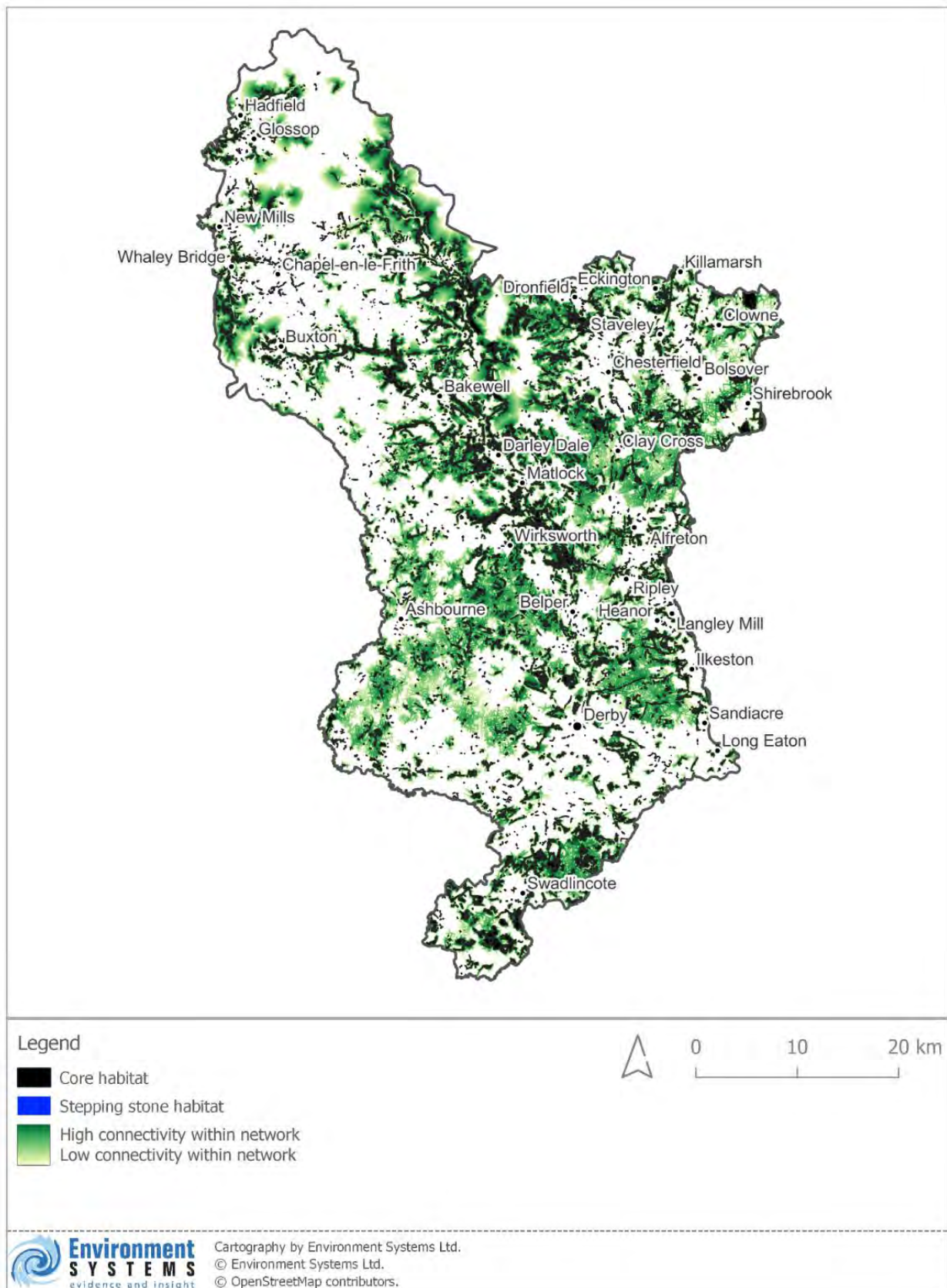# Appendix 5: Methodology used in the production of individual SENCE and climate change maps

Woodland network

Legend

■ Core habitat

■ Stepping stone habitat

High connectivity within network
Low connectivity within network

0   10   20 km

Cartography by Environment Systems Ltd.
© Environment Systems Ltd.
© OpenStreetMap contributors.

Connectivity was modelled using a cost-distance approach. All classes within the HAR were classified as either core type habitats (where species associated with the network type are natively found) or other habitat type. Larger blocks of core habitats are more resilient and

therefore **retained as the 'core' class**, whilst smaller areas were reclassified as 'stepping stones', i.e. areas that a species might use transiently while passing through, but would not choose to nest there. All habitats **(core, stepping stone and 'other') were** additionally assessed for movement cost; a value expressing how difficult it is for a species associated with the network to move through this non-core habitat. Core type habitats have an associated movement cost of 0 – the species are at home in these patches. The cost increases the harder a habitat is to transverse, with intensive agricultural land-use, waterbodies, or urban areas normally having the highest cost values. For this habitat type 'core' habitats were considered as areas of minimum 2ha size, while stepping stone habitats were of the same habitat type, but found in smaller patch sizes. A cut-off value was identified to determine the final extent of the network, in consultation with Derbyshire County Council, Peak District National Park Authority and Derbyshire Wildlife Trust. The table below identifies the HAR habitat types considered 'core' or 'stepping stone' for this habitat network.

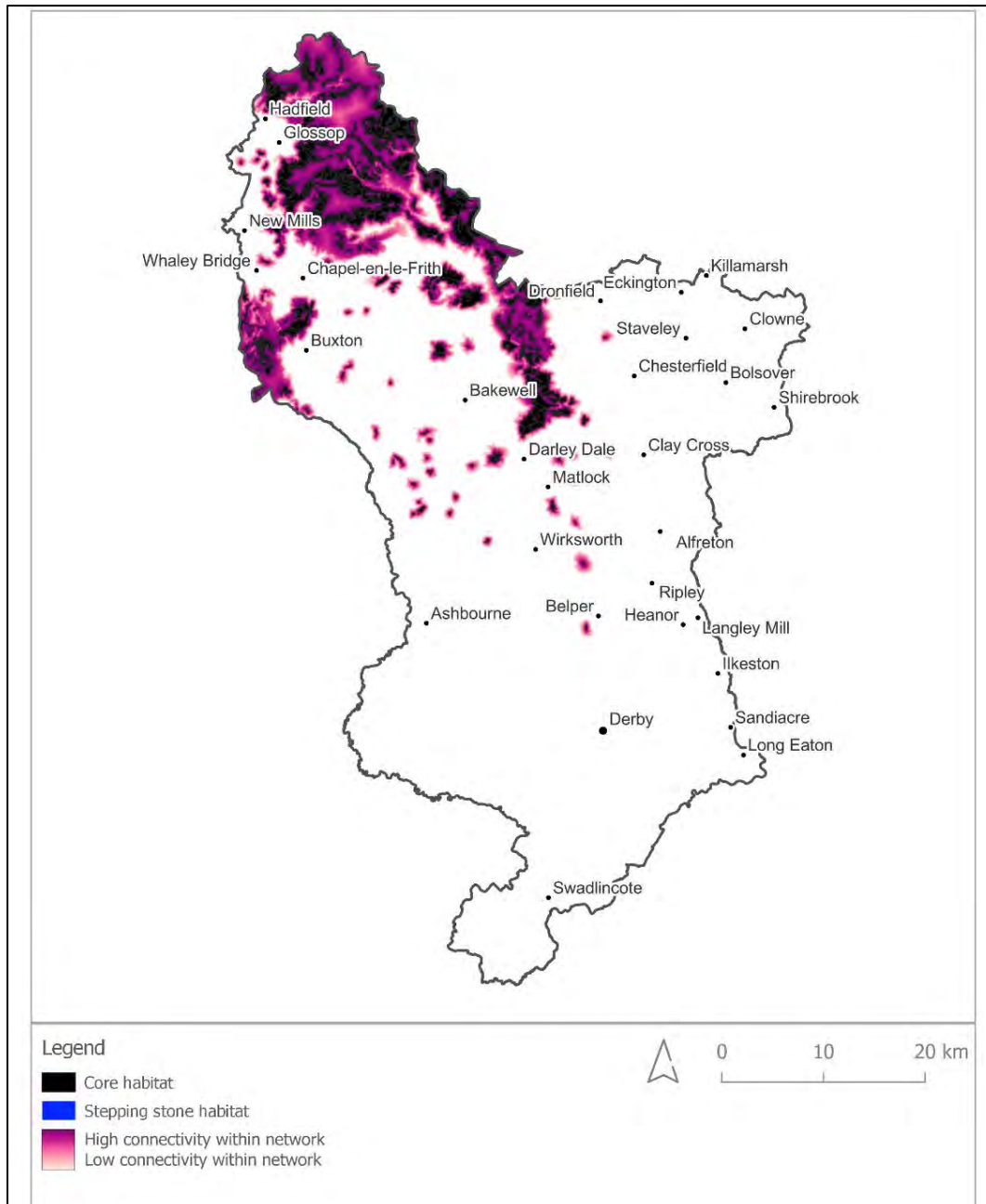| UKHAB_L2	UKHAB_LD	UKHABSEC
Woodland and forest	(Upland oakwood)	No secondary code assigned
Woodland and forest	(Upland oakwood)	Plantation
Woodland and forest	(Upland oakwood)	Semi-natural woodland
Woodland and forest	Broadleaved mixed and yew woodland	Ancient woodland site
Woodland and forest	Broadleaved mixed and yew woodland	Ancient woodland site, Plantation
Woodland and forest	Broadleaved mixed and yew woodland	Ancient woodland site, Semi-natural woodland
Woodland and forest	Broadleaved mixed and yew woodland	No secondary code assigned
Woodland and forest	Broadleaved mixed and yew woodland	Plantation
Woodland and forest	Broadleaved mixed and yew woodland	Secondary woodland
Woodland and forest	Broadleaved mixed and yew woodland	Semi-natural woodland
Woodland and forest	Lowland mixed deciduous woodland	Ancient woodland site, Semi-natural woodland
Woodland and forest	Lowland mixed deciduous woodland	No secondary code assigned
Woodland and forest	Lowland mixed deciduous woodland	Semi-natural woodland
Woodland and forest	Other woodland; mixed	Plantation

Woodland and forest	Upland mixed ashwoods	No secondary code assigned
Woodland and forest	Upland mixed ashwoods	Plantation
Woodland and forest	Upland mixed ashwoods	Semi-natural woodland
Woodland and forest	Wet woodland	No secondary code assigned
Woodland and forest	Wet woodland	Secondary woodland
Woodland and forest	Wet woodland	Semi-natural woodland
Woodland and forest	Woodland and forest	Ancient woodland site
Woodland and forest	Woodland and forest	Ancient woodland site, Plantation
Woodland and forest	Woodland and forest	Ancient woodland site, Semi-natural woodland
Woodland and forest	Woodland and forest	Ancient woodland site, Semi-natural woodland, Wet
Woodland and forest	Woodland and forest	Coppice
Woodland and forest	Woodland and forest	No secondary code assigned
Woodland and forest	Woodland and forest	Plantation
Woodland and forest	Woodland and forest	Planted woodland

Associated data file	Value/Class name
Ecological_Network_Woodland_SS_Core.gpkg	CLASS – Core: hex colour: #000000 CLASS – Stepping stone: hex colour: #ff7f00
Ecological_Network_Woodland.gpkg	Range: 0 – High: dark green 3000 – Low: light green

Heathland network

Connectivity was modelled using a cost-distance approach. All classes within the HAR were classified as either core type habitats (where species associated with the network type are natively found) or other habitat type. Larger blocks of core habitats are more resilient and therefore retained as the 'core' class, whilst smaller areas were reclassified as 'stepping stones', i.e. areas that a species might use transiently while passing through, but would not choose to nest there. All habitats (core, stepping stone and 'other') were additionally assessed for movement cost; a value expressing how difficult it is for a species associated with the network to move through this non-core habitat. Core type habitats have an associated movement cost of 0 – the species are at home in these patches. The cost increases the harder a habitat is to transverse, with intensive agricultural land-use, waterbodies, or urban areas
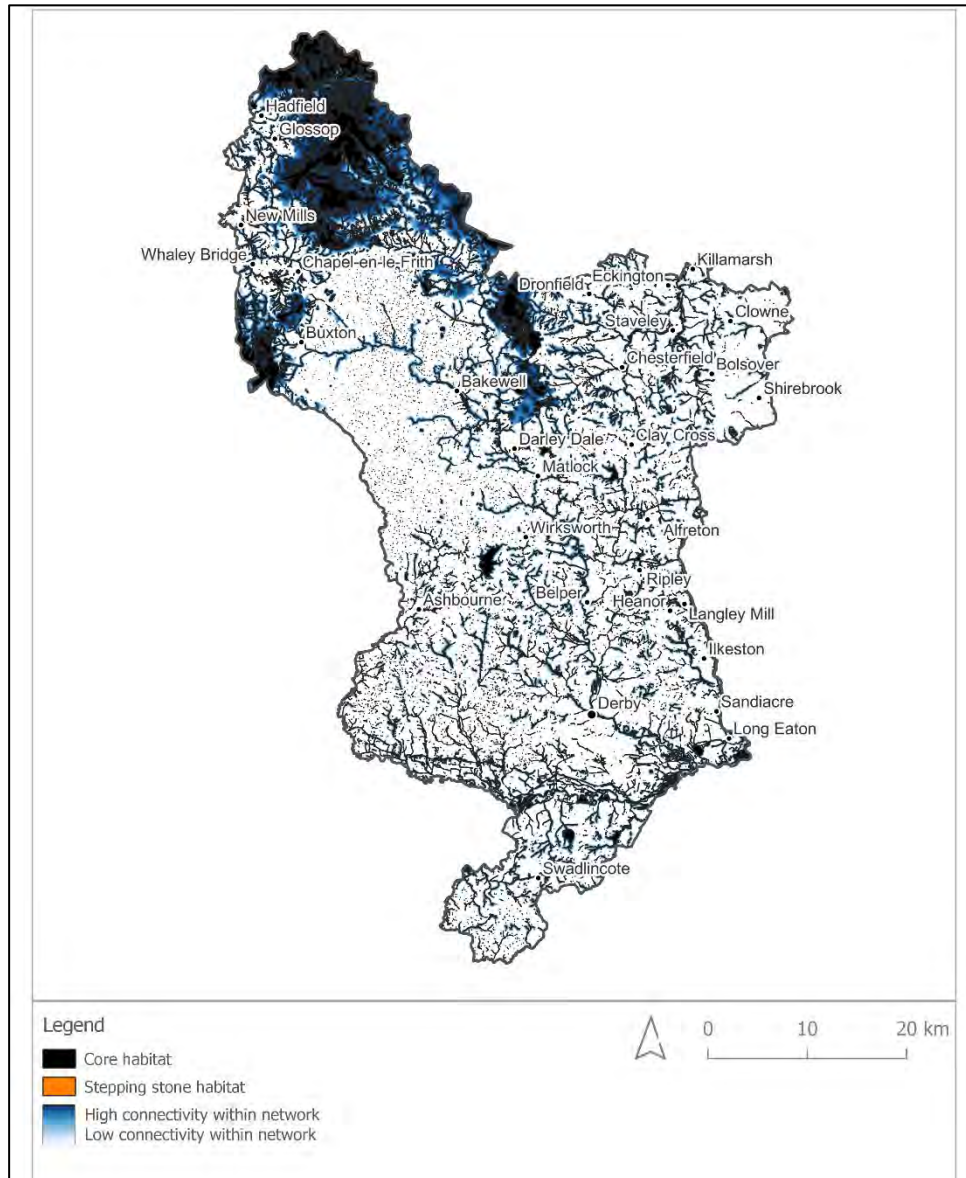
normally having the highest cost values. For this habitat type 'core' habitats were considered as areas of minimum 0.25ha size, while stepping stone habitats were of the same habitat type, but found in smaller patch sizes. A cut-off value was identified to determine the final extent of the network, in consultation with Derbyshire County Council, Peak District National Park Authority and Derbyshire Wildlife Trust. The table below identifies the HAR habitat types considered 'core' or 'stepping stone' for this habitat network.

UKHAB_L2	UKHAB_LD	UKHABSEC
Heathland and shrub	Dwarf shrub heath	No secondary code assigned
Heathland and shrub	Dwarf shrub heath	Scattered grass
Heathland and shrub	Dwarf shrub heath	Wet
Heathland and shrub	Lowland heathland	No secondary code assigned
Heathland and shrub	Upland heathland	Acidic substrate
Heathland and shrub	Upland heathland	Base-rich substrate
Heathland and shrub	Upland heathland	No secondary code assigned
Heathland and shrub	Upland heathland	Scattered grass
Heathland and shrub	Upland Heathland	Wet, Base-rich substrate

Associated data file	Value/Class name
Ecological_Network_Heathland_SS_Core.gpkg	CLASS – Core: hex colour: #000000 CLASS – Stepping stone: hex colour: #032cfc
Ecological_Network_Heathland.gpkg	Range: 0 – High: dark pink 8200 – Low: light pink

Wetland network

Connectivity was modelled using a cost-distance approach. All classes within the HAR were classified as either core type habitats (where species associated with the network type are natively found) or other habitat type. Larger blocks of core habitats are more resilient and therefore retained as the 'core' class, whilst smaller areas were reclassified as 'stepping stones', i.e. areas that a species might use transiently while passing through, but would not choose to nest there. All habitats (core, stepping stone and 'other') were additionally assessed for movement cost; a value expressing how difficult it is for a species associated with the network to move through this non-core habitat. Core type habitats have an associated movement cost of 0 – the species are at home in these patches. The cost increases the harder a habitat is to transverse, with intensive agricultural land-use, waterbodies, or urban areas normally having the highest cost values. For this habitat type 'core' habitats were considered as areas of minimum 0.2ha size, while stepping stone habitats were of the same habitat type, but found in smaller patch sizes. A cut-off value was identified to determine the final extent of the network, in consultation with Derbyshire County Council, Peak District National Park

Authority and Derbyshire Wildlife Trust. The table below identifies the HAR habitat types considered 'core' or 'stepping stone' for this habitat network.

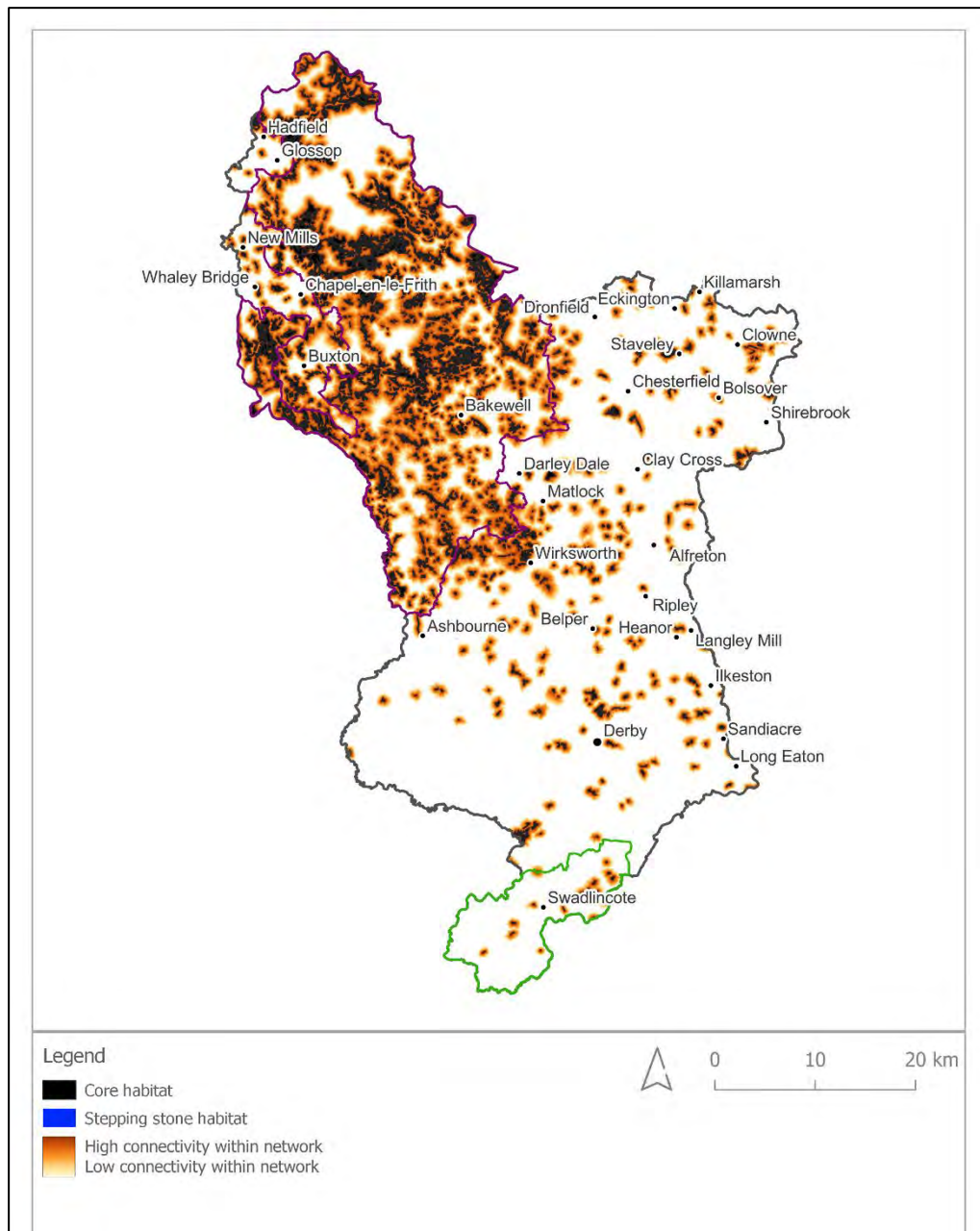| UKHAB_L2	UKHAB_LD	UKHABSEC
Rivers and lakes	Canals	No secondary code assigned
Rivers and lakes	Oligotrophic and dystrophic lakes	No secondary code assigned
Rivers and lakes	Rivers and lakes	No secondary code assigned
Rivers and lakes	Rivers and lakes	Ponds
Rivers and lakes	Rivers and streams	No secondary code assigned
Rivers and lakes	Standing open water and canals	Freshwater - man-made
Rivers and lakes	Standing open water and canals	No secondary code assigned
Wetland	Blanket bog	No secondary code assigned
Wetland	Blanket bog	Wet
Wetland	Blanket bog (H7130)	No secondary code assigned
Wetland	Bog	Bare ground, Peat
Wetland	Bog	Dry
Wetland	Bog	No secondary code assigned
Wetland	Bog	Wet
Wetland	Degraded blanket bog	No secondary code assigned
Wetland	Fen marsh and swamp	Flush
Wetland	Fen marsh and swamp	Flush, Base-rich substrate
Wetland	Fen marsh and swamp	No secondary code assigned
Wetland	Lowland fens	Tall herb
Wetland	Purple moor grass and rush pastures	No secondary code assigned
Wetland	Reedbeds	No secondary code assigned
Wetland	Transition mires and quaking bogs; lowland (H7140)	No secondary code assigned
Wetland	Upland flushes, fens and swamps	No secondary code assigned
Wetland	Wetland	No secondary code assigned
Wetland	Wetland	Peat
Woodland and forest	Wet woodland	No secondary code assigned
Woodland and forest	Wet woodland	Secondary woodland

Woodland and forest	Wet woodland	Semi-natural woodland

Associated data files	Value/Class name
Ecological_Network_Wetland_SS_Core.gpkg	CLASS – Core: hex colour: #000000 CLASS – Stepping stone: hex colour: #ff7f00
Ecological_Network_Wetland.gpkg	Range: 0 – High: dark blue 3000 – Low: light blue

Grassland network

Connectivity was modelled using a cost-distance approach. All classes within the HAR were classified as either core type habitats (where species associated with the network type are natively found) or other habitat type. Larger blocks of core habitats are more resilient and therefore **retained as the 'core' class**, whilst smaller areas were reclassified as 'stepping stones', i.e. areas that a species might use transiently while passing through, but would not choose to nest there. All habitats **(core, stepping stone and 'other') were** additionally assessed for movement cost; a value expressing how difficult it is for a species associated with the network to move through this non-core habitat. Core type habitats have an associated movement cost of 0 – the species are at home in these patches. The cost increases the harder a habitat is to transverse, with intensive agricultural land-use, waterbodies, or urban areas **normally having the highest cost values. For this habitat type 'core' habitats were considered** as areas of minimum 0.25ha size, while stepping stone habitats were of the same habitat type, but found in smaller patch sizes. A cut-off value was identified to determine the final extent of the network, in consultation with Derbyshire County Council, Peak District National Park Authority and Derbyshire Wildlife Trust. The table below identifies the HAR habitat types **considered 'core'** or **'stepping stone' for this habitat network.** Additionally, Derbyshire Wildlife Trust data mapping Open Mosaic Habitats were incorporated into the grassland network as core or stepping stone habitats, depending on the habitat patch size.

| UKHAB_L2	UKHAB_LD	UKHABSEC
Grassland	Acid grassland	Calcareous - acidic mosaic, Sward type mosaic
Grassland	Acid grassland	Grazed
Grassland	Acid grassland	No secondary code assigned
Grassland	Acid grassland	Scattered bracken
Grassland	Acid grassland	Scattered dwarf shrubs
Grassland	Acid grassland	Tall or tussocky sward
Grassland	Calcareous grassland	No secondary code assigned
Grassland	Grassland	Calcareous - acidic mosaic, Sward type mosaic
Grassland	Lowland calcareous grassland	No secondary code assigned
Grassland	Lowland dry acid grassland	No secondary code assigned
Grassland	Lowland dry acid grassland	Scattered dwarf shrubs
Grassland	Lowland hay meadows (H6510)	No secondary code assigned
Grassland	Lowland meadows	No secondary code assigned
Grassland	Neutral grassland	No secondary code assigned
Grassland	Neutral grassland	Scattered scrub
Grassland	Neutral grassland	Tall or tussocky sward
Grassland	Neutral grassland	Wet

Grassland	Upland calcareous grassland	No secondary code assigned
Wetland	Purple moor grass and rush pastures	No secondary code assigned

| Associated data files	Value/Class name
Ecological_Network_Grassland_SS_Core.gpkg	CLASS – Core: hex colour: #000000 CLASS – Stepping stone: hex colour: #032cfc
Ecological_Network_Grassland.gpkg	Range: 0 – High Connectivity: hex: #993404 8200 – Low Connectivity: hex: #ffffd4

Agricultural Land Classification
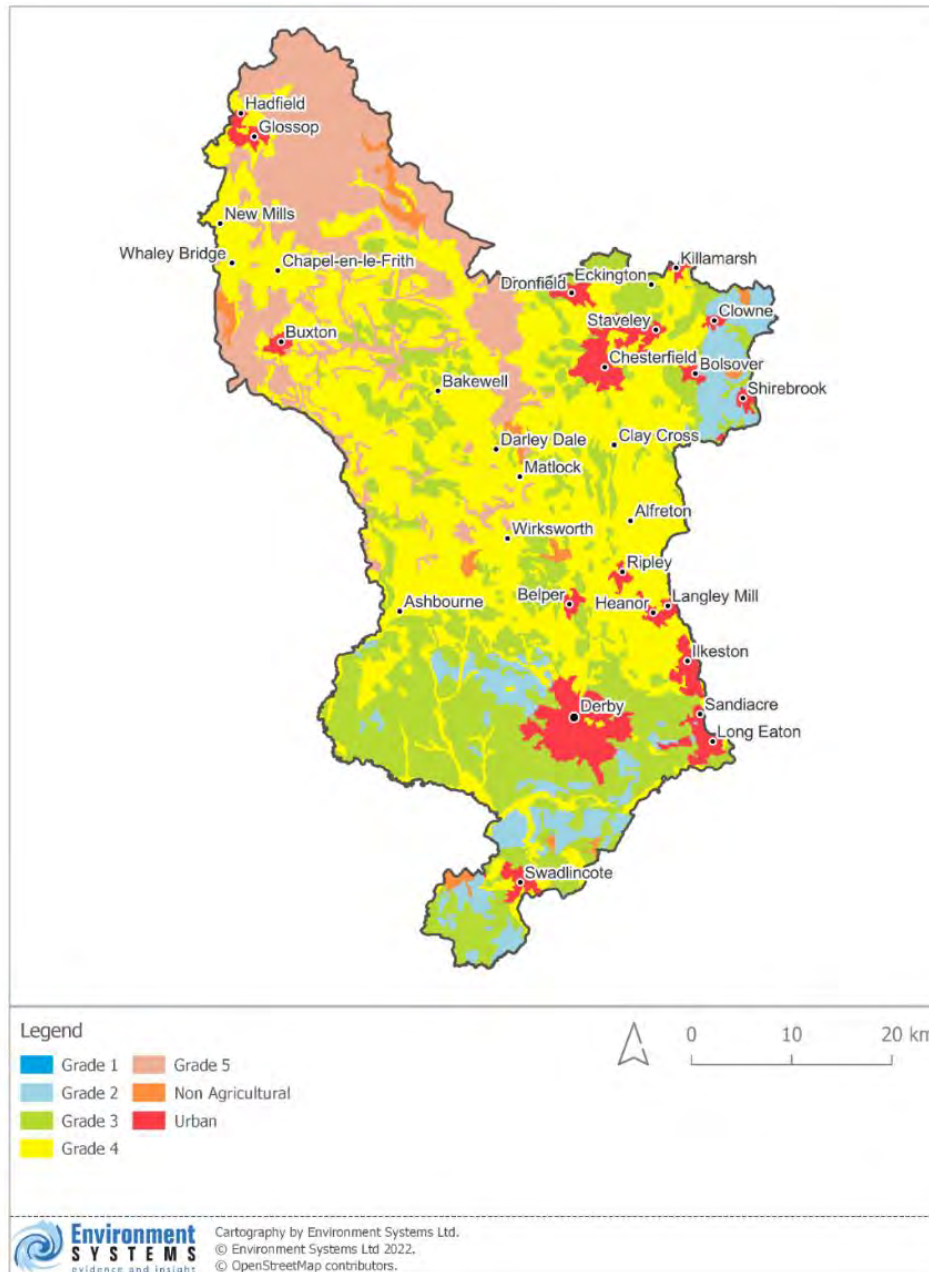
This map shows the current agricultural capability of the land according to the Agricultural Land Classification, where Grade 1 is the best and most versatile land for agriculture, where there are few limitations to cultivation and good yields can be expected, and Grade 5 is the least productive land where there are greater challenges to cultivation. The ALC considers factors such as soil depth, stoniness, wetness, drought susceptibility, steepness of slope, and climate.

Agricultural production: current provision (stock)
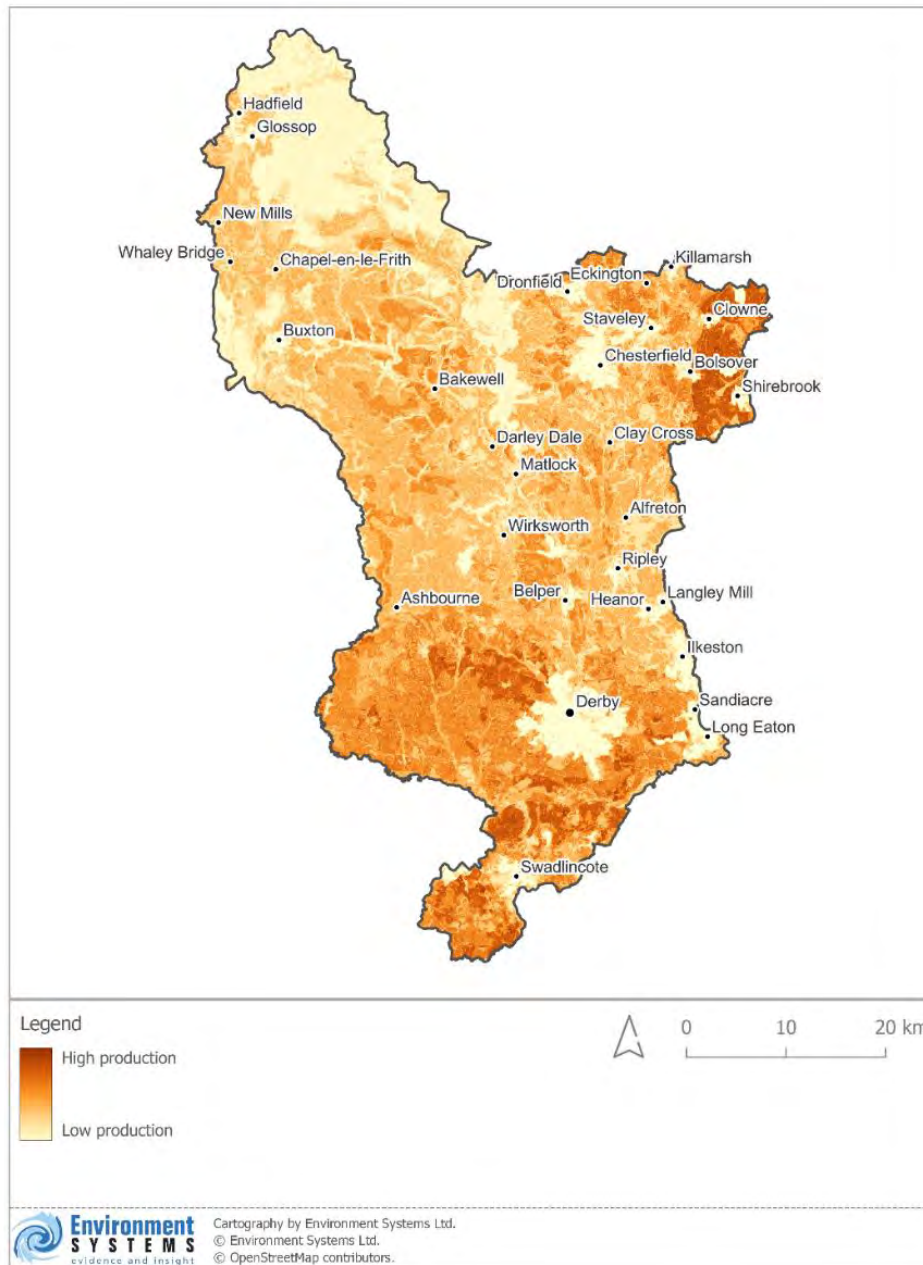
This map shows the relative level of agricultural provision based on habitat, soil type and slope.

| Data input	Reason for usage	Indicative scoring
Habitat Asset Register	This was used as the base dataset; relative agricultural productivity was assessed for each habitat type	Cereal crops: high productivity Coastal and floodplain grazing marsh: moderate productivity Blanket bog: low productivity
Selection of agricultural polygons from the HAR,	The CROME data models the extent of specific crops, providing a greater level of detail as to	Soya, potato: high

attributed with the dominant CROME crop class	relative productivity; this dataset was used to amend the HAR productivity scores.	Winter oilseed: moderate Perennial Crops and Isolated Trees: low
Agricultural Land Classification	This dataset classifies the relative quality of the soil, topography and climate for agriculture; higher yields (greater agricultural productivity) are achieved from the better quality land	Grade 2 land: high productivity Grade 3 land: moderate productivity Grade 5 land: low productivity
Slope (derivative of 5m DEM)	Steep slopes are harder to work; the 5m resolution DEM allows much more detailed consideration of this factor than could be achieved by using the ALC data alone	Slopes of 7-11 degrees: reduce productivity by 10% Slopes of 11 - 18 degrees: reduce productivity by 25% Slopes greater than 40 degrees: reduce productivity by 40%

Associated data file	Value/Class name
Agricultural_Production_Current_Provision.gpkg	Range: 160 – High production: hex: #993404 0 – Low Production: hex: #ffffd4

## Risks to agricultural production: potential conflicts with woodland objectives
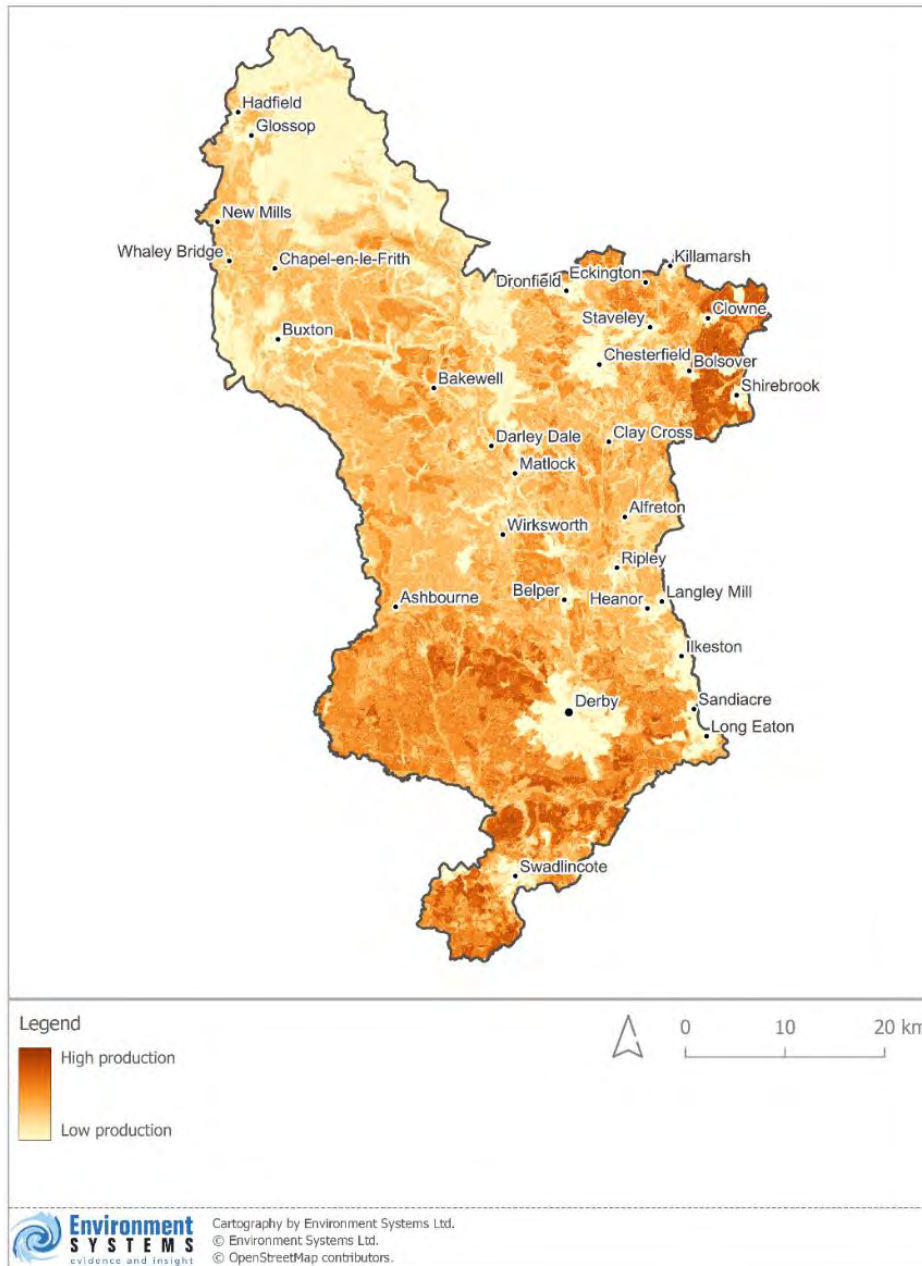
This map shows areas of opportunity for planting woodland (as shown in the map of woodland opportunities for biodiversity) that are located on the best quality agricultural land (ALC Grade 2 and Grade 3 land), located on agricultural areas extracted from the HAR.

Associated data file	Value/Class name
Agricultural_Production_Woodland_Risk.gpkg	1 - Within network: hex colour: #33a02c
	10 - Outside network: hex colour: #ff7f00

Risks to agricultural production: ground-mounted solar PV
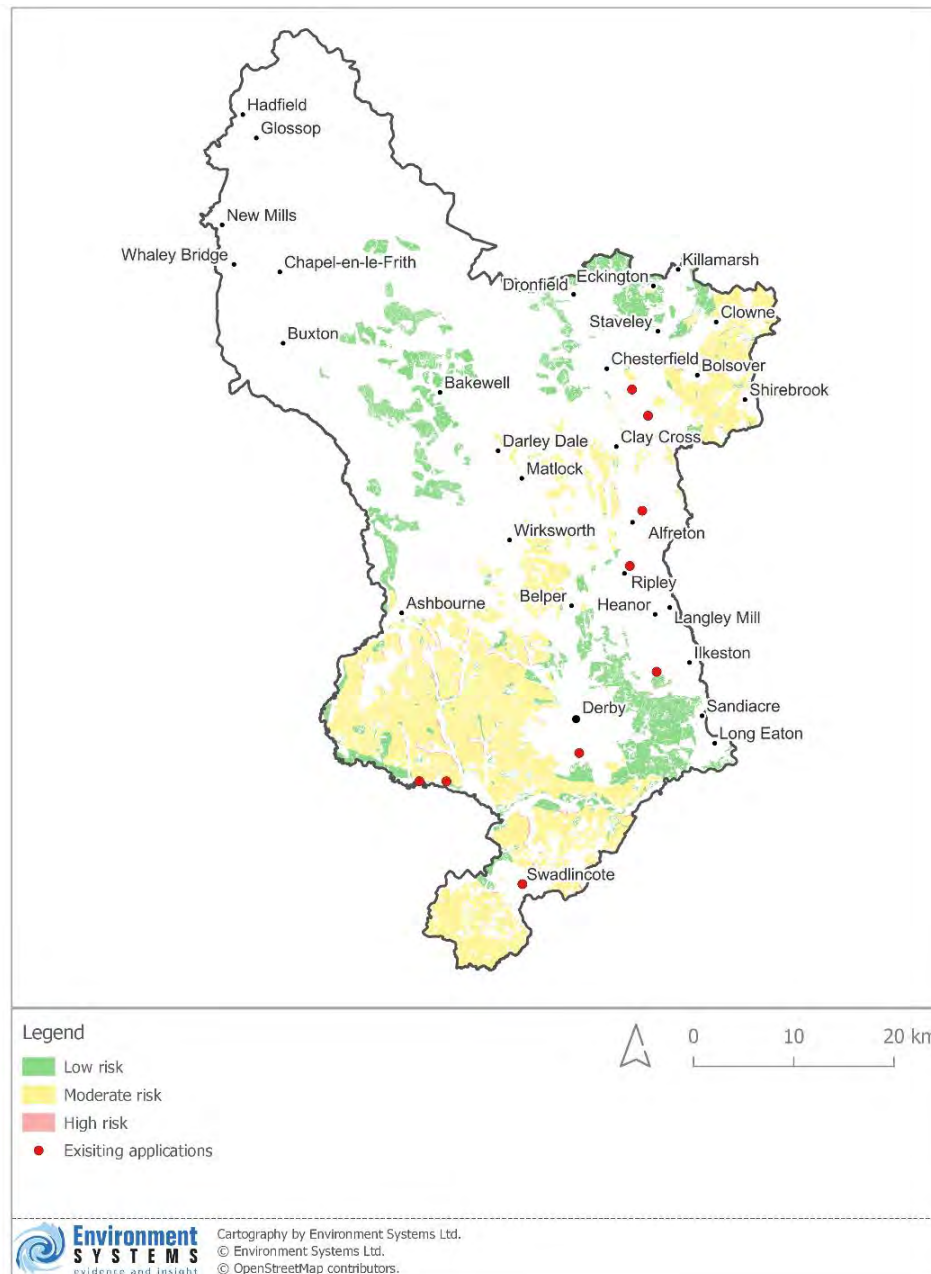
This map shows the modelled locations of ground-mounted solar PV opportunities as derived by georeferencing and manual digitisation of data presented in the Derbyshire Spatial Energy Study (Scene Connect 2022), and intersecting this with Grade 2 and 3 agricultural land (as derived from ALC data and the Derbyshire habitat map) so that only these higher land quality areas are shown. The Spatial Energy Study considered landscape character as an underpinning constraint. Nationally and internationally-designated protected sites were removed from the area, as it was deemed that these sites would not be at risk of development for renewables. Risk categories were assigned according to the level of constraint attributed to the area within the Study, as shown in the table below.

Level of constraint (Derbyshire Spatial Energy Study)	Map risk class
More constrained	Low risk
Constrained	Moderate risk
Less constrained	High risk

The map has been overlain by current and proposed medium, large and very large solar energy applications (>1MW) listed in the Renewable Energy Planning Database for July 2022 (Department for Business, Energy & Industrial Strategy, 2022).

| Associated data file	Value/Class name
Agricultural_Production_Solar_Sites.gpkg	Whole dataset: Existing applications hex colour: #e31a1c
Agricultural_Production_Solar_Energy_Risk.gpkg	Type: More Constrained - Low risk: hex colour: #8ed88a Type: Constrained - Moderate risk: hex colour: #fdf595 Type: Less Constrained - High risk: hex colour: #f9aead

References:
Department for Business, Energy & Industrial Strategy, 2022. Renewable Energy Planning Database for July 2022. https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract [Accessed 2022-08-15]

Scene Connect (2022) Derbyshire Spatial Energy Study. Evidence base for policy makers. Derbyshire County Council

Risks to agricultural production: small wind
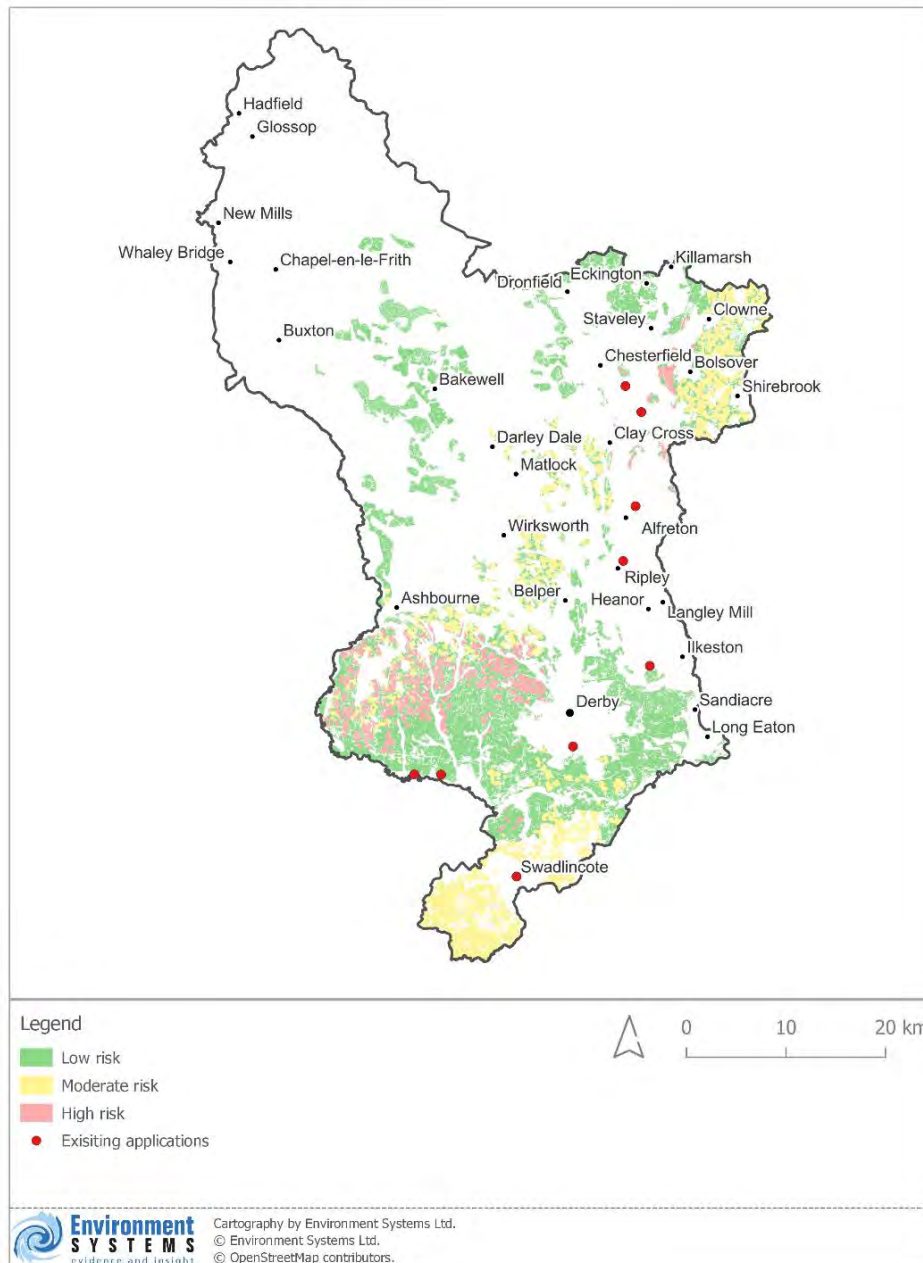
This map shows the modelled locations of small-scale (15-50m) wind development opportunities (>1MW) as derived by georeferencing and manual digitisation of data presented in the Derbyshire Spatial Energy Study (Scene Connect 2022), and intersecting this with Grade 2 and 3 agricultural land so that only these higher land quality areas are shown. The Spatial Energy Study considered agricultural land grade, National Park and National Forest areas as underpinning constraints. Nationally and internationally-designated protected sites were removed from the area, as it was deemed that these sites would not be at risk of development for renewables. Risk categories were assigned according to the level of constraint attributed to the area within the Study, as shown in the table below.

Level of constraint (Derbyshire Spatial Energy Study)	Map risk class
More constrained	Low risk
Constrained	Moderate risk
Less constrained	High risk

The map has been overlain by current and proposed solar energy applications (>1MW) listed in the Renewable Energy Planning Database for July 2022 (Department for Business, Energy & Industrial Strategy, 2022).

| Associated data file	Value/Class name
Agricultural_Production_Small_Wind_Risk.gpkg	Type: More Constrained - Low risk: hex colour: #8ed88a
	Type: Constrained - Moderate risk: hex colour: #fdf595

References:

Department for Business, Energy & Industrial Strategy, 2022. Renewable Energy Planning Database for July 2022. https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract [Accessed 2022-08-15]

Scene Connect (2022) Derbyshire Spatial Energy Study. Evidence base for policy makers. Derbyshire County Council

Risks to agricultural production: large wind
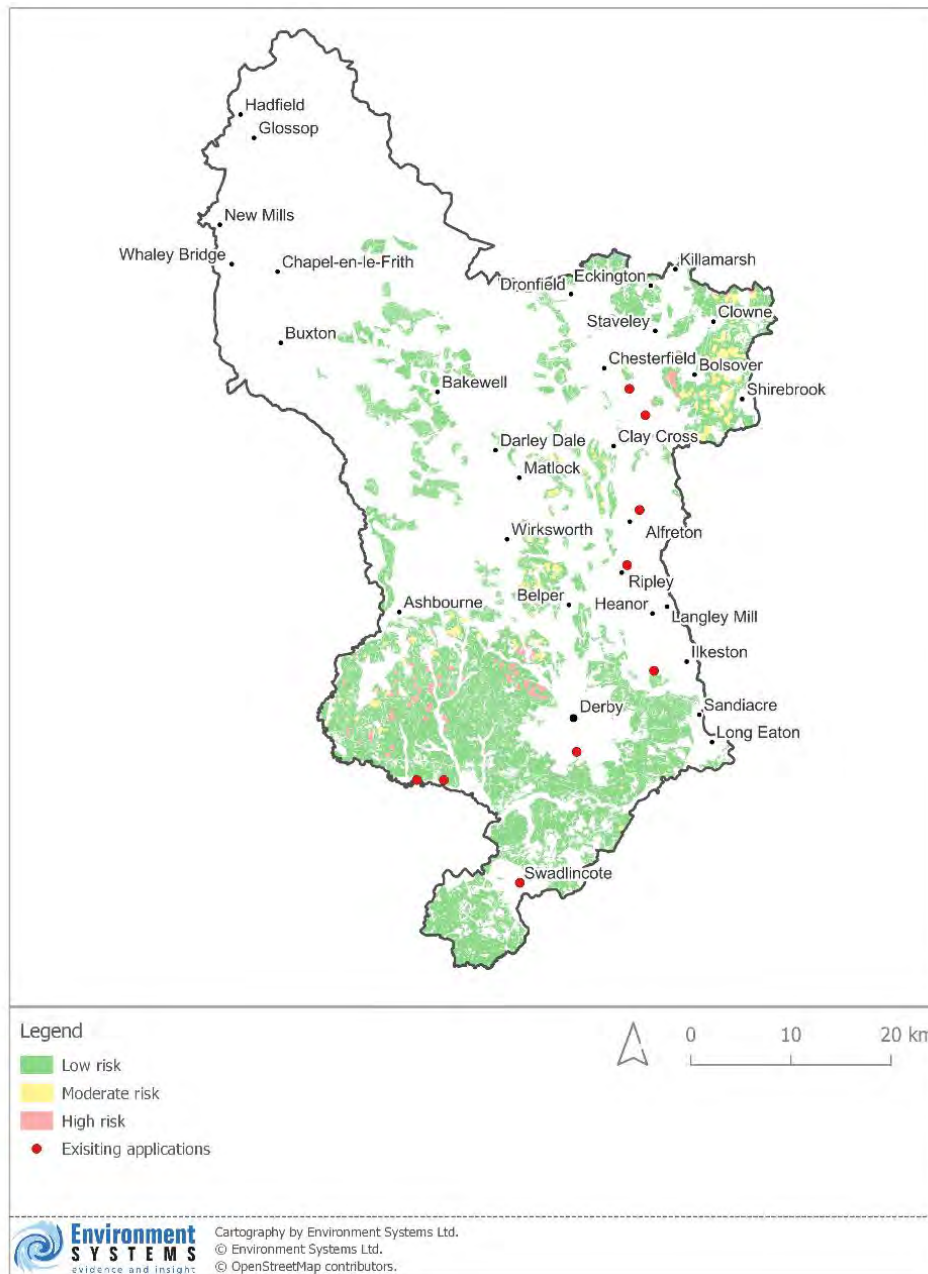
This map shows the modelled locations of large-scale (>50m) wind development opportunities (>1MW) as derived by georeferencing and manual digitisation of data presented in the Derbyshire Spatial Energy Study (Scene Connect 2022), and intersecting this with Grade 2 and 3 agricultural land so that only these higher land quality areas are shown. The Spatial Energy Study considered landscape character as an underpinning constraint. Nationally and internationally-designated protected sites were removed from the area, as it was deemed that these sites would not be at risk of development for renewables. Risk categories were assigned according to the level of constraint attributed to the area within the Study, as shown in the table below.

Level of constraint (Derbyshire Spatial Energy Study)	Map risk class
More constrained	Low risk
Constrained	Moderate risk
Less constrained	High risk

The map has been overlain by current and proposed wind energy applications (>1MW) listed in the Renewable Energy Planning Database for July 2022 (Department for Business, Energy & Industrial Strategy, 2022).

| Associated data files	Value/Class name
Agricultural_Production_Large_Wind_Risk.gpkg	Type: More Constrained - Low risk: hex colour: #8ed88a Type: Constrained - Moderate risk: hex colour: #fdf595 Type: Less Constrained - High risk: hex colour: #f9aead

References:

Department for Business, Energy & Industrial Strategy, 2022. Renewable Energy Planning Database for July 2022. https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract [Accessed 2022-08-15]

Scene Connect (2022) Derbyshire Spatial Energy Study. Evidence base for policy makers. Derbyshire County Council

Biodiversity: current provision (stock)
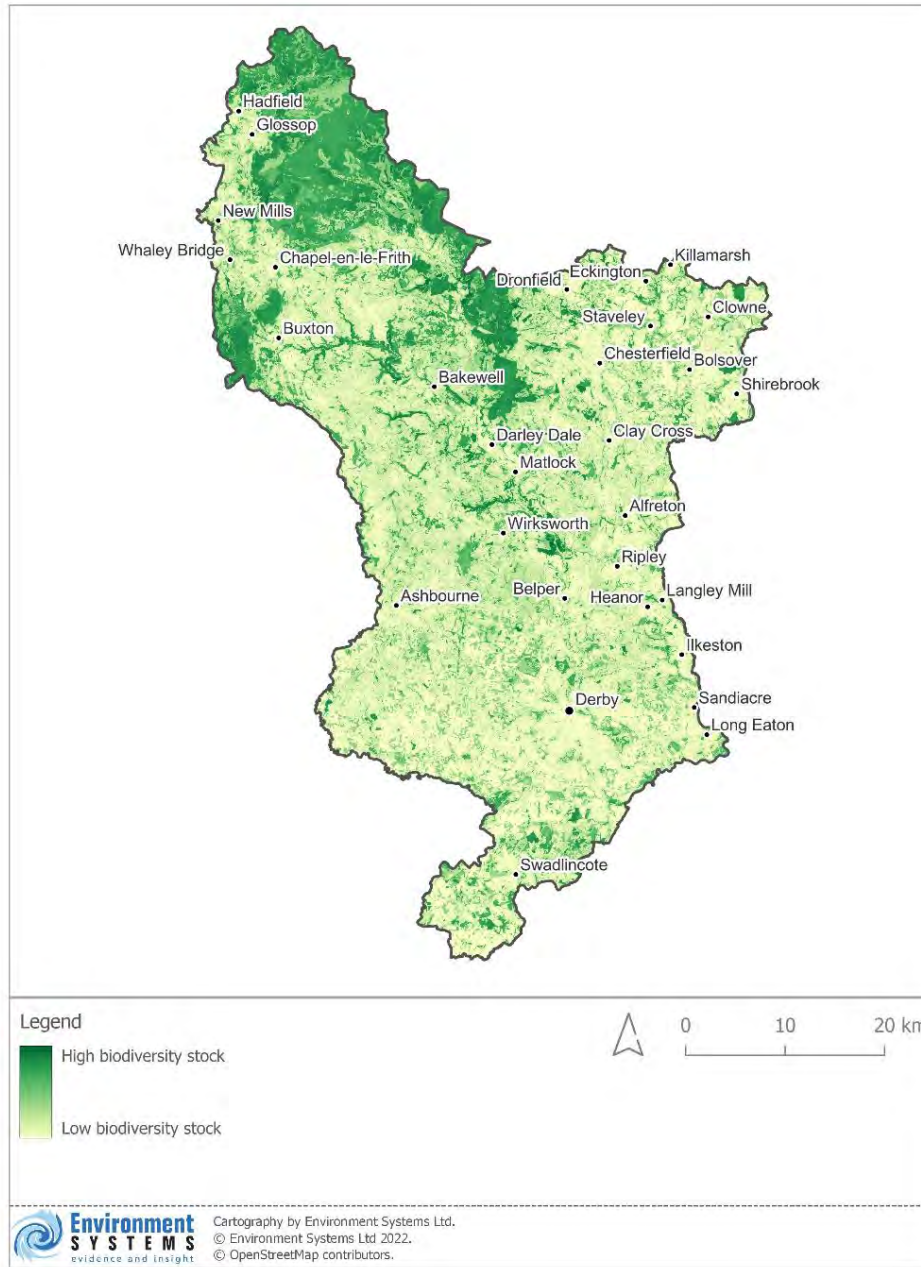
This map shows the current relative levels of biodiversity across Derbyshire, on a scale of low to high.

| Data input	Reason for usage	Indicative scoring
Habitat Asset Register	Base dataset used to assess the biodiversity of individual habitat patches	• Native woodland: high biodiversity value • Intensively managed grassland: low biodiversity value

Ancient Woodland Inventory and DWT Ancient Woodland data	Overlay with HAR to ensure maximum biodiversity value for the habitat type was applied	• Habitat is ancient woodland: assign maximum woodland biodiversity value
DWT open mosaic habitats	Overlay with HAR to ensure maximum biodiversity value for the habitat type was applied	• Habitat is open mosaic habitat: apply minimum value threshold, to ensure OMH areas are assigned a high biodiversity value.
Rasterised DWT species data: bat roosts; GCN; notable invertebrate ponds; otter; water vole; while-clawed crayfish.	Overlay with HAR to increase the biodiversity value of the pixel	• Notable species present; increase biodiversity value of the pixel
Grassland, Heathland, Wetland and Woodland ecological networks	Overlay each individual network with the HAR to increase the biodiversity value of the areas within the ecological networks. Areas that are part of multiple networks will have the largest increase in value.	• Habitat is core habitat: largest increase in biodiversity value • Habitat is stepping stone habitat: moderate increase in biodiversity value • Habitat is part of the wider network (not core or stepping stone): slight increase in biodiversity value • Habitat is not part of the ecological network: no increase in biodiversity value

Associated data file	Value/Class name
Biodiversity_Stock.gpkg	Range: 0 – Low biodiversity stock: hex: #ffffcc 190 – High biodiversity stock: hex: #006837

## Biodiversity hotspots / coldspots
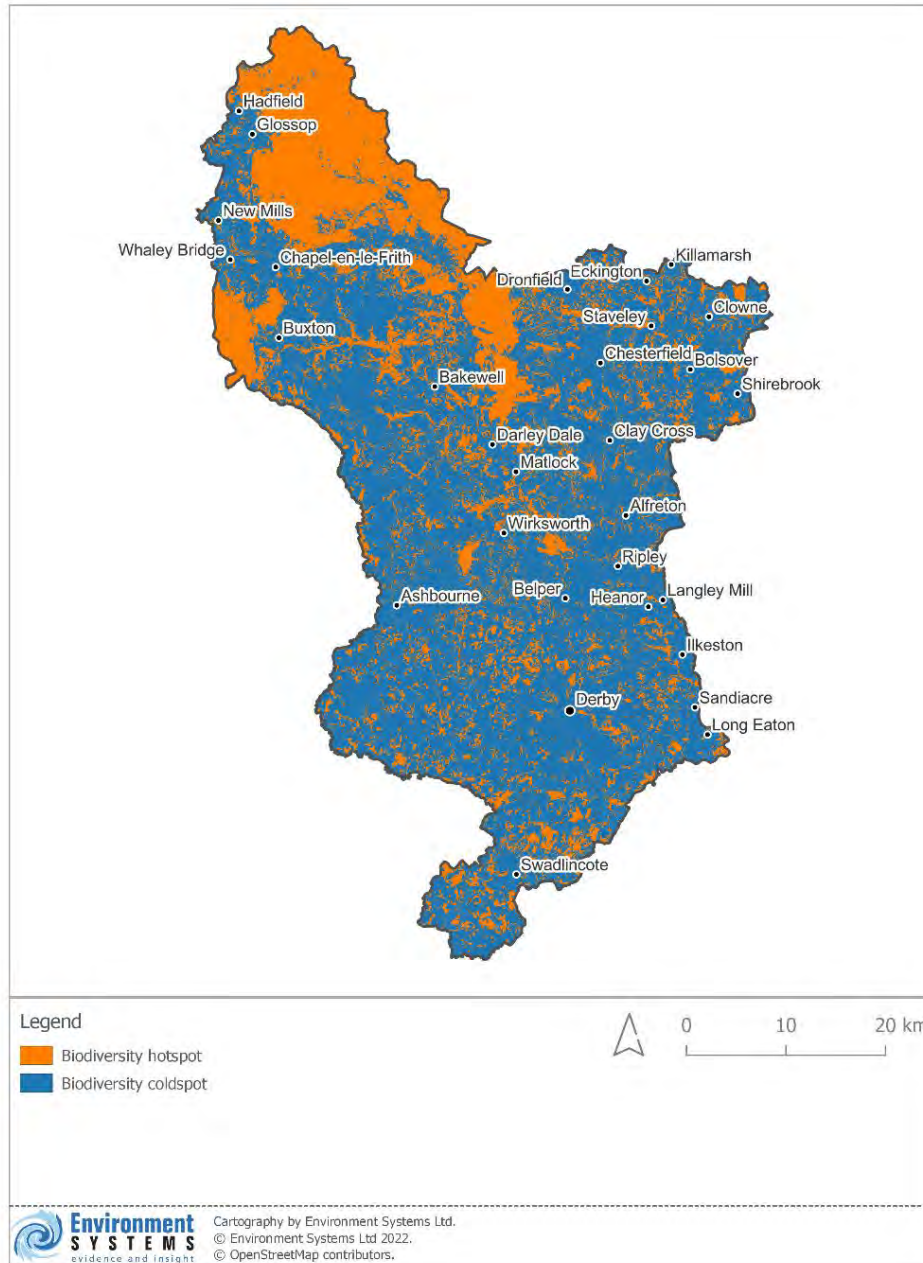
This map has been created from the biodiversity current provision (stock) map; it highlights the areas of highest biodiversity as 'hotspots' and areas of lower biodiversity as 'coldspots'.

Filename	Value/Class name
Biodiversity_Hotspots.gpkg	1 – Biodiversity Hotspot: hex: #ff7f00
	2 – Biodiversity Coldspot: hex: #1f78b4

Opportunities for establishing species-rich grassland
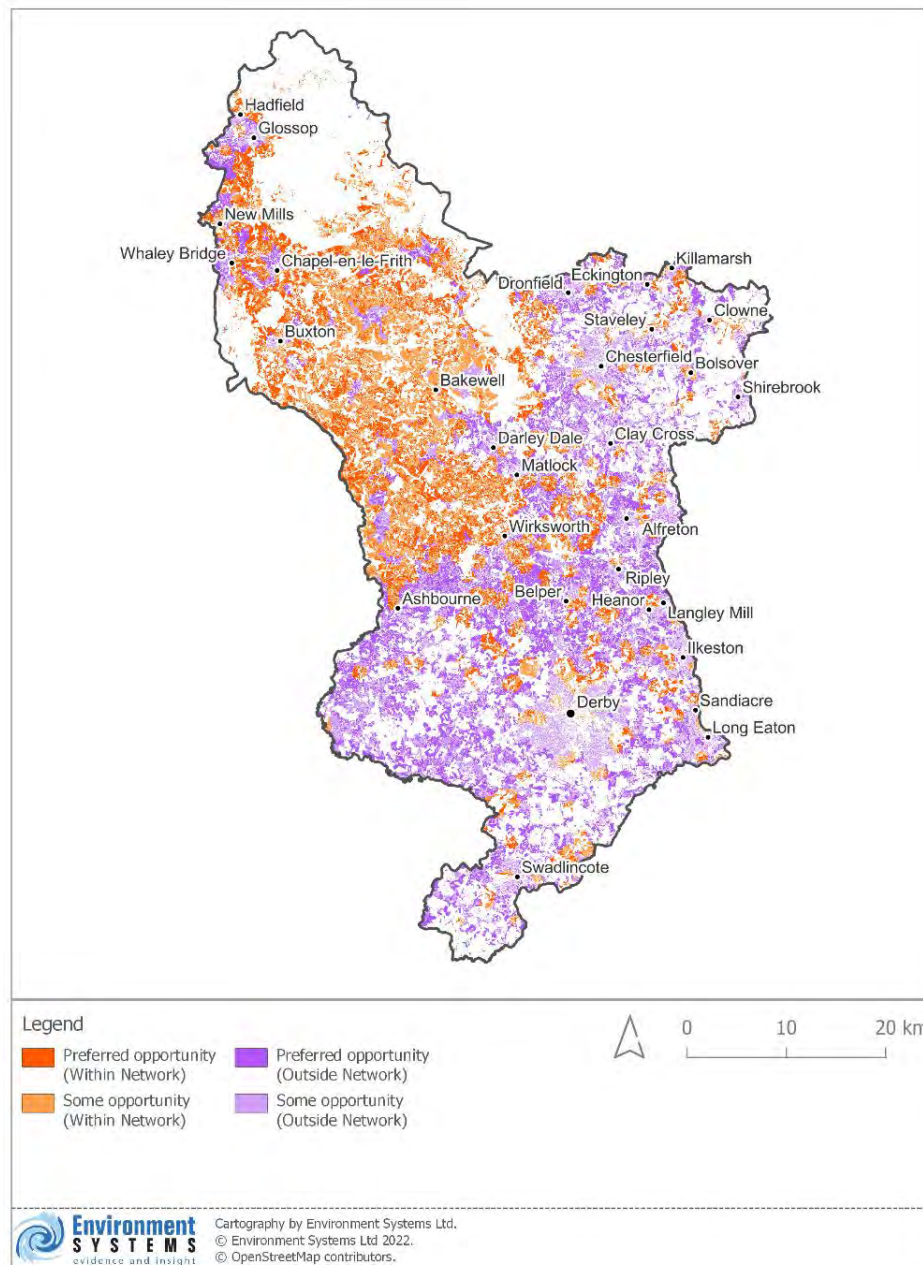
This map shows areas of opportunity for creating grassland habitat, based on the Habitat Asset Register. The opportunities are classified as 'preferred' opportunities if the existing habitat could be readily converted to a high biodiversity value grassland, and 'some opportunity' if the existing habitat would be more difficult, or take longer to convert to species rich grassland. The opportunities are also classified according to whether they lie within the grassland ecological network, or outside the network. HAR habitat classes identified as opportunities for establishing this habitat type are shown in the table below.

UKHAB_L2	UKHAB_LD	UKHABSEC	Opportunity type

Grassland	Bracken	No secondary code assigned	Preferred opportunity
Grassland	Grassland	Bare ground	Preferred opportunity
Grassland	Grassland	Coastal and floodplain grazing marsh	Preferred opportunity
Grassland	Grassland	No secondary code assigned	Preferred opportunity
Grassland	Grassland	Ruderal/ ephemeral	Preferred opportunity
Grassland	Grassland	Seasonally wet, Wet, Waterlogged	Preferred opportunity
Grassland	Grassland	Tall herb	Preferred opportunity
Grassland	Neutral grassland	Pasture or meadow	Preferred opportunity
Grassland	Other neutral grassland	No secondary code assigned	Preferred opportunity
Grassland	Temporary grass and clover leys	Less intensively managed	Preferred opportunity
Sparsely vegetated land	Sparsely vegetated land	Bare ground	Preferred opportunity
Sparsely vegetated land	Sparsely vegetated land	No secondary code assigned	Preferred opportunity
Urban	Artificial unvegetated, unsealed surface	No secondary code assigned	Preferred opportunity
Urban	Urban	Bare ground	Preferred opportunity
Urban	Urban	Natural and semi-natural open space	Preferred opportunity
Grassland	Grassland	Cemeteries	Some opportunity
Grassland	Grassland	Wood-pasture and parkland	Some opportunity
Grassland	Modified grassland	Frequently mown, Introduced shrub	Some opportunity
Grassland	Modified grassland	No secondary code assigned	Some opportunity
Grassland	Temporary grass and clover leys	Intensively managed	Some opportunity
Heathland and shrub	Dense scrub	No secondary code assigned	Some opportunity
Urban	Built-up areas and gardens	Road island/verge	Some opportunity
Urban	Urban	Parks and gardens	Some opportunity

| Associated data file	Value/Class name

	2 - Preferred opportunity (Outside Network): hex colour: #b059f7
	11 - Preferred opportunity (Within Network): hex colour: #ff5a00
Biodiversity_Grassland_Opportunities.gpkg	210 - Some opportunity (Within Network): hex colour: #ffa04c
	400 - Some opportunity (Outside Network): hex colour: #cfa0f8

Grassland opportunities located within Natural England grassland NRNs
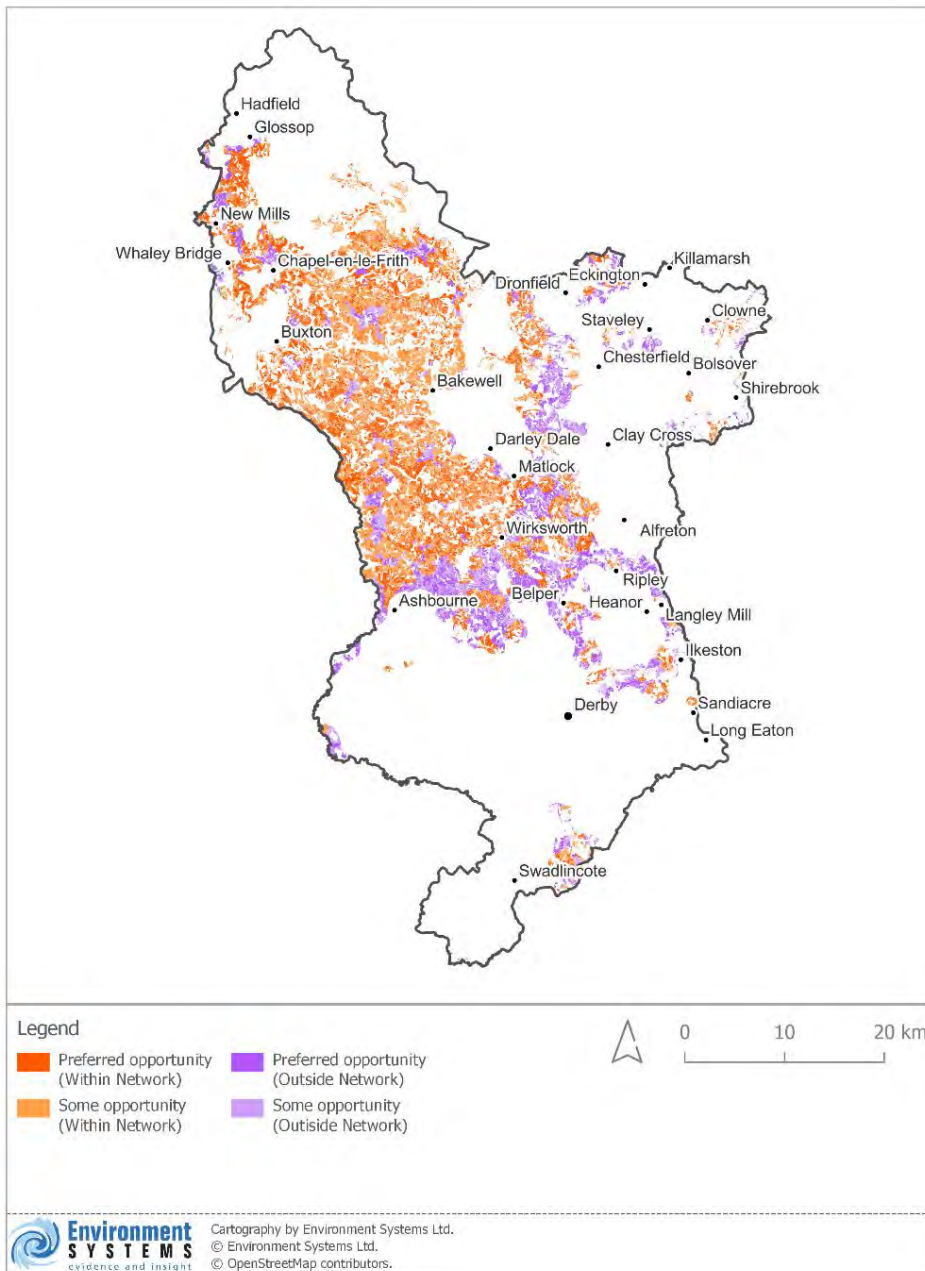
This map was created by intersecting the opportunities for establishing species-rich grassland that lie within the ecological network, with processed Natural England Nature Recovery Network (NRN) data.

The following processing was undertaken to the NRN data prior to intersecting with the biodiversity opportunities:

NRN data for the following habitats were merged to make a single NRN dataset for grasslands, clipped to the Derbyshire boundary:

- Lowland Calcareous Grassland
- Lowland Dry Acid Grassland
- Lowland Meadows
- Upland Calcareous Grassland
- Upland Hay Meadows

Within the merged NRN data any areas that contained areas of Primary Habitat or Associated Habitat (of any grassland habitat type) were removed, so that the remaining areas to be intersected with the biodiversity opportunity data consisted of areas that were part of the wider NRN network, comprising the following classes:

- Restorable Habitat
- Fragmentation Action Zone
- Network Enhancement Zone 1
- Network Enhancement Zone 2
- Network Expansion Zone

Associated data file	Value/Class name
Biodiversity_Grassland_Opportunities_in_NRN.gpkg	DN: 2 - Preferred opportunity: hex colour: #b059f8 DN: 11 - Preferred opportunity: hex colour: #ff5a00 DN: 210 - Some opportunity: hex colour: #ffa04c DN: 400 - Some opportunity: hex colour: #cfa0f8

Opportunities for establishing heathland
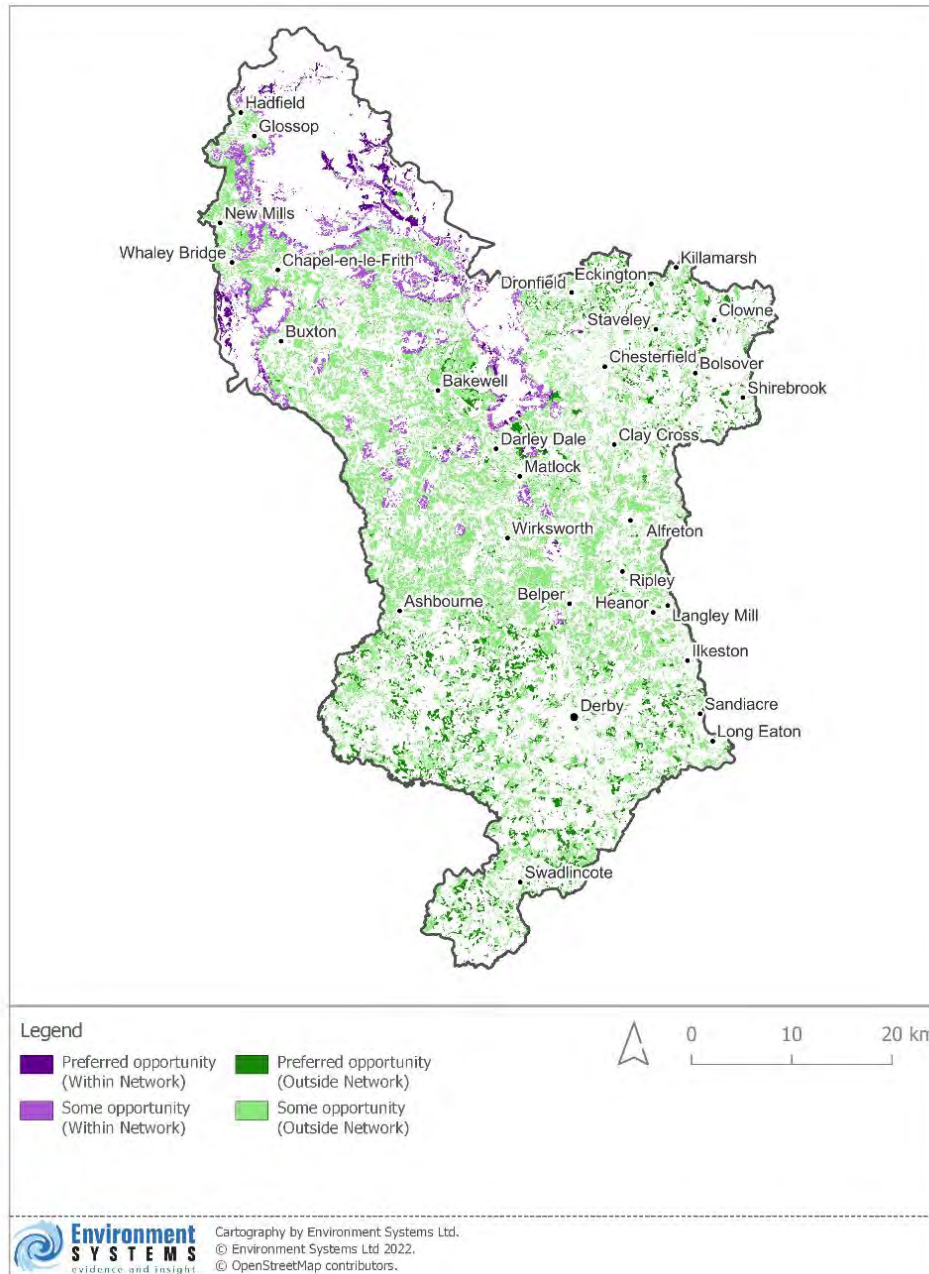
This map shows areas of opportunity for creating heathland habitat, based on the Habitat Asset Register. The opportunities are classified as 'preferred' opportunities if the existing habitat could be readily converted to heathland, and 'some opportunity' if the existing habitat would be more difficult, or take longer to convert to heathland. The opportunities are also classified according to whether they lie within the heathland ecological network, or outside the network. Areas outside the network are likely to be extremely difficult to establish new heathland due to a deficiency in soil mycorrhiza; locations on coniferous woodland may be an exception to this. HAR habitat classes identified as opportunities for establishing this habitat type are shown in the table below.

| UKHAB_L2	UKHAB_LD	UKHABSEC	Opportunity type
Grassland	Bracken	No secondary code assigned	Preferred opportunity
Grassland	Neutral grassland	Pasture or meadow	Preferred opportunity
Grassland	Other neutral grassland	No secondary code assigned	Preferred opportunity
Heathland and shrub	Dense scrub	No secondary code assigned	Preferred opportunity
Heathland and shrub	Heathland and shrub	Scattered scrub	Preferred opportunity
Woodland and forest	Broadleaved mixed and yew woodland	Felled	Preferred opportunity
Woodland and forest	Broadleaved mixed and yew woodland	Young trees - planted	Preferred opportunity
Woodland and forest	Broadleaved mixed and yew woodland	Young trees - planted, Young trees - self-set	Preferred opportunity
Woodland and forest	Coniferous woodland	Ancient woodland site, Plantation	Preferred opportunity
Woodland and forest	Coniferous woodland	Felled	Preferred opportunity
Woodland and forest	Coniferous woodland	No secondary code assigned	Preferred opportunity
Woodland and forest	Coniferous woodland	Plantation	Preferred opportunity
Woodland and forest	Woodland and forest	Felled	Preferred opportunity
Woodland and forest	Woodland and forest	Scattered scrub	Preferred opportunity
Woodland and forest	Woodland and forest	Scattered trees	Preferred opportunity
Woodland and forest	Woodland and forest	Young trees - planted	Preferred opportunity
Woodland and forest	Woodland and forest	Young trees - planted, Young trees - self-set	Preferred opportunity
Grassland	Grassland	No secondary code assigned	Some opportunity
Grassland	Grassland	Ruderal/ ephemeral	Some opportunity
Grassland	Grassland	Seasonally wet, Wet, Waterlogged	Some opportunity
Grassland	Grassland	Tall herb	Some opportunity

Grassland	Modified grassland	No secondary code assigned	Some opportunity
Grassland	Temporary grass and clover leys	Less intensively managed	Some opportunity
Sparsely vegetated land	Sparsely vegetated land	Bare ground	Some opportunity
Sparsely vegetated land	Sparsely vegetated land	No secondary code assigned	Some opportunity

Associated data file	Value/Class name
Biodiversity_Heathland_Opportunities.gpkg	2 - Preferred opportunity (Outside Network): hex colour: #178808 11 - Preferred opportunity (Within Network): hex colour: #5f008e 210 - Some opportunity (Within Network): hex colour: #a855d2 400 - Some opportunity (Outside Network): hex colour: #8ce77e

Heathland opportunities located within Natural England heathland NRNs
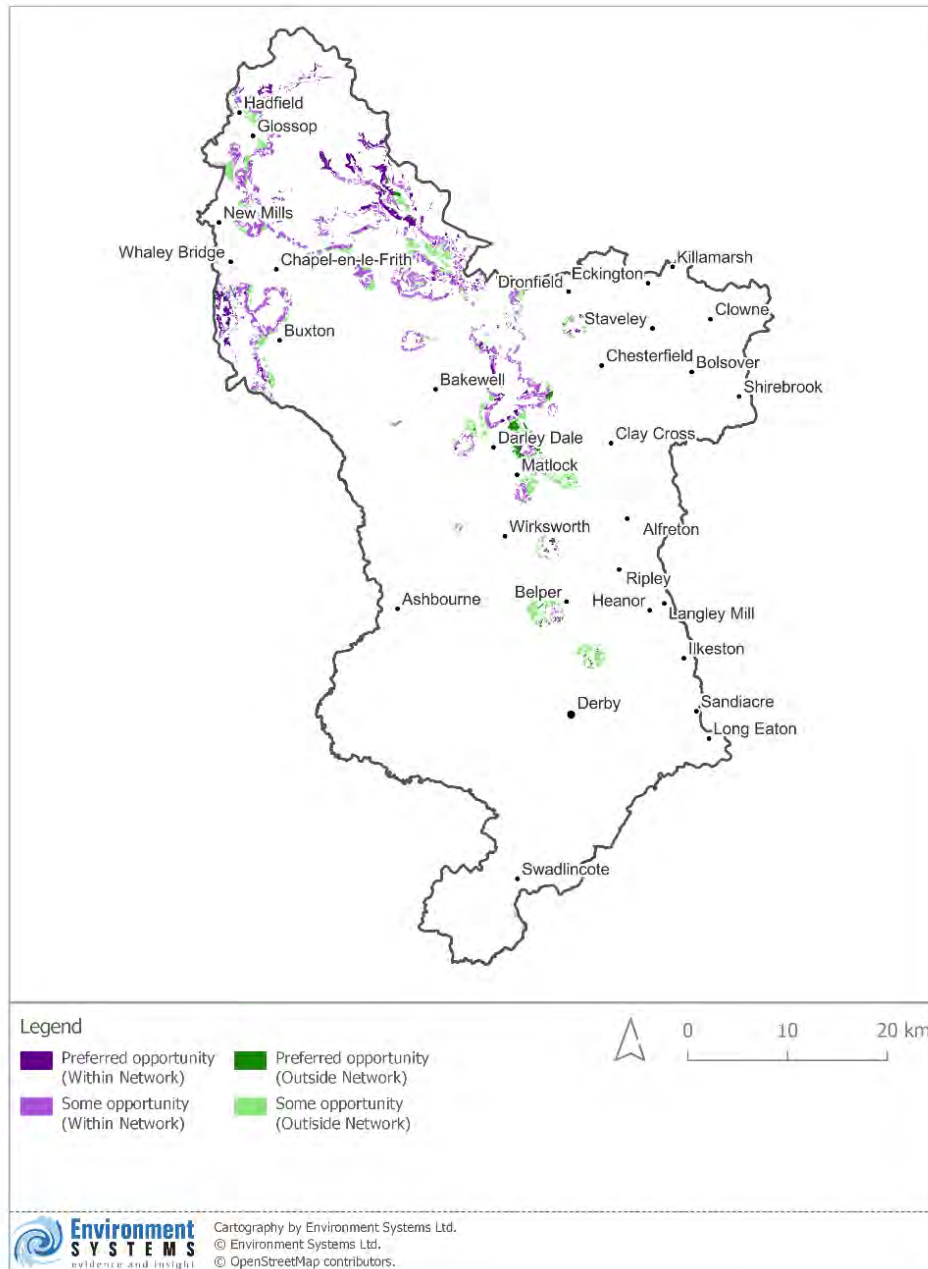
This map was created by intersecting the opportunities for establishing heathland that lie within the ecological network, with processed Natural England Nature Recovery Network (NRN) data.

The following processing was undertaken to the NRN data prior to intersecting with the biodiversity opportunities:

NRN data for the following habitats were merged to make a single NRN dataset for heathlands, clipped to the Derbyshire boundary:

- Lowland Heathland

- Upland Heathland

Within the merged NRN data any areas that contained areas of Primary Habitat or Associated Habitat (of any heathland habitat type) were removed, so that the remaining areas to be intersected with the biodiversity opportunity data consisted of areas that were part of the wider NRN network, comprising the following classes:

- Restorable Habitat
- Fragmentation Action Zone
- Network Enhancement Zone 1
- Network Enhancement Zone 2
- Network Expansion Zone

Associated data file	Value/Class name
Biodiversity_Heathland_Opportunities_NRN.gpkg	DN: 2 - Preferred opportunity: hex colour: #178808 DN: 11 - Preferred opportunity: hex colour: #5f008e DN: 210 - Some opportunity: hex colour: #a855d2 DN: 400 - Some opportunity: hex colour: #8ce77e

Opportunities for establishing wetland
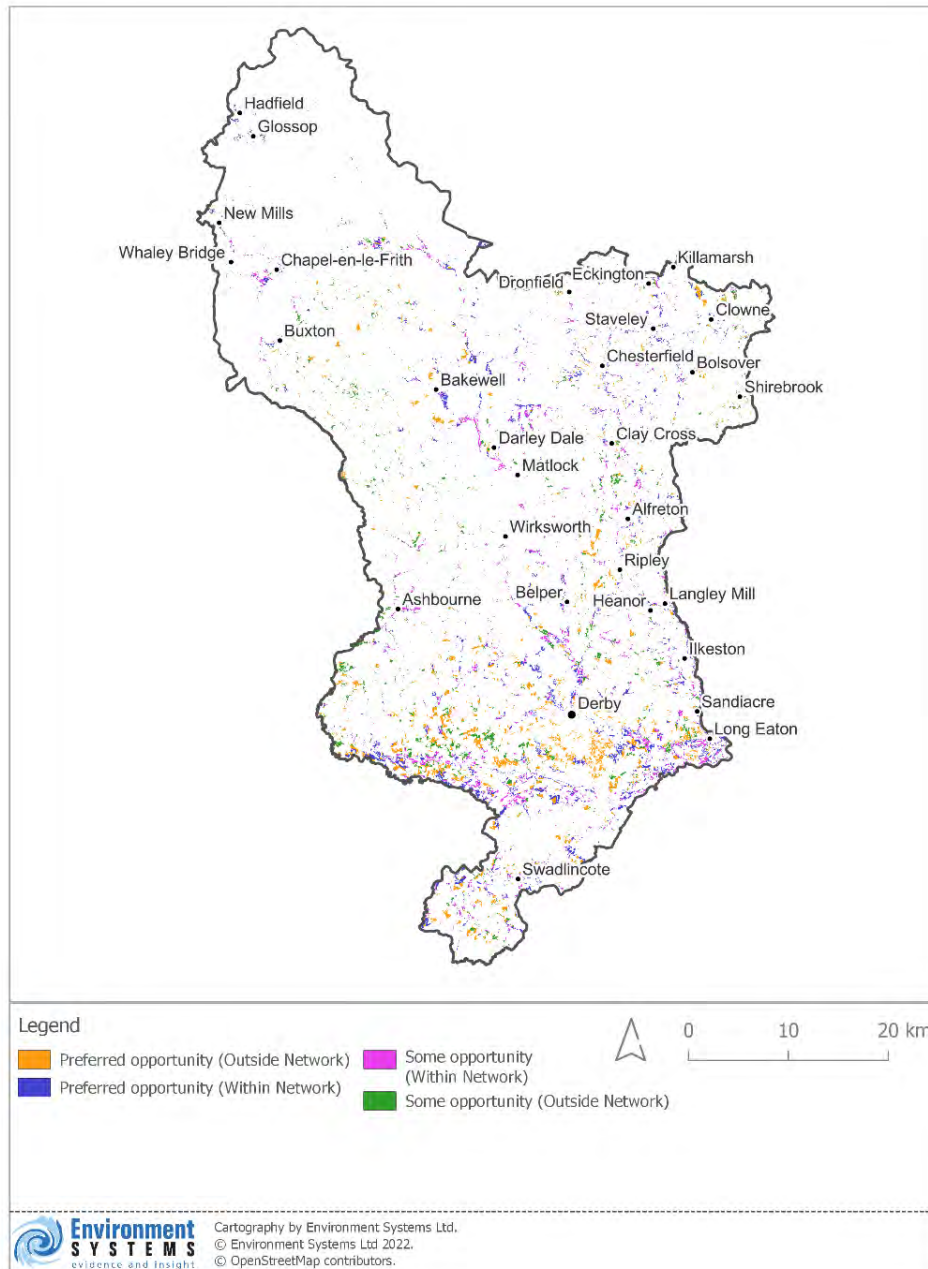
This map shows areas of opportunity for creating wetland habitat, based on the Habitat Asset Register, areas of close proximity to the drainage channel network (derived from the 5m DEM), areas of shallow slopes/flat ground (less than 3° slope), and geology (limestone areas as defined by the Landscape Character Types, and Natmap soil data were classed as a constraint; no wetland opportunities were classified in these areas). The opportunities are classified as 'preferred' opportunities if the existing habitat could be readily converted to a wetland, and 'some opportunity' if the existing habitat would be more difficult, or take longer to convert to a wetland. The opportunities are also classified according to whether they lie within the wetland ecological network, or outside the network. HAR habitat classes identified as opportunities for establishing this habitat type are shown in the table below.

UKHAB_L2	UKHAB_LD	UKHABSEC	Opportunity type
Grassland	Grassland	Coastal and floodplain grazing marsh	Preferred opportunity
Grassland	Grassland	No secondary code assigned	Preferred opportunity
Grassland	Grassland	Seasonally wet, Wet, Waterlogged	Preferred opportunity
Grassland	Modified grassland	Frequently mown, Introduced shrub	Preferred opportunity
Grassland	Modified grassland	No secondary code assigned	Preferred opportunity
Grassland	Neutral grassland	Pasture or meadow	Preferred opportunity
Grassland	Other neutral grassland	No secondary code assigned	Preferred opportunity
Sparsely vegetated land	Sparsely vegetated land	No secondary code assigned	Preferred opportunity
Wetland	Blanket bog	Dry	Preferred opportunity
Grassland	Grassland	Ruderal/ ephemeral	Some opportunity
Grassland	Grassland	Tall herb	Some opportunity
Grassland	Temporary grass and clover leys	Less intensively managed	Some opportunity

Associated data file	Value/Class name
Biodiversity_Wetland_Opportunities.gpkg	2 - Preferred opportunity (Outside Network): hex colour: #e7c621 11 - Preferred opportunity (Within Network): hex colour: #0000b1 210 - Some opportunity (Within Network): hex colour: #4875dc 400 - Some opportunity (Outside Network): hex colour: #ffe57c

Wetland opportunities located within Natural England wetland NRNs
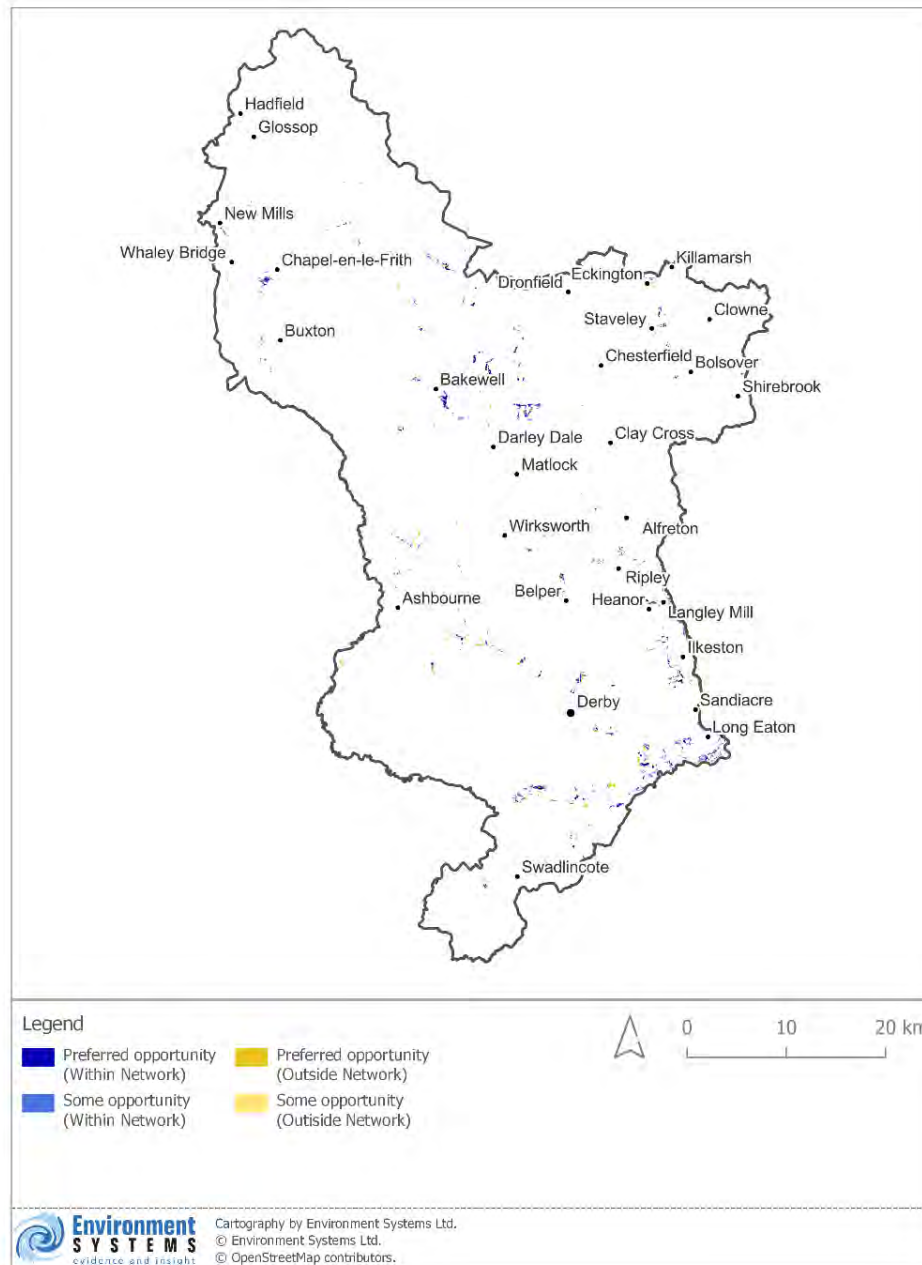
This map was created by intersecting the opportunities for establishing wetland that lie within the ecological network, with processed Natural England Nature Recovery Network (NRN) data.

The following processing was undertaken to the NRN data prior to intersecting with the biodiversity opportunities:

NRN data for the following habitats were merged to make a single NRN dataset for wetlands, clipped to the Derbyshire boundary:

- Blanket Bog

- Lakes
- Lowland Fen
- Lowland Raised Bog
- Purple Moor-Grass Rush Pasture
- Reedbeds
- Rivers
- Upland Fens, Flushes, Swamps

Within the merged NRN data any areas that contained areas of Primary Habitat or Associated Habitat (of any wetland habitat type) were removed, so that the remaining areas to be intersected with the biodiversity opportunity data consisted of areas that were part of the wider NRN network, comprising the following classes:

- Restorable Habitat
- Fragmentation Action Zone
- Network Enhancement Zone 1
- Network Enhancement Zone 2
- Network Expansion Zone

Associated data file	Value/Class name
Biodiversity_Wetland_Opportunities_NRN.gpkg	DN: 2 - Preferred opportunity: hex colour: #e7c621 DN: 11 - Preferred opportunity: hex colour: #0000b1 DN: 210 - Some opportunity: hex colour: #4875dc DN: 400 - Some opportunity: hex colour: #ffe57c

Opportunities for establishing woodland
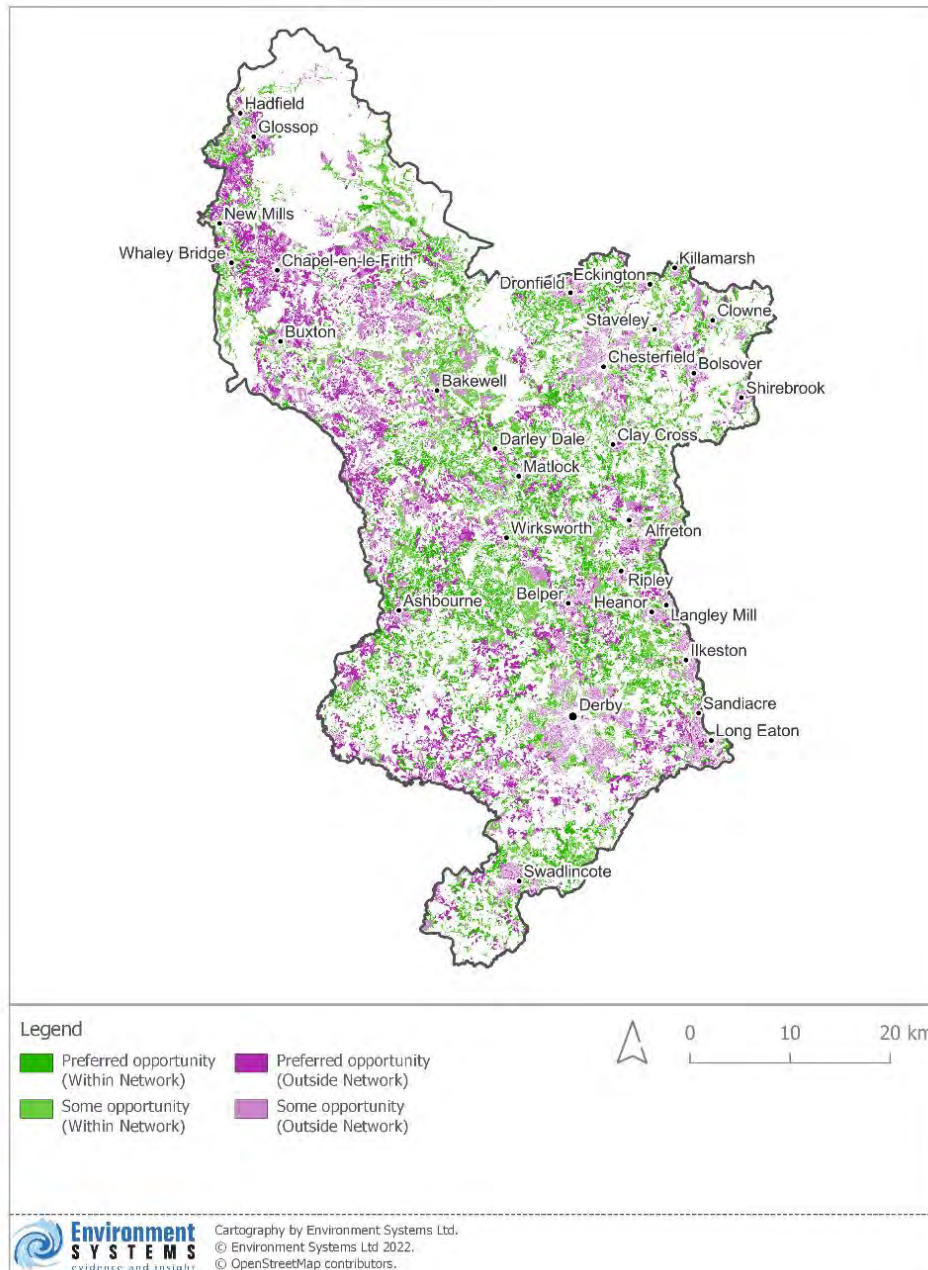
This map shows areas of opportunity for creating woodland habitat, based on the Habitat Asset Register. The opportunities are classified as 'preferred' opportunities if the existing habitat could be readily converted to woodland, and 'some opportunity' if the existing habitat would be more difficult, or take longer to convert to woodland. The opportunities are also classified according to whether they lie within the woodland ecological network, or outside the network. HAR habitat classes identified as opportunities for establishing this habitat type are shown in the table below.

UKHAB_L2	UKHAB_LD	UKHABSEC	Opportunity type

| Grassland	Bracken	No secondary code assigned	Preferred opportunity
Grassland	Grassland	Bare ground	Preferred opportunity
Grassland	Grassland	Ruderal/ ephemeral	Preferred opportunity
Grassland	Grassland	Scattered Scrub	Preferred opportunity
Grassland	Grassland	Seasonally wet, Wet, Waterlogged	Preferred opportunity
Grassland	Grassland	Tall herb	Preferred opportunity
Grassland	Neutral grassland	Pasture or meadow	Preferred opportunity
Grassland	Other neutral grassland	No secondary code assigned	Preferred opportunity
Grassland	Temporary grass and clover leys	Less intensively managed	Preferred opportunity
Heathland and shrub	Dense scrub	No secondary code assigned	Preferred opportunity
Heathland and shrub	Hawthorn scrub	No secondary code assigned	Preferred opportunity
Sparsely vegetated land	Sparsely vegetated land	Bare ground	Preferred opportunity
Woodland and forest	Broadleaved mixed and yew woodland	Felled	Preferred opportunity
Woodland and forest	Broadleaved mixed and yew woodland	Young trees - planted	Preferred opportunity
Woodland and forest	Broadleaved mixed and yew woodland	Young trees - planted, Young trees - self-set	Preferred opportunity
Woodland and forest	Coniferous woodland	Ancient woodland site, Plantation	Preferred opportunity
Woodland and forest	Coniferous woodland	Felled	Preferred opportunity
Woodland and forest	Woodland and forest	Felled	Preferred opportunity
Woodland and forest	Woodland and forest	Scattered scrub	Preferred opportunity
Woodland and forest	Woodland and forest	Scattered trees	Preferred opportunity
Woodland and forest	Woodland and forest	Young trees - planted	Preferred opportunity
Woodland and forest	Woodland and forest	Young trees - planted, Young trees - self-set	Preferred opportunity

Grassland	Grassland	Coastal and floodplain grazing marsh	Some opportunity
Grassland	Grassland	No secondary code assigned	Some opportunity
Grassland	Modified grassland	Frequently mown, Introduced shrub	Some opportunity
Grassland	Modified grassland	No secondary code assigned	Some opportunity
Sparsely vegetated land	Sparsely vegetated land	No secondary code assigned	Some opportunity
Urban	Urban	Natural and semi-natural open space	Some opportunity
Woodland and forest	Coniferous woodland	No secondary code assigned	Some opportunity
Woodland and forest	Coniferous woodland	Plantation	Some opportunity

Associated data file	Value/Class name
Biodiversity_Woodland_Opportunities.gpkg	2 - Preferred opportunity (Outside Network): hex colour: #b02ab0 11 - Preferred opportunity (Within Network): hex colour: #2ab500 210 - Some opportunity (Within Network): hex colour: #6ccb40 400 - Some opportunity (Outside Network): hex colour: #cc86cc

Woodland opportunities located within Natural England wetland NRNs
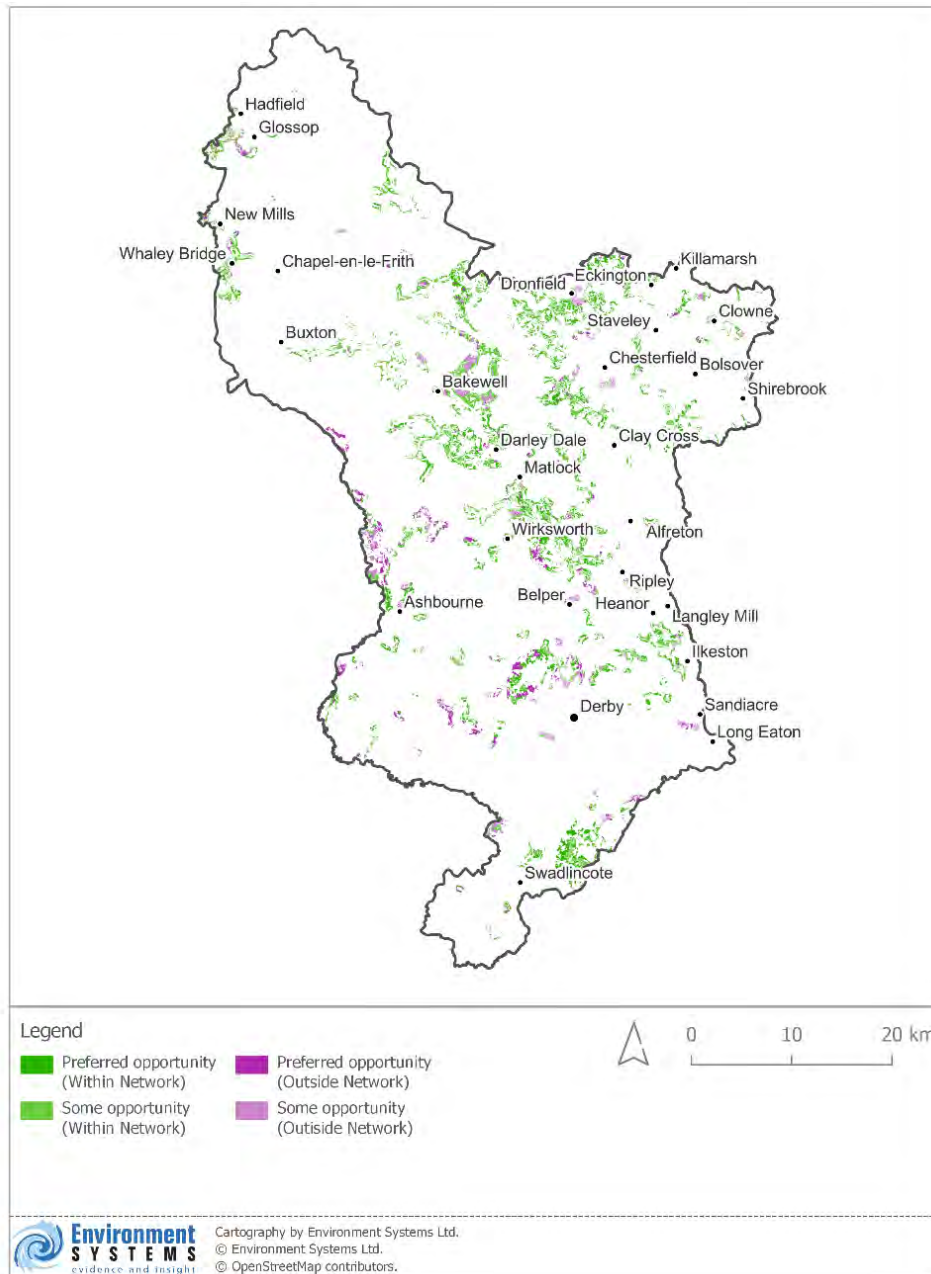
This map was created by intersecting the opportunities for establishing woodland that lie within the ecological network, with processed Natural England Nature Recovery Network (NRN) data.

The following processing was undertaken to the NRN data prior to intersecting with the biodiversity opportunities:

NRN data for the following habitats were merged to make a single NRN dataset for woodlands, clipped to the Derbyshire boundary:

- Ancient Semi Natural Woodland

- Traditional Orchards
- Wood Pasture and Parkland

Within the merged NRN data any areas that contained areas of Primary Habitat or Associated Habitat (of any woodland habitat type) were removed, so that the remaining areas to be intersected with the biodiversity opportunity data consisted of areas that were part of the wider NRN network, comprising the following classes:

- Restorable Habitat
- Fragmentation Action Zone
- Network Enhancement Zone 1
- Network Enhancement Zone 2
- Network Expansion Zone

Associated data file	Value/Class name
Biodiversity_Woodland_Opportunities_in_NRN.gpkg	DN: 2 - Preferred opportunity: hex colour: #b02ab0 DN: 11 - Preferred opportunity: hex colour: #2ab500 DN: 210 - Some opportunity: hex colour: #6ccb40 DN: 400 - Some opportunity: hex colour: #cc86cc

Biodiversity risks
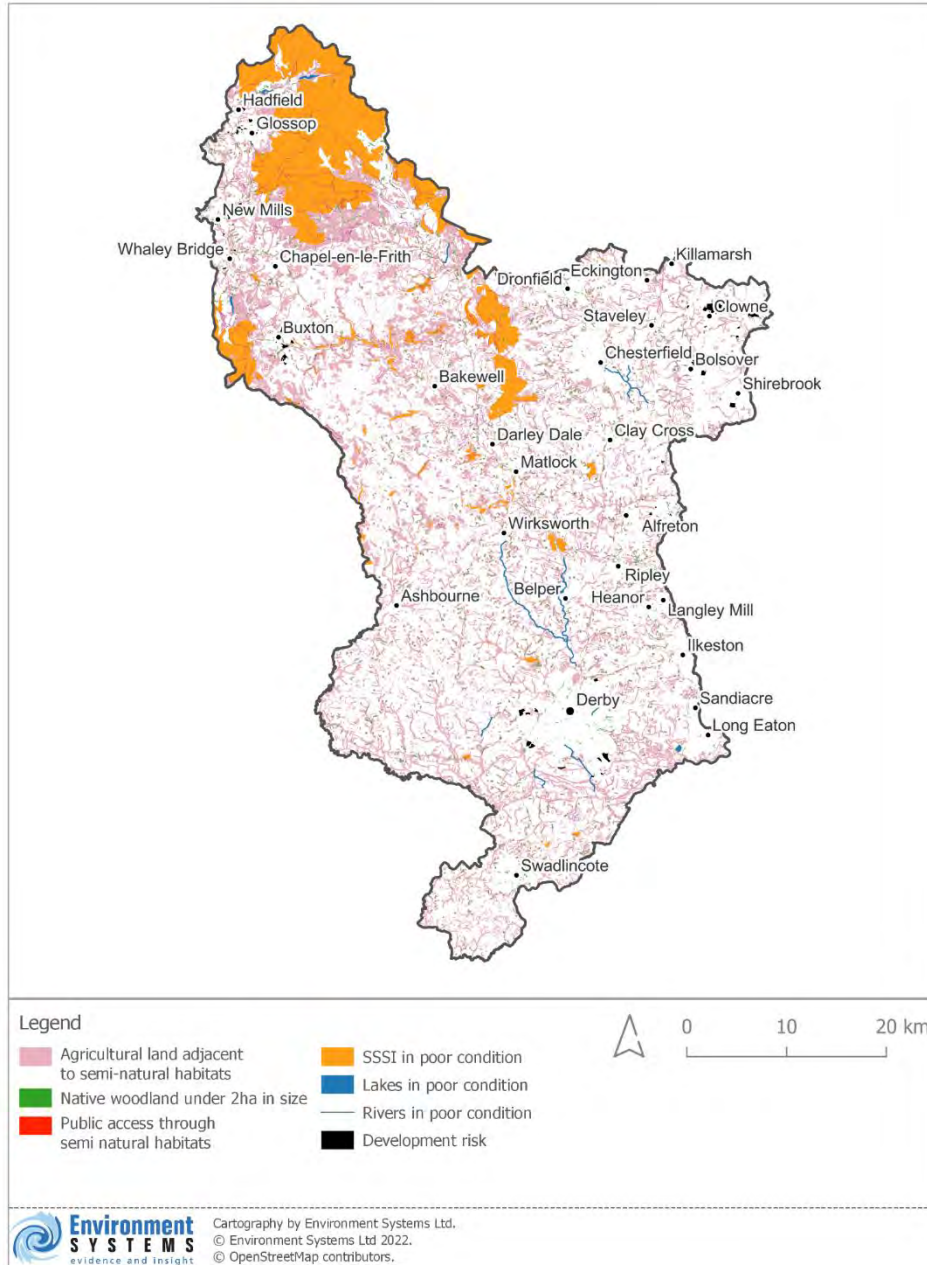
This map shows five different types of risk, as outlined in the table below.

| Risk type	Definition of risk area
SSSI risk areas	SSSIs with the following condition assessments: • Not assessed • Unfavourable declining • Unfavourable recovering • Unfavourable no change • Part destroyed

	• Destroyed
Native woodland under 2ha in size	• Woodland ecological network 'stepping stone' areas
Waterbodies in poor condition	WFD condition assessment for rivers and lakes: • Poor • Fail • Moderate or less
Areas of public access through semi-natural habitat	Places where paths (buffered by 10m) cross areas of semi-natural habitat (identified from the HAR and ecological network core and stepping stone areas).
Agricultural land adjacent to semi-natural habitats	Agricultural areas (selected from the HAR) within 50m of a semi-improved habitat (identified from the HAR and ecological network core and stepping stone areas).
Development risk	Areas allocated for housing and employment development within Local Development Plans for the following areas: • Bolsover • Chesterfield • Derby City • High Peak

Associated data file	Value/Class name
Biodiversity_Risks_Rivers.gpkg	Whole dataset: hex: #1f78b4
Biodiversity_Risks_Public_Access.gpkg	Whole dataset: hex: #ff2301
Biodiversity_Risks_Lakes.gpkg	Whole dataset: hex: #1f78b4
Biodiversity_Risks_Native_Woodland.gpkg	Whole dataset: hex: #33a02c
Biodiversity_Risks_SSSI.gpkg	Whole dataset: hex: #ff9e17
Biodiversity_Risks_Agri_Semi_Natural.gpkg	Whole dataset: hex: #e8b1be

Natural Flood Management: current provision (stock)
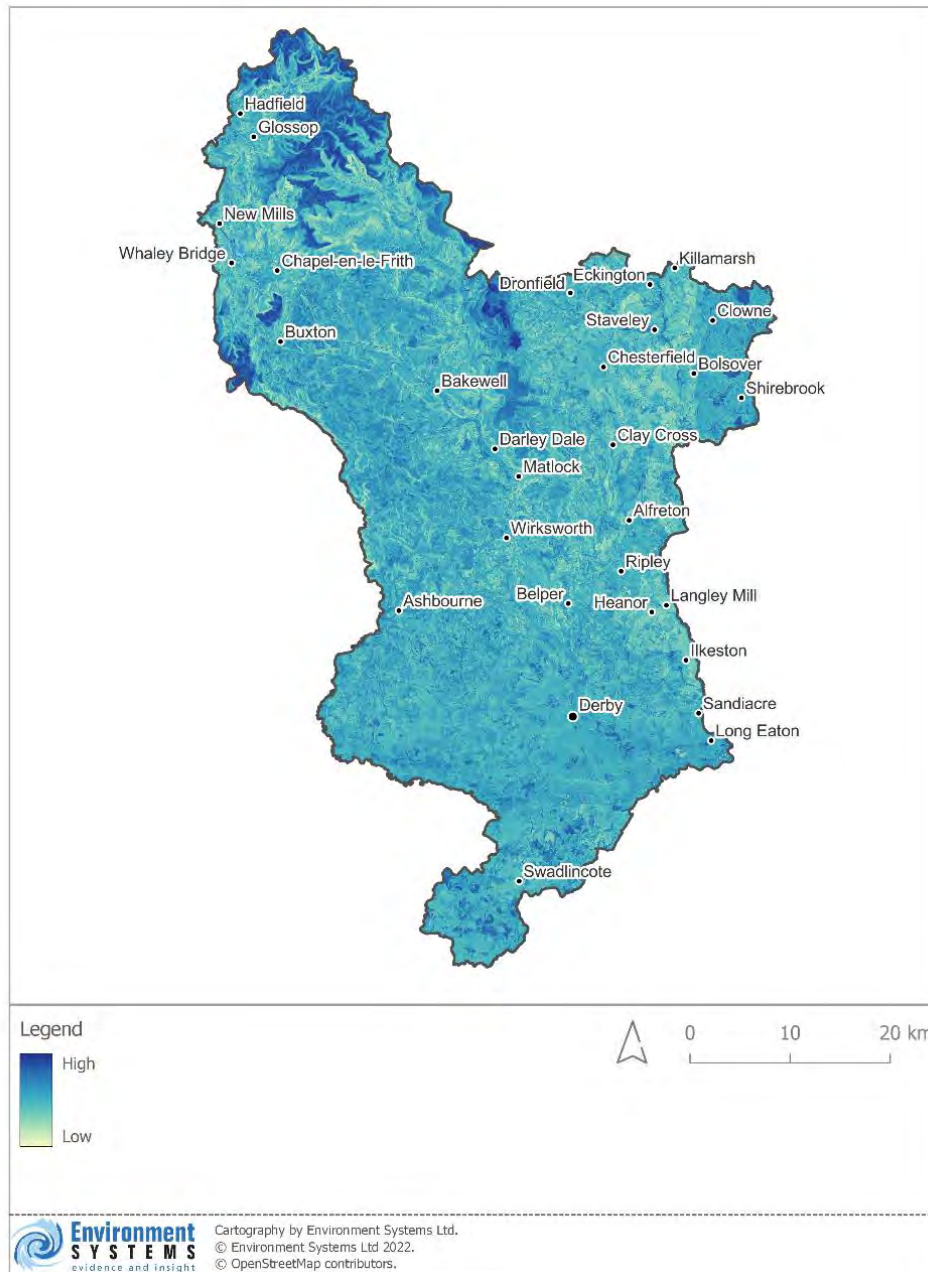
This map shows the existing NFM provision in Derbyshire. Darker areas show areas of higher provision, lighter areas show lower NFM provision.

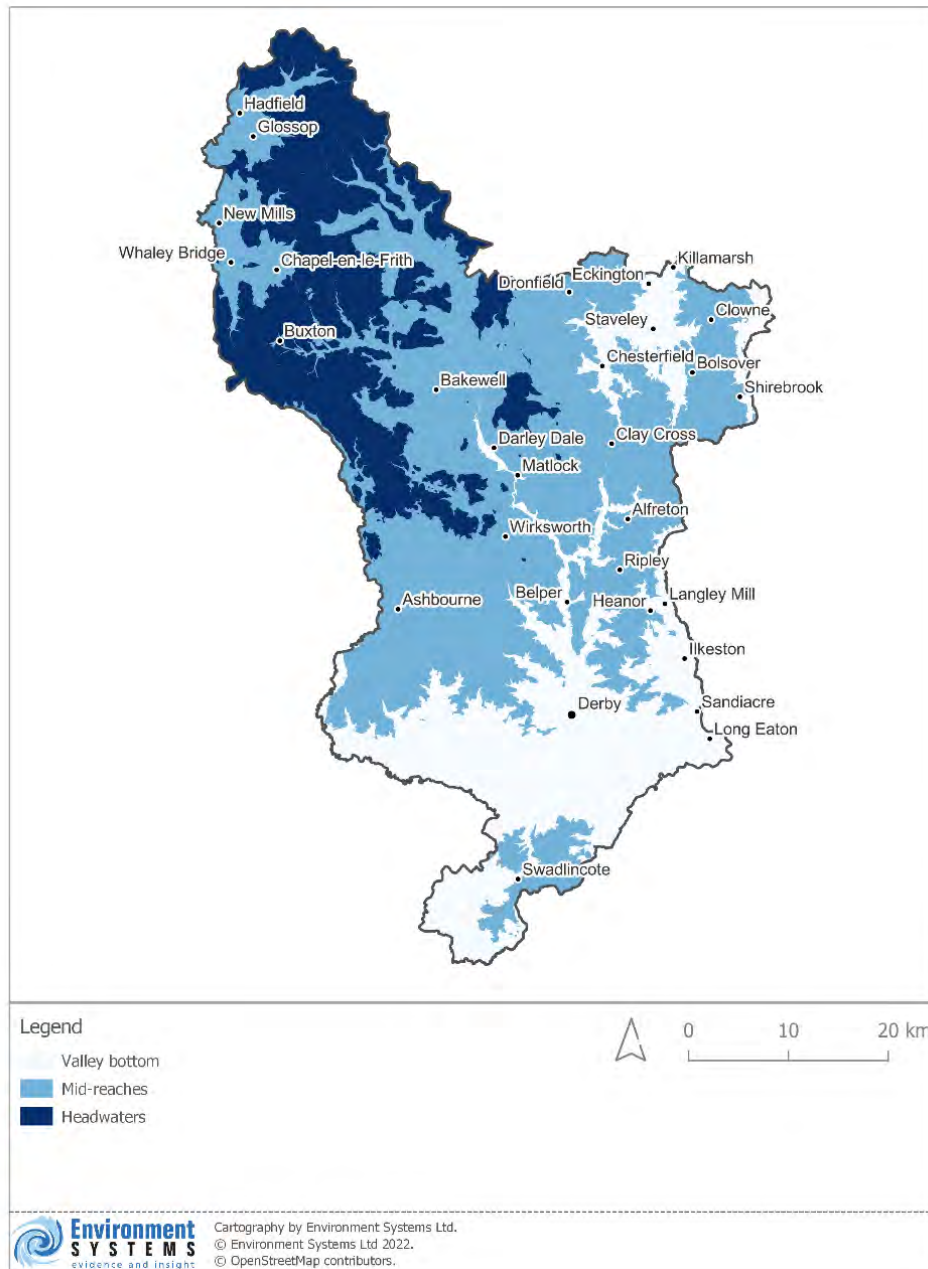| Data input	Reason for usage	Indicative scoring
Slope: 5m resolution DEM	Steepness of slope has a strong effect on how quickly water is shed, and where it is stored	• Flat ground and gentle slopes (up to 3°): highest NFM • Moderate slopes (multiple categories): moderate NFM

		• Steep slopes (> 18º): No NFM benefit (water-shedding)
Natmap soil type (Cranfield data)	Soil texture, organic matter content and depth have a strong impact on water retention	• Peat soils, deep loamy and sandy soils: high NFM • Shallow soils, heavy clays: low NFM
Habitat Asset Register	Vegetation cover and rooting depth affect water interception, surface runoff, and infiltration.	• Woodland: high NFM • Tall or shrubby grassland: moderate NFM • Short grassland, bare ground: low NFM

Associated data file	Value/Class name
NFM_Current_Provision.gpkg	Range: 5 – Low: hex: #ffffcc 285 – High: hex: #253494

Hydrological catchment zones

The catchment zones map shows the partition of the Derbyshire area into headwater, mind-reach, and valley bottom zones.

Data input	Reason for usage	Indicative scoring
5m resolution DEM	Elevation is one of the deciding factors for position within the catchment	• < 100m: valley bottom • 100 - 300m: Mid-reaches • > 300m: headwaters
Environment Agency Floodzone 3	Areas subjected to flooding are likely to be valley bottom	Area falls within Floodzone 3: floodplain catchment zone

Associated data file	Value/Class name
Hydrological_Catchment_Zones.gpkg	Catchment_: Candidate for valley bottom – Valley bottom: hex colour: #f7fbff
	Catchment_: Mid-reaches – Mid-reaches: hex: #73b2d8
	Catchment_: Head Waters – Headwaters: hex: #08306b

Channel network

This map shows the fine-scale natural hydrological drainage channels, extracted through SCIMAP analysis of the 5m DEM
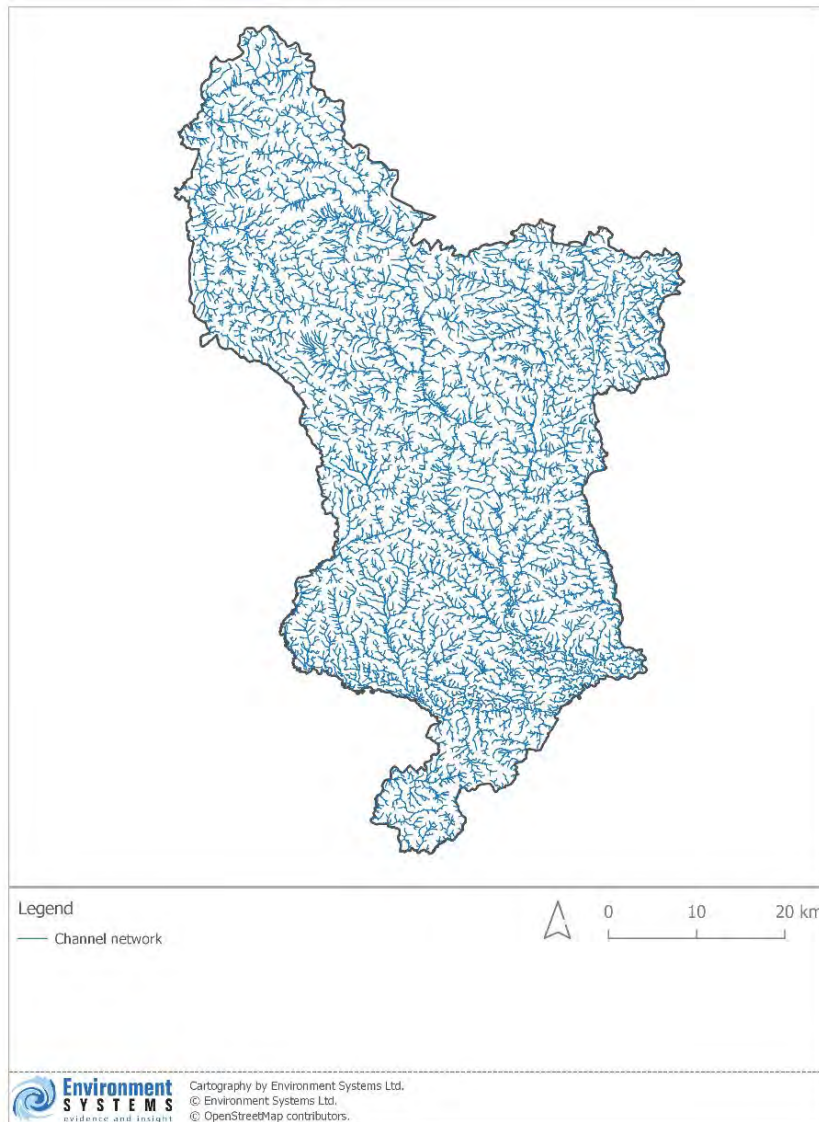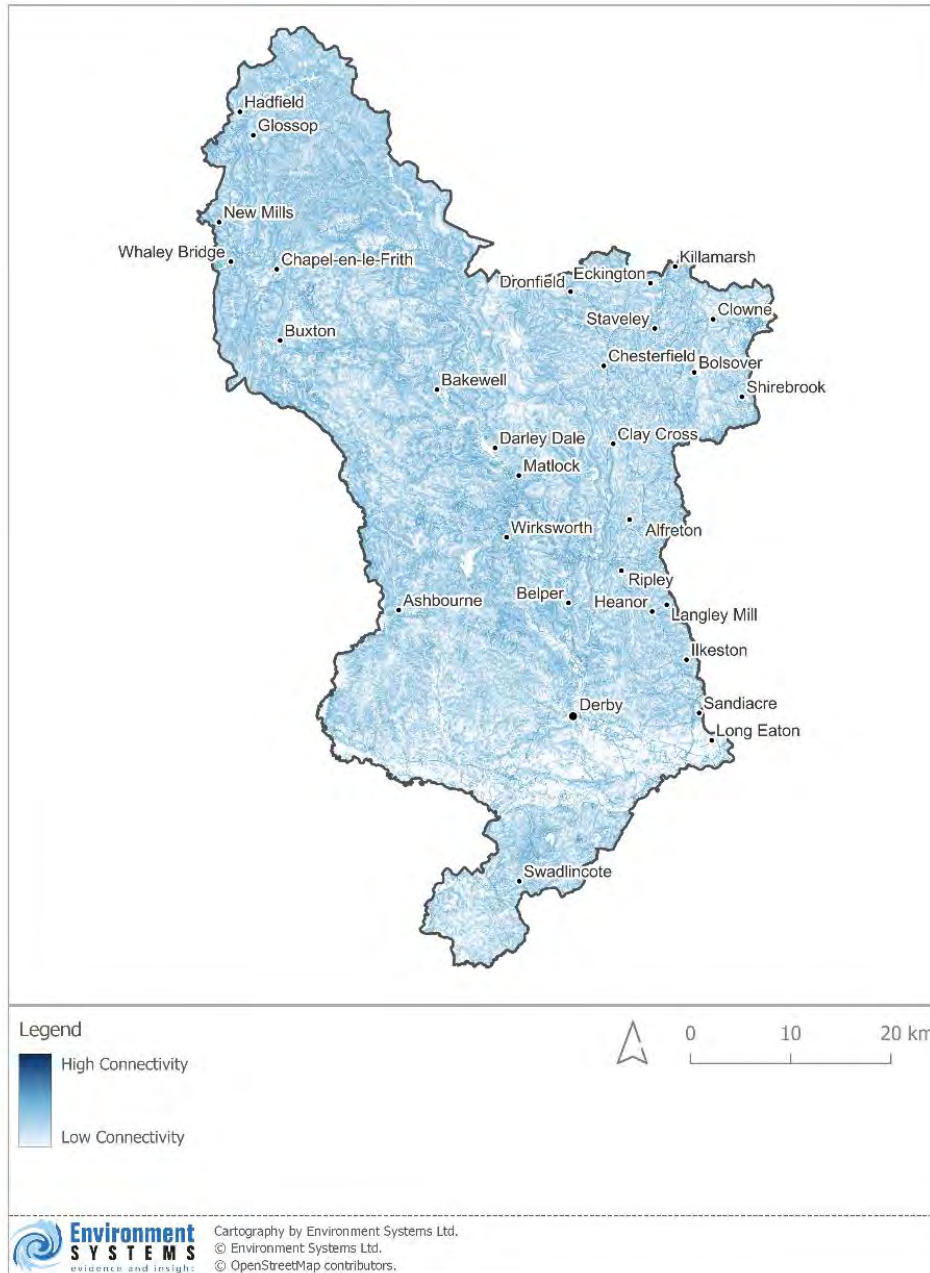
References:

SCIMAP: Diffuse Pollution and Flood Water Source Mapping. https://scimap.org.uk/ [accessed 2022-09-16]

Associated data file	Value/Class name
SCIMAP_Channel_Network.gpkg	Whole dataset: Channel Network hex colour: #1f78b4

Hydrological connectivity

This map shows how strongly areas are connected to the channel network; how important each location is for funnelling water towards the rivers and streams. Areas with high

connectivity funnel more water. This dataset was generated by analysis of the Digital Elevation model with SCIMAP.
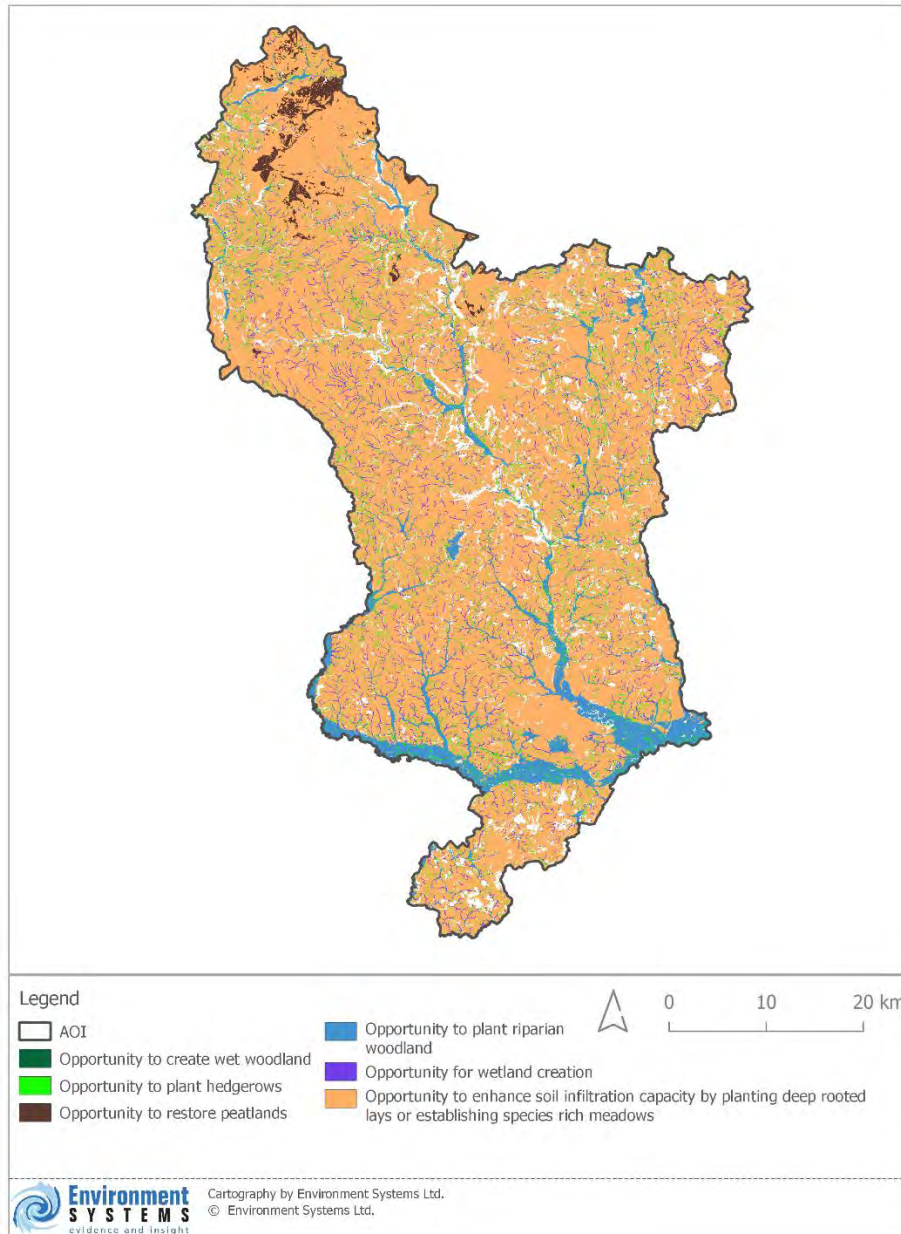
Associated data file	Figure heading	Value/Class name
NFM_Risk_Hydrological_Connectivity.gpkg	Figure 35: Hydrological connectivity	Range: 0 – High Connectivity: hex: #08306b 1 – Low Connectivity: hex: #f7fbff

References:

SCIMAP: Diffuse Pollution and Flood Water Source Mapping. https://scimap.org.uk/ [accessed 2022-09-16]

Natural Flood Management: all NFM opportunities

This map considered opportunities to change the habitat type or condition, or soil condition, to improve surface water regulation by increasing rainfall interception, surface roughness, or soil water-retention capacity (e.g. through increasing rooting depth or organic matter content, or alleviating compaction).

| Data input	Reason for usage
	Grassland and cropland selection to identify areas to enhance habitats by planting deep rooted lays.
	Degraded bogs are opportunities for peatland restoration.
Habitat Asset Register	

	Rivers and streams without adjoining woodland cover are opportunities for riparian woodland creation. Existing hedgerows and stonewalls used as a basis to identify agricultural fields currently lacking hedgerows (or stonewalls), where hedgerows could be created
Landscape Character 2013	Used to identify areas where hedgerow creation would not be appropriate (areas currently characterised by the presence of stone walls), and ensure that hedgerow creation was not recommended in these areas.
Channel network (derived from 5m DEM using SCIMAP)	Used to identify riparian woodland opportunities
Environment Agency Floodzone 2	Floodplain areas used to identify areas suitable for wet woodland and wetland creation
Natmap soil type (Cranfield data)	Groundwater-affected soil types within the floodplain are opportunities for wetland creation
Woodland opportunities (output from Biodiversity theme mapping)	Used to identify areas suitable for wet woodland creation

Associated data file	Figure heading	Value/Class name
Natural_Flood_Management_Opportunities.gpkg	Figure 36: Natural Flood Management: all NFM opportunities	1- Potential to create wet woodland: hex colour: #ef64dd
		2 - Potential to plant hedgerows: hex colour: #1aff00
		3 - Potential to restore peatlands: hex colour: #5e3931
		4 - Potential to plant riparian woodland: hex colour: #1a9426
		5 - Potential for wetland creation: hex colour: #703fea
		6 - Potential to enhance soil infiltration capacity by planting deep rooted lays or establishing species

		rich meadows: hex colour: #ffb168

Natural Flood Management: targeted opportunities
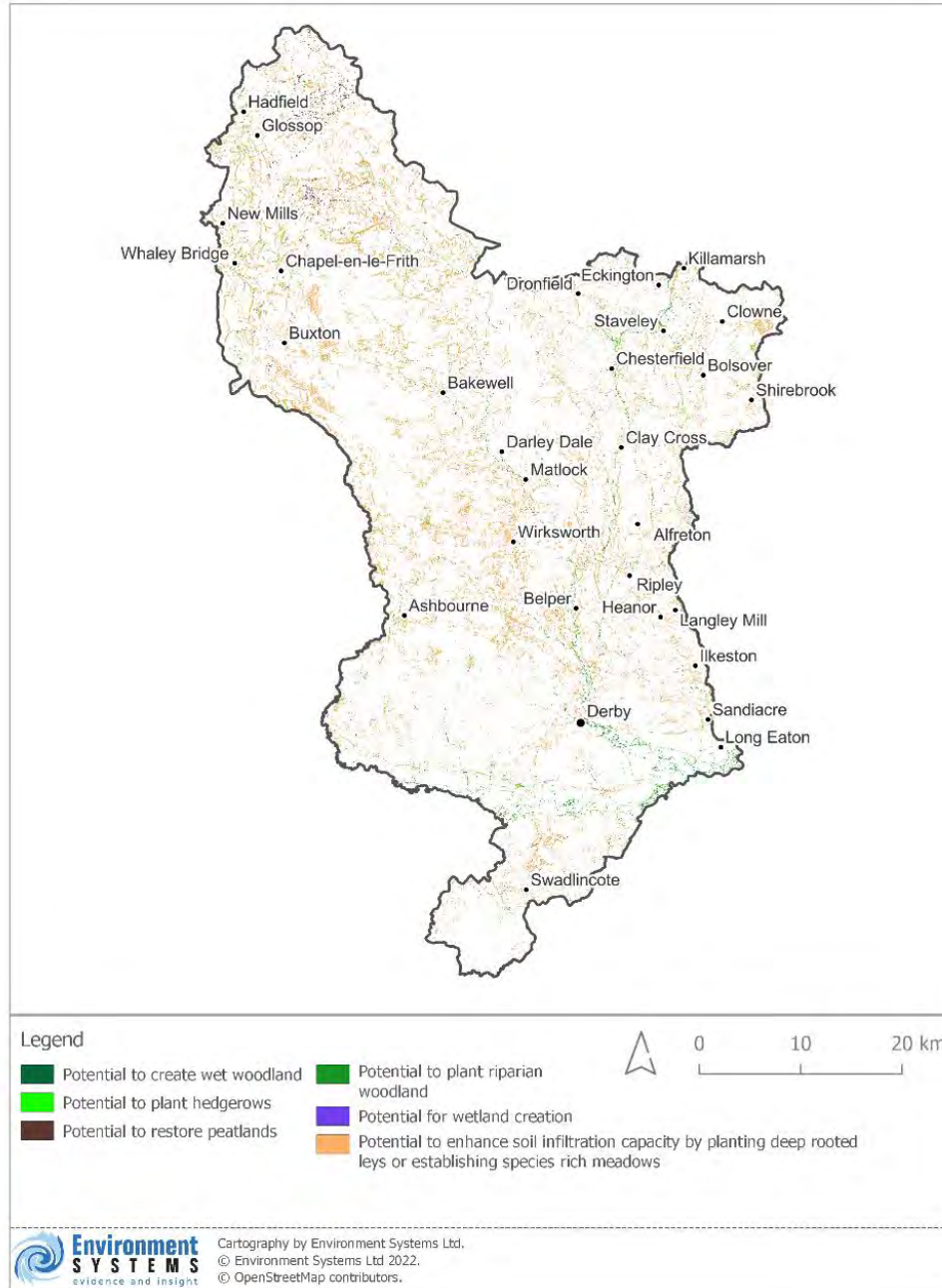
This map was made from the full map of NFM opportunities. It is a selection of areas that occur in the places that have a high hydrological conductivity, meaning the most significant locations for funnelling water towards the rivers and streams. Areas of high hydrological connectivity were identified by analysis of the Digital Elevation model with SCIMAP.

| Associated data files	Value/Class name

NFM_Targeted_Opportunities.gpkg	1 - Potential to create wet woodland: hex colour: #09663c
	2 - Potential to plant hedgerows: hex colour: #1aff00
	3 - Potential to restore peatlands: hex colour: #5e3931
	4 - Potential to plant riparian woodland: hex colour: #1a9426
	5 - Potential for wetland creation: hex colour: #703fea
	6 - Potential to enhance soil infiltration capacity by planting deep rooted lays or establishing species rich meadows: hex colour: #ffb168

References:
SCIMAP: Diffuse Pollution and Flood Water Source Mapping. https://scimap.org.uk/ [accessed 2022-09-16]

Water quality regulation: current provision (stock)
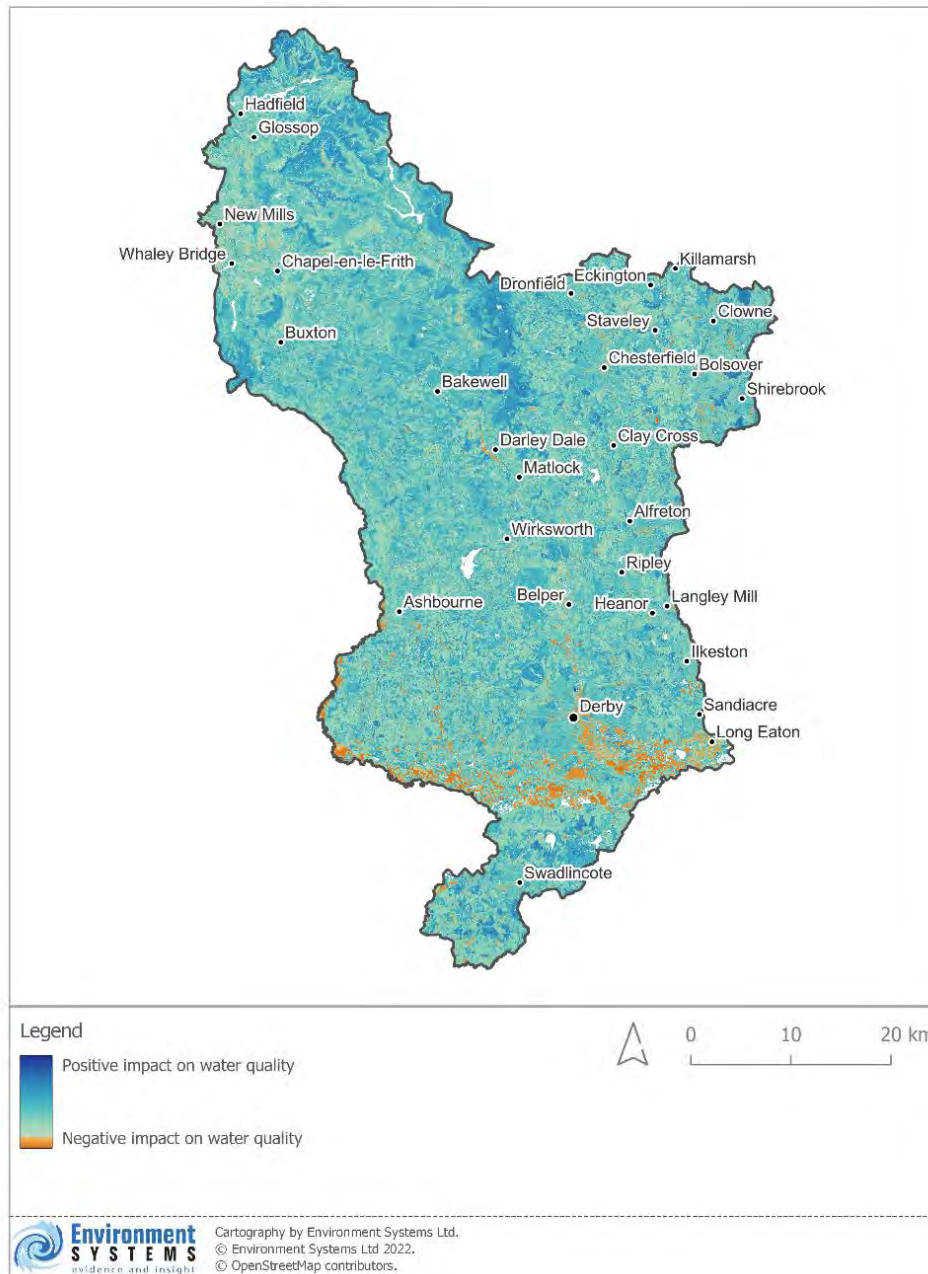
This map was created by combining datasets relating to slope, soil type and land use/land management, each assessed for their contribution to water quality regulation.

| Data input	Reason for usage	Indicative scoring
Slope: 5m resolution DEM	Steepness of slope affects water pooling/shedding and filtration potential	• Flat ground and gentle slopes (up to 3º): high positive effect on water quality regulation • Moderate slopes (multiple categories): moderate positive impact on water quality regulation

		• Steep slopes (> 18º): No water quality regulation benefit
Natmap soil type (Cranfield data)	Soil texture, organic matter content, depth, and underlying geology have a strong impact on water filtration	• Peat soils, soils over limestone: high NFM • Shallow soils over hard rock types: low water quality regulation
Habitat Asset Register	Vegetation cover, rooting and nutrient uptake characteristics affect water filtration and movement of pollutants.	• Wet blanket bog: high positive effect on water quality regulation • Neutral grassland: moderate positive impact on water quality regulation • Arable land: negative impact on water quality regulation

Associated data source	Value/Class name
Water_Quality_Existing_Provision.gpkg	Whole dataset 0: hex #b8d9c5 to 315: hex: #253494 -0.1: hex: #fdbf6f to -50: hex: #d76800

Water quality regulation: risk areas
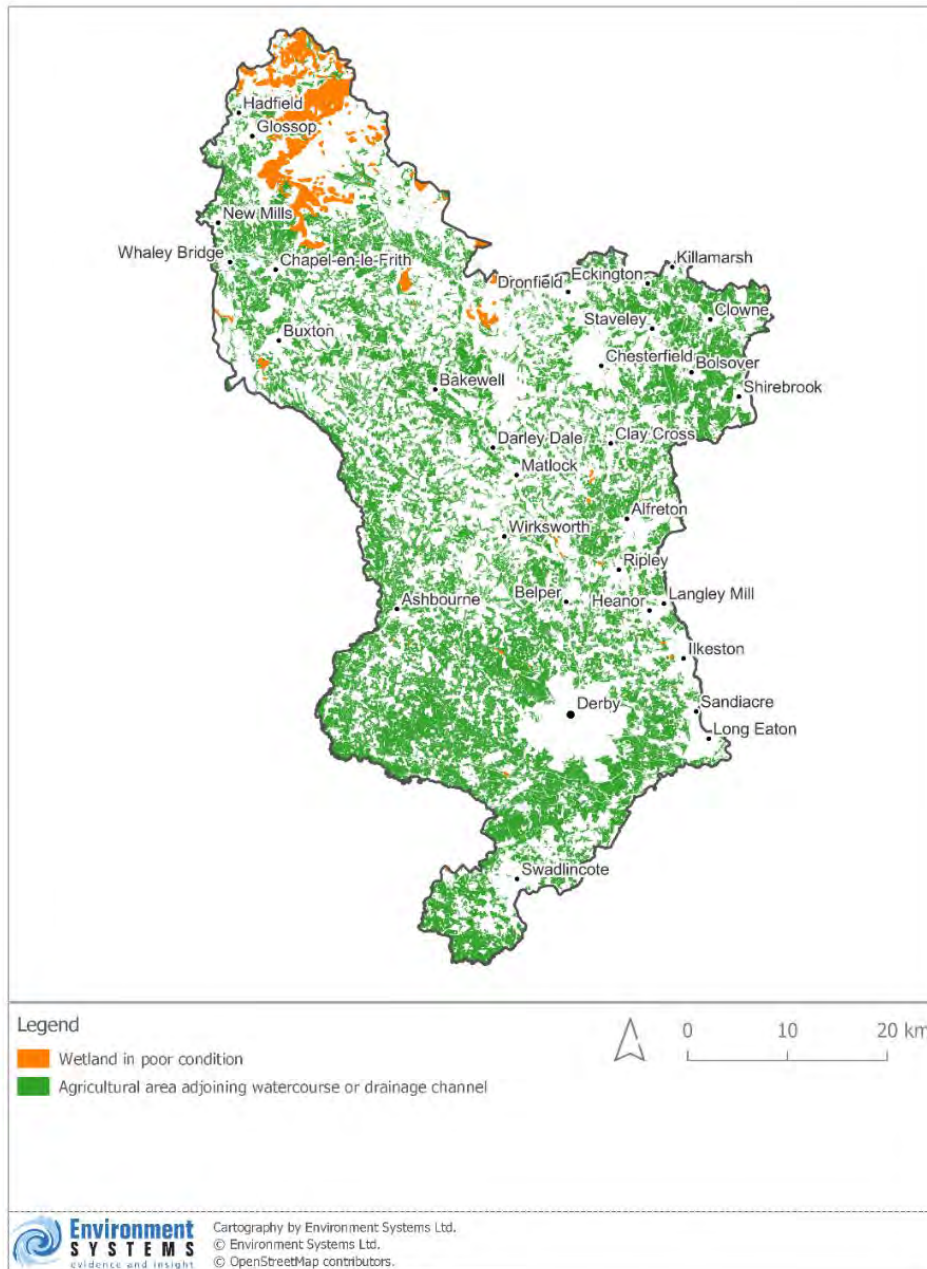
This map identifies the locations of two risk types; degraded peatlands, and agricultural areas adjoining drainage channels.

| Risk type	Definition of risk area
Degraded peatlands	Areas of degraded blanket bog and bare peat, selected from the HAR
Agricultural areas adjoining drainage channels	Agricultural areas (selected from the HAR) within 30m of rivers and streams (selected from the HAR) and natural drainage channels (as identified by SCIMAP analysis of 5m DEM)

Associated data files	Value/Class name

Water_Quality_Risk.gpkg	Whole dataset: Agricultural area adjoining watercourse or drainage channel hex colour: #33a02c
Water_Quality_Risk_Opportunities.gpkg	DN: 3 - Wetland in poor condition hex colour: #ff7f00

Water quality regulation: potential enhancement areas
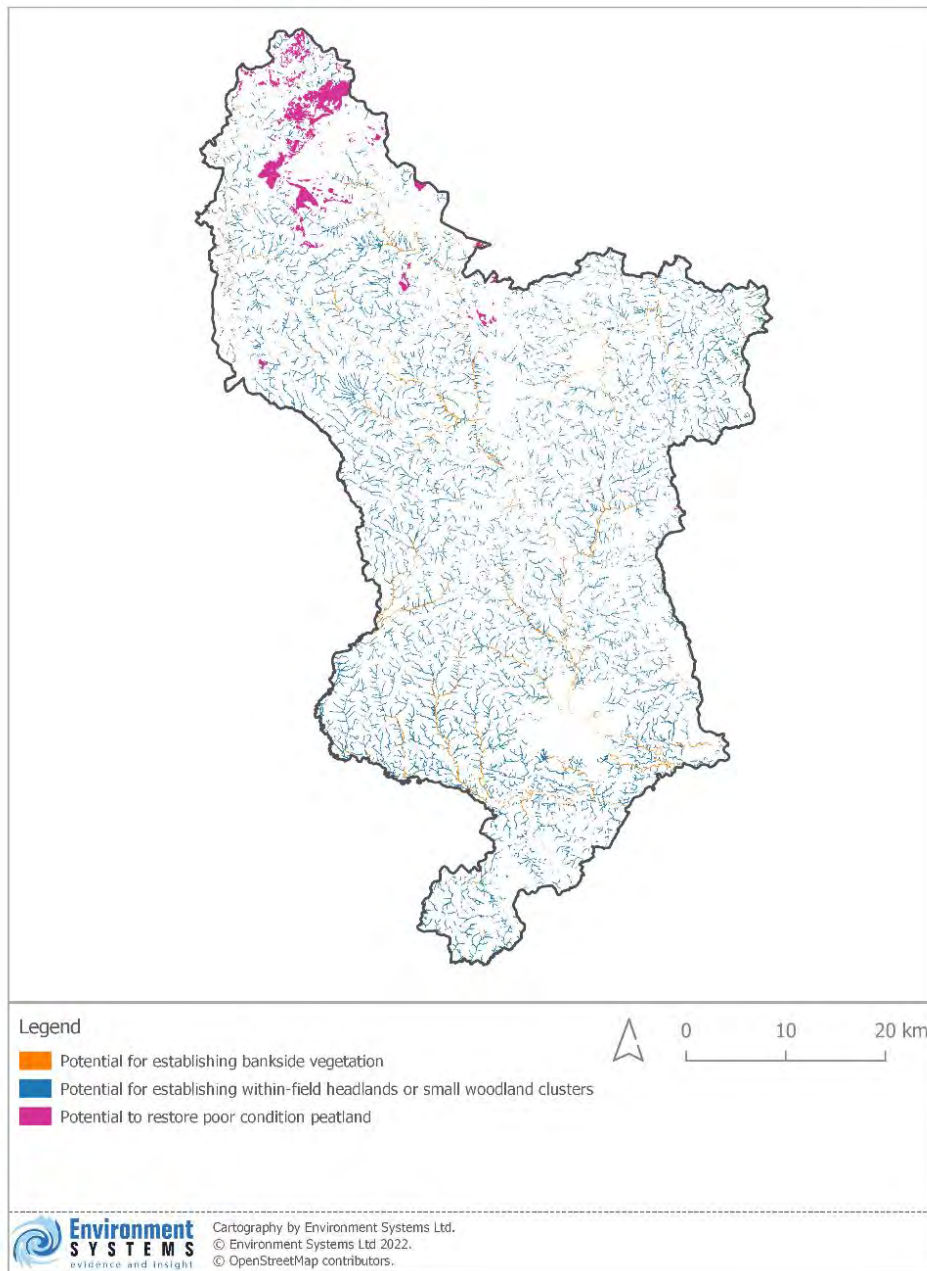
This map shows five different types of opportunity, as outlined in the table below.

Opportunity type	Definition of opportunity area

Opportunity for establishing bankside vegetation	Areas bordering the main rivers and streams (within 30m of the watercourse) that currently lack woodland or shrubby bankside vegetation (as mapped by the HAR)
Opportunity for establishing within-field headlands or small woodland clusters	Agricultural areas (selected from the HAR) within 30m of natural drainage channels (as identified by SCIMAP analysis of 5m DEM)
Opportunity to restore poor condition peatland	Areas of degraded blanket bog and bare peat, selected from the HAR

Filename	Value/Class name
Water_Quality_Opportunities.gpkg	1 - Potential for establishing bankside vegetation: hex colour: #ff7f00 2 - Potential for establishing within-field headlands or small woodland clusters: hex colour: #1f78b4 3 - Potential to restore poor condition peatland : hex colour: #d33494

Current carbon storage (stock)
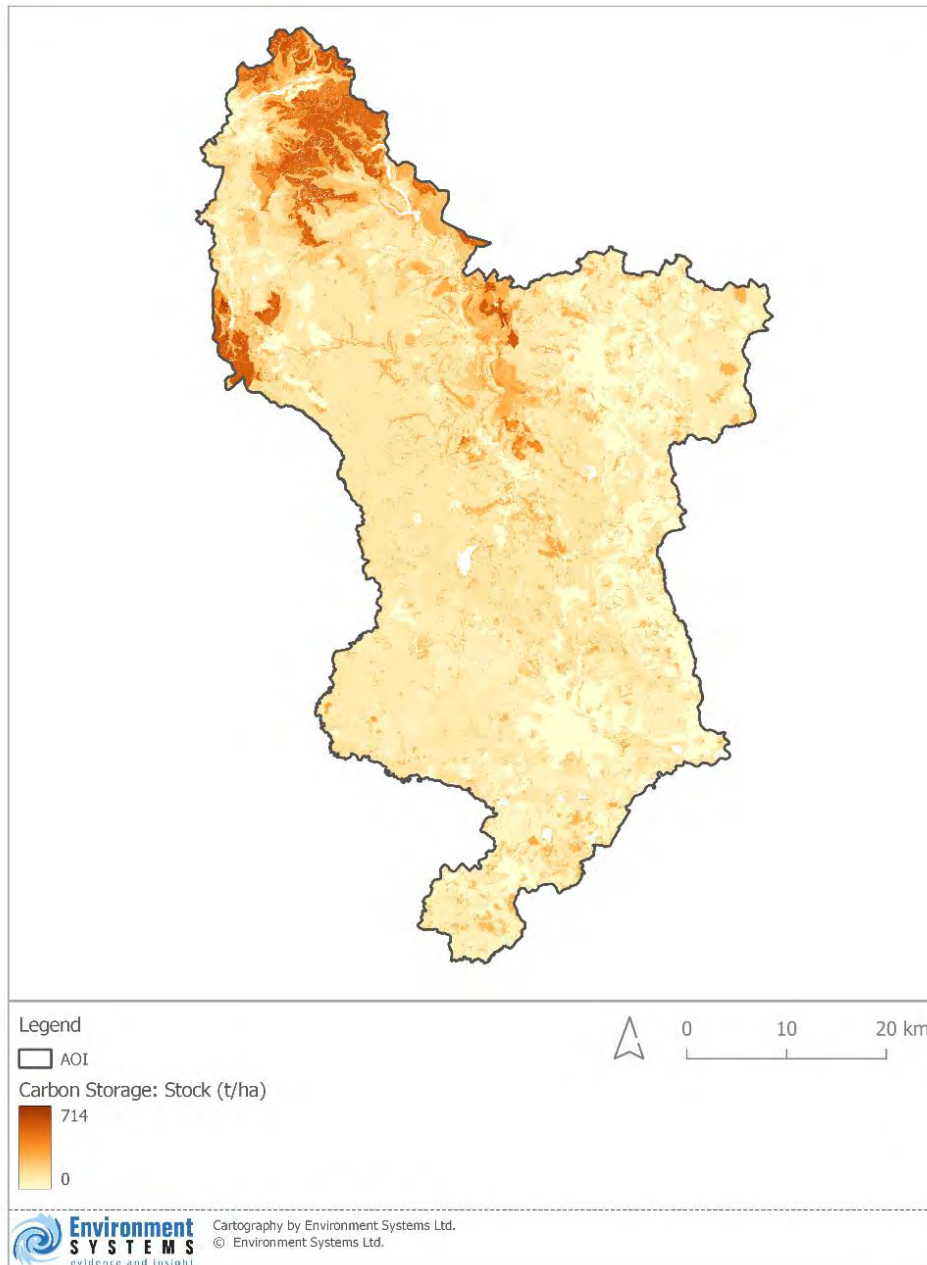
This is a quantitative map; carbon storage values are expressed in t.ha^{-1}. Carbon storage values were taken from Natmap Carbon data obtained under license from Cranfield, based on carbon storage in the 0-30cm depth fraction, with the addition of mean carbon storage values for the habitat present, as determined by the HAR. The Natmap Carbon dataset contains both maximum and minimum carbon values for the soil type. The assigned carbon value was assigned from within this range based on the HAR habitat class and steepness of slope in each location, and the influence of floodplains (e.g. good condition bog habitat would be assigned the maximum value in the Natmap Carbon data range, but bare ground on steep slopes would be assigned a value towards the minimum in the stated Natmap Carbon range), informed by the relative carbon values of different habitat types (Alonso *et. al.*, (2012); Gregg *et. al.*, (2021)). Examples of how the carbon values were determined from

the maximum and minimum values within the Natmap Carbon data are shown in the table below.

Habitat / dataset	Process for selecting carbon value using maximum and minimum values from Natmap Carbon
Ancient woodland	Use the maximum value in the Natmap Carbon dataset
Wet neutral grassland	Select the value that lies half way within the range in the Natmap Carbon dataset.
Areas within floodplains (Floodzone 2)	Increase habitat carbon storage value by 10% (or use Natmap Carbon maximum value, whichever is lower)
Moderate slopes (7-11°)	Decrease habitat carbon storage value by 10% (or use Natmap Carbon minimum value, whichever is higher)
Steep slopes (11-18°)	Decrease habitat carbon storage value by 25% (or use Natmap Carbon minimum value, whichever is higher)
Very steep slopes (>18°)	Decrease habitat carbon storage value by 40% (or use Natmap Carbon minimum value, whichever is higher)

Associated data file	Figure heading	Value/Class name
Carbon_storage_stock.gpkg	Figure 41: Current carbon storage (stock)	Range: 0: hex: #ffffd4 248.39: hex: #993404

Current carbon sequestration (stock)
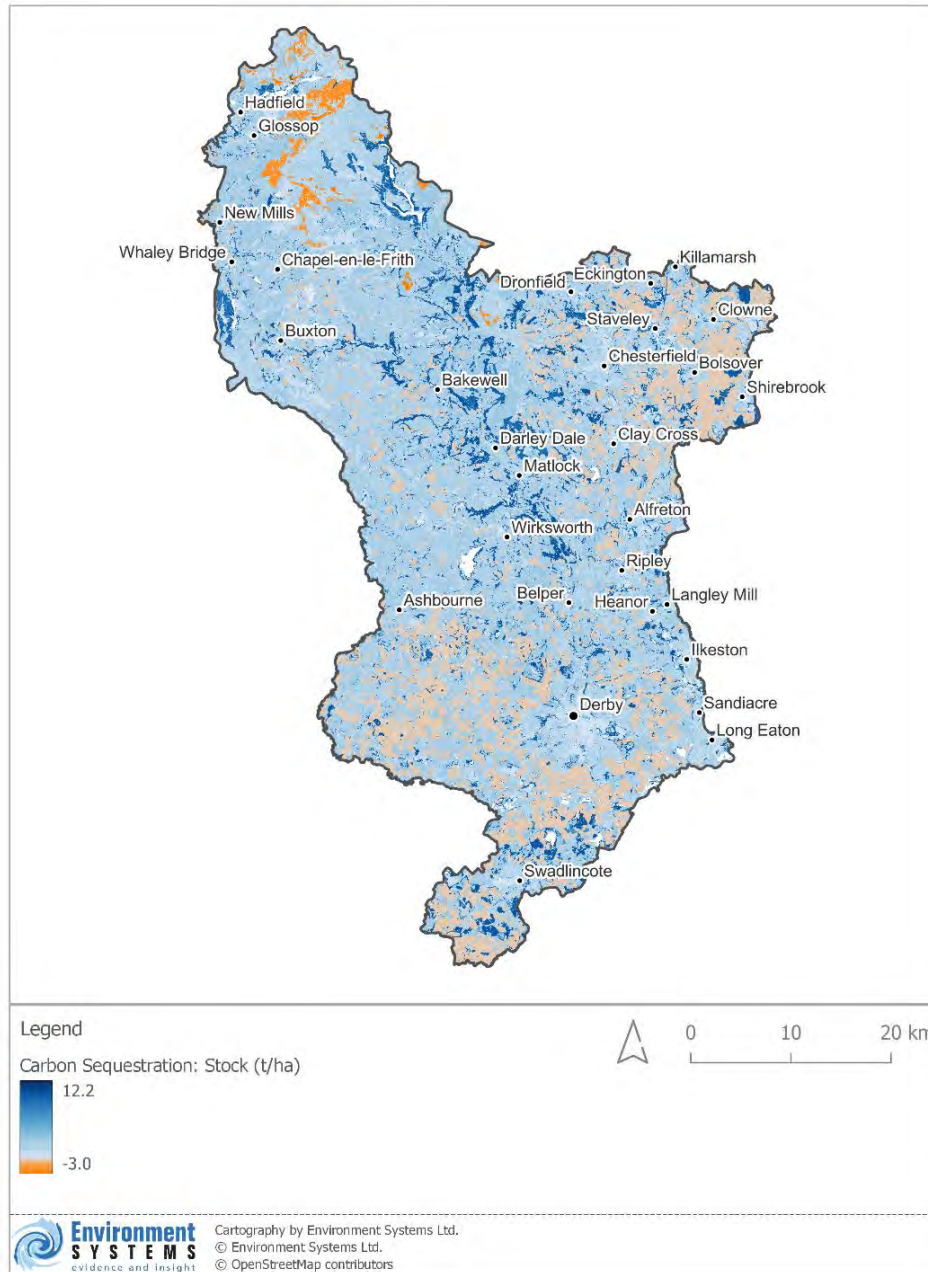
This is a quantitative map; carbon sequestration values are expressed in t.ha^{-1}. Carbon sequestration values were taken from the Natural England report Gregg *et al* (2021). This review considered the scientific evidence for carbon sequestration by semi-natural habitats, in relation to their condition and/or management. This new report updates and expands previous work by Alonso et al (2012). Where evidence was lacking a gap analysis was included showing areas where research was needed. Where research projects were underway, new evidence was obtained under a current carbon mapping project being undertaken by Natural England (Medcalf *et al.*, in press), including gathering carbon storage evidence from northern Europe to fill any final knowledge gaps. The sequestration rates applied to each habitat type are shown in the table below.

UKHAB_L2	UKHAB_LD	UKHABSEC	C sequestration (t.ha^{-1})
Urban	Built-up areas and gardens	Road island/verge	0
Cropland	Cropland	No secondary code assigned	-0.5
Cropland	Arable and horticulture	No secondary code assigned	-0.5
Cropland	Cereal crops	No secondary code assigned	-0.5
Cropland	Non-cereal crops	No secondary code assigned	-0.5
Wetland	Wetland	No secondary code assigned	-0.5
Wetland	Wetland	Peat	-3
Wetland	Bog	No secondary code assigned	1.7
Wetland	Bog	Bare ground, Peat	1.7
Wetland	Bog	Dry	-2
Wetland	Bog	Wet	1.7
Wetland	Blanket bog	No secondary code assigned	1.7
Wetland	Blanket bog	Dry	-2
Wetland	Blanket bog	Wet	1.7
Wetland	Blanket bog (H7130)	No secondary code assigned	1.7
Wetland	Fen marsh and swamp	No secondary code assigned	1.8
Wetland	Fen marsh and swamp	Flush	0.4
Wetland	Fen marsh and swamp	Flush, Base-rich substrate	1.8
Wetland	Lowland fens	Tall herb	1.8
Wetland	Transition mires and quaking bogs; lowland (H7140)	No secondary code assigned	1.7
Wetland	Purple moor grass and rush pastures	No secondary code assigned	0.8
Wetland	Upland flushes, fens and swamps	No secondary code assigned	0.4
Wetland	Reedbeds	No secondary code assigned	6.5
Grassland	Grassland	No secondary code assigned	2.9
Grassland	Grassland	Seasonally wet, Wet, Waterlogged	2.5
Grassland	Grassland	Tall herb	2.5
Grassland	Grassland	Ruderal/ ephemeral	2.3
Grassland	Grassland	Calcareous - acidic mosaic, Sward type mosaic	0.8
Grassland	Grassland	Traditional orchards	1.4
Grassland	Grassland	Coastal and floodplain grazing marsh	2.8
Grassland	Acid grassland	No secondary code assigned	0.5
Grassland	Acid grassland	Scattered bracken	2
Grassland	Acid grassland	Scattered dwarf shrubs	2.3
Grassland	Acid grassland	Tall or tussocky sward	2.2

		Calcareous - acidic mosaic, Sward type mosaic	2.7
Grassland	Acid grassland	Grazed	2.2
Grassland	Acid grassland	Grazed	2.2
Grassland	Lowland dry acid grassland	No secondary code assigned	0.5
Grassland	Lowland dry acid grassland	Scattered dwarf shrubs	2
Grassland	Bracken	No secondary code assigned	2.3
Grassland	Calcareous grassland	No secondary code assigned	0.8
Grassland	Lowland calcareous grassland	No secondary code assigned	0.8
Grassland	Upland calcareous grassland	No secondary code assigned	0.8
Grassland	Neutral grassland	No secondary code assigned	3.1
Grassland	Neutral grassland	Pasture or meadow	3
Grassland	Neutral grassland	Wet	2.5
Grassland	Neutral grassland	Tall or tussocky sward	3
Grassland	Lowland meadows	No secondary code assigned	3.4
Grassland	Other neutral grassland	No secondary code assigned	2.8
Grassland	Modified grassland	No secondary code assigned	2.5
Grassland	Modified grassland	Frequently mown, Introduced shrub	2.5
Heathland and shrub	Dwarf shrub heath	No secondary code assigned	2.3
Heathland and shrub	Dwarf shrub heath	Wet	2.3
Heathland and shrub	Dwarf shrub heath	Scattered grass	2
Heathland and shrub	Lowland heathland	No secondary code assigned	2.8
Heathland and shrub	Upland heathland	No secondary code assigned	2.8
Heathland and shrub	Upland Heathland	Wet, Base-rich substrate	2.8
Heathland and shrub	Upland heathland	Base-rich substrate	2.8
Heathland and shrub	Upland heathland	Acidic substrate	2.8
Heathland and shrub	Upland heathland	Scattered grass	2.7
Heathland and shrub	Hedgerows	No secondary code assigned	0.5
Heathland and shrub	Dense scrub	No secondary code assigned	9.7
Heathland and shrub	Hawthorn scrub	No secondary code assigned	9.7
Rivers and lakes	Rivers and lakes	No secondary code assigned	Not mapped
Rivers and lakes	Standing open water and canals	No secondary code assigned	Not mapped

Rivers and lakes	Standing open water and canals	Reservoirs	Not mapped
Rivers and lakes	Standing open water and canals	Freshwater - man-made	Not mapped
Rivers and lakes	Oligotrophic and dystrophic lakes	No secondary code assigned	Not mapped
Rivers and lakes	Canals	No secondary code assigned	Not mapped
Rivers and lakes	Rivers and streams	No secondary code assigned	Not mapped
Sparsely vegetated land	Sparsely vegetated land	No secondary code assigned	0
Sparsely vegetated land	Inland rock	No secondary code assigned	0
Sparsely vegetated land	Limestone pavement	No secondary code assigned	0
Sparsely vegetated land	Calaminarian grasslands	No secondary code assigned	0
Urban	Urban	No secondary code assigned	0
Urban	Built-up areas and gardens	No secondary code assigned	0.5
Urban	Built-up areas and gardens	Introduced shrub	0.5
Urban	Built-up areas and gardens	Allotments	0.2
Urban	Open Mosaic Habitats on Previously Developed Land	No secondary code assigned	10
Woodland and forest	Woodland and forest	No secondary code assigned	9.7
Woodland and forest	Woodland and forest	Scattered scrub	5
Woodland and forest	Woodland and forest	Scattered trees	10.4
Woodland and forest	Woodland and forest	Ancient woodland site	10.4
Woodland and forest	Woodland and forest	Ancient woodland site, Plantation	10.4
Woodland and forest	Woodland and forest	Ancient woodland site, Semi-natural woodland	10.4
Woodland and forest	Woodland and forest	Ancient woodland site, Semi-natural woodland, Wet	10
Woodland and forest	Woodland and forest	Plantation	12.2
Woodland and forest	Woodland and forest	Coppice	0
Woodland and forest	Woodland and forest	Felled	7

Woodland and forest	Woodland and forest	Young trees - planted	7
Woodland and forest	Woodland and forest	Young trees - planted, Young trees - self-set	10.4
Woodland and forest	Broadleaved mixed and yew woodland	No secondary code assigned	10.5
Woodland and forest	Broadleaved mixed and yew woodland	Ancient woodland site	10.4
Woodland and forest	Broadleaved mixed and yew woodland	Ancient woodland site, Plantation	10.4
Woodland and forest	Broadleaved mixed and yew woodland	Ancient woodland site, Semi-natural woodland	10.3
Woodland and forest	Broadleaved mixed and yew woodland	Plantation	10.4
Woodland and forest	Broadleaved mixed and yew woodland	Semi-natural woodland	10
Woodland and forest	Broadleaved mixed and yew woodland	Secondary woodland	0
Woodland and forest	Broadleaved mixed and yew woodland	Felled	7
Woodland and forest	Broadleaved mixed and yew woodland	Young trees - planted	6
Woodland and forest	Broadleaved mixed and yew woodland	Young trees - planted, Young trees - self-set	10.4
Woodland and forest	(Upland oakwood)	No secondary code assigned	10.2
Woodland and forest	(Upland oakwood)	Plantation	10.4
Woodland and forest	(Upland oakwood)	Semi-natural woodland	10
Woodland and forest	Upland mixed ashwoods	No secondary code assigned	9.8
Woodland and forest	Upland mixed ashwoods	Plantation	10
Woodland and forest	Upland mixed ashwoods	Semi-natural woodland	8.5
Woodland and forest	Wet woodland	No secondary code assigned	8.5
Woodland and forest	Wet woodland	Semi-natural woodland	8.5
Woodland and forest	Wet woodland	Secondary woodland	10.4
Woodland and forest	Lowland mixed deciduous woodland	No secondary code assigned	10.4
Woodland and forest	Lowland mixed deciduous woodland	Ancient woodland site, Semi-natural woodland	10.4
Woodland and forest	Lowland mixed deciduous woodland	Semi-natural woodland	10
Woodland and forest	Other woodland; mixed	Plantation	9.2

Woodland and forest	Coniferous woodland	No secondary code assigned	9.2
Woodland and forest	Coniferous woodland	Ancient woodland site, Plantation	9.2
Woodland and forest	Coniferous woodland	Plantation	0
Woodland and forest	Coniferous woodland	Felled	0
Sparsely vegetated land	Inland rock outcrop and scree habitats	No secondary code assigned	0.5
Sparsely vegetated land	Sparsely vegetated land	Quarry - hard rock	2.8
Heathland and shrub	Heathland and shrub	Scattered scrub	2.5
Cropland	Temporary grass and clover leys	Intensively managed	2.5
Cropland	Temporary grass and clover leys	Less intensively managed	-3
Wetland	Degraded blanket bog	No secondary code assigned	6
Woodland and forest	Single line of trees	No secondary code assigned	0
Inland rock outcrop and scree habitats		No secondary code assigned	0
Urban	Urban	Golf course	0.5
Sparsely vegetated land	Sparsely vegetated land	Bare ground	2
Grassland	Grassland	Bare ground	0
Urban	Urban	Bare ground	3
Grassland	Grassland	Wood-pasture and parkland	1
Grassland	Grassland	Solar farm	0.5
Sparsely vegetated land	Sparsely vegetated land	Quarry - hard rock, Quarry - sand and gravel	8.4
Woodland and forest	Woodland and forest	Planted woodland	0
Wetland	Wetland	Exposed riverine sediments	2.7
Grassland	Grassland	Scattered Scrub	0
Rivers and lakes	Rivers and lakes	Ponds	2.9
Grassland	Lowland hay meadows (H6510)	No secondary code assigned	0
Urban	Artificial unvegetated, unsealed surface	No secondary code assigned	2.8
Grassland	Grassland	Cemeteries	2.8
Grassland	Grassland	Grassland/Childrens play areas	3

Urban	Urban	Parks and gardens	3
Urban	Urban	Natural and semi-natural open space	0.5
Urban	Urban	Sport pitches	0
Grassland	Grassland	Dry stone wall	0
Urban	Urban	Quarry - hard rock	2.9

| Associated data file	Value/Class name
Carbon_sequestration_stock.gpkg	Range: -3: hex: #ff7f00 to -1.3111: hex: #ff9f45 0: hex: #d2e3f3 to 12.2: hex: #08306b

References:

Alonso, I., Weston, K., Gregg, R. and Morecroft, M. 2012. Carbon storage by habitat - Review of the evidence of the impacts of management decisions and condition on carbon stores and sources. Natural England Research Report NERR043. Natural England, York.

Gregg, R., Elias, J. L., Alonso, I., Crosher, I.E. and Muto, P. and Morecroft, M.D. (2021) Carbon storage and sequestration by habitat: a review of the evidence (second edition) Natural England Research Report NERR094. Natural England, York.

Medcalf, K., Williams, J. and Selman, C. (in press) Spatial Prioritisation of Land Management for Carbon Dataset. Draft report for Natural England. Environment Systems Ltd.
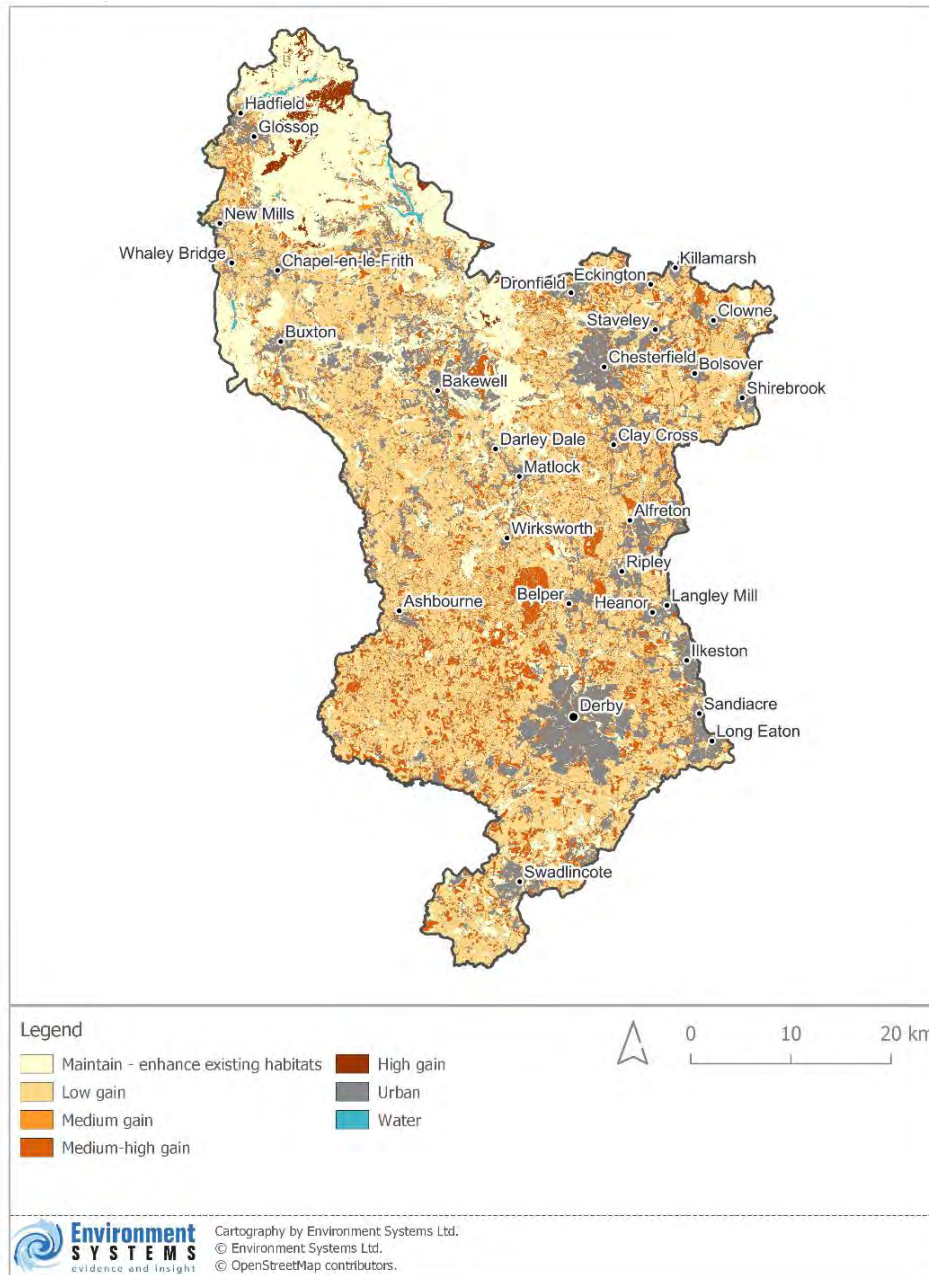
Carbon sequestration risks
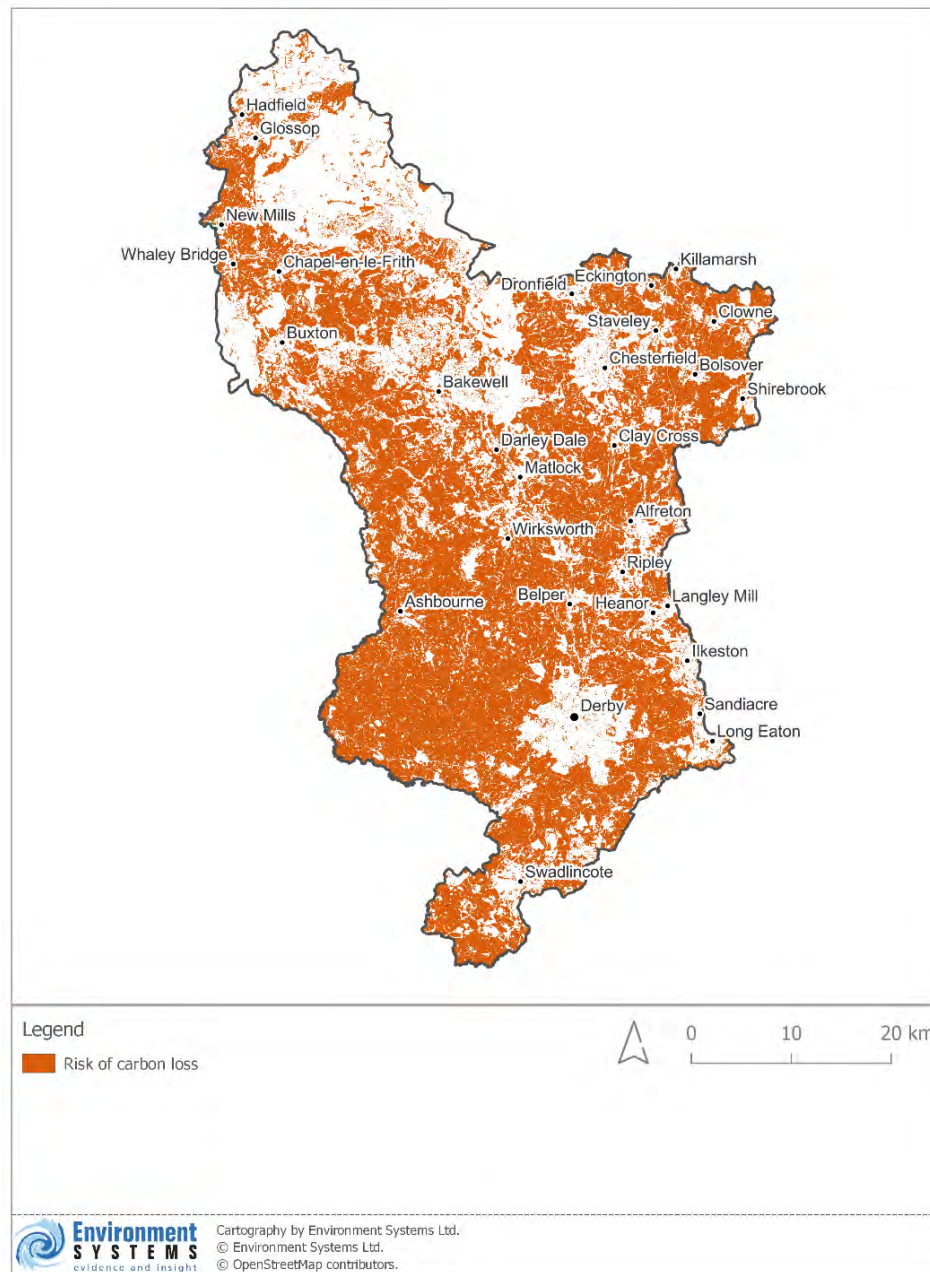
This map shows risk areas for carbon sequestration, and is based on the level of carbon abatement that could be achieved by appropriate management, as an indicator of the fragility of the current carbon sequestration system. Areas of low gain, medium gain, medium-high gain and high gain (as defined in the carbon abatement opportunities map) have been highlighted as risk areas.

Associated data file	Value/Class name
Carbon_sequestration_risk.gpkg	Whole dataset: Risk of carbon loss hex colour: #d95f0e

Carbon abatement opportunities: relative gain in carbon storage/sequestration

This map shows opportunities for enhancing carbon storage/sequestration, based on the existing habitat type as mapped by the HAR.

Opportunity type	Description
Maintain - enhance existing habitats	Some of our existing habitats, e.g. blanket bog on deep peat, are not in a degraded condition, and their existing carbon content is therefore likely to be close to their natural maximum. For this reason the opportunity type has been classified as maintain/enhance existing vegetation for these habitat types. To understand if the condition needs to be enhanced a more

	detailed analysis on this particular habitat/location, or a field visit is recommended.
Low gain	On productive agricultural land (intensive grassland and arable) there are possibilities to enhance carbon storage by changing land management practices, to incorporate more organic matter into the soil and to prevent oxidation of the topsoil layers. Changing management practices, even a small amount, can result in an increased carbon balance in the soil, benefiting not just climate mitigation but soil health and water regulation as well.
Low/medium gain	This was assigned where the existing habitat could be replaced with a more suitable (more natural, better condition, more carbon-rich) habitat, leading to low-medium gains in carbon storage/sequestration. For example; • If heathland is found on deep peat, restoration of any drainage channels dug in the peat would allow bog vegetation to re-establish, which is likely to sequester more carbon. • Where improved grassland is returned to a semi-natural grassland a M/L increase in soil carbon would be expected
Medium gain	This class is allocated where changing land use could result in a fairly good enhancement of carbon sequestration. Land was scored as medium where: • Coastal and flood plain grazing marsh: this habitat class has a higher level of uncertainty as it can encompass a variety of different grassland and wetland types. Returning these areas to wetland would produce good carbon storage benefits, therefore a medium score was awarded. • Marshy grasslands and fen, marsh and swamp can be enhanced to species rich marshy grassland or to wet woodlands (depending on local biodiversity objectives), giving a medium carbon abatement gain.
Medium-high gain	This was awarded where the likely carbon abatement would be good, for example: • all bare ground was awarded this class as re-establishing a natural vegetation cover would significantly enhance the carbon sequestration. • All low productivity grasslands (e.g. Acid, Calcareous, Neutral grassland') on soil suitable for native woodland may have the potential for planting native woodland and were therefore awarded this class.
High gain	The highest benefits to sequestration are restoring the fenlands which are currently under arable and intensive grazing.
Urban	It was not in scope for this project to look at carbon values in urban areas
Water	It was not in scope for this project to look at carbon values within water bodies

Associated data file	Value/Class name
Carbon_abatement_opps_for_storage.gpkg	1 - Maintain - enhance existing habitats: hex colour: #ffffd4

	2 - Low gain: hex colour: #fed98e
	4 - Medium gain: hex colour: #fe9929
	5 - Medium-high gain: hex colour: #d95f0e
	6 - High gain: hex colour: #993404
	7 - Urban: hex colour: #888888
	8- Water: hex colour: #41b6c4

## Areas of high importance for recreation: input datasets
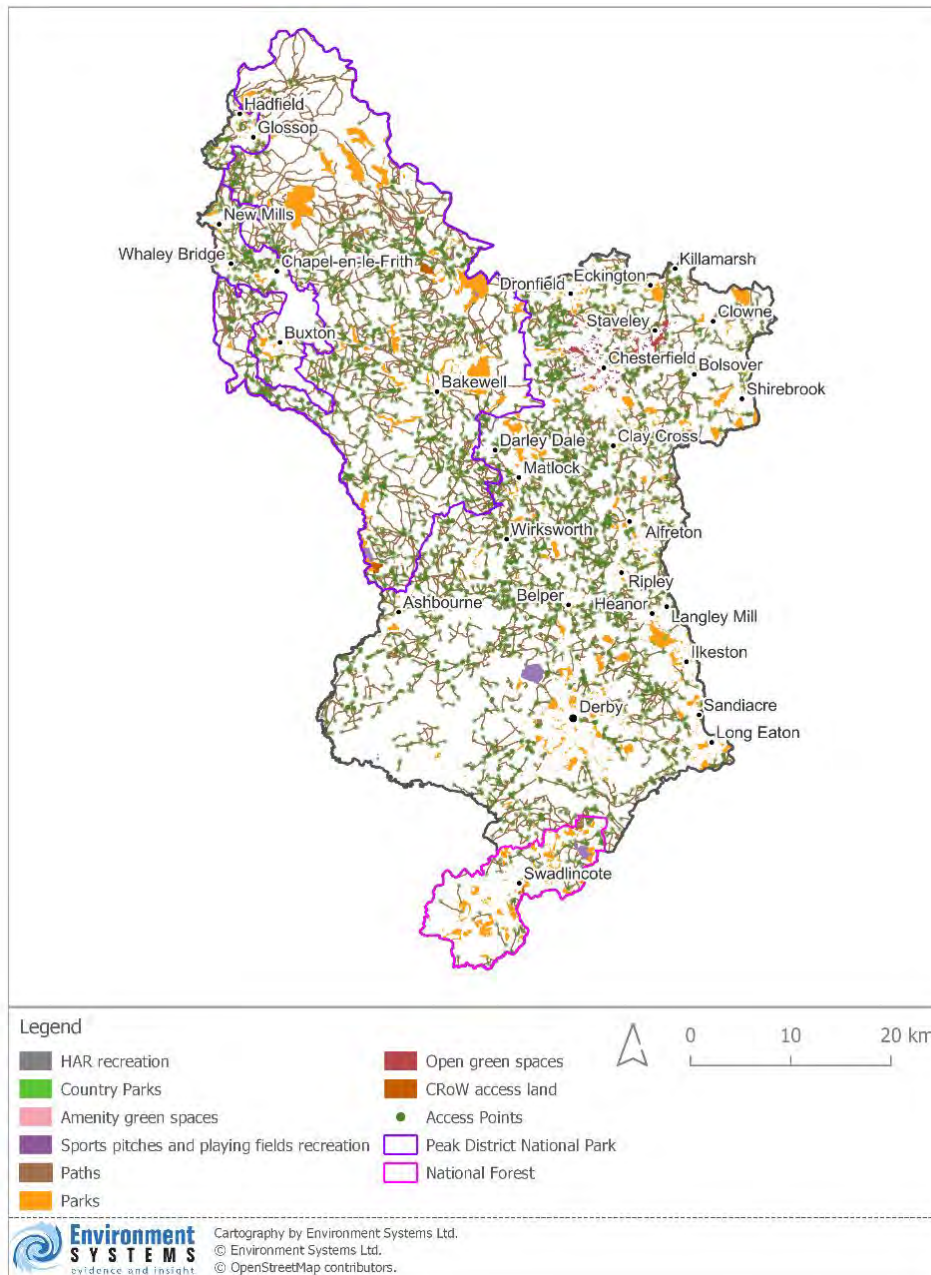
This map shows the type and distribution of input data used to produce the recreation maps, sourced from the following datasets:

- HAR habitat classes 105, 165, 180, 181, 182, 184
- Country Parks
- Amenity greenspaces
- Sports pitches and playing fields
- Paths and access points
- Parks
- Open green spaces
- CRoW access land

Associated data file	Value/Class name
Recreation_Inputs_HAR_Recreation	hex colour: #838383

Areas of high importance for recreation in terms of visitor numbers
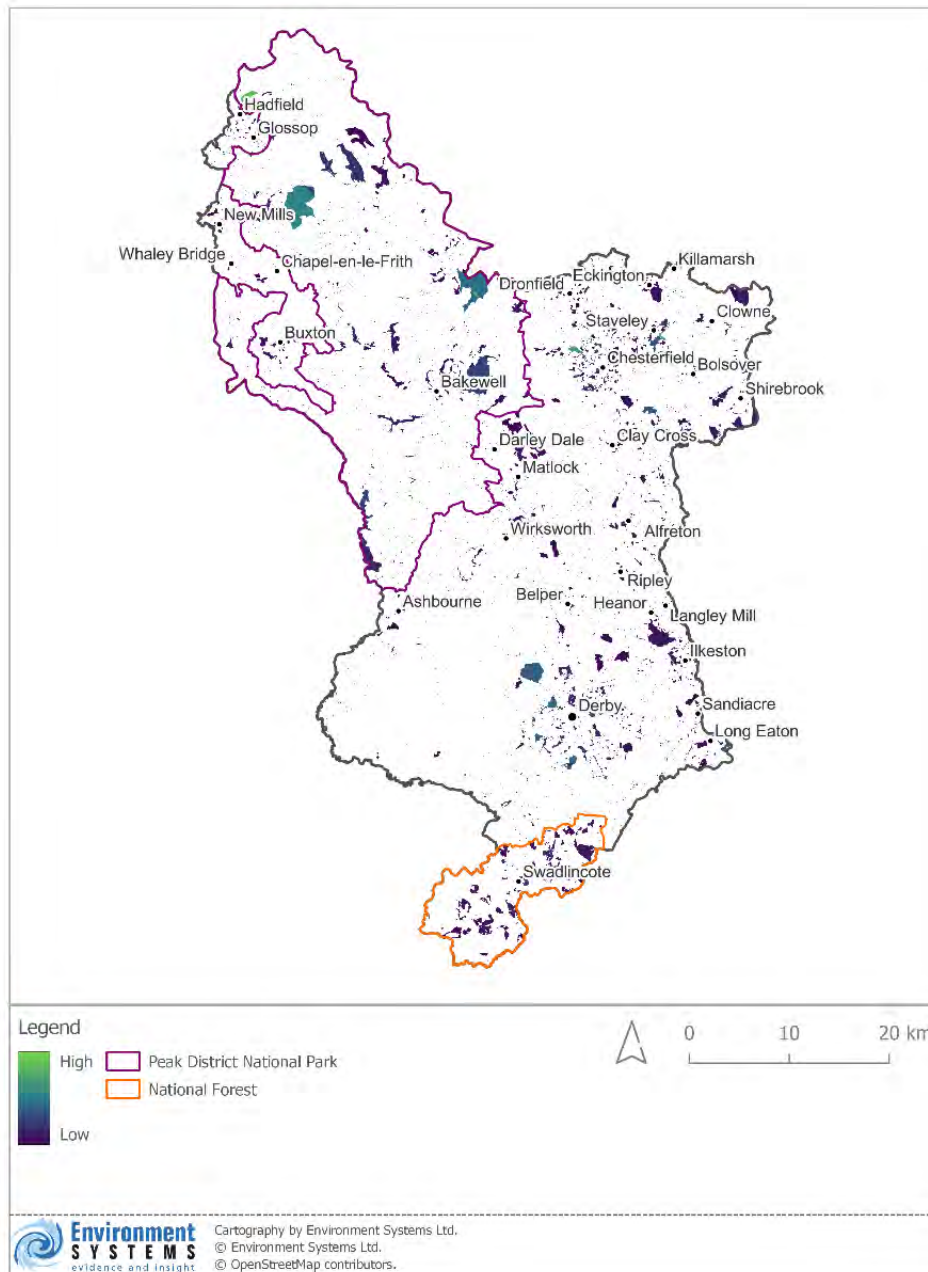
This map was created by compiling spatial datasets representing recreational assets and assessing the relative number of visitors to each feature using ORVal (Outdoor Recreation Valuation Tool Version 2.0). This was done by extracting the underlying HAR habitat classes for each polygon and assigning the corresponding ORVal classification to each habitat type, as shown in the table below. The attributed recreation features were then uploaded to ORVal, which assigned modelled visitor numbers to each feature.

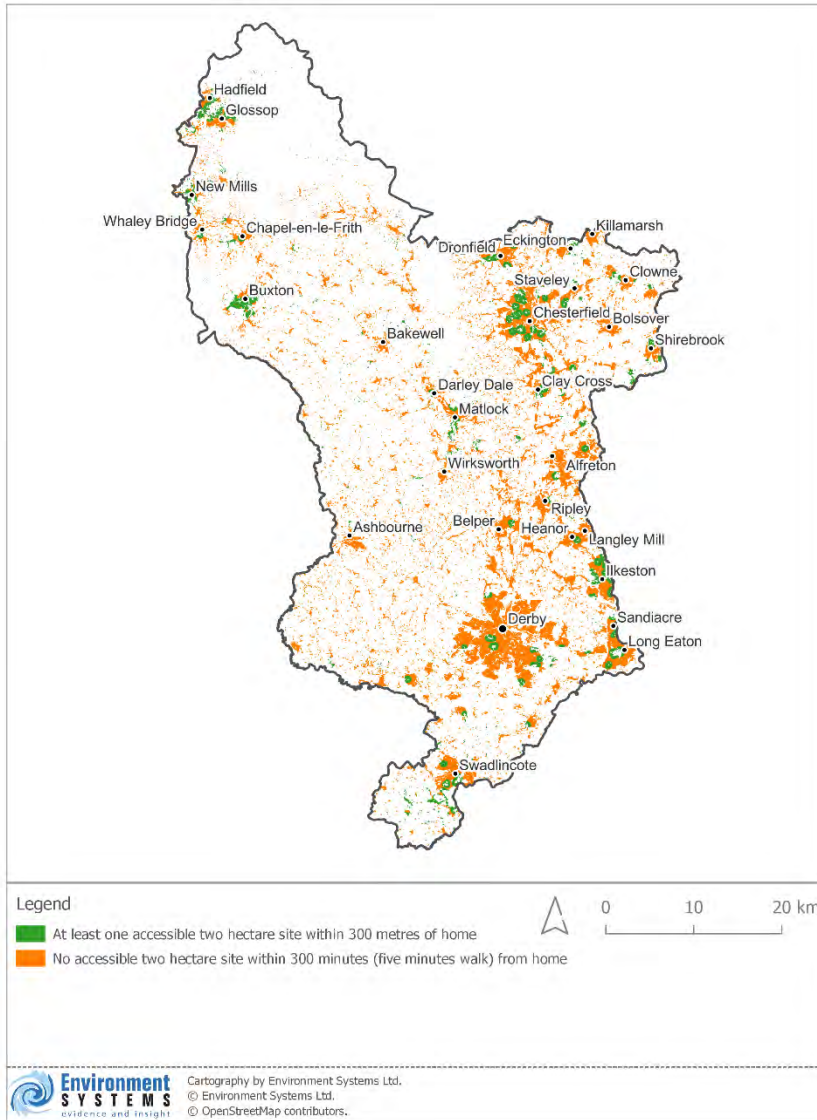| ORVal class	Corresponding HAR Habitat IDs / feature parameters
Area in Hectares / Length in km	Polygon area / polyline length

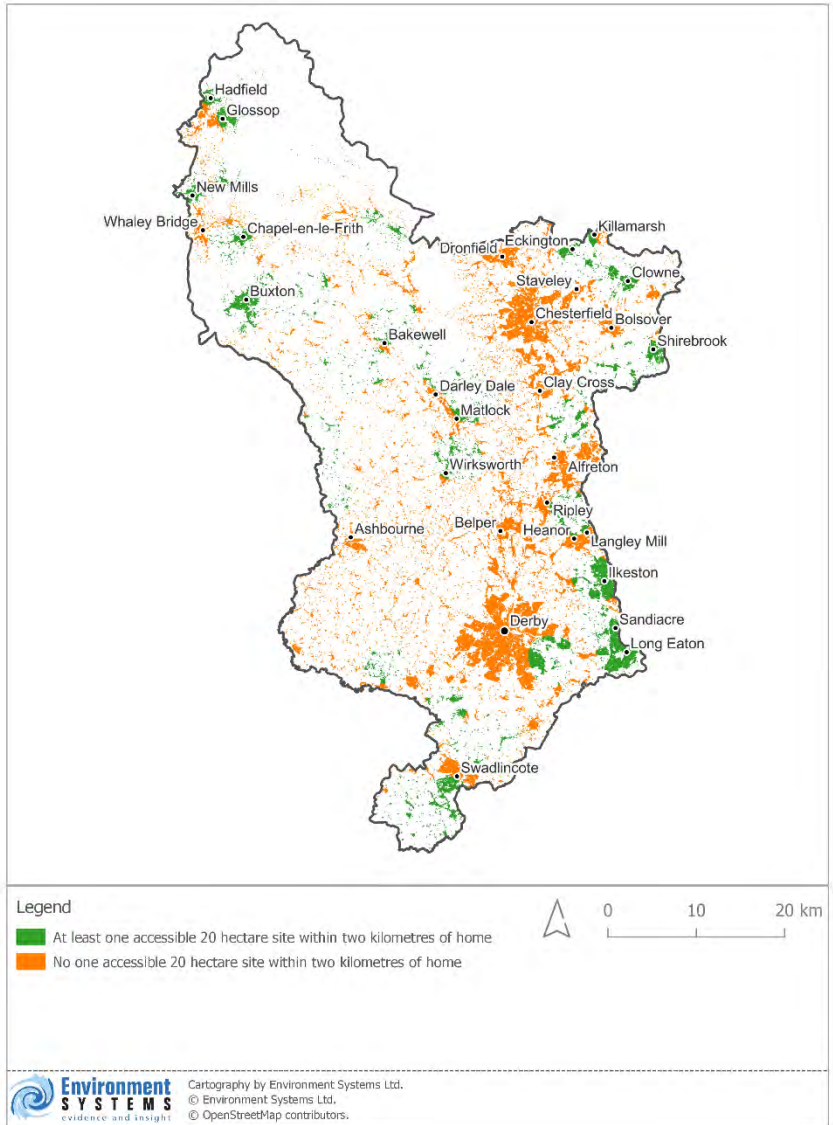|	
Landcover Managed Grass	1, 73, 75
Landcover Sports Pitch	184
Landcover Formal Garden	103, 104, 182
Landcover Agriculture	12, 13, 15, 16, 41, 43, 48, 69, 72, 87, 158, 159, 168, 171, 189
Landcover Allotment	105
Landcover Cemetery	180
Landcover Wood Coniferous	150, 151, 152
Landcover Wood Broadleaf	113, 114, 121, 123, 124, 125, 126, 127, 128, 130, 131, 133, 136, 137, 138, 141, 142, 143, 144, 145, 146, 147, 148
Landcover Wood Young/felled	118, 129, 154
Landcover Wood Unknown Type	107, 108, 109, 111, 112, 115, 117, 119, 120, 149, 162, 173
Landcover Wood Pasture	170
Landcover Natural Grass	44, 45, 46, 47, 49, 51, 52, 53,54, 55, 57, 58, 60, 61, 64, 65, 66, 69, 70, 71, 106, 168, 170, 171, 175, 178, 183, 195
Landcover Moors Heath	20, 21, 22, 24, 26, 27, 28, 29, 37, 77, 78, 79, 80, 81, 83, 84, 85, 86, 87, 88, 89, 99, 100, 157
Landcover Fen Marsh	17, 18, 19, 30, 31, 32, 34, 35, 36, 37, 38, 40, 161, 174
m of River/Canal margin	174
m of Lake/Reservoir margin	Perimeter of HAR reservoir polygons
River Water Quality	Assigned to WFD river segments based on quality status (1 = High Quality, 0 = Low Quality)
Playground	181

Associated data file	Value/Class name
Recreation_high_importance.gpkg	Range: 588 – Low: purple 350405 – High: green

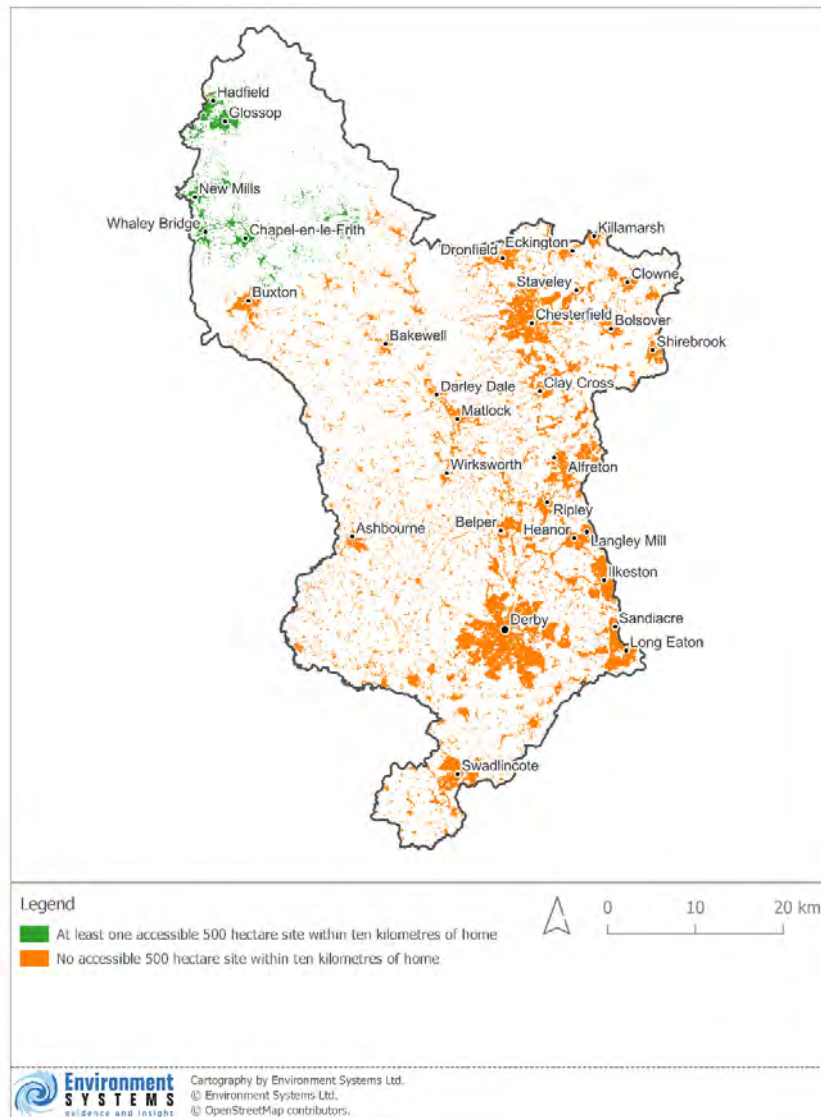# Recreation risks: urban areas with and without access to a 2ha site

Hadfield
Glossop
New Mills
Whaley Bridge
Chapel-en-le-Frith
Killamarsh
Eckington
Dronfield
Clowne
Staveley
Buxton
Chesterfield Bolsover
Bakewell
Shirebrook
Darley Dale Clay Cross
Matlock
Wirksworth Alfreton
Ripley
Ashbourne Belper Heanor Langley Mill
Ilkeston
Sandiacre
Derby Long Eaton
Swadlincote

Legend

■ At least one accessible two hectare site within 300 metres of home

■ No accessible two hectare site within 300 minutes (five minutes walk) from home

0   10   20 km

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Recreation risks: urban areas with and without access to a 20ha recreational site

Legend

At least one accessible 20 hectare site within two kilometres of home

No one accessible 20 hectare site within two kilometres of home

0   10   20 km

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Recreation risks: urban areas with and without access to a 100ha recreational site

Legend

🟩 At least one accessible 100 hectare site within five kilometres of home
🟧 No accessible 100 hectare site within five kilometres of home

0   10   20 km

Cartography by Environment Systems Ltd.
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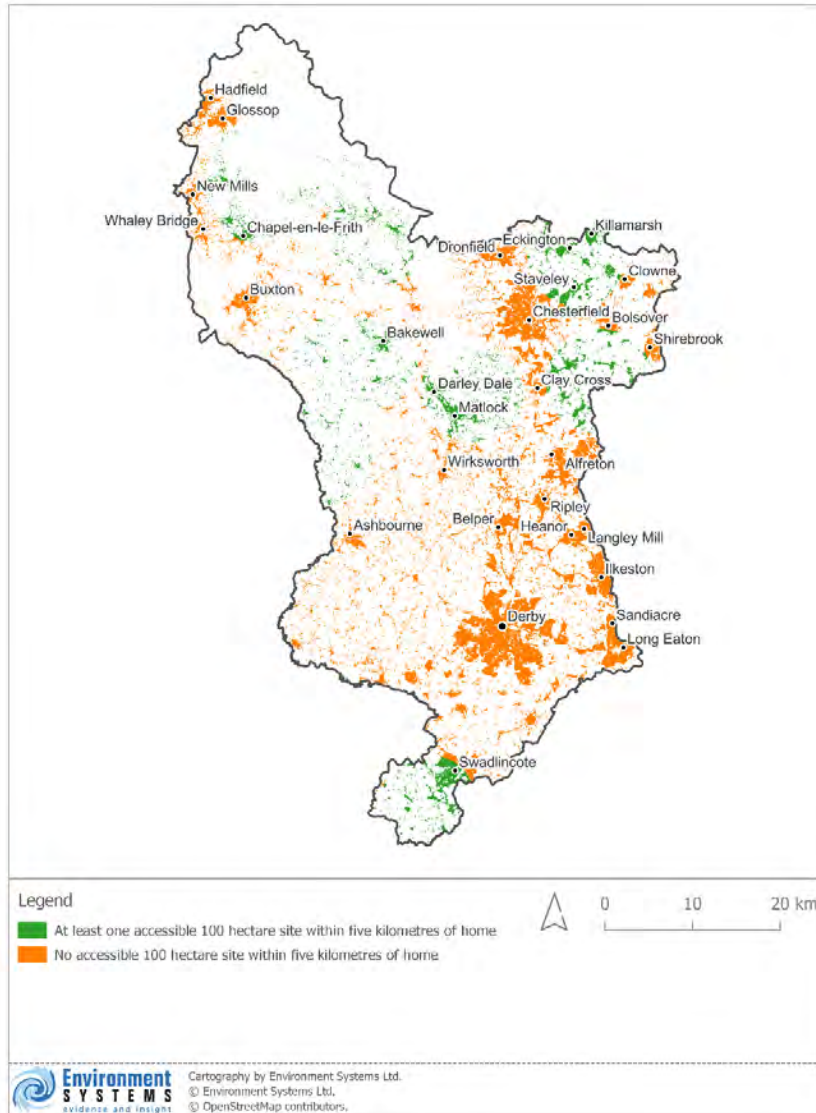
Recreation risks: urban areas with and without access to a 500ha recreational site

Recreation risk was assessed as residential areas that do not currently have sufficient access to greenspace according to the ANGst criteria. Settlement areas (OS Vectormap data) were buffered according to the ANGSt thresholds, and recreation features meeting the required size criteria were identified. This allowed the settlement areas to be divided into areas with and without greenspace access within the required distance. Analyses of the different greenspace criteria are shown on separate maps, as detailed below:

Map figure name	Angst criteria
Figure 44: Recreation risks: urban areas with and without access to a 2ha site	A site of at least 2ha in size within 300 m (5 minutes' walk) of home
Figure 45: Recreation risks: urban areas with and without access to a 20ha site	A site of at least 20 ha in size within 2km of home

Figure 46: Recreation risks: urban areas with and without access to a 100ha site	A site of at least 100 ha in size within 5km of home
Figure 47: Recreation risks: urban areas with and without access to a 500ha site	A site of at least 500 ha in size within 10km of home

Associated data file	Value/Class name
Recreation_Risk_300.gpkg	Buff_300: Of at least 2 hectares in size, no more than 300 metres (5 minutes walk) from home: hex colour: #33a02c Buff_300: Null - More than 300 metres (5 minutes walk) from home: hex colour: #ff7f00
Recreation_Risk_2k.gpkg	Buff_2k: At least one accessible 20 hectare site within two kilometres of home: hex colour: #33a02c Buff_2k: Null - No one accessible 20 hectare site within two kilometres of home: hex colour: #ff7f00
Recreation_Risk_5k.gpkg	Buff_5k: At least one accessible 100 hectare site within five kilometres: hex colour: #33a02c Buff_5k: Null - No accessible 100 hectare site within five kilometres: hex colour: #ff7f00
Recreation_Risk_10k.gpkg	Buff_10k: At least one accessible 500 hectare site within ten kilometres: hex colour: #33a02c Buff_10k: Null - No accessible 500 hectare site within ten kilometres: hex colour: #ff7f00

Areas of high importance for tourism: input datasets
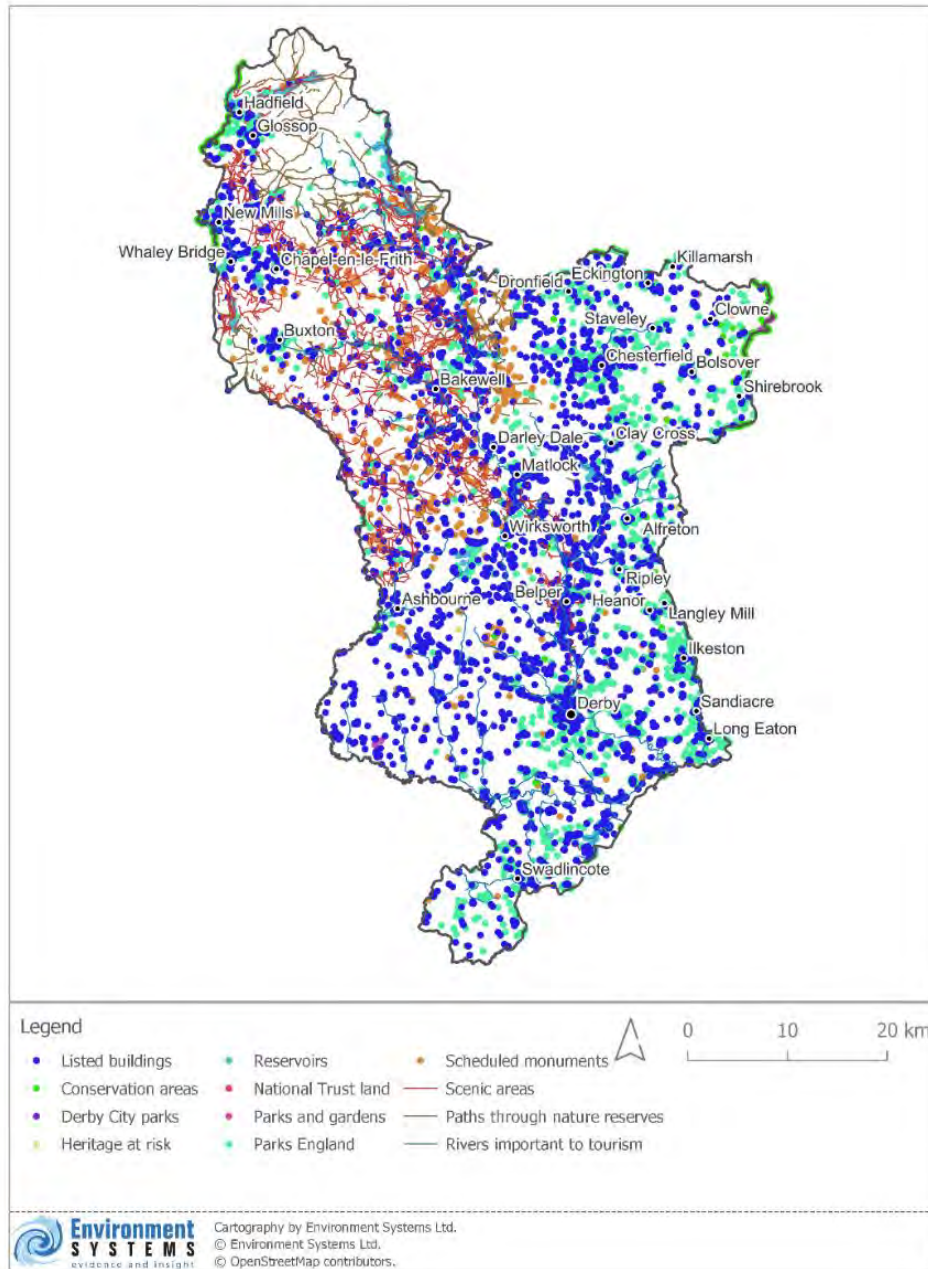
This map shows the type and distribution of input data used to produce the tourism maps, sourced from the following datasets:

- CRoW land lying within the Peak District National Park
- National Trust estates
- Registered parks and gardens
- Heritage at Risk
- Green spaces – parks
- Scheduled monuments
- Listed buildings
- Derby City parks; Darley Abbey park, Derby Arboretum, Markeaton Park only

- Reservoirs (selected from the HAR)
- Paths located within nature reserves (Ramsar sites, SACs, SPAs, NNRs, LNRs) and scenic areas (Peak District National Park, AONBs, World Heritage Sites)
- Canals
- Selected rivers: Derwent, Dove, Trent

Associated data file	Value/Class name
Tourism_Inputs_Places_of_Interest.gpkg	layer: Derby_City_parks – Derby City parks: hex colour: #791ad3

layer: HAR_Reservoirs – HAR Reservoirs: hex colour: #4ebad2 |

Areas of high importance to tourism: current stock
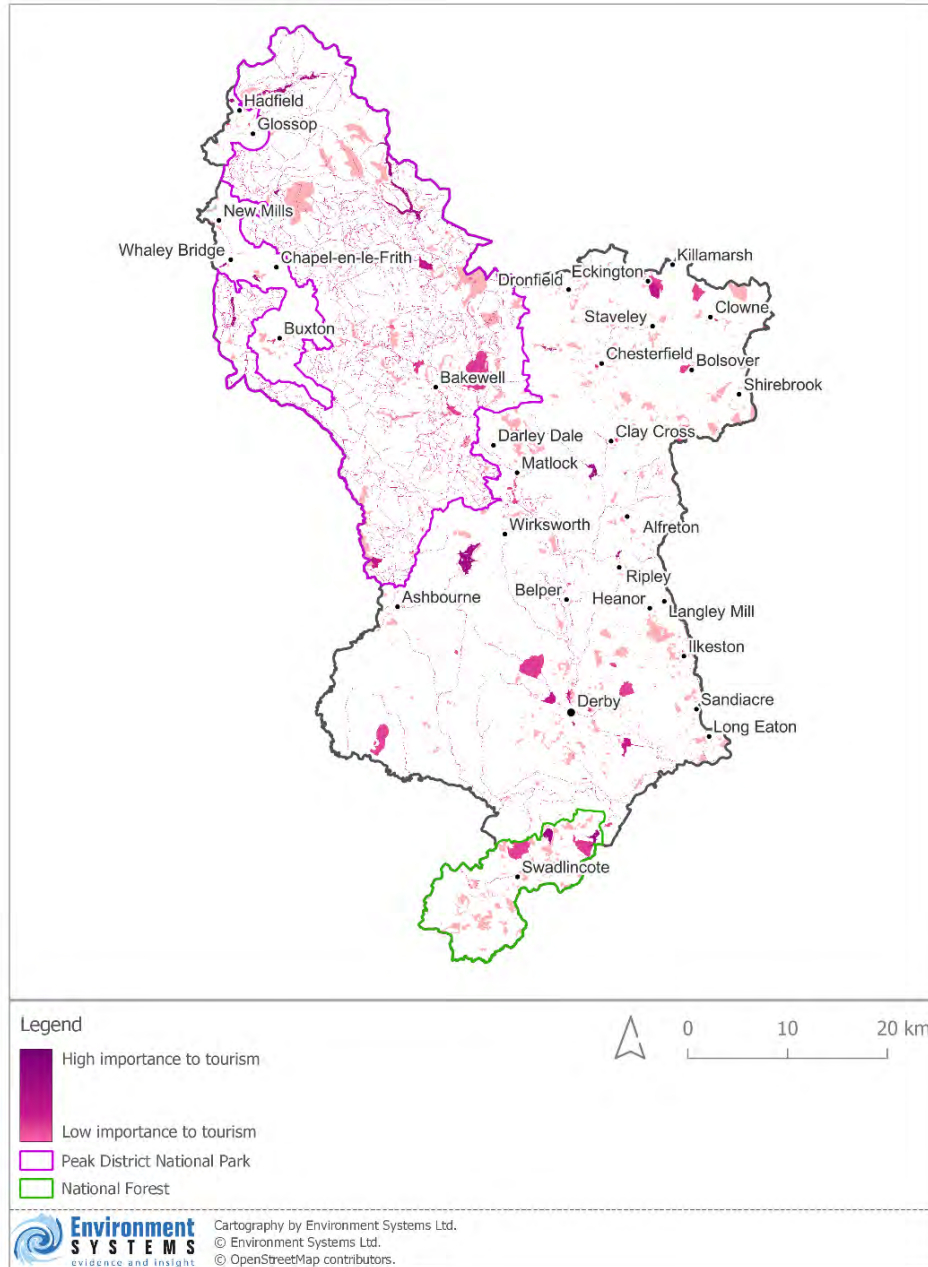
This map was created by compiling spatial datasets representing tourism assets and ranking them in terms of their relative value, as outlined in the table below.

Data input	Indicative scoring
CRoW land lying within the Peak District National Park	High
National Trust estates	High
Canals	High
Selected rivers: Derwent, Dove, Trent	High
Derby City parks; Darley Abbey park, Derby Arboretum, Markeaton Park only	High

Reservoirs (selected from the HAR)	High
Paths located within scenic areas (Peak District National Park, AONBs, World Heritage Sites)	High
Registered parks and gardens	Moderate
Heritage at Risk	Moderate
Paths located within nature reserves (Ramsar sites, SACs, SPAs, NNRs, LNRs)	Moderate
Green spaces – parks	Low
Scheduled monuments	Low
Listed buildings	Grade 1 - low Other grades - very low

Associated data file	Value/Class name
Tourism_High_Importance.gpkg	Range: 5 – Low: light pink 300 – High: dark pink

Clustered tourism sites; groupings of sites of high importance for tourism
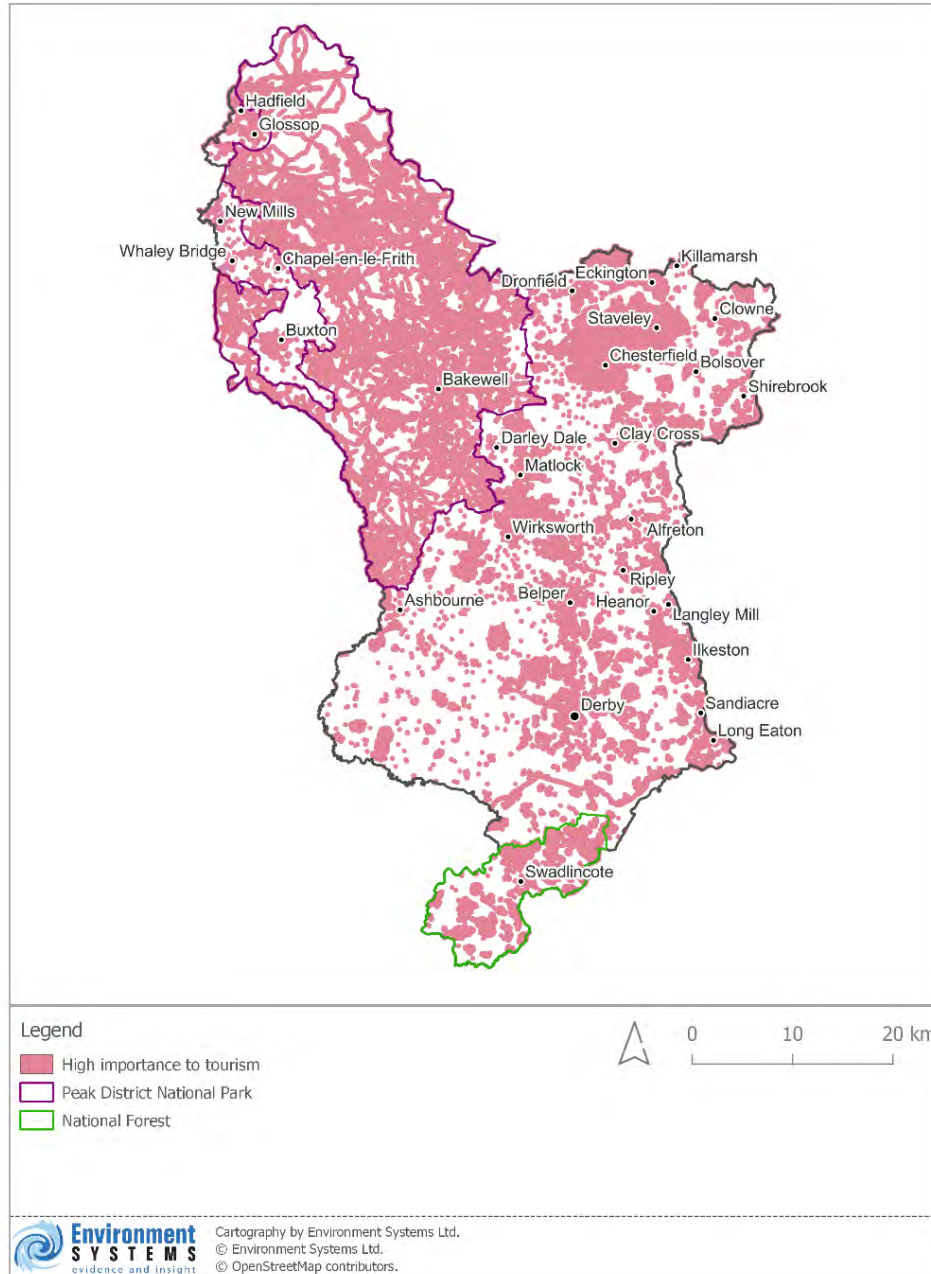
This map was made by rasterising all of the input tourism datasets to 5m resolution, and buffering them to highlight clusters.

Associated data file	Value/Class name
Tourism_Clustering_Areas_of_High_Importance.gpkg	0: hex colour: #e28498 50: hex colour: #e28498

Relative contribution of agriculture to landscape character
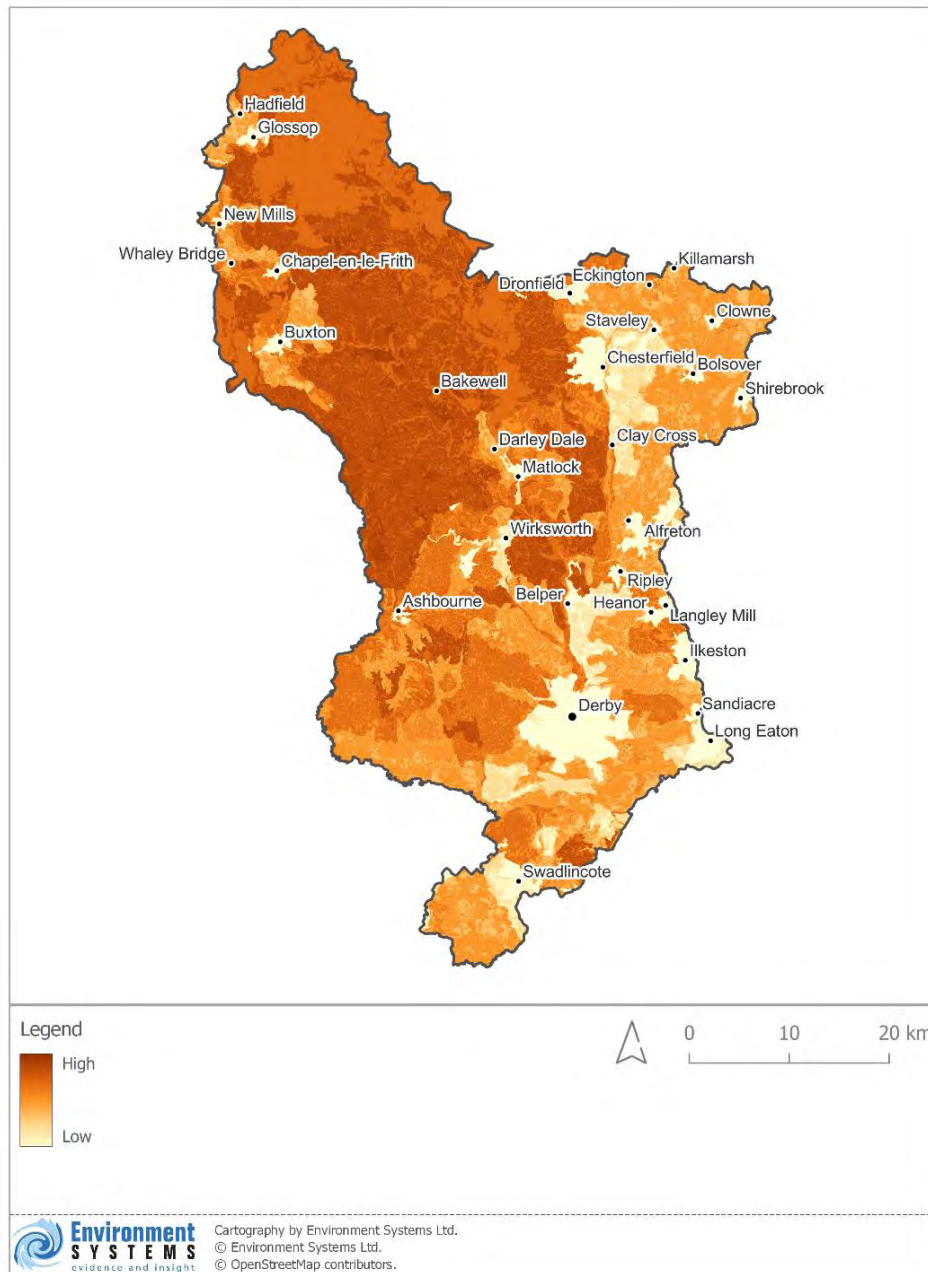
Agricultural areas were selected from the HAR and assigned a baseline score. This was then amended according to the level of visual intactness, and whether any important cultural sites are present. Input datasets were individually scored, then summed together to provide the final assessment of contribution of agriculture to landscape character.

Data input	Reason for usage	Indicative scoring
Visual intactness (October 2010 evaluation)	This dataset assesses the visual intactness of areas, using Landscape Character Types as a spatial framework. Within these areas (subdivided as necessary)	Unified: High contribution Coherent: Moderate-high contribution

	the agricultural environment forms an integral part of the assessment of intactness.	Interrupted: Moderate contribution
		Incoherent: Low contribution
		Urban: No contribution
Peak District National Park boundary	The visual intactness data does not cover the area within the national park. The national park area was therefore given an estimated visual intactness score, based on the level of land use regulation in force within the national park.	Area is within the national park: high contribution
Scheduled monuments	Cultural heritage assets add to the landscape character of an area	Low contribution
Country parks		Low contribution
Heritage at risk		Low contribution
HAR agriculture selection	The agricultural areas have an inherent value in terms of their contribution to landscape character, therefore all agricultural areas were assigned a baseline score.	Agriculture: Low-moderate contribution (baseline score)

Associated data file	Value/Class name
Contribution_Agri_Landscape_Character.gpkg	Range:
	0 – Low: light orange
	145 – High: dark orange

# Potential risks to landscape character from woodland planting within the ecological network
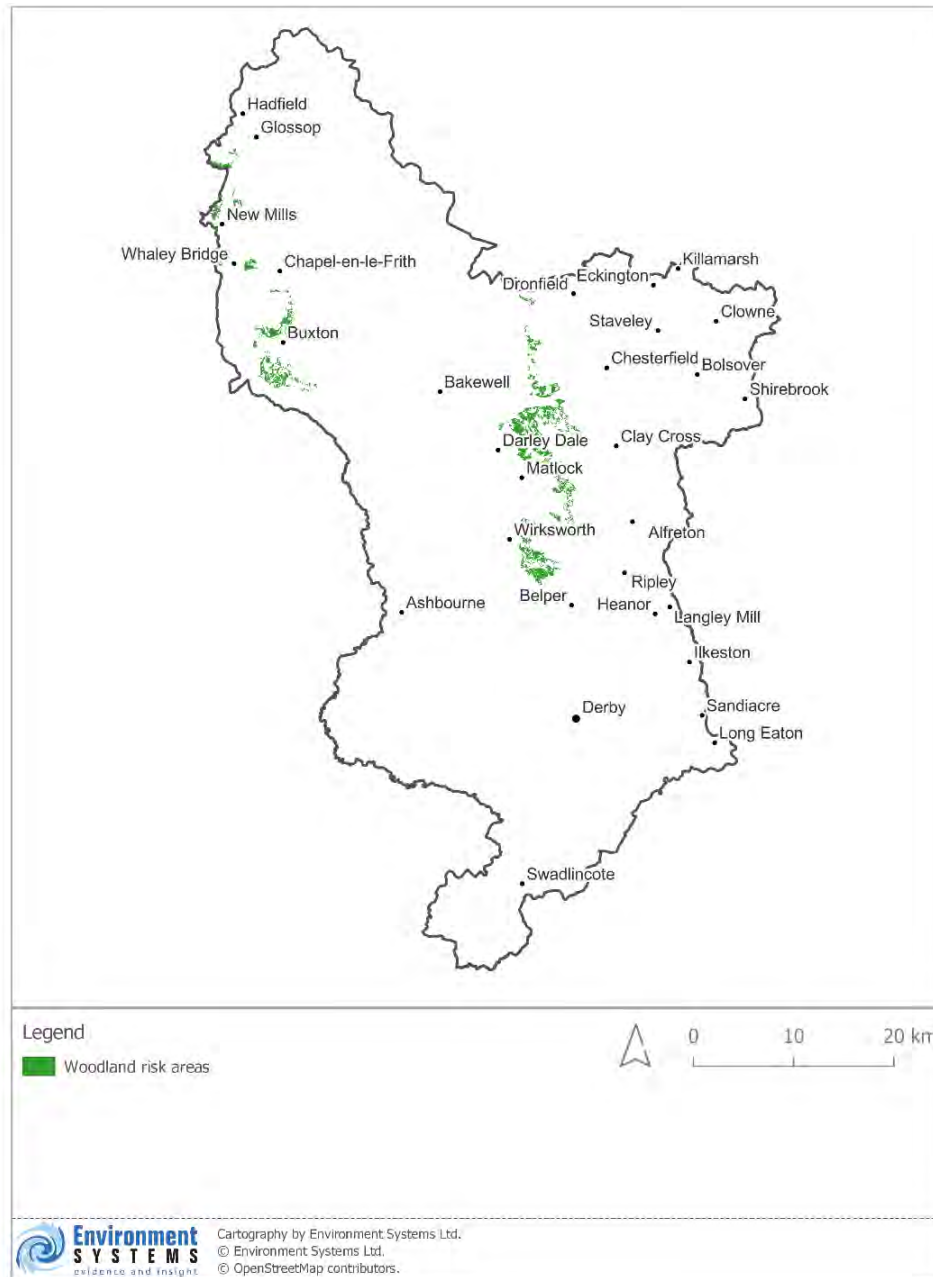
This map shows areas identified as opportunity areas for woodland during the biodiversity opportunity mapping process, that occur in places where the woodland vision going forward is for the area to remain 'Open / Unwooded' according to the Landscape Character Type.

Associated data file	Value/Class name
Contribution_Agri_Landscape_Character_Woodland_Risk.gpkg	Whole dataset: Woodland risk areas hex colour: #33a02c

Potential risks to landscape character from solar and wind renewable energy projects
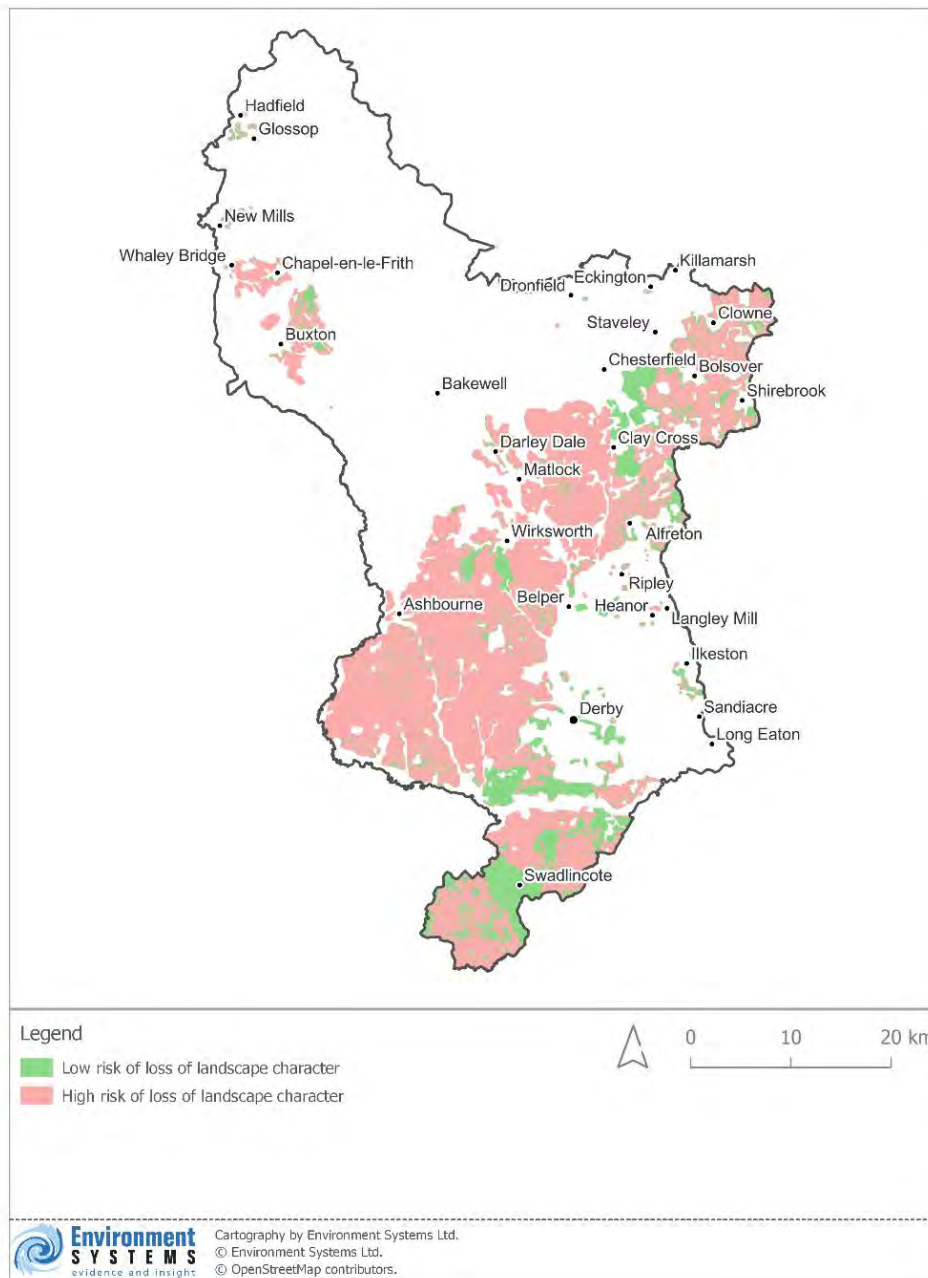
This map shows areas where the existing contribution of agriculture to landscape character has been assessed as high (in the stock map), and where there are opportunities for solar and wind renewable energy generation (as modelled under the agricultural production risks theme).

Associated data file	Value/Class name
Contribution_Agri_Landscape_Character_Renewable_Risk.gpkg	DN_1: 0 - Low risk of loss of landscape character: hex colour: #8ed88a DN_2: 1 - High risk of loss of landscape character: hex colour: #f9aead

## Biodiversity and water quality regulation multi-benefits

Legend
- Wetland opportunity for water quality regulation
- Grassland opportunity for water quality regulation
- Woodland opportunity for water quality regulation
- Grassland or woodland opportunity for water quality regulation
- Heathland opportunity for water quality regulation
- Grassland or heathland opportunity for water quality regulation
- Grassland or heathland opportunity for water quality regulation
- Grassland or woodland or heathland opportunity for water quality regulation

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This map was created by identifying the areas of intersection between the biodiversity opportunities and the water quality regulation opportunities that were deemed compatible with each type of biodiversity opportunity. For example, wetland biodiversity opportunities would be compatible with the water quality opportunity type 'restore poor-condition peatland', but not 'create within-field headlands or small woodland clusters'.

Biodiversity opportunity type	Compatible water quality opportunity type/s
Grassland	Within-field headlands or small woodland clusters Bankside vegetation
Heathland	Within-field headlands or small woodland clusters
Wetland	Restore poor condition peatland
Woodland	Within-field headlands or small woodland clusters Bankside vegetation

Associated data file	Value/Class name
Multibenefits_Biodversity_NFM.gpkg	1 - Woodland opportunity for NFM: hex colour: #019529 10 - Wetland opportunity for NFM: hex colour: #003bea 100 - Grassland opportunity for NFM: hex colour: #ff7f00

Biodiversity and NFM multi-benefits
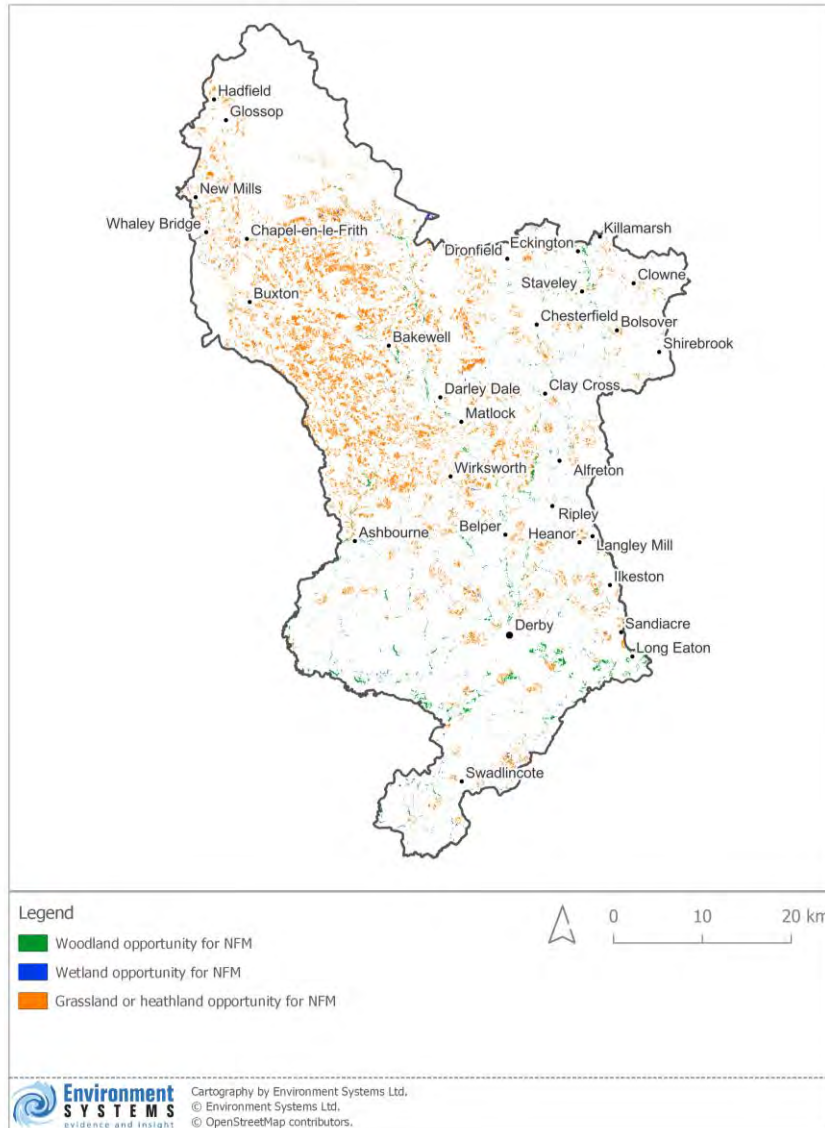
This map was created by identifying the areas of intersection between the biodiversity opportunities and the NFM opportunities that were deemed compatible with each type of biodiversity opportunity. For example, wetland biodiversity opportunities would be compatible with the NFM opportunity types 'restore peatlands' and 'create wetland', but not 'plant hedgerows'.

Biodiversity opportunity type	Compatible NFM opportunity type/s
Grassland	Deep rooted leys/species rich meadows
Wetland	Restore poor condition peatland Create wetland
Woodland	Plant hedgerows Create wet woodland

	Create riparian woodland

Change in seasonality of precipitation (right) between the present day and 2080 (WorldClim ssp370)
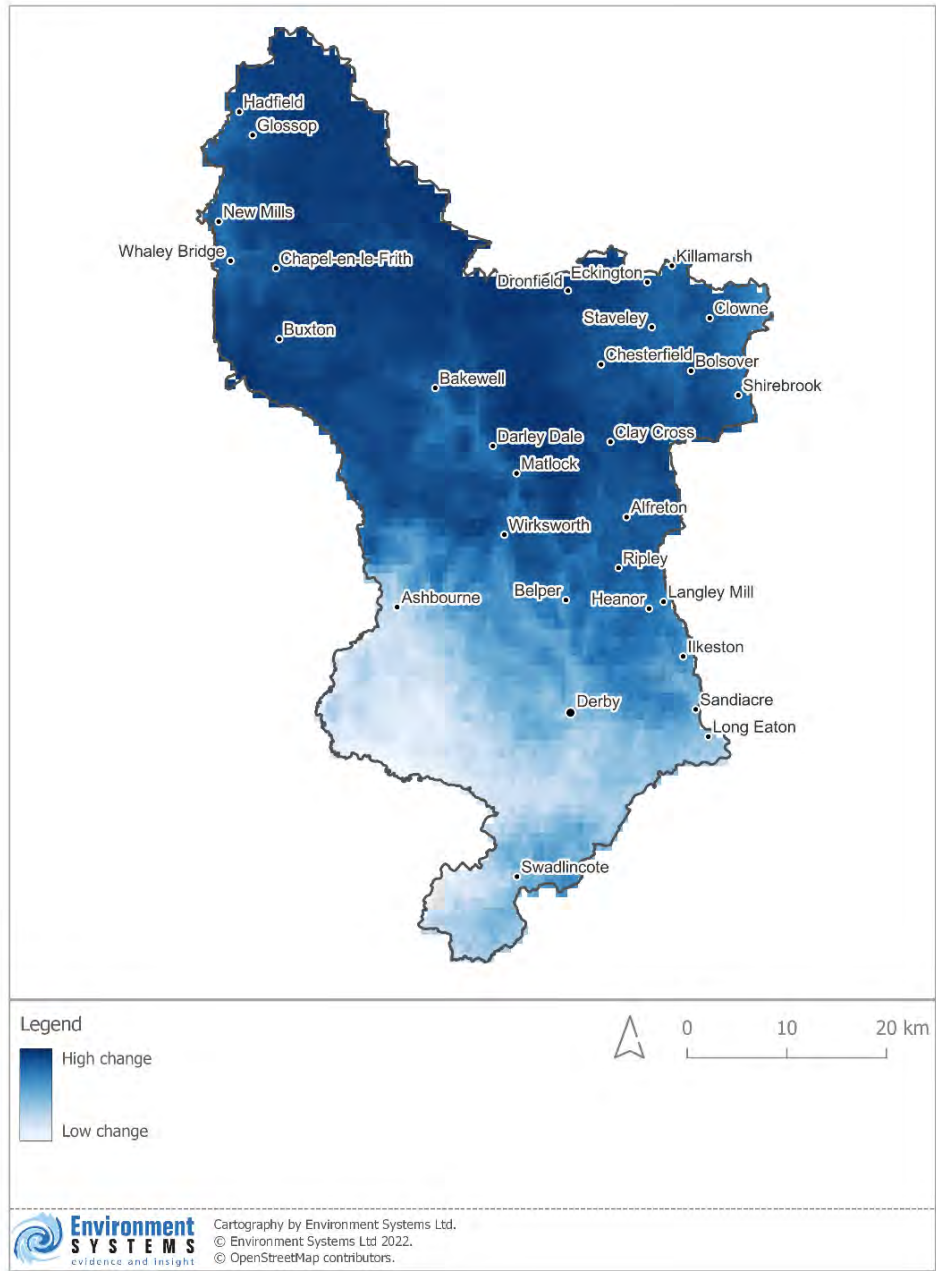
This map was generated by analysis of 30 arc second (approximately 1km) WorldClim historical and future climate data for Bioclimatic Variable 15; Precipitation Seasonality (Coefficient of Variation); SSP370. Values from the 2061-2080 data were subtracted from the historical data (representing an average of the period 1970-2000) in order to calculate the difference. The mean value across all available climate models was used. Higher values

indicate a larger increase in the seasonality of precipitation events; lower values indicate a smaller increase in the seasonality of precipitation events.

Comparison of areas receiving at least 1200mm Annual Average Rainfall in the present day
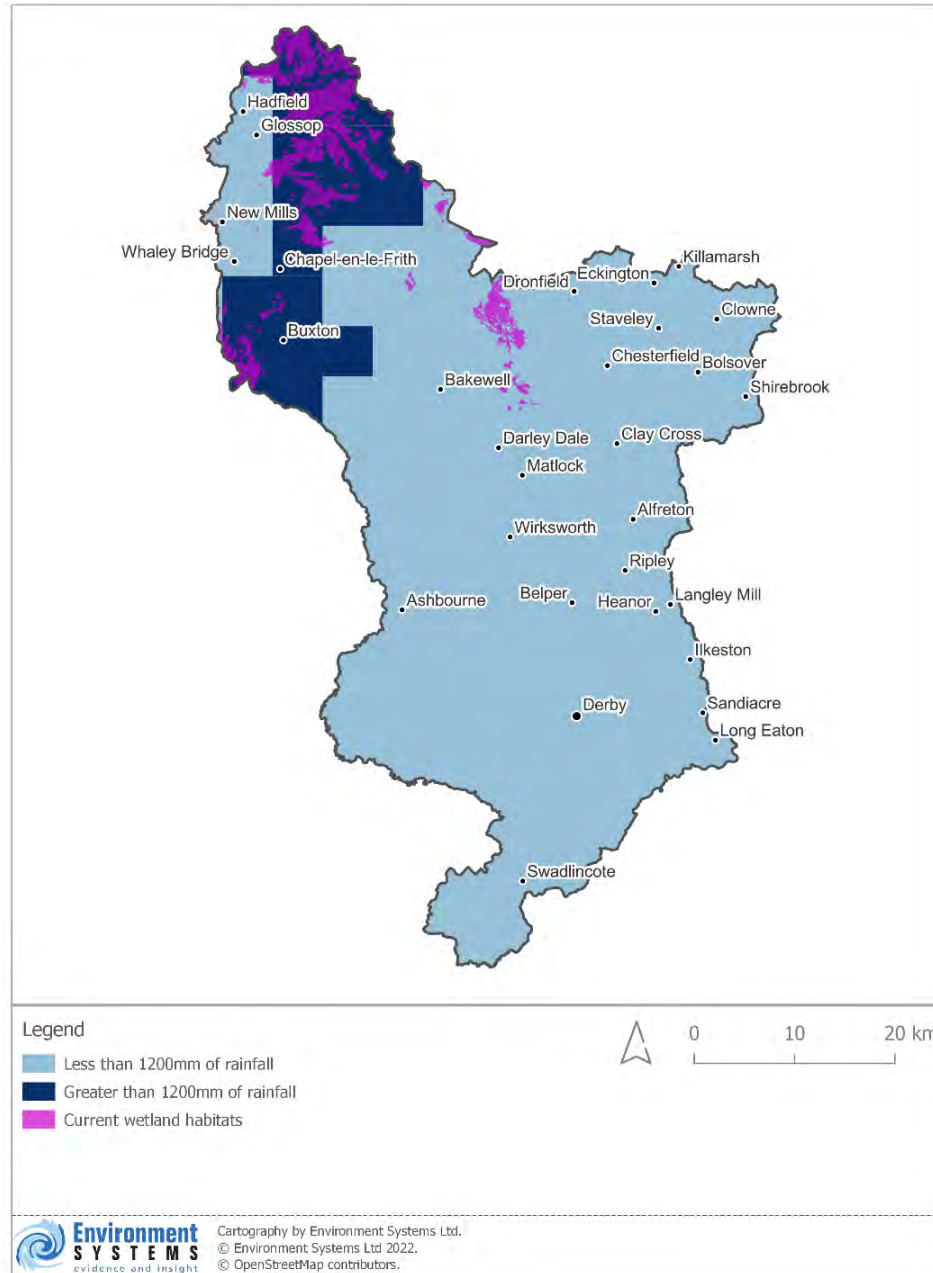
This map was generated by displaying 30 arc second (approximately 1km) historical WorldClim 2.1 data for Annual Average Rainfall, representing an average of the period 1970-2000. The rainfall data is overlain by a selection of wetland habitats from the Habitat Asset Register.

References:

WorldClim Historical climate data. https://www.worldclim.org/data/worldclim21.html
[Accessed 2022-09-12]

Fick, S.E. and R.J. Hijmans, 2017. WorldClim 2: new 1km spatial resolution climate surfaces for

global land areas. International Journal of Climatology 37 (12): 4302-4315

## Comparison of areas receiving at least 1200mm Annual Average Rainfall in 2080 (UKCP18 RCP 6.0)
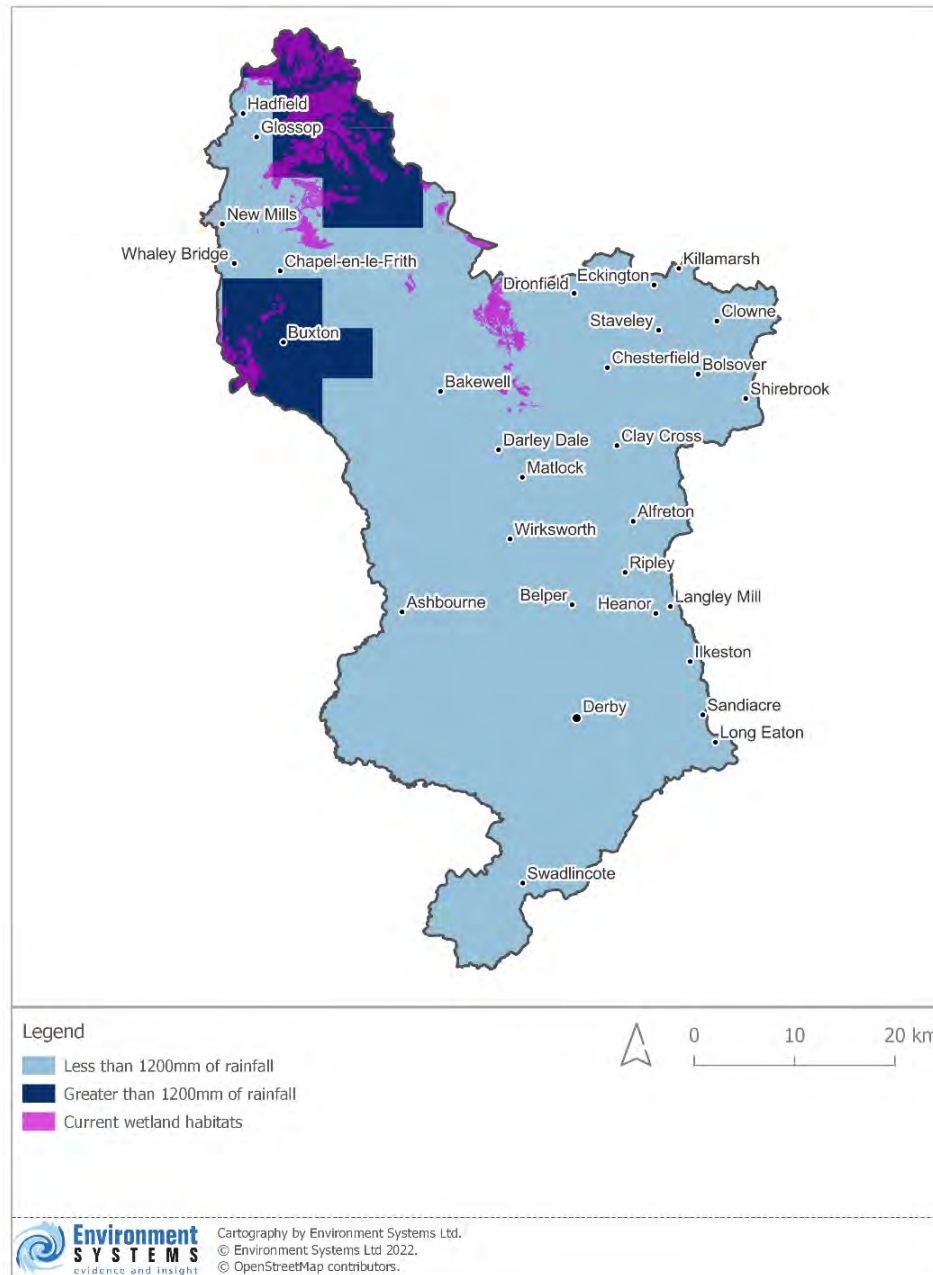
This map was generated by displaying 30 arc second (approximately 1km) WorldClim future climate data for Annual Average Rainfall, representing an average of the period 2061-2080 under Shared Socio-economic Pathway (SSP) 370. The mean value across all available

climate models was used. The rainfall data is overlain by a selection of wetland habitats from the Habitat Asset Register.

Comparison of areas where the soil experiences at least 270 Field Capacity Days in the present day (left)
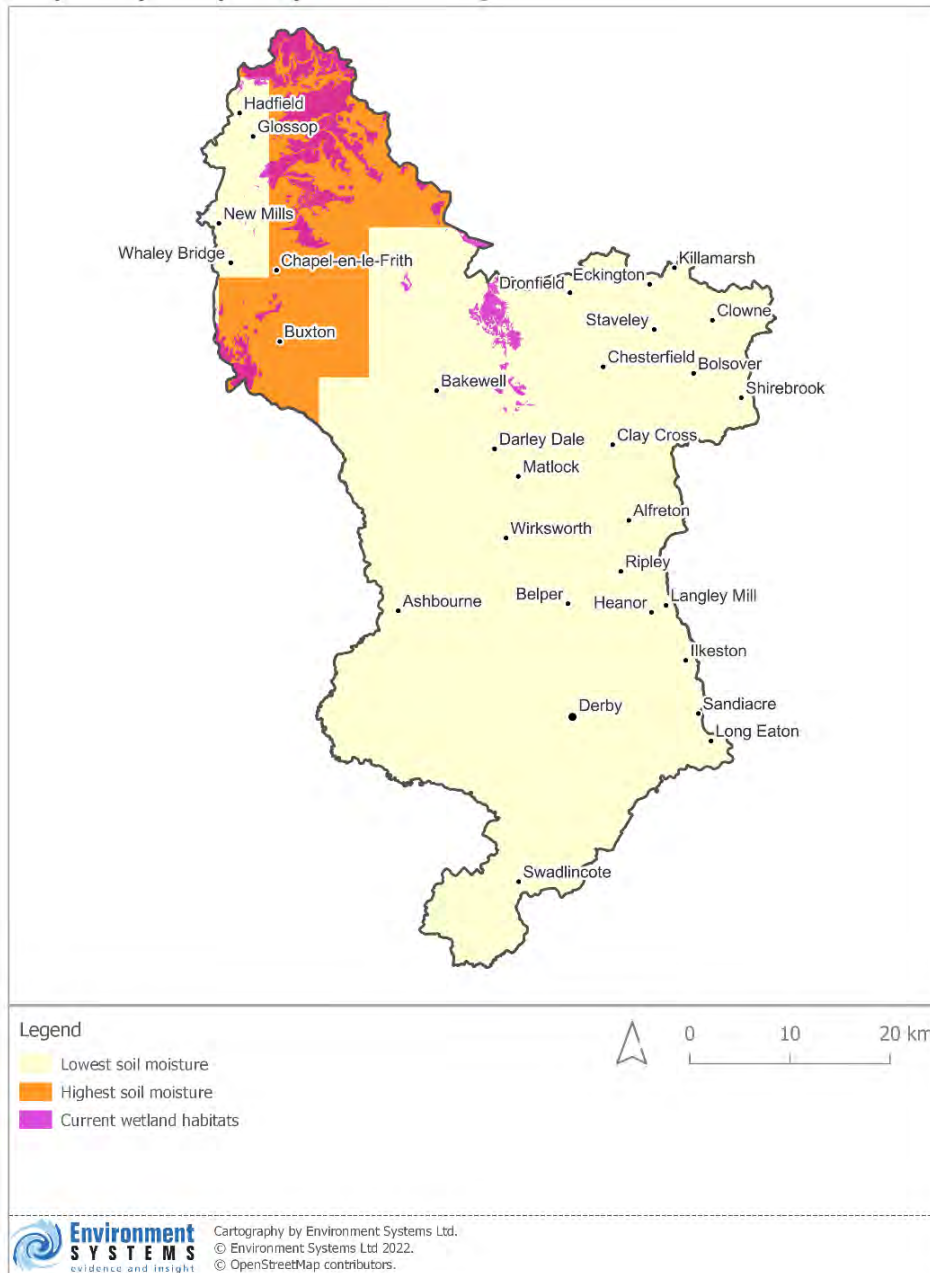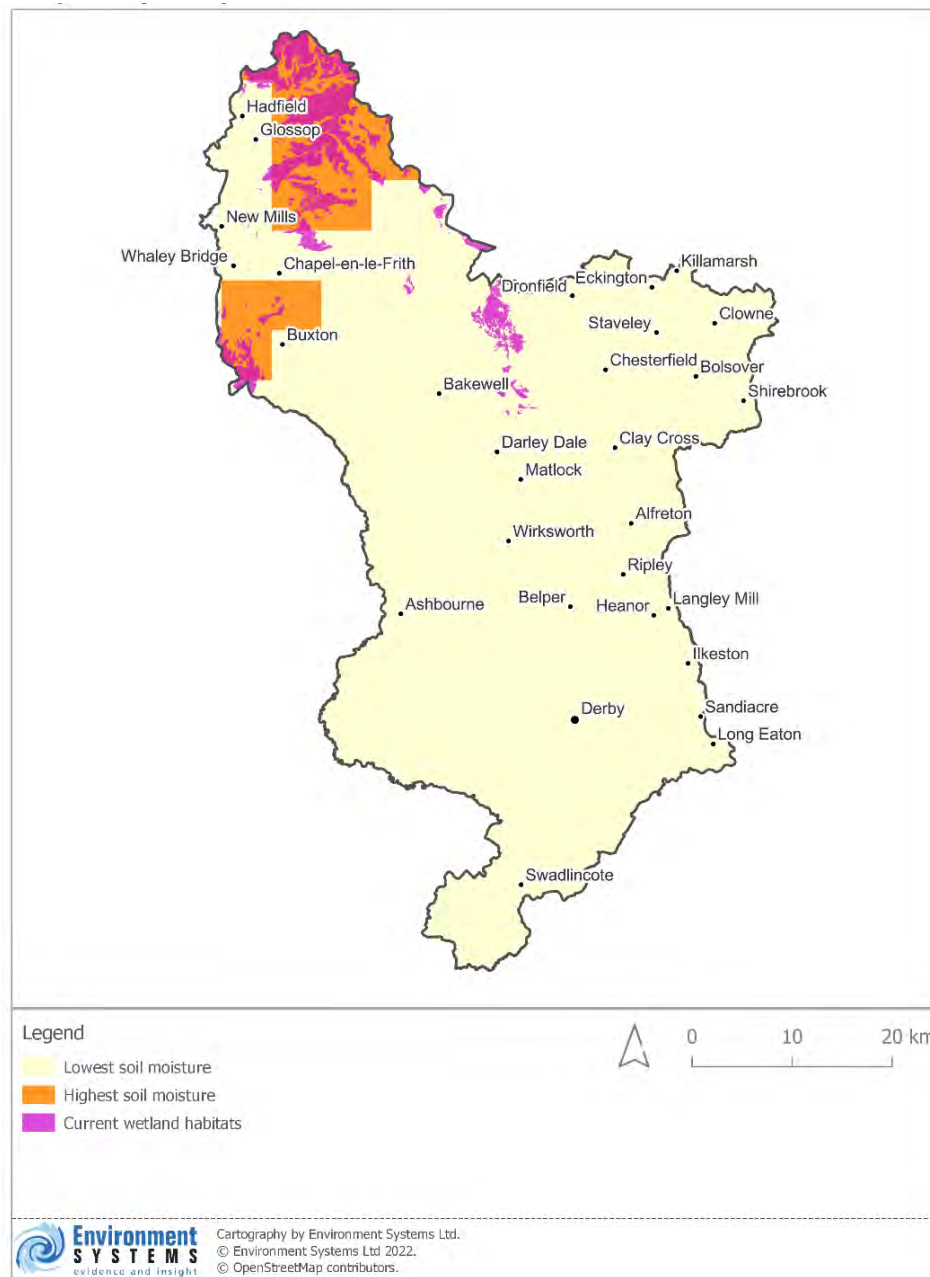

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This map used modelled ALC data generated from UKCP18 climate change model data for 2020 under a medium GHG emissions scenario (RCP 6.0); Keay, 2020. The map shows areas predicted to receive greater than and less than 270 field capacity days (FCD) per year (FCD being the state of a soil holding as much water against gravity as physically possible, following saturation and free drainage).

Comparison of areas where the soil experiences at least 270 Field Capacity Days in 2080 (UKCP18 RCP 6.0)

This map used modelled ALC data generated from UKCP18 climate change model data for 2080 under a medium GHG emissions scenario (RCP 6.0); Keay, 2020. The map shows areas predicted to receive greater than and less than 270 field capacity days (FCD) per year.

Predicted changes in Agricultural Land Classification grade between the present day and 2080 (UKCP18 RCP 6.0)
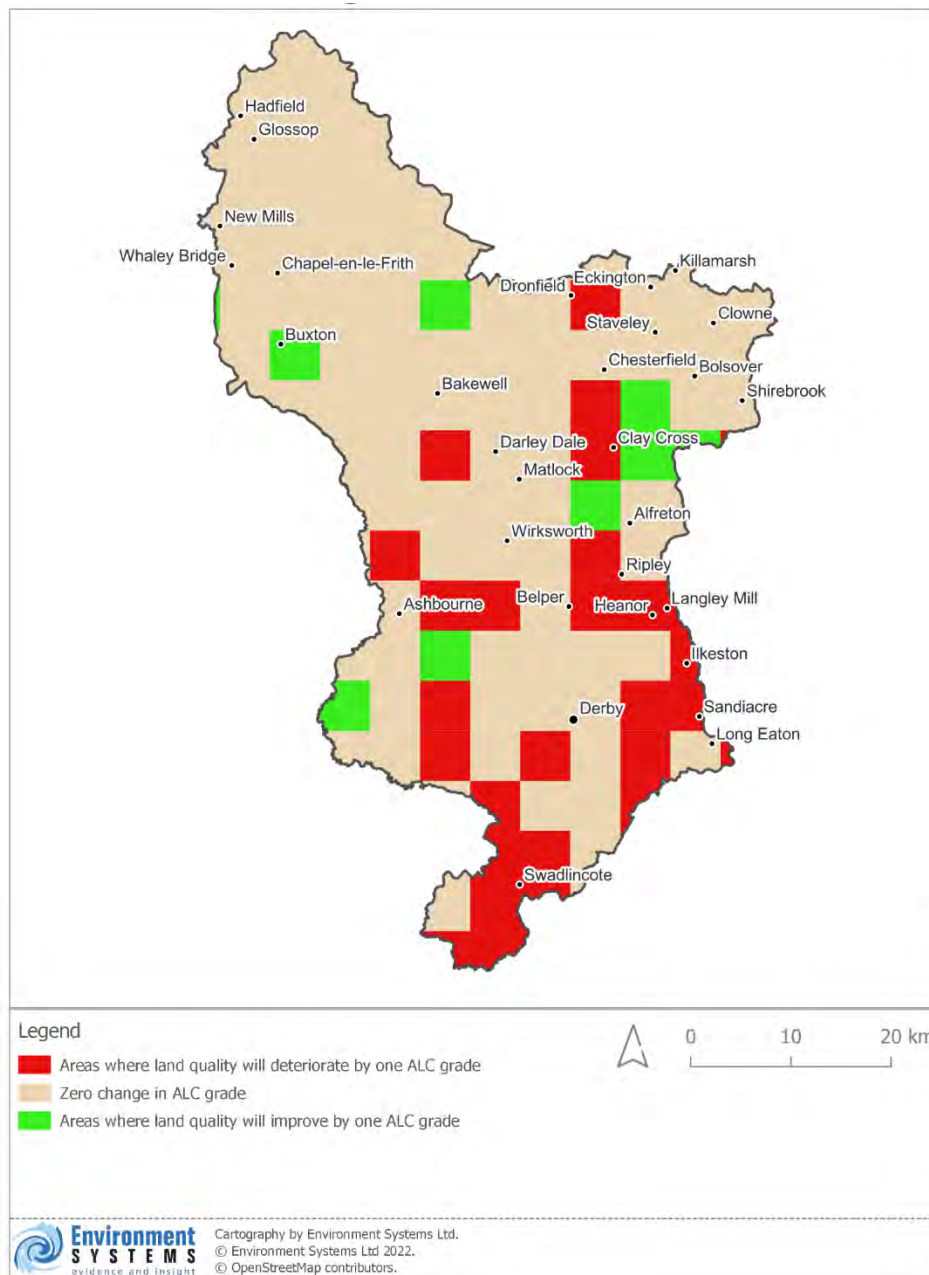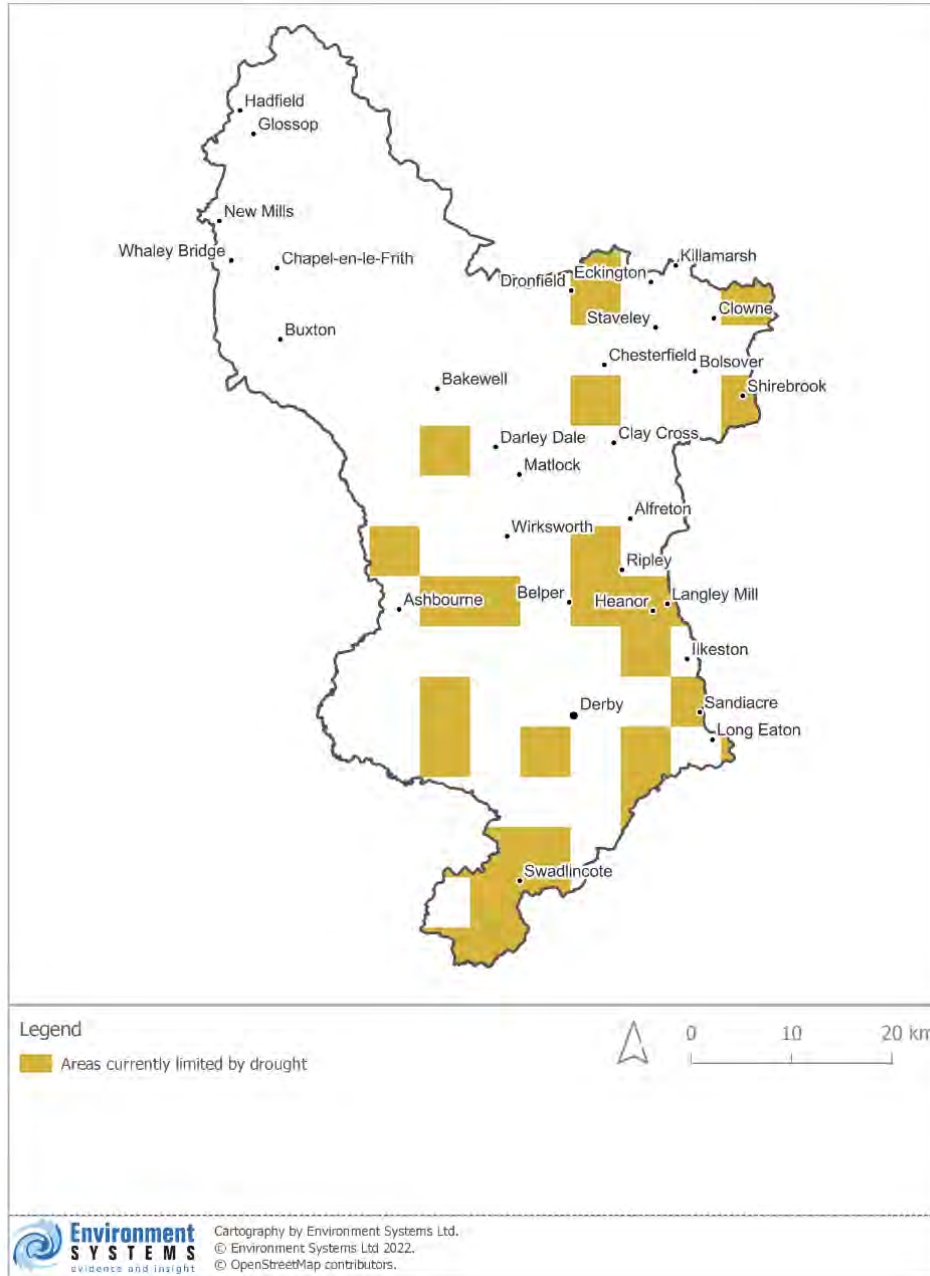

This map used modelled ALC data generated from UKCP18 climate change model data for 2020 and 2080. The UKCP18 scenarios predict conditions that will be experienced under a medium GHG emissions scenario (RCP 6.0); these models were used to generate forecasts of ALC grade, on a 5km grid; Keay, 2020. A comparison was undertaken between the 2020 grade and the 2080 grade, to identify locations where agricultural land quality improved, deteriorated, or remained static.

References:

Keay, C. 2020. Capability, Suitability & Climate Programme Rerun SP1104 with UKCP18 data. Available at: https://gov.wales/sites/default/files/publications/2021-04/capacity-suitability-climate-programme-2012-study-rerun.pdf [Accessed 2022-09-12]

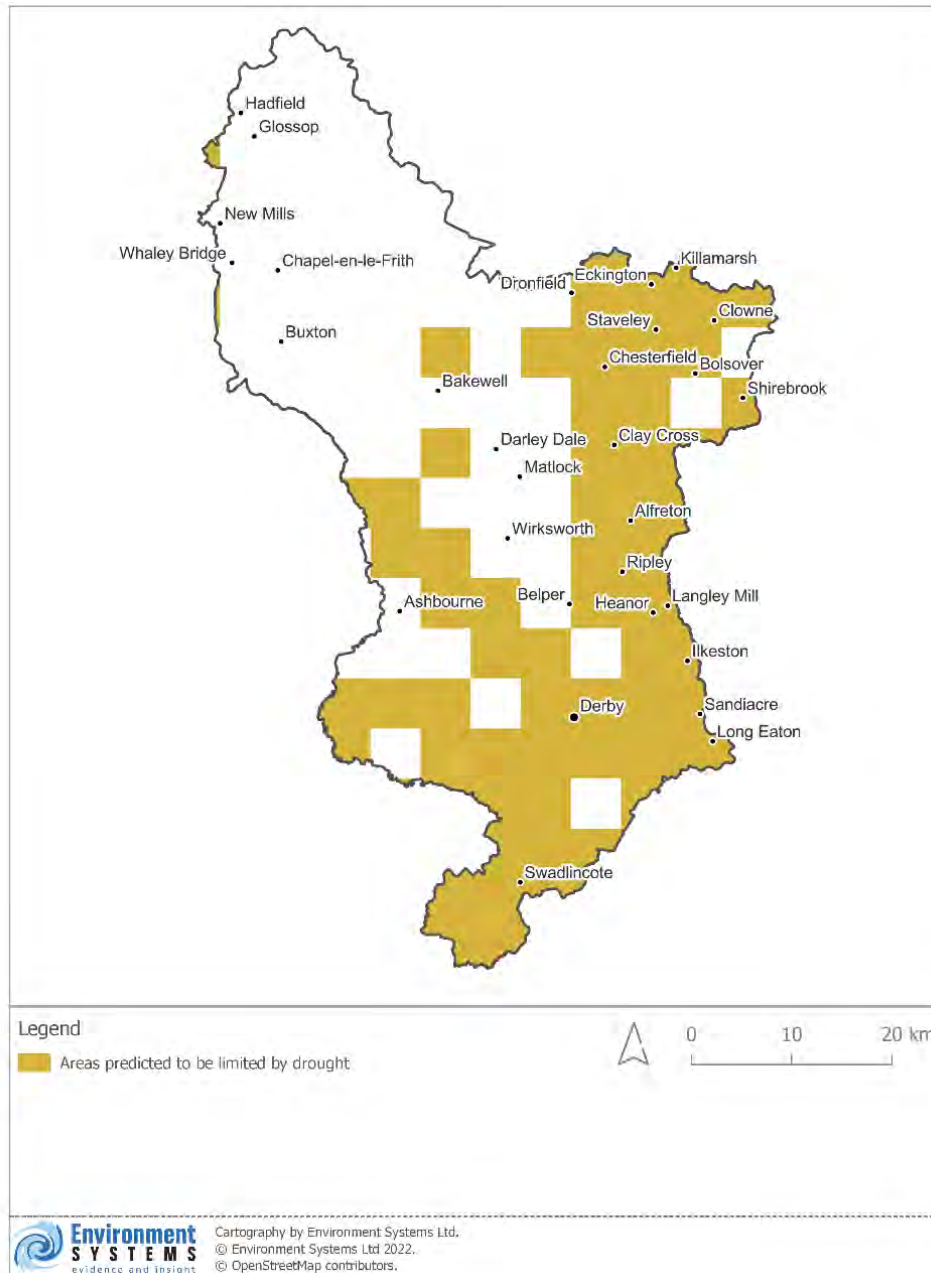## Areas where drought is a significant limiting factor for agriculture: present day UKCP18 RCP 6.0

This map used modelled ALC data generated from UKCP18 climate change model data for 2020 under a medium GHG emissions scenario (RCP 6.0); Keay, 2020. Areas where drought is listed as a limiting factor, either alone or in combination with other limiting factors, are highlighted on the map.

References:

Keay, C. 2020. Capability, Suitability & Climate Programme Rerun SP1104 with UKCP18 data. Available at: https://gov.wales/sites/default/files/publications/2021-04/capacity-suitability-climate-programme-2012-study-rerun.pdf [Accessed 2022-09-12]

Areas where drought is a significant limiting factor for agriculture: UKCP18 RCP 6.0

This map used modelled ALC data generated from UKCP18 climate change model data for 2080 under a medium GHG emissions scenario (RCP 6.0); Keay, 2020. Areas where drought is

listed as a limiting factor, either alone or in combination with other limiting factors, are highlighted on the map.

References:
Keay, C. 2020. Capability, Suitability & Climate Programme Rerun SP1104 with UKCP18 data. Available at: https://gov.wales/sites/default/files/publications/2021-04/capacity-suitability-climate-programme-2012-study-rerun.pdf [Accessed 2022-09-12]