



Worcestershire
Wildlife Trust

The State of Worcestershire's Grasslands

March 2023



Making hay at Eades Meadow NNR © Andy Barlett

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| Author | Jasmine Walters (Wildlife & Farming Officer, Worcestershire Wildlife Trust) | |
| Reviewed by | Louise McGowan (Local Nature Recovery Strategy Senior Advisor, Natural England) Cody Levine (Team Leader – Ecology, Worcestershire County Council) Helen Woodman (Head of Conservation, Worcestershire Wildlife Trust) Steve Bloomfield (Senior Conservation Officer – Planning, Worcestershire Wildlife Trust) | |

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Summary

This report compares records from the 1990's Worcestershire Grasslands Inventory (WGI) with the 2021 refreshed Worcestershire Habitats Inventory (WHI2) to interpret changes which have occurred over time in semi-natural grassland extent, classification, and condition within Worcestershire. Limitations exist within both datasets; therefore, the findings of this report provide a general impression only of overall trends from which to take action to secure the future of semi-natural grassland habitat in Worcestershire.

Key findings

- Worcestershire is a varied county and hosts a range of lowland semi-natural grasslands including acid grassland, calcareous grassland, neutral meadows and floodplain meadows.
- Semi-natural grasslands cover 4807ha within Worcestershire, when old and new inventories are combined. This represents only 2.8% of the county. Of the 2.8% of Worcestershire hosting semi-natural grassland, 0.62% is acid grassland, 0.27% is calcareous grassland, 1.54% is lowland meadow, and 0.03% is lowland floodplain meadow. 8% of Worcestershire is occupied by or is close (within 100m) to semi-natural grassland, representing opportunities for restoration of grassland networks.
- Worcestershire remains notable at a national level for its area of lowland meadow (including floodplain meadow) when more recent local data is considered. Various estimates of England's extent of lowland meadow have been published, and place Worcestershire's lowland meadows as representing between 7.55 – 34% of England's total resource when new local data is considered against these different national sources. Worcestershire occupies 1.33% of England.
- Some areas of the county with higher concentrations of semi-natural grassland are well known, such as acid grasslands around the Wyre Forest and Malvern Hills, and calcareous grasslands on the Cotswold fringe. Other grassland hotspots are worthy of further investigation, such as small lowland meadows within the Forest of Feckenham, Longdon & Eldersfield, north of Redditch, and the Malvern Chase.
- Only 46% of semi-natural grasslands are protected by a designation for biodiversity value; 22% are at a statutory level as Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR) and 24% are at a non-statutory level as Local Wildlife Site (LWS). The average LWS grassland parcel size is smaller than that of SSSIs, meaning that the LWS designation is an important source of protection for smaller semi-natural grasslands, such as small hay meadows typical of the Worcestershire countryside.

- A total of 1200ha of known semi-natural grassland have been recorded as destroyed, based on data recorded since the 1990s (this area is excluded from the total 4807ha of known surviving semi-natural grassland). 1083ha of this total was recorded as destroyed prior to 2011, although in some cases may be capable of recovery. 121ha of this total is considered to have been recorded as destroyed between 2011 – 2021, having been lost to woodland, agriculture, and urban development. This latter figure would increase if less permanent causes of recent loss were also taken into account, such as a decline in grassland quality from lowland meadow to less species-rich neutral grassland.
- An additional 1853 ha of semi-natural grassland has been recorded post 2011. Some gain in area is due to recovery of grasslands which were recorded as destroyed prior to 2011. A limited gained area may be a result of grassland creation projects, however the pre-dominant cause of apparent grassland gains is considered to be a result of the WHI2 method used to identify grasslands, where technology used has identified previously unrecorded grasslands rather than newly formed grasslands, and a margin of error is also likely to reduce real-term gains.
- Recent information on semi-natural grassland condition is largely unknown for sites other than statutory designated sites. Figures derived from recent SSSI condition assessments and damaged grasslands recorded by the WGI suggest that at least 30% is not in favourable condition. A lack of information and the small, isolated nature of non-statutory designated sites makes it likely that these are at even greater risk of unfavourable condition, and SSSI condition reporting supports this with SSSI neutral grasslands suffering the greatest levels of unfavourable declining condition and destruction.

Next steps

- Carry out field surveys to improve accuracy of the inventory and add new important information about semi-natural grassland extent and condition in Worcestershire.
- Develop a complete and up-to-date inventory of semi-natural grassland which can be used as a tool for monitoring, creating, and restoring grasslands as part of the Local Nature Recovery Strategy for Worcestershire.
- Increase protection of Worcestershire's semi-natural grasslands through designation as Local Wildlife Site and defining certain grassland types as 'irreplaceable habitat' in accordance with evidence which demonstrates that recovery occurs beyond human timeframes (Maskell, Jarvis, Jones, Garbutt, & Dickie, 2014). This will embed semi-natural grasslands within strategic frameworks such as the Local Nature Recovery Strategy for Worcestershire and increase prioritisation for survey and provision of landowner advice.

- Engage people with the management, restoration, creation, and monitoring of semi-natural grassland through investing resources in provision of landowner advice and formation of community action groups.

1. Introduction

1.1. The importance of Worcestershire's grasslands

Semi-natural grasslands are an important part of the cultural and environmental character of Worcestershire's countryside, where distinct communities of plants have established over hundreds and sometimes thousands of years to reflect local soil, hydrology, and land management practices. As such, semi-natural grasslands are those which have not been altered extensively for agricultural grazing or silage production.

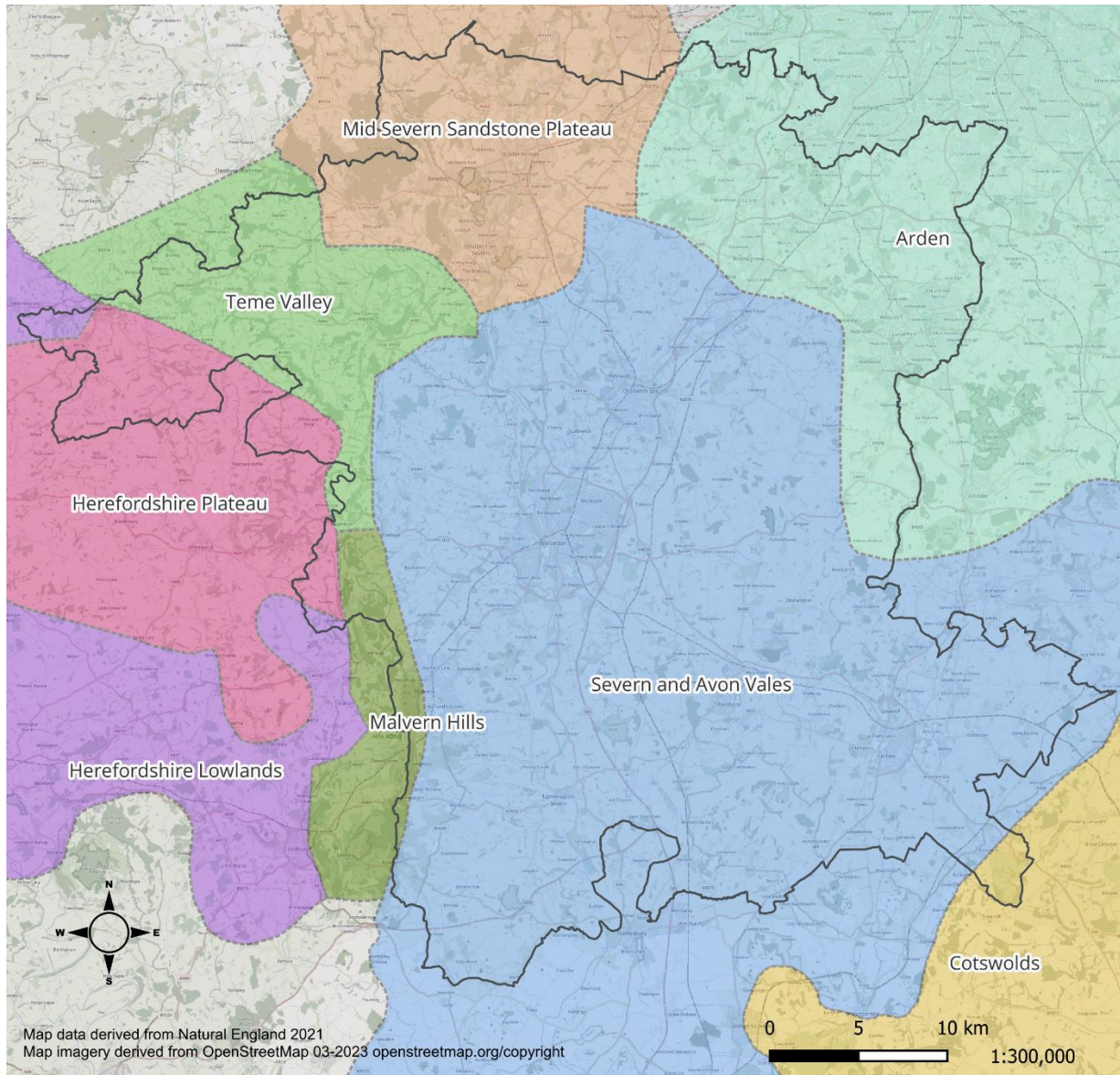
A vast range of wildlife species depend on semi-natural grasslands, ranging from breeding farmland birds such as the curlew to many species of beneficial insects. Grasslands also lock carbon in the soil when managed carefully and provide other ecosystem services such as natural flood management.

The county hosts lowland acid grasslands, lowland calcareous grasslands, lowland wet grassland, and lowland neutral hay meadows and pastures (including floodplain meadows). The National Character Areas (NCA) set by Natural England and shown in Figure 1 below provide a framework for describing the distribution of grasslands across Worcestershire's landscape.

Acid grasslands are found in the Wyre Forest and Bromsgrove districts within the Mid-Severn Sandstone Plateau and Arden area of north Worcestershire, and in association with the Malvern Hills. Calcareous grasslands in Worcestershire encompass a range of scarce community types and can be found at the Cotswold fringes of Bredon Hill and Broadway, and at scattered locations such as across the Teme Valley. Lowland floodplain meadows occur in discrete parcels within the floodplains of the Severn and Avon Vales in the southern half of the county. Lowland hay meadows are the most widespread grassland type and occur throughout the county, with important concentrations at the foot of the Malvern Hills in the Malvern Chase, the Teme Valley, Wyre Forest, Arden, and the Forest of Feckenham within the Severn and Avon Vales.

Lowland hay meadows are found at such a high concentration within the West Midlands that the region is notable at a national level (Natural England, 2008), and figures suggest that Worcestershire may support up to 25% of the entire resource of lowland meadow within England (Worcestershire Biodiversity Partnership, 2018).

Figure 1: National Character Areas occurring within Worcestershire.



□ Worcestershire County Boundary

1.2. Loss of grassland

The loss and degradation of semi-natural grassland in lowland England has been dramatic, with an estimated 97% being lost in England and Wales between 1930 and 1984 due to agricultural intensification and, to a lesser extent, development (Fuller, 1987). More recent studies have shown that grassland habitat losses have since continued unabated (King, 2004), and the national distribution of semi-natural grassland plant species supports this picture; exhibiting a general decline of iconic species such as devil's-bit scabious *Succisa pratensis* and harebell *Campanula rotundifolia* between 2000 and 2019 (Walker, et al., 2023).

Within Worcestershire an estimated 45% of remaining semi-natural grasslands were damaged and 30% completely destroyed between 1975 and 2000, leaving only 25% of remaining semi-natural grasslands intact (King, 2004) (Stephen, 1997). Ongoing loss of semi-natural grassland within Worcestershire is of particular concern for this county since grasslands are typically present as small and fragmented parcels amidst a farmed landscape. This nature makes them highly vulnerable to land use change, and difficult to record. With a recovery time of up to 100 years once damaged, it is important to look after what remains of the existing semi-natural grassland resource and look to new opportunities to restore what has been lost (Maskell, Jarvis, Jones, Garbutt, & Dickie, 2014) (Holmes & Wentworth, 2022).

1.3. Purpose of this report

Worcestershire lacks an up-to-date picture of semi-natural grassland extent and condition. The last comprehensive dataset of grassland type, extent, and condition was provided by the Worcestershire Grassland Inventory in the 1990s and was last partially updated in 2011. The Worcestershire Habitats Inventory, refreshed in 2021, now provides a more recent but high-level desk-based assessment of habitat class and extent.

The two county-wide datasets have not yet been compared to interpret changes which have occurred in semi-natural grassland extent and classification over time, and additional Natural England datasets offer an opportunity to identify broad themes in grassland protection, management, and condition. This report aims to take the first steps in this task and provide a basis from which to take further action to strengthen the evidence base and secure the future of semi-natural grassland in Worcestershire.

2. Data, methodology and limitations

2.1. Data sources

Worcestershire Grasslands Inventory

The Worcestershire Grassland Inventory (WGI) provided a comprehensive snapshot in time of the location, area, and condition of semi-natural grassland in the county when first undertaken in the 1990s. It was developed as a partnership between Worcestershire Biological Records Centre (WBRC), Worcestershire Wildlife Trust (WWT), and English Nature. The inventory was updated following field surveys of subsets of grassland sites in 1996, 1997 and 2011.

Limitations

- A high proportion of the dataset contains records made from field observations occurring over 20 years ago. It is likely that much habitat change has occurred within this time, especially given the vulnerability of grassland to land use change.
- Grasslands labelled as ‘destroyed’ are excluded from the area of semi-natural grassland calculated for this report. However, parameters for ‘destroyed’ used at the time of the last significant inventory review in 1996/97 do include reversible activities such as overgrazing or neglect, with recovery over time being feasible in some cases through changes in management.
- Some grasslands did not have an NVC classification attributed to them. In these cases, this report has retained them for consideration but translation to a UKHab class beyond level 2 has not been possible.

Worcestershire Habitats Inventory

The Worcestershire Habitat Inventory (WHI) was first developed by Worcestershire County Council in 2010 from aerial photography, historic records, and limited field surveys to identify and monitor the distinctiveness and change of broad habitats and a subset of recognised priority habitats. The WHI was refreshed in 2021 to produce WHI2. This refreshed dataset used an artificial intelligence and remote sensing data-based approach to update the habitats census and make a high-level assessment of changes in habitat extent and connectivity (Arup, 2021). The inventory can be publicly viewed using a webtool hosted on the WCC website (Worcestershire County Council, 2023).

Limitations

- A guidance report provides more comprehensive information regarding limitations specific to WHI2 (Arup, 2021). To summarise, WHI2 has been developed for use at a county and landscape scale, rather than site scale. Predictive modelling based on training data has identified the likelihood of a habitat class occurring at a location and does not provide an absolute identification. Whilst a proportion of WHI1 and WHI2 data was validated through field surveys, the inventory would benefit from further ground-truthing. This is particularly relevant to semi-natural grasslands, for which identification of type is only likely if remote observation techniques (such as those used by WHI2) are combined with satellite imagery and good quality ancillary data for factors such as soils, geology, and hydrology, as described by the Crick Framework (JNCC, 2019). WHI2's overall accuracy levels (across c.100 different habitat types) was reported to be 81%. The model used had relatively low sensitivity to lowland meadow and lowland hay meadow habitat types (67%) but high specificity (100%), meaning that WHI2 relatively infrequently resolved habitats to these typologies, but, performed 100% correctly (against training data testing) when it did so.
- Querying the dataset for the chosen semi-natural grassland classifications comprehensively was not possible within the timeframe of this report. This is because the WHI2 attribute data has been gathered from multiple sources to populate numerous fields to varying degrees of completeness and complexity. In addition, a small number of labelling errors were identified within the 'UKHab' field on which the main query was based, in terms of factors such as primary habitat codes not being coded to the greatest level possible, addition of secondary codes, case sensitive errors and spelling errors. Unfortunately, such errors are inevitable within such a large dataset. Although WHI2 was queried again on other fields to fill these gaps, some areas of known semi-natural grassland remain missing from the WHI2 query output on this occasion, such as areas of acid grassland on the Malvern Hills (this habitat is present within the WGI dataset and therefore is still considered within this report). In addition, manual spot checks have shown that the query of non-priority grasslands intersecting with grasslands mapped by the WGI is incomplete in some cases. As a result of these limitations, this report only intends to present indicative trends of the county's semi-natural grassland resource.
- The WHI2 dataset was queried based on UKHab codes g1a, g2a, g3a, g3a5, and a suite of label naming conventions to capture other semi-natural grassland parcels without a correct UKHab code. Due to the large quantity of data and limited resources available at this stage of reporting, other neutral grasslands (UKHab g3c) which are not lowland meadow (UKHab g2a, NVC MG5 and UKHab g2a5, NVC MG4) are excluded from the WHI2 data considered within this report. This means that there is more data to explore for grasslands which are

potentially in the process of losing species-richness through degradation, gaining species-richness through restoration, and wet grasslands. However, records of grasslands with an NVC classification of MG1, MG6, MG9, and MG10 are retained from WGI when present, so that recent shifts in grassland class identified by WHI2 could be identified.

2.2. Making datasets comparable

Habitat classification

This report refers to ‘semi-natural grassland’ as including lowland acid grassland, lowland calcareous grassland and lowland neutral grassland. It should be noted that neutral grassland other than lowland meadows and floodplain meadows has not been included within the WHI2 dataset at this stage, due to the large volume of data for these remaining grassland categories.

The Worcestershire Grasslands Inventory uses the NVC classification system (JNCC, 2023) to record grassland class, whilst WHI originally used the Integrated Habitat System (IHS) (SERC, 2023) and later the UKHab classification system (UKHab, 2023) when refreshed in 2021. Table 1 below lists the UKHab grassland categories which are present within the data analysed as part of this report, and the corresponding IHS and NVC codes where it has been necessary to translate codes from original sources for the purposes of this report, such as WGI. Codes at a lower specificity than acid, calcareous, and neutral grassland are present within the dataset, but other attribute information provides enough confidence that these parcels do contain semi-natural grassland for them to be included within the analysis.

Table 1 UKHab grassland categories present within the analysed data, and corresponding IHS and NVC codes.

| UKHab category | UKHab code | UKHab summary description | IHS code | NVC code | WGI / WHI2 |
|----------------------------------|------------|--|----------|----------|-------------|
| Grassland | g | Level 2 broad habitat code for all grassland habitats. This code was assigned to WGI data lacking any other habitat information. | - | - | WGI |
| Acid grassland | g1 | Level 3 code for all acid grassland. | GA0 | - | WHI2 |
| Lowland dry acid grassland | g1a | Level 4 code for acid grassland occurring on nutrient-poor, acid, generally free-draining, dry (to moist) soils with pH 4- to 5.5, overlying acid rocks or superficial deposits such as sands and gravels. Characterised by heath bedstraw <i>Galium saxatile</i> , sheep's fescue <i>Festuca ovina</i> , common bent <i>Agrostis capillaris</i> , sheep's sorrel <i>Rumex acetosella</i> , sand sedge <i>Carex arenaria</i> , wavy hair-grass <i>Deschampsia flexuosa</i> , and tormentil <i>Potentilla erecta</i> . Dwarf shrubs and bilberry <i>Vaccinium myrtillus</i> can occur at low abundance. | GA1 | U1 - 4 | WGI WHI2 |
| Other lowland dry acid grassland | g1a6 | Level 5 code for lowland acid grassland which is dry and is not found on inland dunes. | GA1Z | - | WHI2 |
| Calcareous grassland | g2 | Level 3 code for all calcareous grassland. | GC0 | - | WHI2 |

| | | | | | |
|---|------|--|---------------|-----------------------|-------------|
| Lowland calcareous grassland | g2a | Level 4 code for lowland calcareous grassland occurring on shallow and dry lime-rich soils in the lowlands with a pH of 5-6+, often on escarpments or dry valley slopes. Characterised by upright brome <i>Bromopsis erecta</i> , tor-grass <i>Brachypodium pinnatum</i> , fairy flax <i>Linum catharticum</i> , salad burnet <i>Sanguisorba minor ssp. minor</i> , carline thistle <i>Carlina vulgaris</i> , dwarf thistle <i>Cirsium acaule</i> , horseshoe vetch <i>Hippocrepis comosa</i> , dropwort <i>Filipendula vulgaris</i> , lady's bedstraw <i>Galium verum</i> , quaking grass <i>Briza media</i> , crested hair-grass <i>Koeleria macrantha</i> , and common rock-rose <i>Helianthemum nummularium</i> . | GC1 | CG1 - 8 | WGI WHI2 |
| Neutral grassland | g3 | Level 3 code for all neutral grassland. | GN0 | - | WGI WHI2 |
| Lowland meadow | g3a | Level 4 code for neutral grassland occurring throughout lowland UK, often on shallow slopes or level ground with relatively deep soils that are neither strongly acidic nor lime-rich. This is a broad category of grasslands which are managed for pasture and hay-cropping and have not been substantially modified for agricultural production. A rich mixture of grasses and broad-leaved herbs are present and is characterised by crested dog's tail <i>Cynosurus cristatus</i> , red fescue <i>Festuca rubra</i> , black knapweed <i>Centaurea nigra</i> , bird's-foot trefoil <i>Lotus corniculatus</i> , ox-eye daisy <i>Leucanthemum vulgare</i> , meadow vetchling <i>Lathyrus pratensis</i> , lady's bedstraw <i>Galium verum</i> , and cowslip <i>Primula veris</i> . | GN1 | MG5 / MG4 / MG8 | WGI WHI2 |
| Lowland floodplain meadows | g3a5 | Level 5 code for species-rich hay meadows on little to moderately fertilised alluvial soils which are usually periodically flooded. Characteristic species include meadow foxtail <i>Alopecurus pratensis</i> , greater burnet <i>Sanguisorba officinalis</i> , marsh-marigold <i>Caltha palustris</i> , and meadowsweet <i>Filipendula ulmaria</i> . | GN11 | MG4 | WGI WHI2 |
| Other neutral grassland | g3c | Level 4 code for neutral grassland occurring throughout lowland UK, which do not meet the criteria of g3a but often have <30% cover rye grass and 9-15 additional species per m ² . | GNZ / GN12 | - | WGI |
| <i>Arrhenatherum</i> neutral grassland | g3c5 | Level 5 code for neutral grassland dominated by false oat-grass <i>Arrhenatherum elatius</i> . | - | MG1 | WGI |
| <i>Lolium-Cynosurus</i> neutral grassland | g3c6 | Level 5 code for neutral grassland dominated by perennial rye-grass <i>Lolium perenne</i> and other grasses such as crested dog's-tail <i>Cynosurus cristatus</i> and sweet vernal grass <i>Anthoxanthum odoratum</i> . | - | MG6 | WGI |
| <i>Deschampsia</i> neutral grassland | g3c7 | Level 5 code for neutral grassland dominated by tufted hair-grass <i>Deschampsia cespitosa</i> and Yorkshire fog <i>Holcus lanatus</i> . | - | MG9 | WGI |
| <i>Holcus-Juncus</i> neutral grassland | g3c8 | Level 5 code for neutral grassland dominated by Yorkshire fog <i>Holcus lanatus</i> and rushes <i>Juncus spp.</i> | - | MG10 | WGI |

Reliability

To make the WGI and WHI2 comparable in terms of reliability, parameters within Table 2 have been used for each dataset to assign a reliability score of high, moderate or low to individual

records. The percentage of each dataset falling into reliability categories is also shown within the table.

Table 2 Parameters used to assign a common reliability score to records originating from different datasets.

| Reliability | Score | WGI parameters | % dataset | WHI2 parameters | % dataset |
|-------------|-------|-----------------------------------|-----------|--|-----------|
| High | 1 | - | 0 | Source = Ground truthed WBRC updated Habitat class derived from recent field surveys Source = WBRC updated Habitat class derived from recent field observations of the habitat from afar. Source = Training data Habitat class derived from training data, such as recent LWS surveys | 9 |
| Moderate | 2 | Survey date = 1990-2010 | 57 | Source = Predicted Habitat class derived from 1 st model prediction with high accuracy / no WHI1 habitat class Source = Confirmed The model's first or second predicted habitat class matches WHI1 habitat class | 80 |
| Low | 3 | Survey date = Pre 1990 / Null / 0 | 43 | Source = Original WHI The model prediction has low accuracy so WHI1 retained. Source = Input data Habitat class derived from input datasets alone | 11 |

Both datasets show that there is a significant need for further ground truthing through field surveys to increase reliability of a greater proportion of data to 'High'. In addition, field survey information exists that has not yet been incorporated into either the WGI or WHI2 dataset. For example, large areas of the grassland on the Malvern Hills are recorded as having low reliability due to the recorded field survey occurring pre-1990, but NVC surveys are known to have been recently undertaken for this area. Maps 8.1 and 8.2 in the Appendix at the end of this report show the location of grasslands recorded at low, moderate, and high reliability for the WGI and WHI2.

3. Extent of semi-natural grassland

NB: Figures 2 & 3 are the only maps included within the main body of the report and can be viewed at A4 scale. All other maps produced are presented within the Appendix at the end of this report, and if printed should be produced at A3 size or larger.

3.1. Overall extent

When records of surviving grasslands recorded by WGI are combined with records of selected semi-natural grasslands recorded by WHI2, **semi-natural grasslands cover 4807ha within Worcestershire, which represents 2.8% of the county**. This is a small proportion considering that the WHI2 reported all grassland habitats cover a much greater 44.22% of Worcestershire (Arup, 2021).

WHI2 reported that Biodiversity Action Plan priority acid, calcareous and neutral grasslands covered 2.45% of Worcestershire, which represented a slight increase of approximately 1% since the first WHI was produced in 2010 owing to the model's ability to classify habitats that the previous API-approach was not able to distinguish (Arup, 2021). Now that the WHI2 is combined with the WGI, overall coverage of grassland remains largely unchanged, and it can be presumed that this figure is currently the best possible estimate of semi-natural grassland coverage in Worcestershire. It should be noted that this figure would increase with inclusion of data for other neutral grassland from the WHI2 dataset, which is likely to include numerous restoration opportunities for more species-rich acid, calcareous and neutral grasslands.

When occurrence of semi-natural grassland is represented as occupied 100m squares (Figure 3), this provides an approximation that **8% of Worcestershire hosts semi-natural grassland or is close (within 100m) to it**. This represents a substantial proportion of the county for which there are potential opportunities for connectivity and creation of semi-natural grassland.

Table 3 Area of semi-natural grassland recorded by WGI and WHI2, and the total % coverage of Worcestershire when records are combined. Area of Worcestershire = 174,052ha.

| | Area (ha) | % of Worcestershire |
|--|-----------|---------------------|
| WGI (including other neutral grassland) | 2954 | 1.7 |
| WGI (excluding other neutral grassland) | 2355 | 1.4 |
| WHI2 | 2970 | 1.7 |
| Coverage of semi-natural grassland within Worcestershire WGI merged with WHI2 (including WGI other neutral grassland) | 4807 | 2.8 |
| Coverage of semi-natural grassland within Worcestershire WGI merged with WHI2 (excluding WGI other neutral grassland) | 4210 | 2.4 |
| Approximate coverage of semi-natural grassland within Worcestershire + land located within 100m of semi-natural grassland | 14343 | 8.2 |

3.2. Overall distribution

Figures 2 & 3 on pages 17 & 18 demonstrate the distribution of semi-natural grasslands within Worcestershire. The distribution mirrors areas of the county previously identified as a priority for biodiversity conservation and identifies additional areas which are less well known. Areas supporting higher concentrations of semi-natural grassland are listed in Table 4 below. Maps 8.5, 8.6 and 8.7 in the Appendix provide mapped areas of grassland habitat classes recorded separately by the WGI and WHI2, and the mapped area when combined.

Table 4 Important areas for semi-natural grasslands within Worcestershire.

| Important area for semi-natural grassland | Main grassland resource |
|---|--|
| Wyre Forest | Lowland acid grassland and lowland meadows |
| Clent Hills | Lowland acid grassland and lowland meadows |
| Malvern Hills / Malvern Chase | Lowland acid grassland and lowland meadows |
| Bredon Hill | Lowland calcareous grassland |
| Broadway | Lowland calcareous grassland |
| North of Redditch | Lowland meadows |
| Chaddesley Woods | Lowland meadows |
| Forest of Feckenham | Lowland meadows |
| The Lenches | Lowland meadows |
| Suckley Hills | Lowland meadows |
| Kyre Brook & tributaries, Tenbury | Lowland meadows |
| Longdon and Eldersfield | Lowland meadows and floodplain meadows |

3.3. Extent and distribution of individual grassland types

Table 5 below shows the area of each semi-natural grassland type recorded separately on the WGI and WHI2. The two datasets broadly agree, with WHI2 showing a slightly greater area of calcareous grassland and lowland meadows than were recorded by WGI. It should be noted that the WHI2 was not comprehensively queried (a limitation discussed in Section 2), and the significantly lower figure for WHI2 acid grassland is a product of this rather than actual area of acid grassland recorded by the inventory.

The difference in mapped area for all grassland categories suggests that there is a large difference between distribution of grassland recorded by WGI and WHI2, however, when maps 8.9, 8.10, 8.11 and 8.12 in the Appendix are examined for each grassland category, distribution is broadly the same between the two datasets and the differences mostly occur at finer scale. This provides further evidence of the need for ground-truthing of the datasets to gain further detail than can currently be derived.

When WGI data is combined with WHI2 data, the overall % coverage of each grassland type within the county is similar, with minor increases. In the case of lowland meadows (including floodplain meadows), Worcestershire has been previously quoted to host a significant 25% of

England's total resource (Worcestershire Biodiversity Partnership, 2018). There have been various published estimates of the extent of semi-natural grassland in England since the late 1990s, based on different data sources and sometimes on differing definitions. The area of lowland meadow within England (7,282ha) used to arrive at the 25% figure was derived from the 2005 UK HAP Steering Group Targets Review for lowland grasslands (direct reference could not be found) (Rodwell, Morgan, Jefferson, & Moss, 2007). The 2013 priority habitats inventory, published by Natural England and used in the England Biodiversity Indicators (2a – Extent and condition of priority habitats), is currently considered the best available national source of extent data. This inventory estimates 36,129ha of lowland meadow within England (DEFRA, 2023). This is a large increase on the previous figure used for national reporting, and DEFRA acknowledges that overestimation exists, particularly for lowland meadows, due to the methodology used to achieve a single layer of extent and the broad inclusion of grasslands as 'lowland meadow'. As a result, they advise against drawing conclusions of change in extent of habitat over time (DEFRA, 2021).

Although drawing comparisons between different datasets should be treated with caution, these **more recent local and national datasets continue to demonstrate that Worcestershire remains notable at a national level for hosting a significant proportion of England's lowland meadows.** Worcestershire occupies only 1.33% of England yet hosts 7.55% of England's lowland meadows when the 2013 national dataset is used. If the older estimates of approximately 8000ha of lowland meadow in England are treated as more representative, then Worcestershire hosts 34% of England's lowland meadows. Calculations are demonstrated in Table 6 below.

Table 5 Area of individual grassland types mapped by WGI and WHI, and the overall % coverage within Worcestershire when datasets are combined. An indication of the difference between % coverage identified by WHI2 and that identified when WHI2 is combined with WGI is also given.

| Grassland type | Area mapped by WGI (ha) | Area mapped by WHI2 (ha) | Difference in mapped area (ha) | Total area when WGI & WHI2 combined (ha)* | Overall % coverage of the county when WGI & WHI2 combined * | WHI2 % coverage |
|-----------------------------------|-------------------------|--------------------------|--------------------------------|---|---|-----------------|
| Acid grassland | 890 | 475 | 798 | 1080 | 0.62 | 0.56 |
| Calcareous grassland | 280 | 355 | 299 | 467 | 0.27 | 0.23 |
| Neutral grassland (all types) | 1617 | 2139 | - | - | - | 1.66 |
| g3a Lowland meadow | 1150 | 2106 | 2111 | 2678 | 1.54 | |
| g3a5 Lowland floodplain meadow ** | 34 | 26 | 46 | 53 | 0.03 | |

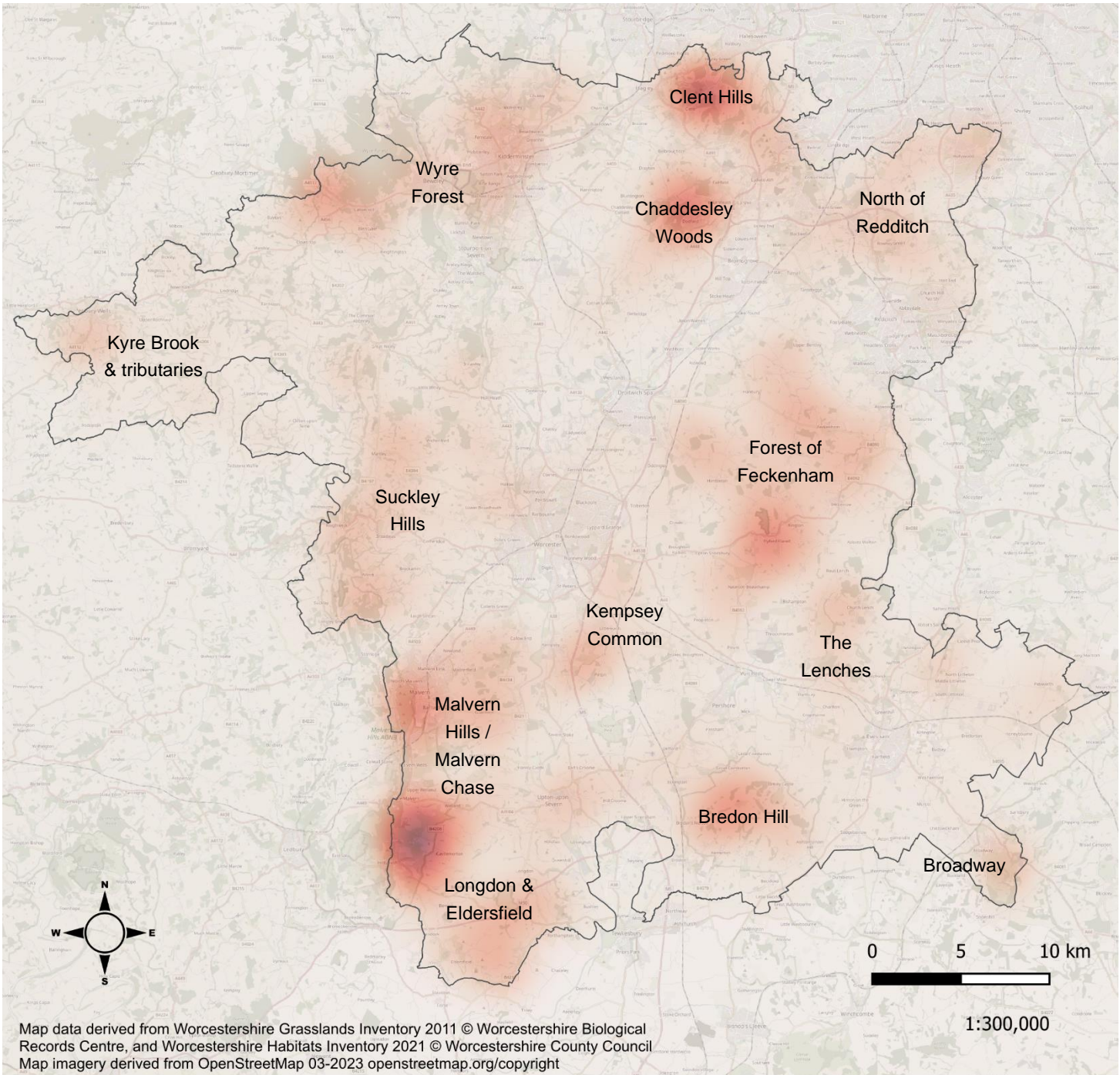
* In some instances, WGI and WHI2 record different grassland types at the same location. Therefore, these areas may overlap spatially.

** Significant known areas of g3a5 Lowland floodplain meadow are present at Upton Ham SSSI and Rectory Farm Meadows SSSI in the Severn and Avon Vales. However, the two sites were not recorded within a priority grassland category by WHI2 and were listed as predominantly lowland meadow (g3a) by the WGI. Therefore, these sites are accounted for within the g3a category rather than the g3a5 within this report. SSSI condition surveys occurring more recently than the WGI record g3a5 Lowland floodplain meadows at these sites, so this demonstrates limitations (discussed in Section 2) with the existing inventory dataset that more recent and more accurate information is not taken into account, ground-truthing of WHI2 data is important, and a grasslands inventory which incorporates new information is required.

Table 6 Area of lowland meadow within Worcestershire and England

| | | |
|---|-------------|---------------|
| Total area of lowland meadow and lowland floodplain meadow within Worcestershire (WGI & WHI2 combined) (ha) | 2731 ha | |
| Total area of lowland meadow Priority Habitat within England (2013) (ha) | 36129 ha | |
| Area of Worcestershire | 174052 ha | |
| Area of England | 13046000 ha | |
| % of England which is Worcestershire | | 1.33 % |
| % of England's lowland meadows occurring within Worcestershire | | 7.55 % |

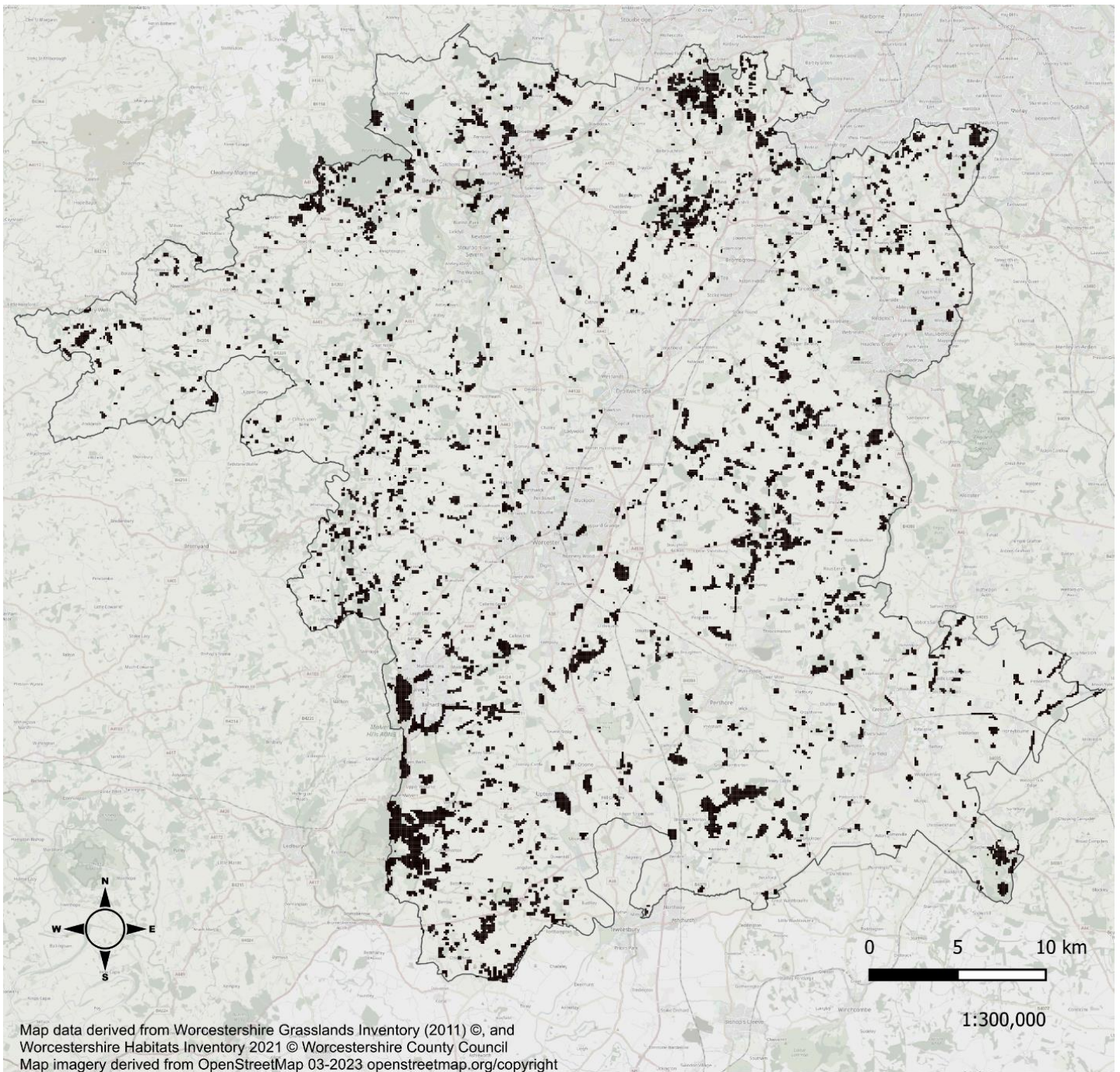
Figure 2 Heat map to demonstrate the distribution and concentration of semi-natural grasslands within Worcestershire.



Key

- Worcestershire County Boundary
- Heat map of 1km squares containing semi-natural grassland on the Worcestershire Grasslands Inventory (2011) and the Worcestershire Habitats Inventory (2021)

Figure 3 100m squares in which semi-natural grassland occurs within Worcestershire.



Key

□ Worcestershire County Boundary ■ 100m squares intersecting WHI (2021) + WGI (2011)

4. Protection of semi-natural grassland

The combined dataset of the WGI and WHI2 represents the most valuable grasslands in the county. However, **only 46% of these semi-natural grasslands are protected by a designation for biodiversity value; 22% are at a statutory level mostly as Sites of Special Scientific Interest (SSSI) and 24% are at a non-statutory level as Local Wildlife Site (LWS)**. This leaves over half of all semi-natural grasslands unprotected within Worcestershire by formal designation. Map 8.12 in the Appendix shows the location of statutory and non-statutory protected semi-natural grasslands within Worcestershire.

% Area of semi-natural grassland protected by a designation

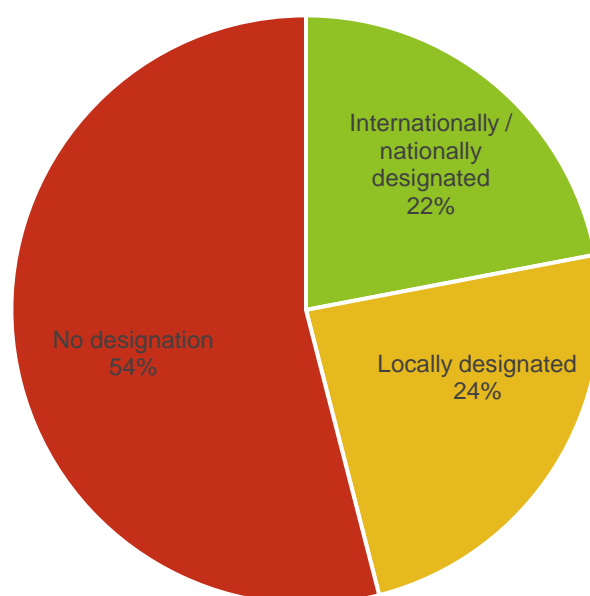


Table 6 Area of semi-natural grasslands protected by statutory and non-statutory designations within Worcestershire.

| | Area of semi-natural grassland (ha) | % of total area of semi-natural grassland | Average parcel size (ha) |
|--|-------------------------------------|---|--------------------------|
| NNR (Foster's Green Meadows, Chaddesley Woods, Wyre Forest, Bredon Hill) | 57* | 1* | - |
| SSSI | 1065* | 22* | 9 |
| Total area statutorily protected | 1065 | 22 | - |
| LWS | 1155 | 24 | 5 |
| Total area non-statutorily protected | 1155 | 24 | - |
| Total area of inventory | 4807 | - | - |
| Total area unprotected | 2587 | 54 | - |

*Areas designated overlap

Non-statutory designation

With a quarter of all semi-natural grasslands within Worcestershire designated as LWS, this designation is a significant source of protection within the county. To make this role even more important, **the average grassland parcel size designated as LWS is smaller than the average SSSI parcel size**, and therefore accounts for many of the smaller and more vulnerable semi-natural grasslands such as small hay meadows which are typical of the Worcestershire countryside.

However, the protection afforded by a LWS designation is currently limited to consideration within Local Development Plans and during decision-making processes undertaken by a Local Planning Authority. This consideration does not necessarily translate to firm protection and to date has been of very limited help in driving improved (or indeed any) management, which would help to avoid site loss through neglect or intensification. Noting the thresholds for agricultural EIA (2ha) and the usually small size of Worcestershire's grassland this represents a significant gap in site protection. Regular surveys and provision of landowner advice through the Worcestershire Local Wildlife Sites Partnership is an important tool for ensuring good condition and management of LWS, although this has been restricted over recent decades due to very limited availability of resources.

No designation

With the biodiversity value of over half of the best semi-natural grasslands in the county unrecognised by a site designation, this leads to them being easily overlooked when standard checks are carried out during the decision-making processes for planning, environmental consents, and environmental grant frameworks. There is significant opportunity to increase the weight of importance of these grasslands via a designation, bringing them to the attention of authorities and consultees. This is discussed further in section 6.

5. Changes in extent of semi-natural grassland

5.1. Grassland losses

The WGI and WHI2 have recorded that **a total of 1200ha of semi-natural grassland recorded since the 1990s has been destroyed so far**. 1083ha of this total was recorded as destroyed prior to 2011 at the time of the last WGI update (see Map 8.13 within the Appendix). 121ha of this total has been recorded by WHI2 as lost to woodland, agriculture, and development between 2011 – 2021 (see Map 8.14 within the Appendix). This area lost is not included within the total of 4807ha of surviving known semi-natural grassland stated in section 3.1.

It is considered likely that the area recorded as destroyed prior to 2011 may be inflated in comparison to real terms due to the stringent parameters used to label a grassland as destroyed, where in fact its condition was recoverable (a limitation discussed in Section 2). Vice versa, the area recorded as destroyed post 2011 may significantly increase if less permanent causes of loss are taken into account, such as potential decline in condition of priority semi-natural grassland to non-priority grassland excluded from the current analysis. In fact, the WGI recorded 1852ha of surviving semi-natural grassland which is absent from WHI2, but limitations such as difficulties with querying WHI2 data thoroughly make this figure unreliable and return of non-grassland WHI2 habitat codes across all WGI grassland parcels appear to be incomplete (a limitation discussed in Section 2).

Table 7 Area of surviving grassland recorded by WGI which has now been lost to permanent land-use change.

| Non-priority grasslands recorded by WHI2 which intersect with WGI* | Area intersecting WGI* (ha) | % of WGI * (total 2954ha) |
|--|------------------------------------|----------------------------------|
| Woodland (broadleaf, coniferous, scrub) | 68 | 2.3 |
| Agriculture (cropland and modified grassland**) | 42 | 1.4 |
| Urban | 13 | 0.44 |
| * Excluding parcels labelled as already destroyed in 2011 ** The UKHab class g4 modified grassland (agriculturally improved grassland) is likely to be further broken down into finer detail in future revisions of the UKHab classification system. Ground-truthing of re-classified g4 grassland parcels may place some into semi-natural grassland categories. | | |

Case studies

Agriculture

- 5ha of MG5 lowland meadow east of Droitwich recorded by the WGI has since been converted to arable production.

Development

- 2.4ha of MG5 lowland meadow in Pershore was destroyed by a housing development in 2016. It should be noted that this parcel of grassland had not been recorded by the WGI or first iteration of the WHI, and so suggests that additional areas of lowland meadow identified by WHI2 and discussed in greater detail in Section 5.2 below have merit in having successfully identified previously unrecorded parcels of semi-natural grassland.

Woodland/Scrub

- 3ha of MG5 grassland near Hallow recorded by the WGI has since been recorded as dense scrub by WHI2. Aerial imagery suggests colonisation by scrub began two decades ago and is likely to be a result of under management.
- Increasing pressure to plant trees is likely to exacerbate risks to unknown parcels of semi-natural grassland. Anecdotal evidence suggests that some high-quality grassland has already been compromised by well-meaning but ultimately harmful planting.

Transition to non-priority semi-natural grassland

- 26ha of MG5/MG9 grassland designated as Smithmoor Common and Meadows LWS near Earl's Croome was recorded as lowland meadow by the WGI. WHI2 has not identified presence of a lowland meadow at this location, so it is possible that the grassland has declined in quality due to a lack of grazing or the technology used by WHI2 has failed to identify high quality grassland in this case. Ground-truthing would confirm such cases.

5.2. Grassland gains

WHI2 recorded 1853 ha of semi-natural grassland which was absent from the WGI due to having never been recorded or due to being recorded as destroyed at that time. Recovery of some grasslands recorded as destroyed prior to 2011 is one reason underlying some grassland gains, where 81ha recorded as destroyed by WGI has returned to the WHI2 dataset as one of the selected priority grassland classes, implying that the habitat has recovered. However, the predominant cause of gains is likely to be a product of the WHI2 method used to identify grasslands: the more comprehensive identification technology has identified previously unrecorded grasslands rather than newly formed grasslands, and a margin of error (a limitation discussed in Section 2) is also likely to reduce real-term gains. As such, ground-truthing is required. Map 8.6 within the Appendix shows that some **newly identified areas of grassland are small parcels of lowland meadow concentrated in areas such as the Forest of Feckenham, Longdon & Eldersfield, north of Redditch, and the Malvern Chase.**

Case studies

Recovery

- 8ha of lowland calcareous grassland important for waxcap fungi and designated as Broadway Hill Meadows LWS on the Cotswold fringe was recorded as destroyed by WGI in 1993 due to agricultural improvement. After this time, LWS records from 2008 show the site was in

positive management and WHI2 independently classified the grassland in 2021 as g2a Lowland calcareous grassland.

- 3ha of MG5 grassland adjacent to the Leigh Brook in the Suckley Hills was recorded as destroyed through 'neglect' by the WGI, but WHI2 classified the grassland in 2021 as g3a Lowland meadow.
- 2ha of MG5 grassland adjacent to Grafton Wood within the Forest of Feckenham was recorded as destroyed through 'herbicide' by the WGI, but WHI2 classified 1ha in 2021 as g3a Lowland meadow.
- 2ha MG8 grassland designated as part of Caunsell Marsh LWS along the River Stour near Cookley was recorded as destroyed by the WGI, but WHI2 classified 1ha of the grassland as seasonally wet g3a Lowland meadow and 1ha as acid grassland, indicating that a possible change in hydrology or management has resulted in a shift in priority grassland type.

Creation

- Worcestershire Wildlife Trust Reserve Hill Court Farm & the Blacklands in the Longdon and Eldersfield area at the southwest of the county was managed as intensive pasture and arable when the Trust purchased the reserve in 2001. Work has been underway to restore neutral hay meadow and wetland habitats, resulting in WHI2 now recording over 20ha of lowland acid grassland. The current grassland currently exhibits neutral meadow indicator species but does overlie slightly acid clay soil which has likely been used within the WHI2 method to make the classification. This case again demonstrates the need for ground truthing.

Increased WHI2 mapping capability

- Approximately 15ha of acid grassland which is part of a mosaic with heathland at Burlish Top and Devil's Spittleful in the Wyre Forest was successfully recorded by WHI2 but was absent from WGI, presumably due to the nature of the fine-scale habitat mosaic being challenging to map prior to WHI2 technology.

This example also draws attention to future gains of semi-natural grassland which are expected with continued conservation management but have not yet been recorded. Wyre Forest District Council and Worcestershire Wildlife Trust are undertaking a large heathland and acid grassland restoration and creation project across Burlish Meadows (former golf course), Droppingwell Farm (former arable), and Blackstone Fields (also former arable). Some areas of grassland, such as the hillside with Burlish Meadows, already show a transition towards acid grassland with presence of some indicator species, and positive conservation management will continue this trajectory towards larger areas of this priority grassland habitat.

5.3. Grassland condition

Over **1400 ha of semi-natural grassland recorded as surviving by the WGI in 2011 had also been recorded as damaged, which equates to approximately 30% of the current combined inventory.** This is a significant proportion of the inventory and suggests that much of the remaining resource of semi-natural grassland resource continues to be in poor condition, or worse may now have been lost altogether if causes behind poor condition were not changed. Map 8.15 within the Appendix shows the location of grassland mapped as damaged by the WGI.

SSSIs can be used as a representative sub-sample to indicate the general condition of semi-natural grasslands within Worcestershire. Condition monitoring undertaken between 2009-2021 does not suggest a satisfactorily positive picture of SSSI grassland condition. Only 5.4% of SSSI acid grassland is in 'Favourable' condition, and 60-66% of SSSI calcareous and neutral grassland is in 'Favourable' condition. Broadly speaking, these figures support suggestions from the WGI that at least 30% of all semi-natural grasslands are not in favourable condition overall, however it should be noted that 93% of SSSI acid grassland and 22-38% calcareous and neutral grassland is in Unfavourable – Recovering condition, indicating that management is in place to restore condition.

The **condition of semi-natural grasslands occurring outside of statutorily designated sites is likely to be significantly poorer** due to the reduced level of protection they receive, the lack of information available for these sites, and the smaller and more isolated nature of grassland parcels. Notably, over 10% of SSSI Neutral grassland is in 'Unfavourable – Declining' condition, which implies this category which includes lowland meadows is at particular risk within the county.

Table 8 Area of SSSI designated acid, calcareous and neutral semi-natural grassland in Favourable and Unfavourable condition according to condition monitoring carried out by Natural England between 2009 – 2021.

| | Acid | | Calcareous | | Neutral | |
|---------------------------|-----------|--------|------------|--------|-----------|--------|
| | Area (ha) | % Area | Area (ha) | % Area | Area (ha) | % Area |
| Total SSSI units | 396.31 | | 48.49 | | 532.09 | |
| Favourable | 21.5 | 5.4 | 29.27 | 60.4 | 355.76 | 66.9 |
| Unfavourable - Recovering | 370.12 | 93.4 | 18.24 | 37.6 | 114.2 | 21.5 |
| Unfavourable - Declining | 4.69 | 1.2 | 0.98 | 2.0 | 59.42 | 11.2 |
| Unfavourable - no change | | | | | 1.03 | 0.2 |
| Partially destroyed | | | | | 1.68 | 0.3 |

6. Next steps

Current sources of information show that only a small proportion of Worcestershire's grassland is high quality semi-natural grassland, and this resource has been and continues to be vulnerable to ongoing land use change within the county. Furthermore, the extent of lowland meadows within Worcestershire remains of national importance. The following actions are recommended to strengthen the evidence base and secure the existing resource and future recovery of semi-natural grassland in Worcestershire.

6.1. Field surveys

A very limited proportion of semi-natural grassland data has been ground-truthed by recent field surveys, if at all, and condition data is absent for most grassland parcels. Carrying out targeted field surveys would improve accuracy of the current inventory and add important information about semi-natural grassland extent and condition in Worcestershire.

Table 9 lists survey priorities and objectives, alongside an approximation of the resources required to achieve these. Resource approximations are based on a survey season lasting between May – September, with 80 working days available within that season. A single surveyor could feasibly survey (and carry out associated admin work) an average of 10ha per day based on a survey method of collating a species list with DAFOR codes via a walkover survey, UKHab classification of habitats present, and taking notes regarding condition of habitat. Resources required are likely to vary from the approximation according to grassland type being surveyed (e.g. acid grassland is likely to be surveyed more rapidly than calcareous grassland), the area of land for which permission is granted for access, the level of reporting required, and the survey method required to meet other objectives. For instance, a more comprehensive survey method may be required to collect sufficient evidence to classify some parcels of semi-natural grassland as irreplaceable habitat, if the opportunity arises subject to new government guidance.

Table 9 Priorities for field survey of semi-natural grassland, objectives, and approximate resources required to achieve this.

| Survey priorities | Approx. area of semi-natural grassland (ha) | Location and grassland type (see Fig.2) | Approx. full time equivalent of a single surveyor for 1 field season | Objectives |
|--|--|--|--|--|
| Semi-natural grassland designated as LWS | 549 | Across Worcestershire All grassland types | 0.75 | LWS have substantive value for nature conservation within Worcestershire and represent a suite of grasslands which lie outside of well-known and better protected nature reserves and statutory designated sites. This makes them an ideal candidate for collecting rapid impressions of the status and condition of known semi-natural grassland sites which may also be more vulnerable to land use change than statutory designated sites. Data collected would make a contribution to Worcestershire's Local Habitat Map within the LNRS. |
| Undesignated semi-natural grasslands occurring within hotspots | Total = 673 LWS = 141 SSSI = 60 NNR = 12 Undes. = 460 | Forest of Feckenham Lowland meadows | 0.75 | Survey of semi-natural grasslands for which there is little existing information and occur within apparent grassland hotspots (see Fig. 2, Section 3) would increase the accuracy of WHI2 and improve knowledge of the most vulnerable grasslands which are currently undesignated, such as small parcels of lowland meadow for which Worcestershire is renowned. Collection of this information may also provide an opportunity to designate a greater area of semi-natural grassland as LWS. Data collected would make a contribution to opportunity mapping for grassland enhancement within Worcestershire's LNRS, and would be considered by the LNRS Local Habitat Map if sites are designated as LWS. |
| | Total = 110 LWS = 29 SSSI = 2 Undes. = 79 | The Lenches Lowland meadow / calcareous grassland | | |
| | Total = 294 LWS = 33 SSSI = 37 Undes. = 224 | Suckley Hills Lowland meadow | 0.25 | |
| | Total = 971 LWS = 319 SSSI = 420 Undes. = 232 | Malvern Hills & Chase Acid grassland / Lowland meadow | 0.25 | |
| | Total = 232 LWS = 17 SSSI = 24 Undes. = 191 | North of Redditch Lowland meadow | 0.25 | |
| | Total = 369 | Wyre Forest | 0.5 | |

| | | | | |
|--|---|--|------|--|
| | <i>LWS = 65</i> <i>SSSI/NNR = 131</i> Undes. = 173 | Acid grassland / Lowland meadow | | |
| | Total = 286 <i>LWS = 108</i> <i>SSSI = 36</i> Undes. = 142 | Clent Hills Acid grassland / Lowland meadow | | |
| | Total = 149 <i>LWS = 24</i> <i>SSSI/NNR = 15</i> Undes. = 110 | Chaddesley Lowland meadow | | |
| | Total = 209 <i>LWS = 33</i> <i>SSSI = 23</i> Undes. = 153 | Longdon & Eldersfield Lowland meadows / floodplain meadow | 0.25 | |
| | Total = 61 <i>LWS = 4</i> <i>SSSI = 4</i> Undes. = 53 | Kyre Brook & tributaries Lowland meadows | | |
| | Total = 126 <i>LWS = 81</i> <i>SSSI = 23</i> Undes. = 22 | Kempsey Acid grassland / Lowland meadow | 0.25 | |
| | Total = 72 <i>LWS = 19</i> <i>SSSI = 15</i> Undes. = 38 | Broadway Calcareous grassland | | |
| | Total = 261 <i>LWS = 25</i> <i>SSSI/NNR = 180</i> Undes. = 56 | Bredon Hill Calcareous grassland | | |
| Semi-natural grassland recorded as destroyed | 1200 | Across Worcestershire All grassland types | 1.5 | Survey of semi-natural grasslands which have been recorded as destroyed will provide a more accurate picture of real-term grassland losses, and potentially identify the most urgent opportunities to restore semi-natural grassland where this is possible. |

6.2. Semi-natural grassland inventory for Worcestershire

The sources of information about grasslands in Worcestershire currently remain separate. A combined inventory which uses the best available sources of information and incorporates new information as it arises is a crucial tool for monitoring, creating and restoring grasslands in the county, as well for as monitoring progress towards targets steered by the emerging Local Nature Recovery Strategy.

Potential areas of work include:

- Use parameters common across different data sources to create a combined inventory with no overlaps, which takes the most reliable source of information available for every grassland parcel.
- Process attribute information to simplify, complete, and correct errors. This would make the inventory easier to query comprehensively.
- Invest resources into a mechanism (such as the WCC WHI2 web-tool) to record new grassland information as it arises and incorporate it into a dynamic grassland inventory which is integrated with the Natural England Priority Habitat Inventory available on MAGIC.

6.3. Protection of semi-natural grasslands

Worcestershire's lowland meadows and areas of acid and calcareous grassland make a substantial contribution to the county's natural character and biodiversity and form critical components of the nature recovery network. However, over half of the current known resource of semi-natural grassland is unrecognised and unprotected by a designation, leaving parcels vulnerable to land use change.

Potential areas of work include:

- Designate a greater proportion of semi-natural grassland as LWS. This will embed important grasslands within the Local Habitat Map of the Local Nature Recovery Strategy, showing areas which are or could become of particular importance for biodiversity and the environment to target nature recovery action through avenues such as Biodiversity Net Gain.(DEFRA, 2023).
- Define semi-natural grasslands as 'irreplaceable habitat' wherever possible, to strengthen their protection and embed them within the Local Habitat Map of the Local Nature Recovery Strategy. Evidence suggests that complete restoration of calcareous grasslands will take more than 100 years and ultimately may even be impossible to

achieve (Maskell, Jarvis, Jones, Garbutt, & Dickie, 2014) (Holmes & Wentworth, 2022). This period is beyond human timeframes, and therefore should be considered as irreplaceable habitat in the same way as ancient woodland.

- Invest resources into ongoing monitoring of SSSI condition and landowner engagement, and action to protect SSSI grassland from land use change and damage.
- Lobby for improved protections for sites, including through revisions to agricultural EIA, strengthened protection of irreplaceable and Priority habitat through the planning system and delivery of increased resources for relevant bodies and programmes. Appropriate weight must be given to LNRS commitments and to grassland restoration as well as protection.

6.4. People engagement

Enabling people to better engage with semi-natural grassland in Worcestershire is crucial if there is to be greater value placed on them and positive action occurring to manage, create, restore, and monitor grasslands.

Potential areas of work include:

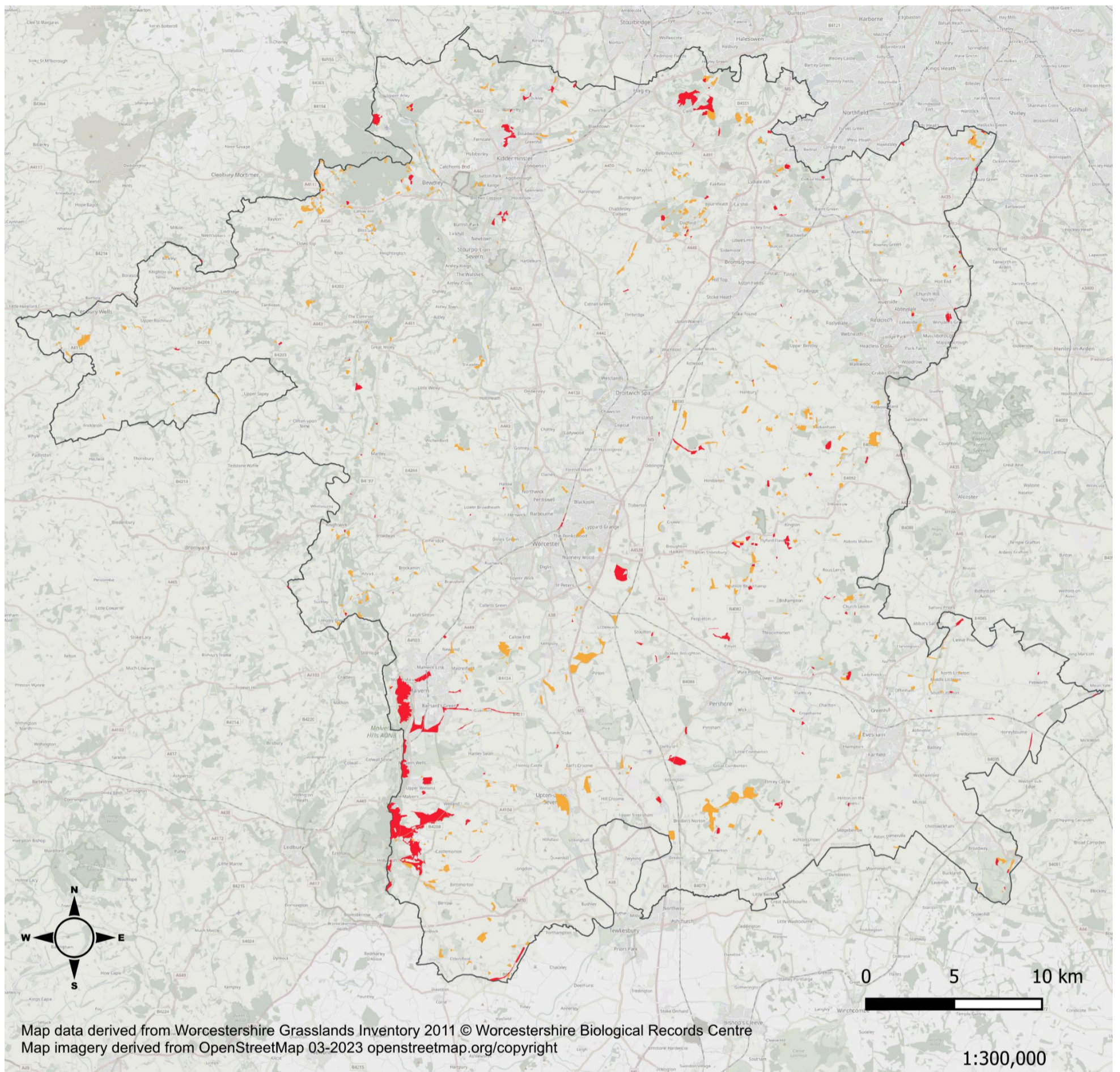
- Invest resources into provision of expert advice to land managers of semi-natural grassland designated as LWS. Expert advice will help land managers understand the value of the grasslands they manage and make informed habitat management decisions.
- Explore the creation of community and landowner groups, such as a 'Worcestershire Meadows' group, where engaged people can join training workshops and visits to learn how to manage, restore, create, and monitor semi-natural grasslands.

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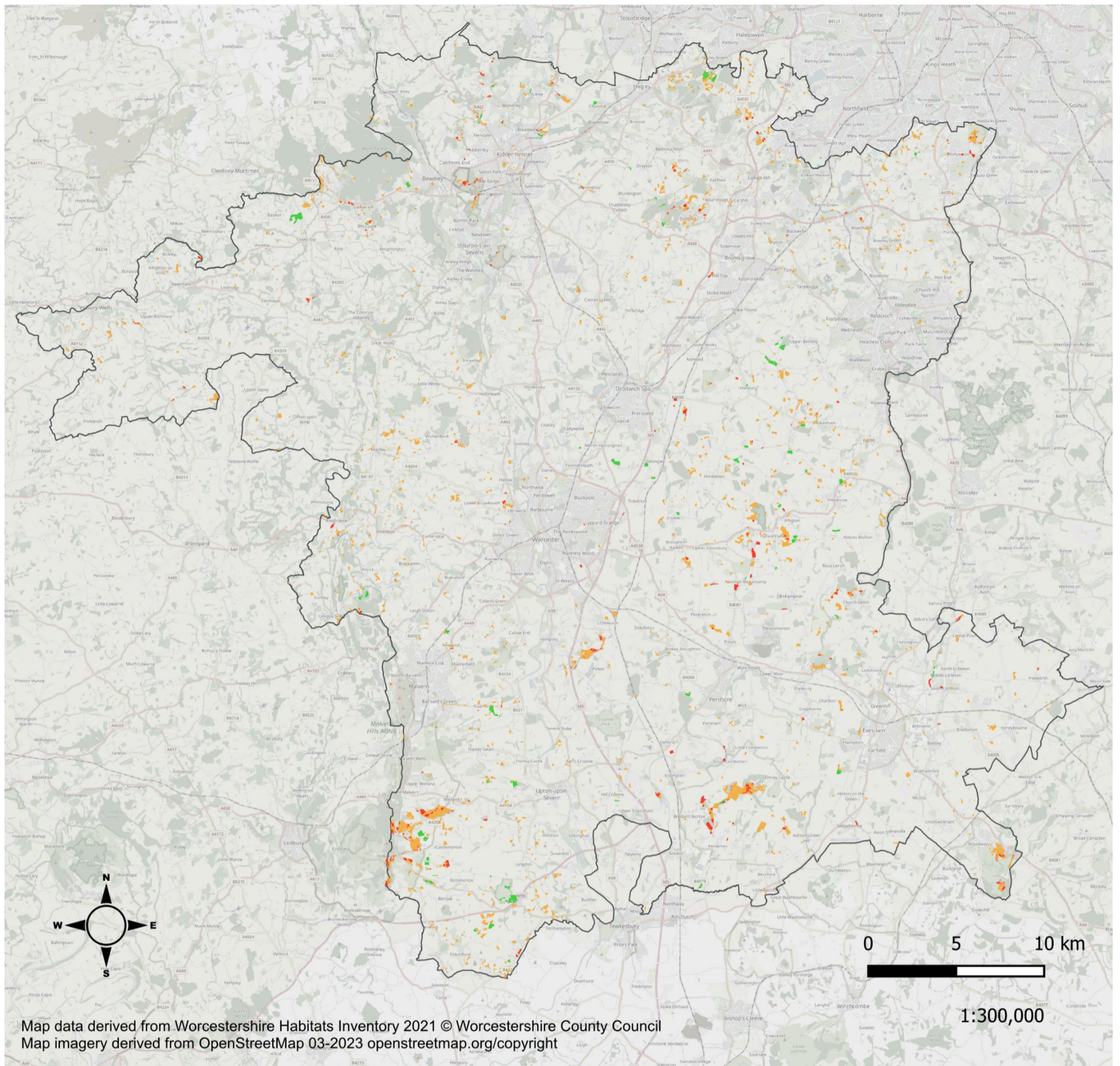
8. APPENDIX

8.1. Reliability of Worcestershire Grasslands Inventory



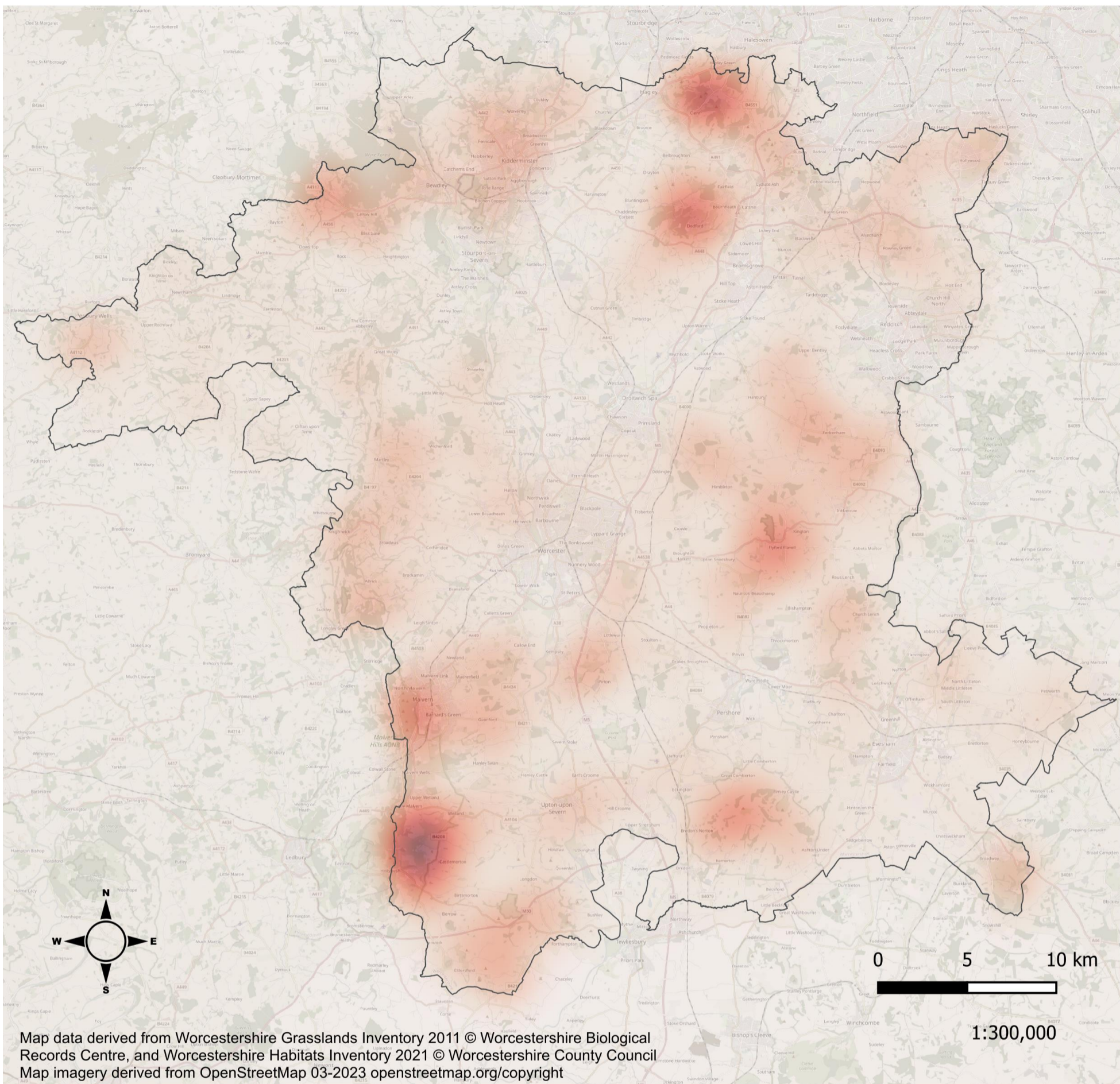
- Moderate reliability (WGI data)
- Low reliability (WGI data)
- Worcestershire County Boundary

8.2. Reliability of Worcestershire Habitats Inventory



- High reliability (WHI2 data)
- Moderate reliability (WHI2 data)
- Low reliability (WHI2 data)
- Worcestershire County Boundary

8.3. Heat map of semi-natural grassland distribution within Worcestershire



Key

-  Worcestershire County Boundary
-  Heat map of 1km squares containing semi-natural grassland on the Worcestershire Grasslands Inventory (2011) and the Worcestershire Habitats Inventory (2021)

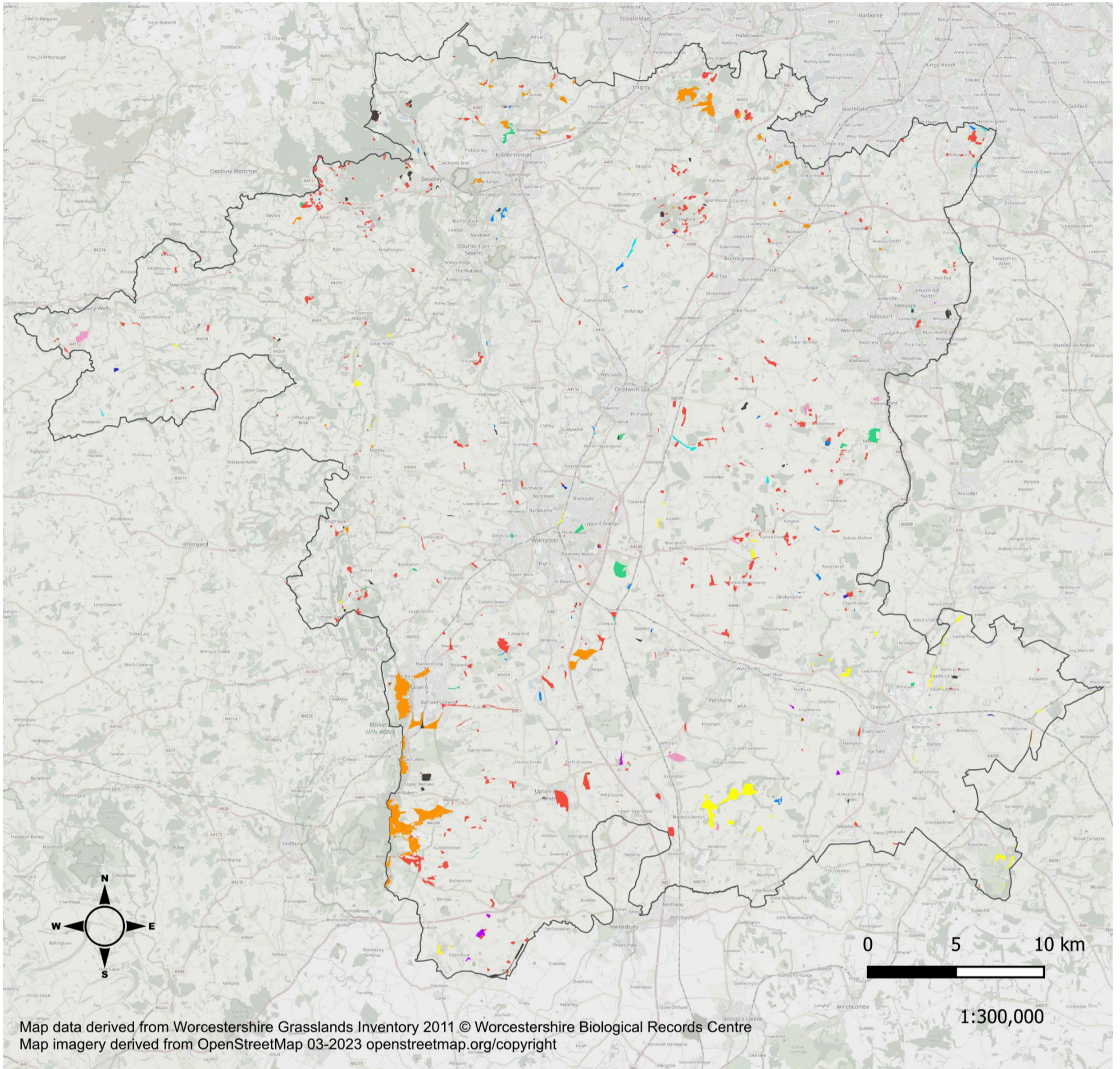
8.4. Indicative distribution of semi-natural grassland within Worcestershire















Key

- Worcestershire County Boundary
- 100m squares intersecting WHI (2021) + WGI (2011)

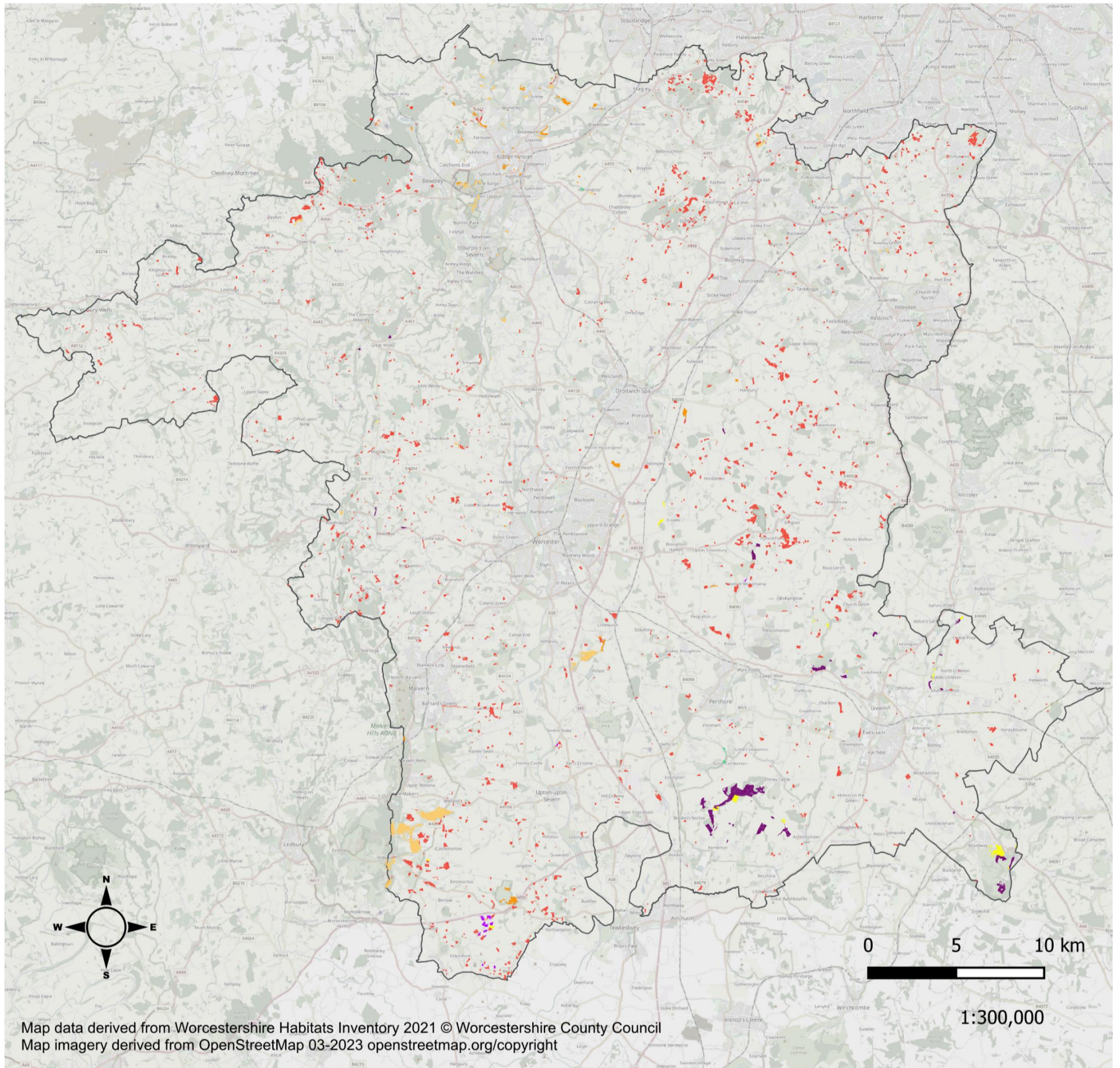
8.5. Semi-natural grassland classes recorded by Worcestershire Grasslands Inventory



WGI (2011) UKHab grasslands

- | | |
|---|---|
|  g - Grassland |  g3c - Other neutral grassland |
|  g1a - Lowland dry acid grassland |  g3c5 - Arrhenatherum neutral grassland |
|  g2a - Lowland calcareous grassland |  g3c6 - Lolium-Cynosurus neutral grassland |
|  g3 - Neutral grassland |  g3c7 - Deschampsia neutral grassland |
|  g3a - Lowland meadows |  g3c8 - Holcus-Juncus neutral grassland |
|  g3a5 - Lowland hay meadows (<i>Alopecurus pratensis</i> - <i>Sanguisorba officinalis</i>) |  Worcestershire County Boundary |

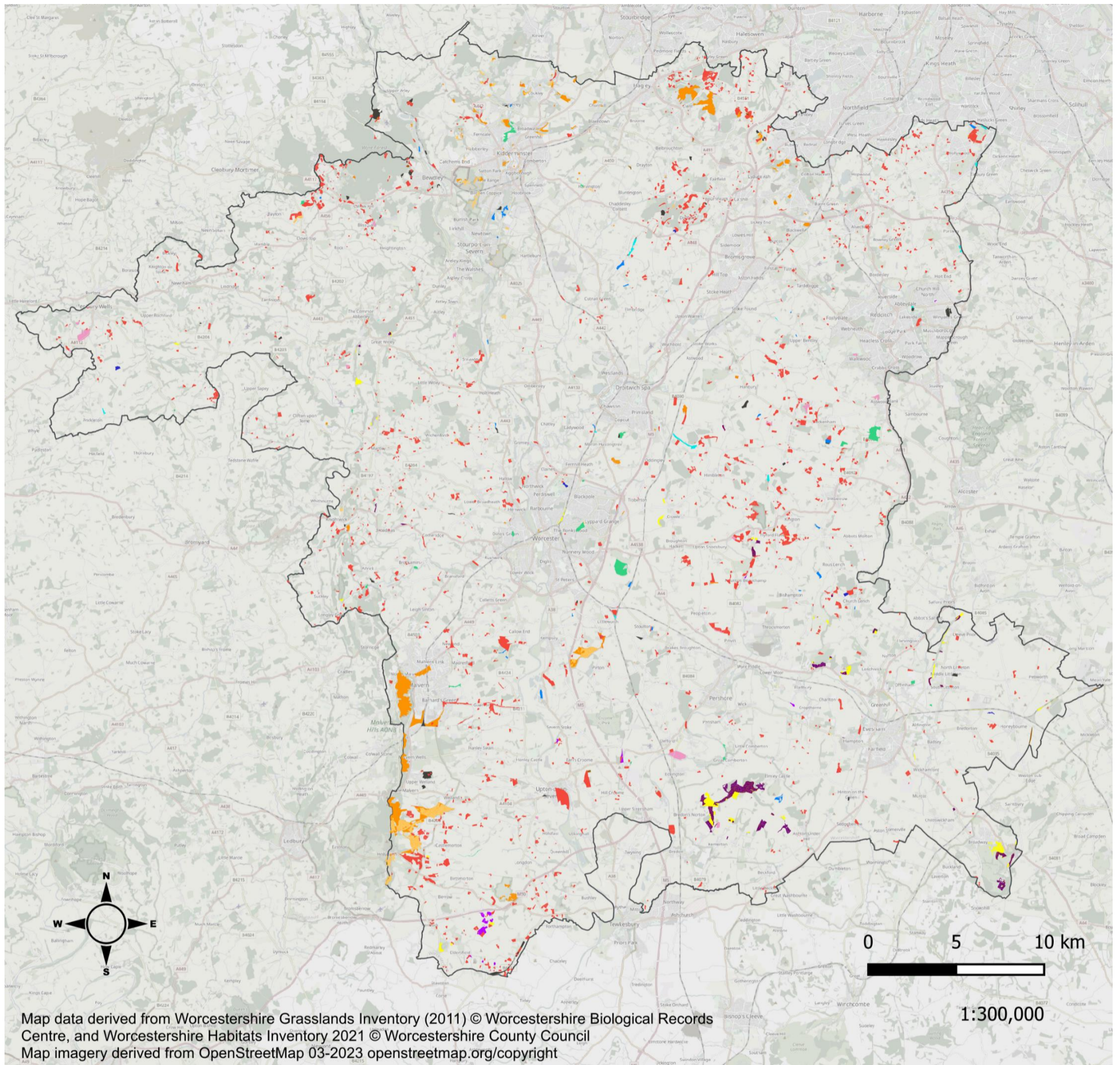
8.6. Semi-natural grassland classes recorded by Worcestershire Habitats Inventory


















WHI2 (2021) UKHab grasslands

- | | | | |
|---|---|---|---|
|  | Worcestershire County Boundary |  | g2a - Lowland calcareous grassland |
|  | g1 - Acid grassland |  | g3 - Neutral grassland |
|  | g1a - Lowland dry acid grassland |  | g3a - Lowland meadows |
|  | g1a6 - Other lowland dry acid grassland |  | g3a5 - Lowland hay meadows (<i>Alopecurus pratensis</i> - <i>Sanguisorba officinalis</i>) |
|  | g2 - Calcareous grassland | | |

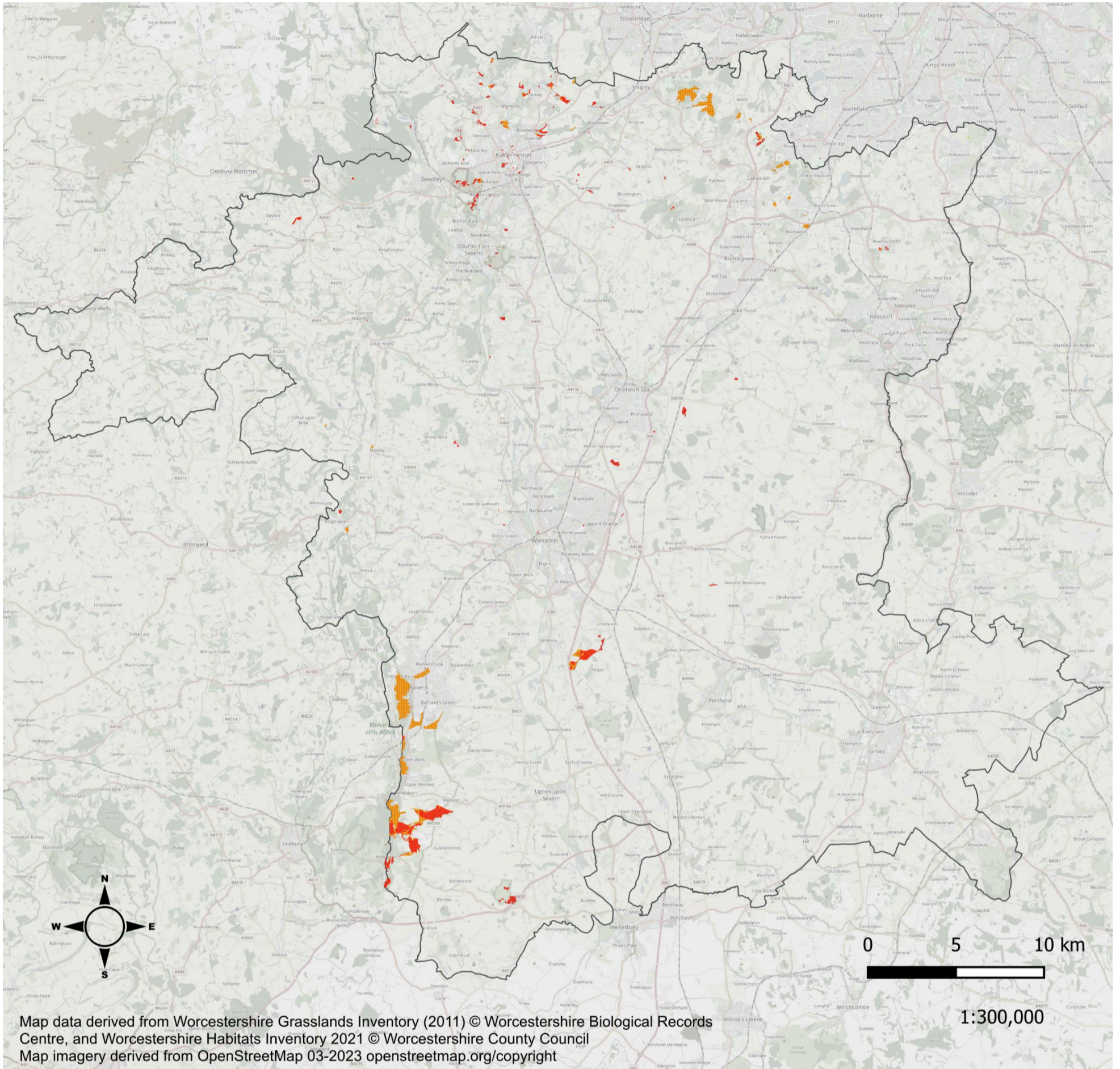
8.7. Semi-natural grassland classes recorded by Worcestershire Grasslands Inventory & Worcestershire Habitats Inventory. NB – datasets overlap.







WGI (2011) & WHI2 (2021) UKHab grasslands

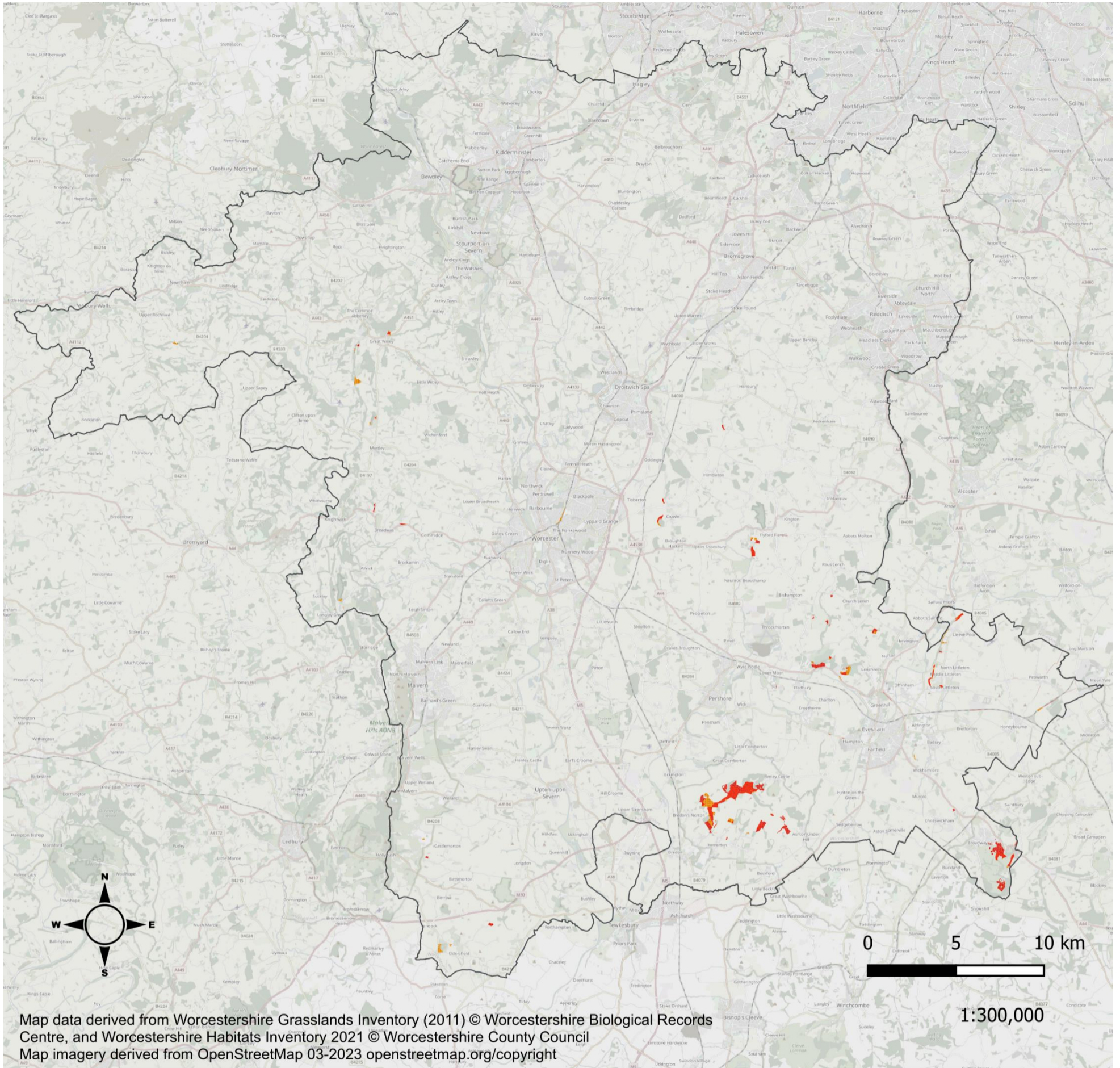
- | | |
|---|---|
|  Worcestershire County Boundary |  g3a - Lowland meadows |
|  g - Grassland |  g3a5 - Lowland hay meadows (<i>Alopecurus pratensis</i> - <i>Sanguisorba officinalis</i>) |
|  g1 - Acid grassland |  g3c - Other neutral grassland |
|  g1a - Lowland dry acid grassland |  g3c5 - Arrhenatherum neutral grassland |
|  g1a6 - Other lowland dry acid grassland |  g3c6 - Lolium-Cynosurus neutral grassland |
|  g2 - Calcareous grassland |  g3c7 - Deschampsia neutral grassland |
|  g2a - Lowland calcareous grassland |  g3c8 - Holcus-Juncus neutral grassland |
|  g3 - Neutral grassland | |





8.8. Acid grassland recorded by the Worcestershire Grasslands Inventory & Worcestershire Habitats Inventory



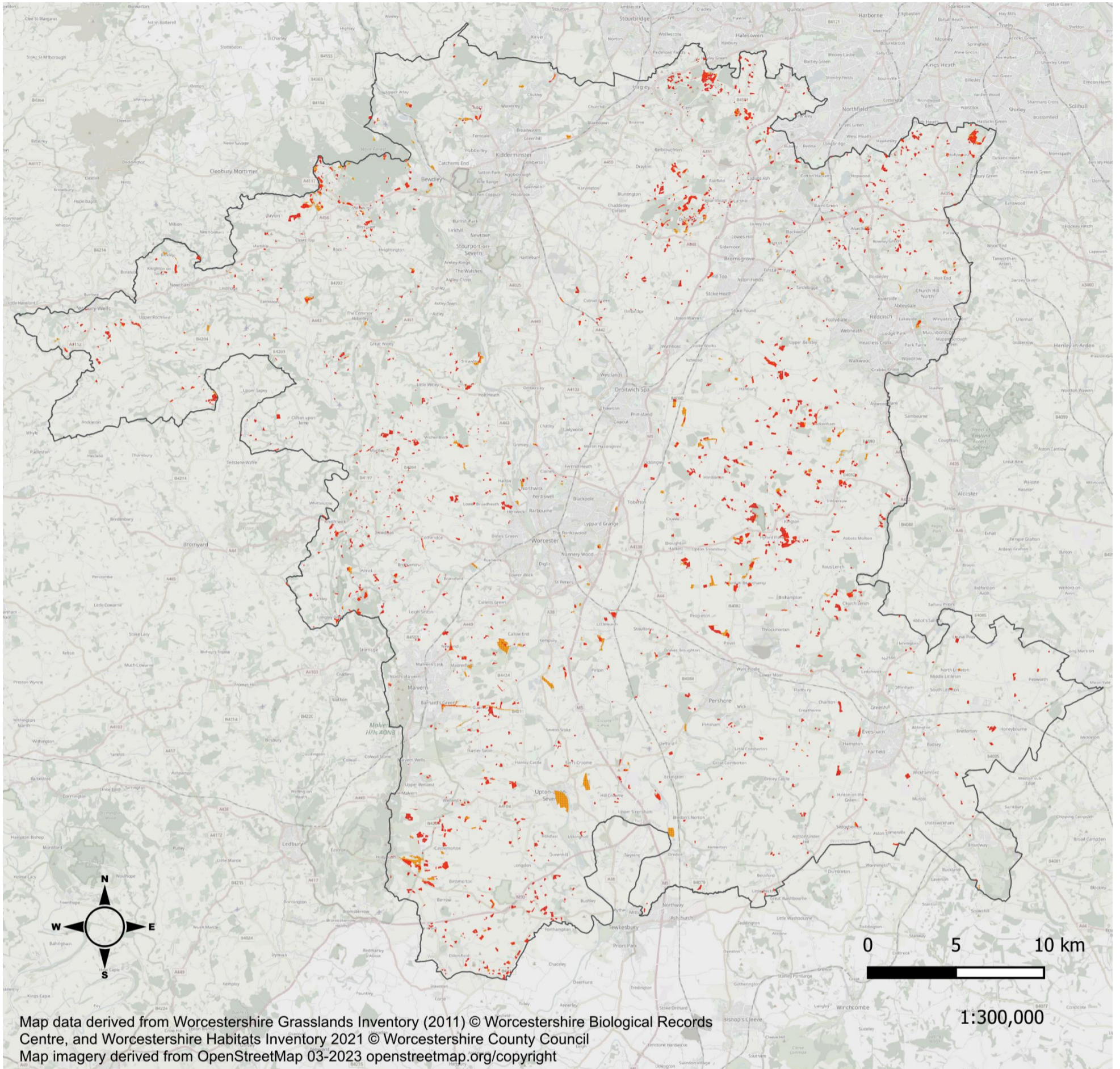
-  Worcestershire County Boundary
-  WHI2 (2021) Acid grassland
-  WGI (2011) Acid grassland
-  Difference in mapped area between WGI and WHI2





8.9. Calcareous grassland recorded by the Worcestershire Grasslands Inventory & Worcestershire Habitats Inventory



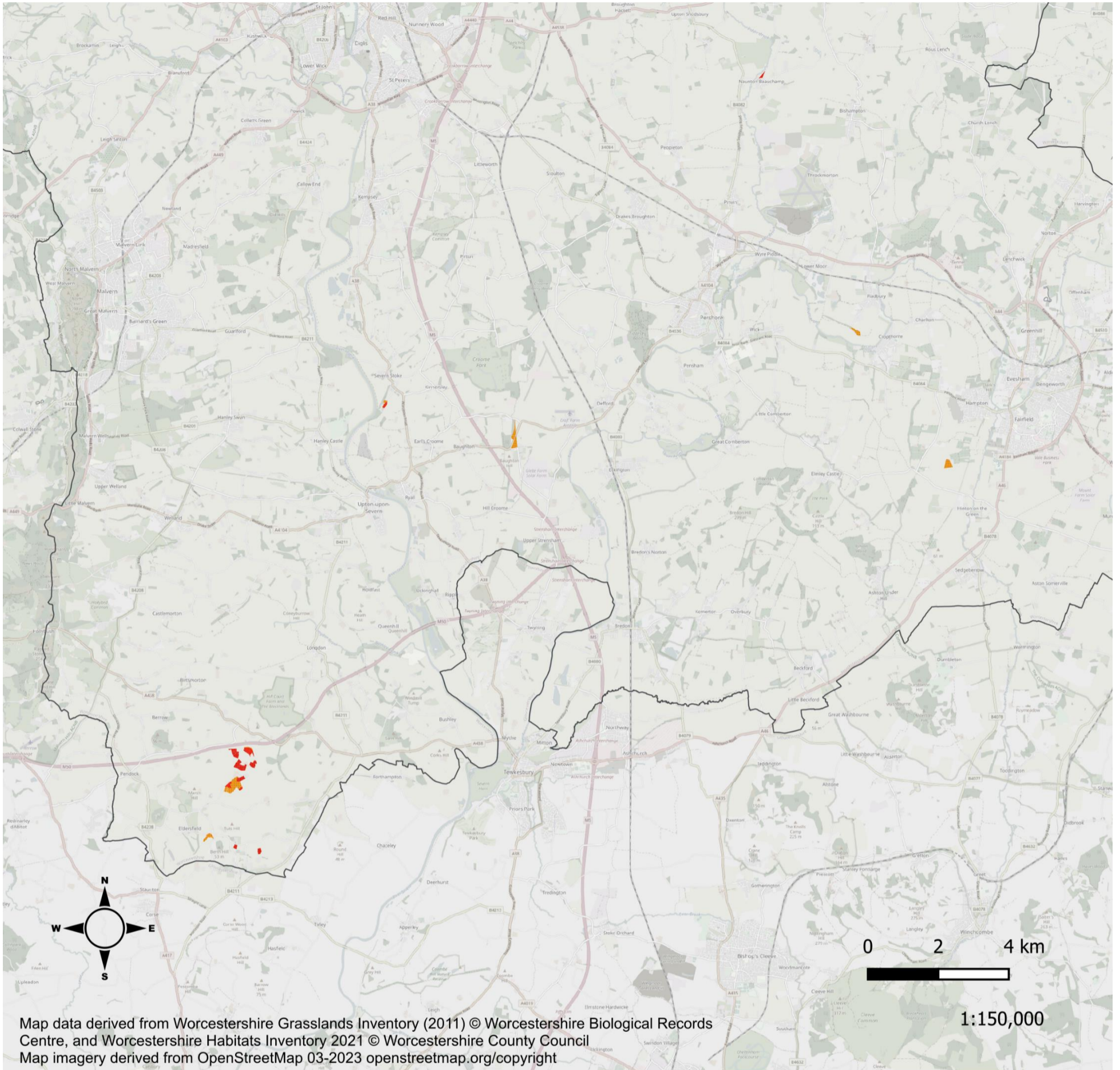
-  Worcestershire County Boundary
-  WGI Calcareous grassland
-  WHI2 Calcareous grassland
-  Difference in mapped area between WGI and WHI2





8.10. Lowland meadows (g3a) recorded by the Worcestershire Grasslands Inventory & Worcestershire Habitats Inventory



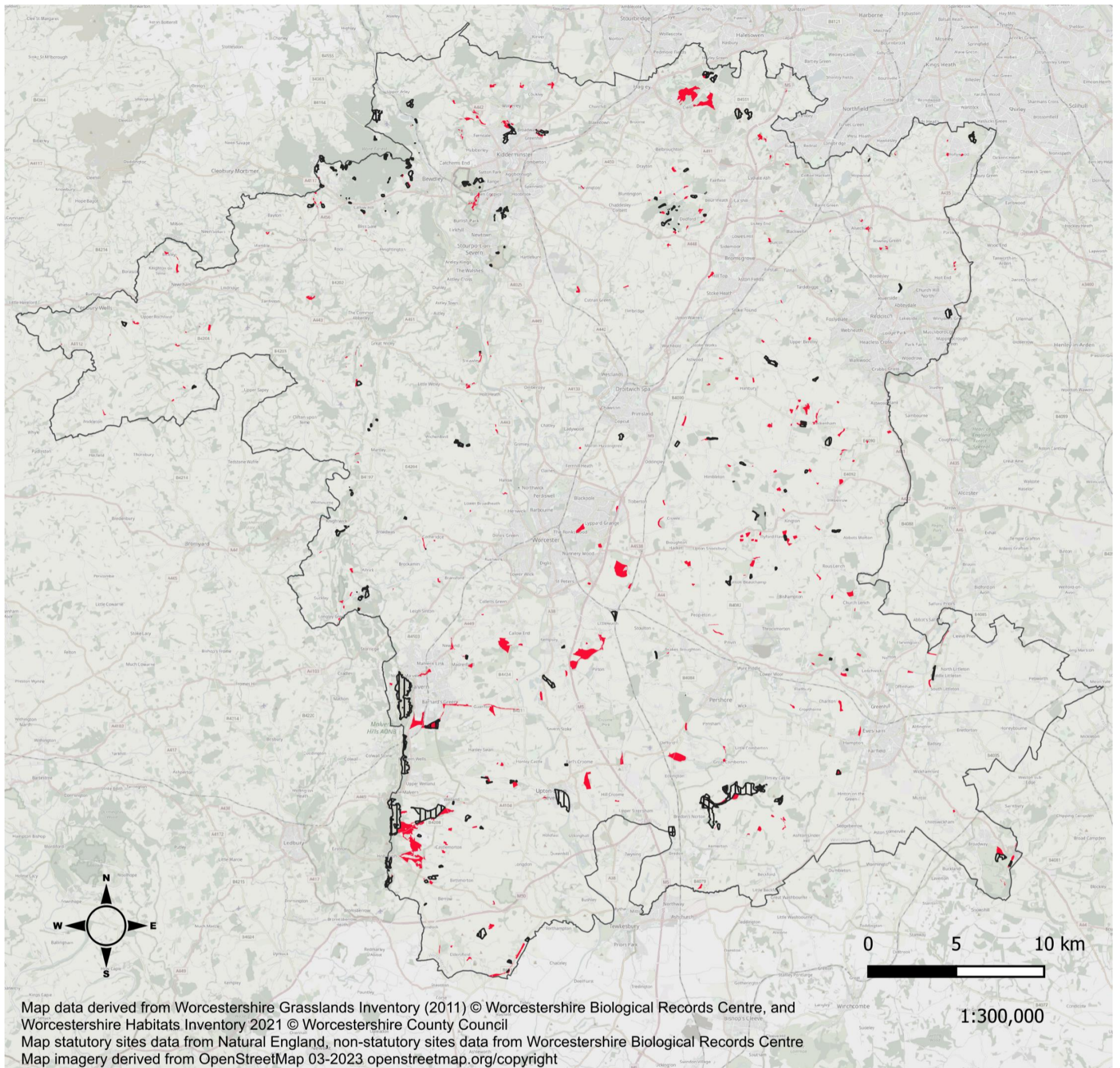
-  Worcestershire County Boundary
-  Difference in mapped area between WGI and WHI2
-  WGI (2011) Lowland meadow g3a
-  WHI2 (2021) Lowland meadow g3a

8.11. Lowland floodplain meadows (g3a5) recorded by the Worcestershire Grasslands Inventory & Worcestershire Habitats Inventory







-  Worcestershire County Boundary
-  Difference in mapped area between WGI and WHI2
-  WGI (2011) Lowland floodplain meadow g3a5
-  WHI2 (2021) Lowland floodplain meadow g3a5

8.12. Protection of semi-natural grassland within Worcestershire



Key

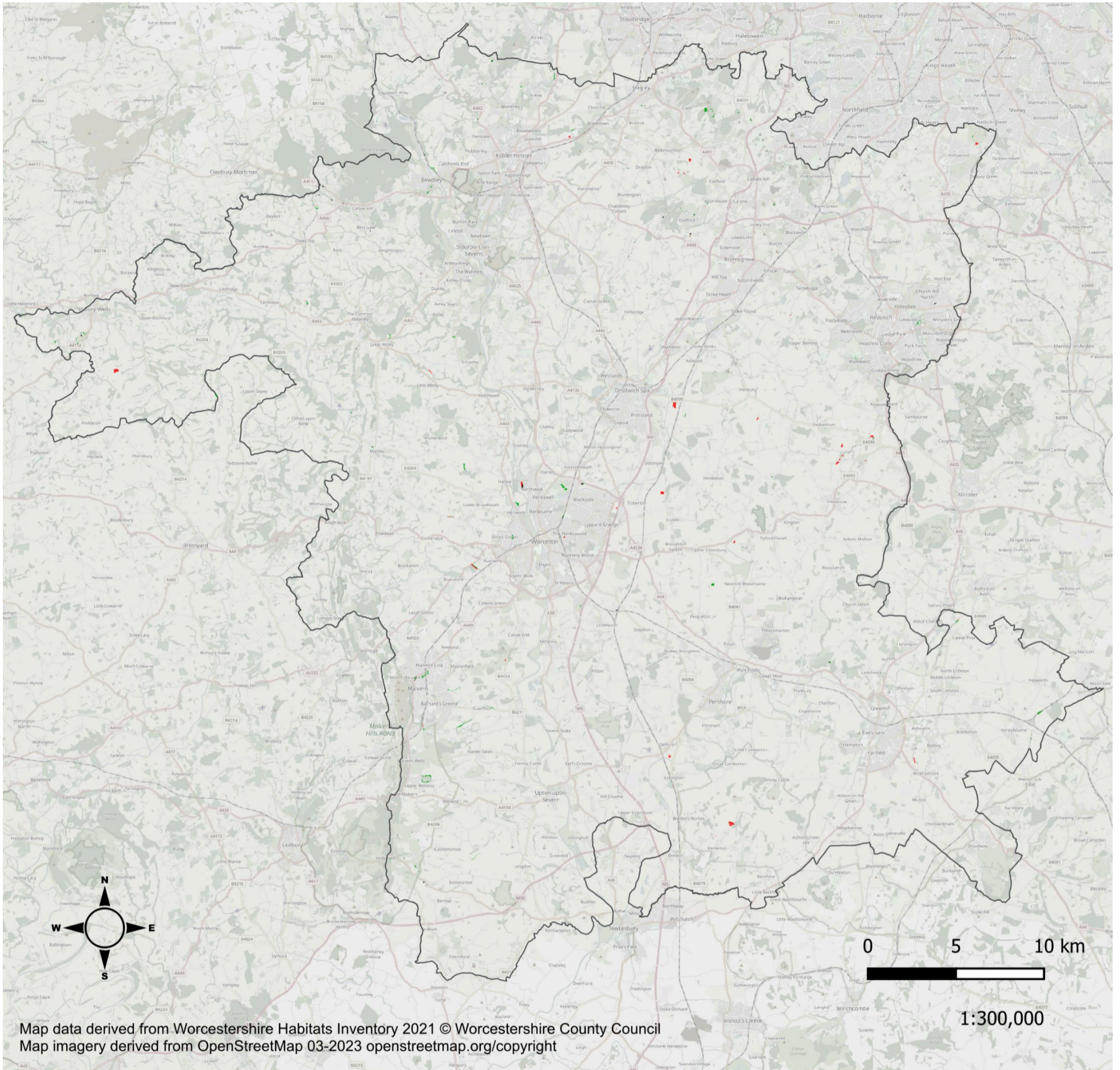
-  Semi-natural grassland occurring within a National Nature Reserve (NNR)
-  Semi-natural grassland occurring within a Site of Special Scientific Interest (SSSI)
-  Semi-natural grassland occurring within a Local Wildlife Site (LWS)
-  Worcestershire County Boundary

8.13.Semi-natural grassland recorded as destroyed by Worcestershire Grasslands Inventory



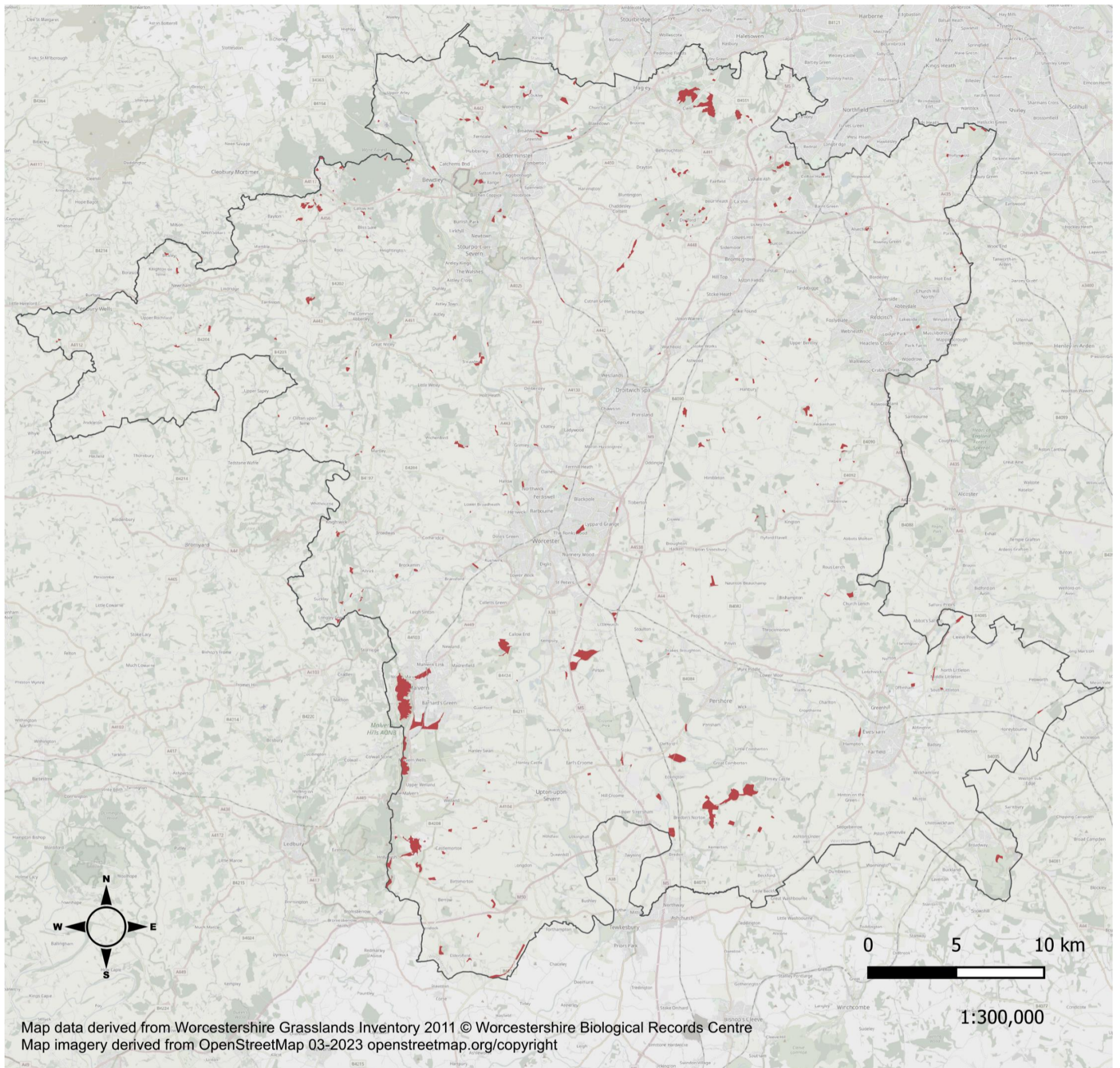
Semi-natural grasslands destroyed pre-2011
 Worcestershire County Boundary

8.14. Semi-natural grassland recorded as lost to woodland, agriculture and development by Worcestershire Habitats Inventory since 2011



- Worcestershire County Boundary
- WHI2 (2021) Agriculture habitat class intersecting WGI (2011) record of surviving semi-natural grassland
- WHI2 (2021) Urban habitat class intersecting WGI (2011) record of surviving semi-natural grassland
- WHI2 (2021) Woodland habitat class intersecting WGI (2011) record of surviving semi-natural grassland

8.15.Semi-natural grassland recorded as damaged by Worcestershire Grasslands Inventory



- Worcestershire County Boundary
- Semi-natural grasslands recorded as damaged by WGI (2011)