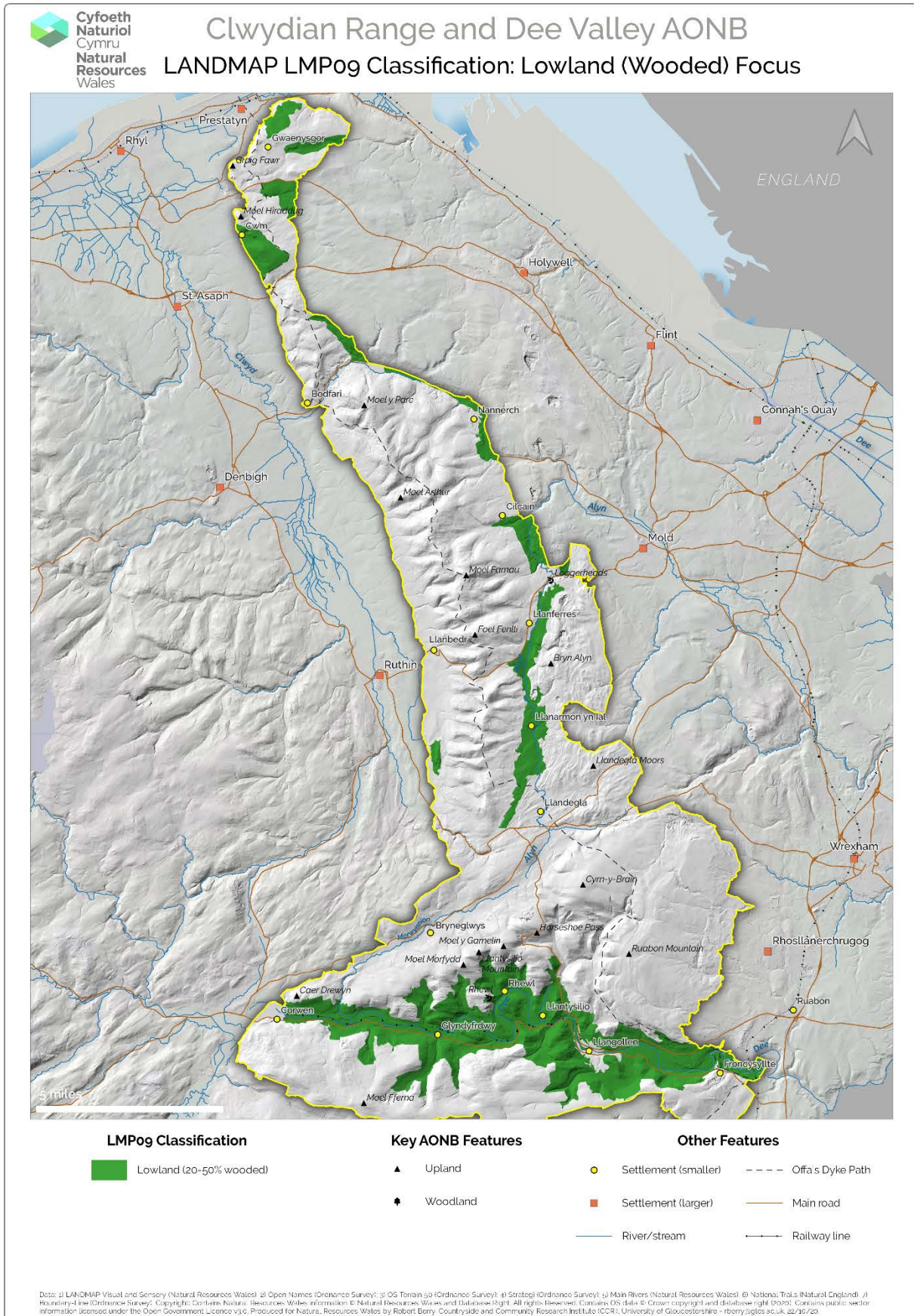


Figure 18. Lowland (20-50%) focus map

5.5. Lowland (Open)

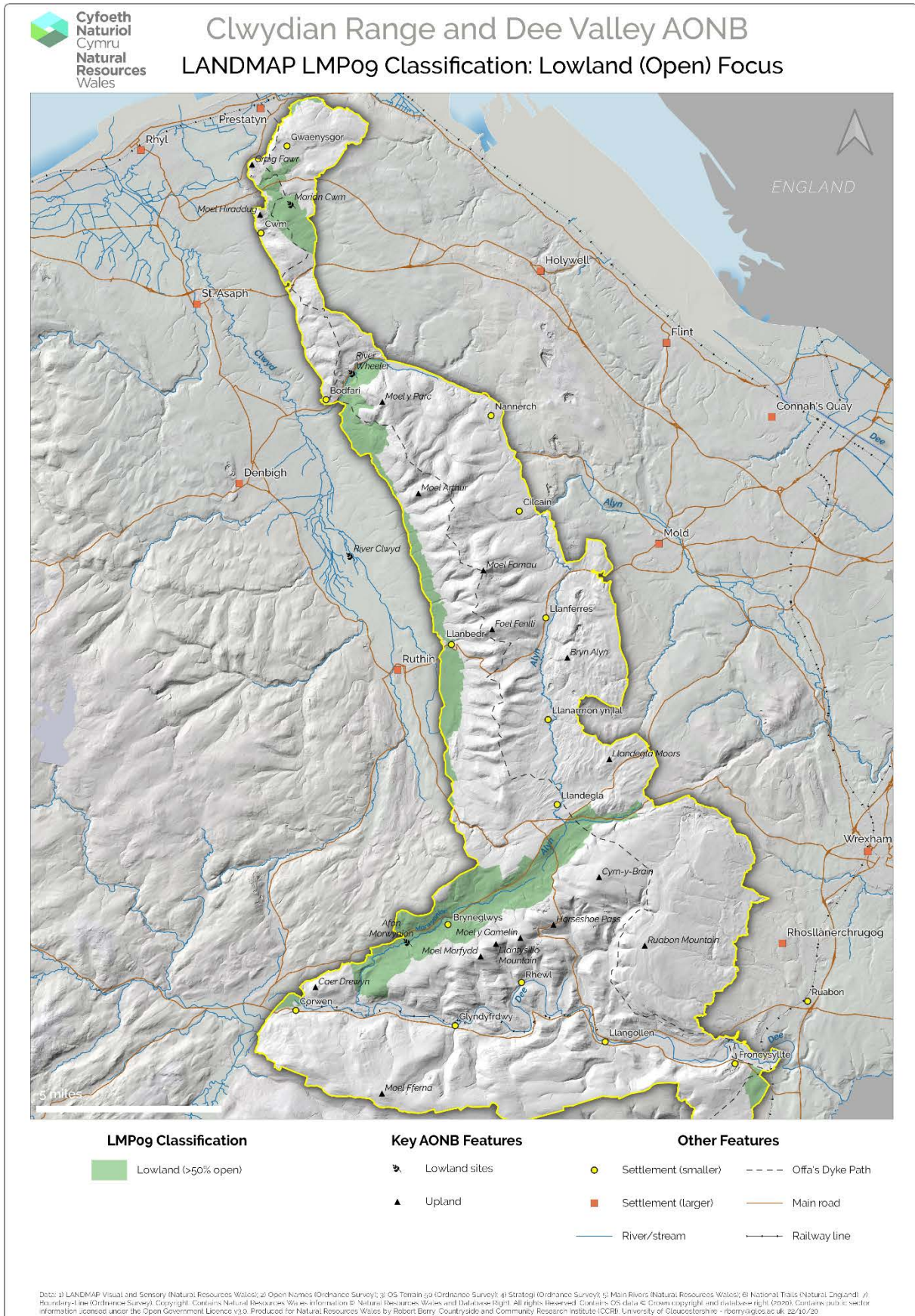


Figure 19. Lowland (>50% open) focus map

5.6. Developed Land

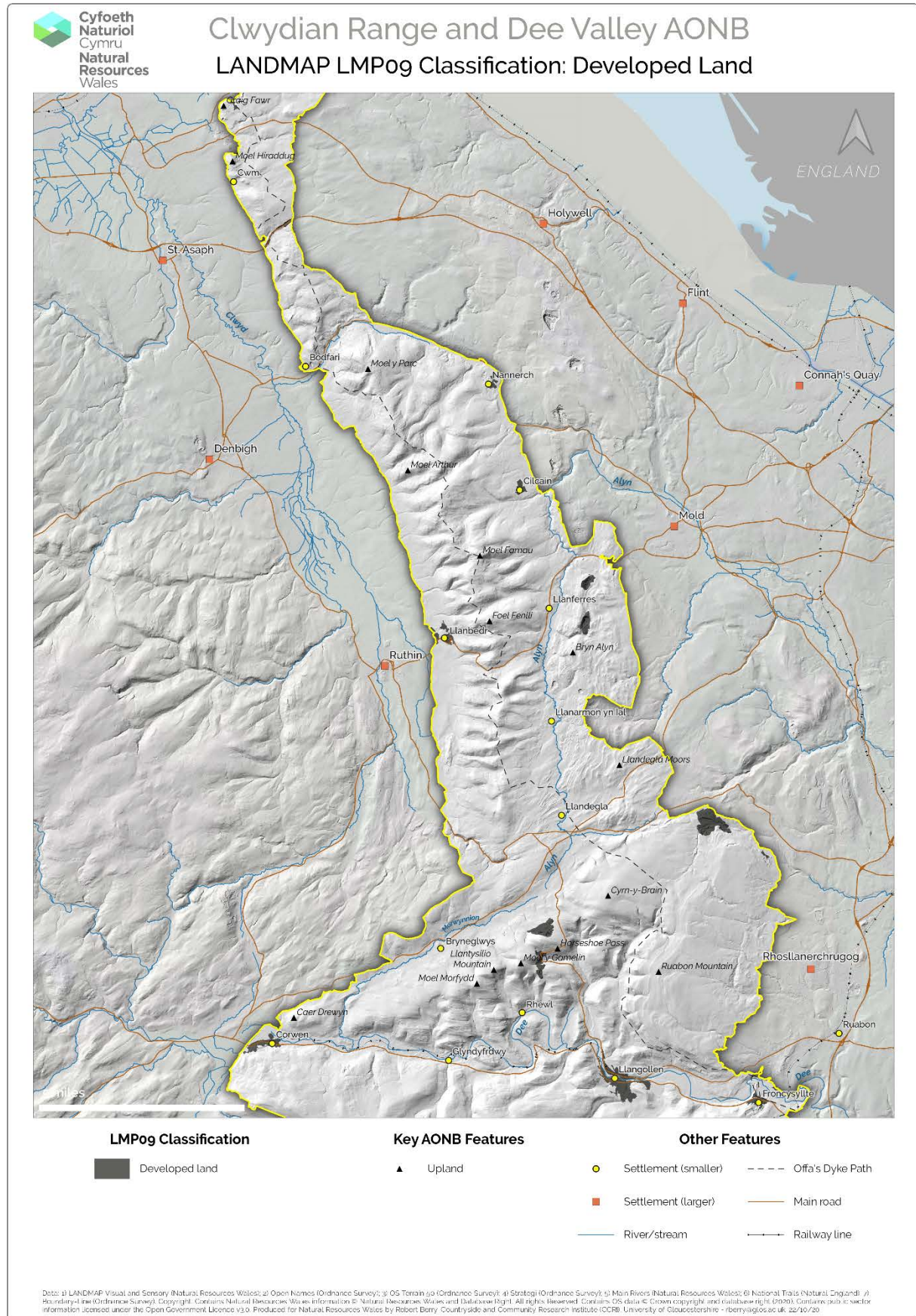


Figure 20. Developed land focus map

6. Appendices

6.1. Data Archive Appendix

Data outputs associated with this project are archived in the Document Management System and the GIS server-based storage at Natural Resources Wales.

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] A full set of maps produced in PDF and PNG format.

[C] An online Github code repository containing the R programming code and data resources (including QGIS map legend styles) used to for the landscape reclassification, mapping, spatial analysis and statistical analysis - https://github.com/robertberryuk/CRDV_AONB.

6.2. Project Metadata Table

Table 9. Metadata table for spatial data layers used in the project

Theme	Data Layer Name	Source	Spatial Resolution / Geographical Units / Scale	Update frequency	Reference / collection / publication date	Data Type (raster / vector)	Data Format	Spatial Reference System	Access Constraints
Land cover	LANDMAP Visual and Sensory data layer	NRW via Lle GeoPortal	LANDMAP Aspect Areas	As needed	2020	Vector	ESRI Shape (.shp)	British National Grid (ESPG:27700)	Open data
Place names	Open Names	Ordnance Survey	N/A	Quarterly	2020	Vector	ESRI Shape (.shp)	British National Grid (ESPG:27700)	Open data
Hydrology	Main Rivers	NRW via Lle GeoPortal	N/A	Unknown	2018	Vector	ESRI Shape (.shp)	British National Grid (ESPG:27700)	Open data
	Flood Zone 3	NRW, EA via Lle GeoPortal	N/A	Quarterly	2020	Vector	ESRI Shape (.shp)	British National Grid (ESPG:27700)	Open data
Landform / Elevation	OS Terrain 50	Ordnance Survey	50x50m	Annual	2020	Raster	ASCII Grid (.asc)	British National Grid (ESPG:27700)	Open data
Administrative Boundaries	Boundary-Line	Ordnance Survey	N/A	Biannual	2019	Vector	ESRI Shape (.shp)	British National Grid (ESPG:27700)	Open data
Base mapping	Strategi	Ordnance Survey	N/A	Discontinued	2016	Vector	ESRI Shape (.shp)	British National Grid (ESPG:27700)	Open data
Recreation	National Trails	Natural England	N/A	Unknown	2020	Vector	ESRI Shape (.shp)	British National Grid (ESPG:27700)	Open data



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