

North West Brown Hare Project

Interim report Dec 2010 to Oct 2011



Produced by Samuel Bolton

North West Brown Hare Project, Greater Manchester Ecology Unit, Room 1.45 Tameside MBC Council Offices, Wellington Road, Ashton Under Lyne. OL6 6DL

Tel: (0161) 3424409 Mob: 07854163376 email: samuel.bolton@tameside.gov.uk

Website: www.brownhare.org.uk

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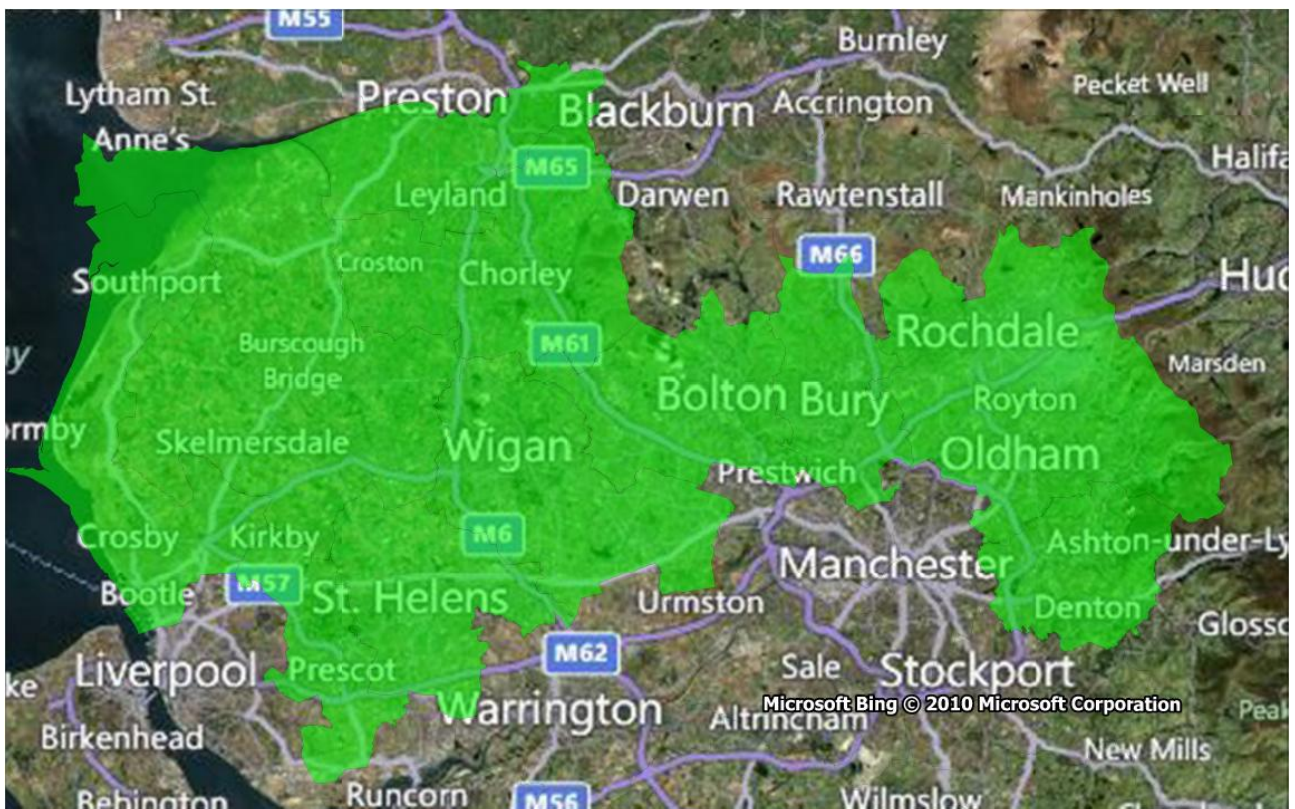
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1.0 Introduction

The North West Brown Hare Project (NWBHP) aims to improve our understanding of the brown hare population and distribution within Greater Manchester, North Merseyside and South Lancashire. The goal over the two years of the project, is to highlight isolated or fragmented populations and link up or expand populations into areas where they are absent, delivering landscape scale benefits to farmland biodiversity. The project will directly inform the Greater Manchester, Lancashire and North Merseyside Biodiversity Action Plans providing baseline data on which to underpin targets and contribute to the achievement of these targets (Waymont, 2003; Ashley, 2007; Rogers, 2008).

Map 1: North West Brown Hare Project area



The project area encompasses several broad but distinct geographical areas. The north and east of Greater Manchester are made up of the Southern Pennines, West Pennine Moors and the Pennine fringe. Predominately pastoral, there are densely urbanised mill towns set within strongly enclosed valleys which contrast with the open moorland and in-by-land.

To the east of Greater Manchester and into South Lancashire, the Mersey Valley and Lancashire Coal Measures take over. They include open, flat, large scale farmland, some derived from improved/drained mossland, which supports mixed agriculture with little woodland cover. The Coal Measures' farmland has a weak vegetation structure and much of the area has been settled and developed.

Moving further into North Merseyside and South Lancashire are the West Lancashire Plains. Drained mosses now comprise of ordered fields divided by drainage channels with few hedgerows and trees. Finally, to the west, the Sefton Coast is characterised by intertidal sands and silts, dune systems, coastal heath and is backed by arable farmland (Porter et al., 2009).

2.0 Current status of brown hare in the South Lancashire, North Merseyside and Greater Manchester.

The Mammal Tracking Partnership has some of the most up to date published information on brown hare at a country wide level. However, the observed percentage increase of 37% over 25 years and a 19% to 3% increase over 10 years are not seen to be statistically significant and trends are unclear (Anon, 2009).

In the North West region, national game bag records have shown a 33% decrease in the index of game bag densities between 1995 and 2008. Again however, caution is required as the 95% confidence intervals show that this figure could range anywhere between an 89% decrease to a 148% increase (Davey et al., 2010).

The British Trust for Ornithology (BTO) Breeding Bird Survey (BBS) provides independent data on trends in UK bird abundance, part of this survey includes the recording of mammals. The BTO BBS has taken place continually since 1995, providing 15 years of comparable hare data from surveyors. Conducted twice a year at any time between 6am and 9am, once between 1st April and mid May and the second between mid May and the end of June (BTO, 2011). Data for the NWBHP area was kindly provided by the BTO (Chart 1 & 2). It should be noted that data for 2001 is low owing to foot-and-mouth disease and a subsequent lack of survey effort. It should also be noted that only positive records have been provided and BBS transects with no hare sightings have not yet been provided.

While the total average of 4.8 hares/km sq and the 2010 figure of 5.5 hares/km sq show a slight increase from the 1995 figure of 4.3 hares/km sq, the overall results show no significant trend over the period. There has however, been some significant peaks in the mean average. This may, in part, be explained by mean average annual temperatures in the North West region. Schmidt et al., (2004) showed that mild winters were beneficial to European brown hares and Chart 2 seems to show hare numbers decreasing and increasing in response to average annual temperature variations.

Two other sets of data have been compiled in the region over the last decade. The Wildlife Trust for Lancashire, Greater Manchester and North Merseyside (Lancs WLT) have conducted an annual 1km squared curved transect survey in 2002,2003,2005 and 2006 for which figures are available. Surveys were

also conducted between 2008 and 2011, for which the figures still need to be collated. Merseyside BioBank also conducted a similar 1km squared curved transect survey between 2008 and 2010 (Chart 3).

Chart 1: BTO BBS average numbers of hares seen per transect (NWBHP area)

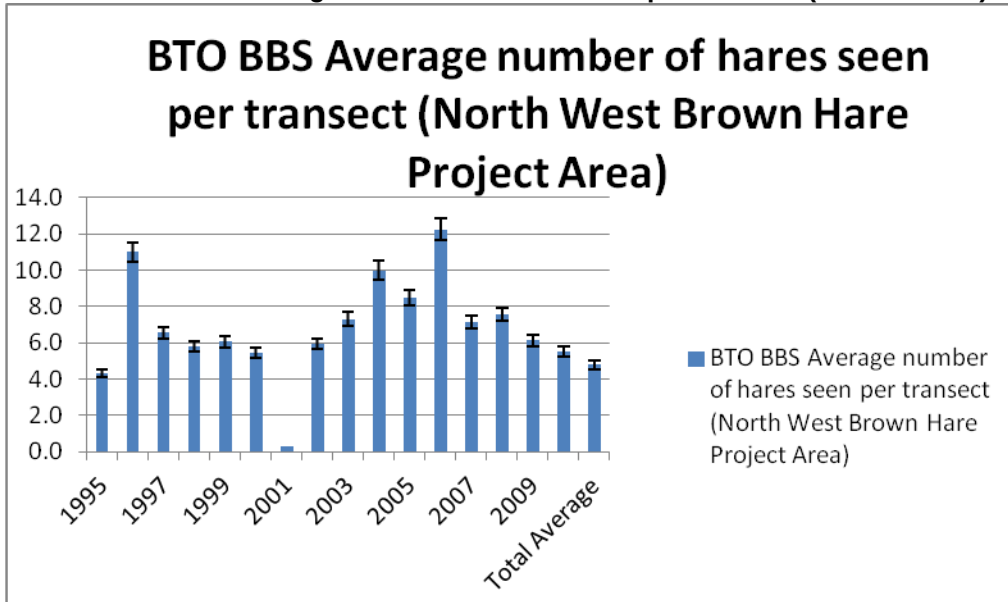


Chart 2: BTO BBS average number of hares seen per transect (NWBHP area) against NW England and N Wales average mean annual temperature (Celsius)

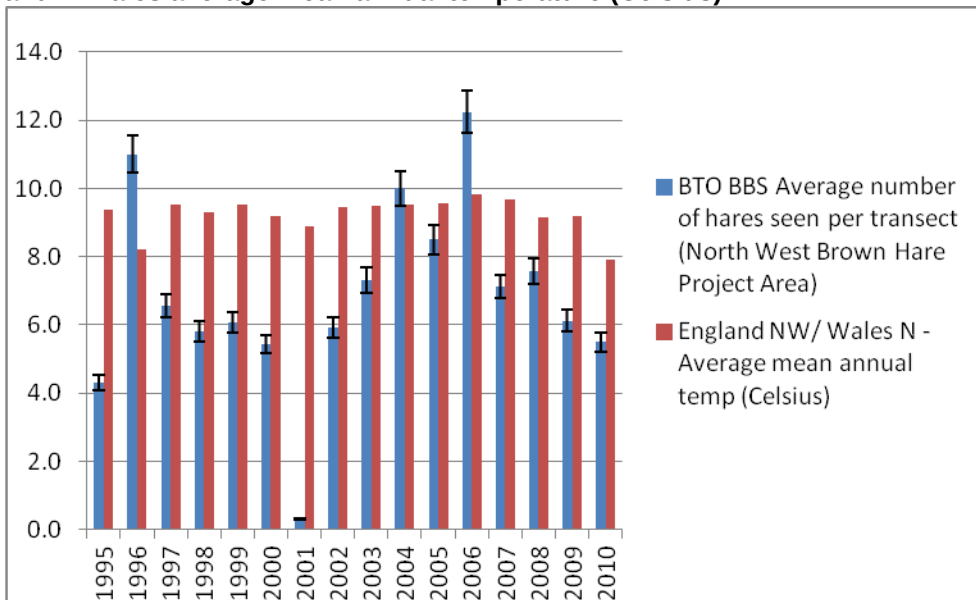
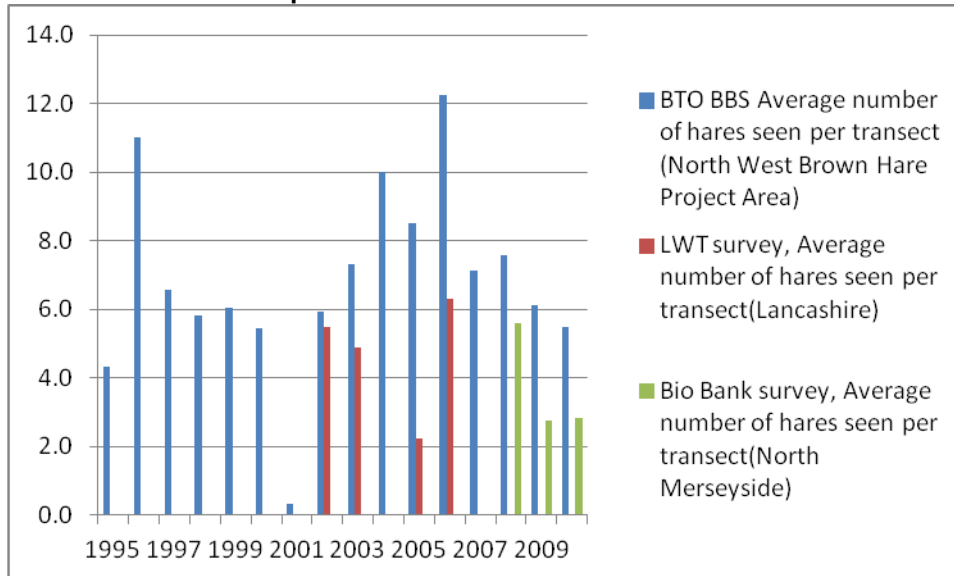


Chart 3: BTO BBS, Lancs Wildlife Trust and Merseyside Biobank brown hare surveys – average number of hares seen per km²



Both surveys have been useful in identifying potential populations, however there is not enough year on year data to infer any long term trends in brown hare densities within each of these areas. More work needs to be done by the NWBHP to ensure that the same squares are surveyed in the up and coming survey season, in order for Biobank's historic results to be more comparable with the current set of survey data.

3.0 The North West Brown Hare Project Survey

3.1 Location

The initial study area was selected on the basis of previous hare records gathered by 3 local record centres; Merseyside Biobank (MBB), Lancashire Environmental Records Centre (LERN) and Greater Manchester Local Records Centre (GMLRC). The project chose to concentrate its efforts in the council boundaries of Bury, Bolton, Wigan, St Helens, Knowsley, Sefton, Chorley, South Ribble and West Lancashire. However, once the project was initiated, further records came to light which warranted an extension of the survey into Rochdale, Oldham and Tameside. At a landscape scale, the survey area was stratified according to the Natural England's North West Broad Landscape Character Areas. The North West Landscape Character Framework (NWLCF) is a map and associated database that describes the variation in landscape at a regional scale (Porter et al, 2009).

3.2 Survey Design

The survey methodology adopted by the NWBHP was the same as that used by the Lancs WLT for a survey of the West Pennine Moors (Skeltcher 2007) and was partly based on Harris and Hutchings national hare survey (Hutchings et al 1996). As with the national hare survey, the survey method was chosen because of its ease of use and understanding by volunteers. It also allowed the NWBHP survey to be compared with previous surveys completed in the area.

3.3 Survey Method

Surveyors were initially offered one 1 km squared map, with the option to survey more squares if their time allowed. Approximate site locations were selected by obtaining the surveyors preferred general area. Specific survey squares were selected using a combination of factors, taking into account, proximity to other squares already issued, broad landscape character type, previous hare sightings and the ability to cover the square by footpaths or permissions.

Unless the surveyor had indicated that they could have unlimited access, sites were selected that had footpaths running through them. Surveys along routes provide estimates of animal densities in the vicinity of the route, which maybe unrepresentative of the survey region because of ease of access by poachers or due

to greater disturbance (Buckland et al. 2001). Hares avoid the proximity to roads and prefer large non-fragmented areas over small isolated patches (Roedenbeck et al. 2008). However, the density of unpaved field tracks has a positive effect (on hare numbers), probably because vegetation along field tracks contributes to the diet spectrum (Roedenbeck et al. 2008). It was decided that sites with footpaths were to be selected due to the difficulty of obtaining landowner permission over such a wide area and in order to compare the results of the previous Merseyside Biobank and Lancs WLT surveys.

The transect within the square, was chosen by the surveyor on the ground and followed footpaths or open land that covered as much of the square as possible. The route taken was marked on the issued map along with any hare sightings. The hares perpendicular distance from the footpath was recorded (changed to the minimum distance between the hare and the footpath for 2011/12 survey). The time seen, behaviour, habitat, land use, weather conditions, start and finish time and date of walk were also recorded. The distance walked by the surveyor (effort) was measured by transposing and measuring the route on the software package Google Earth.

3.4 Data Collection and Results

In total 135 km squared surveys were returned for the season 2010/11. These figures exclude the surveys issued by Lancs WLT for the rest of Lancashire and the RSPBs surveys completed for the Farmland Bird Survey. The survey also excludes data on mountain hares, as this will be dealt with in a separate report.

As well as mapping the results, survey data has been input into the statistical software package DISTANCE. Using the package, density estimates were calculated for the project area as a whole and stratified by broad landscape character types.

Over 230 hares were recorded in total and surveyors have walked over 400km, which is the equivalent of a journey from the Wildlife Trusts Office in Bolton to Aberdeen, as the crow flies.

General hare records were also collected from local record centres and through the promotion of a recording website, kindly produced and hosted by Merseyside Biobank (www.brownhare.org.uk). To give an example of its use, 406 hare records were added between November and early May.

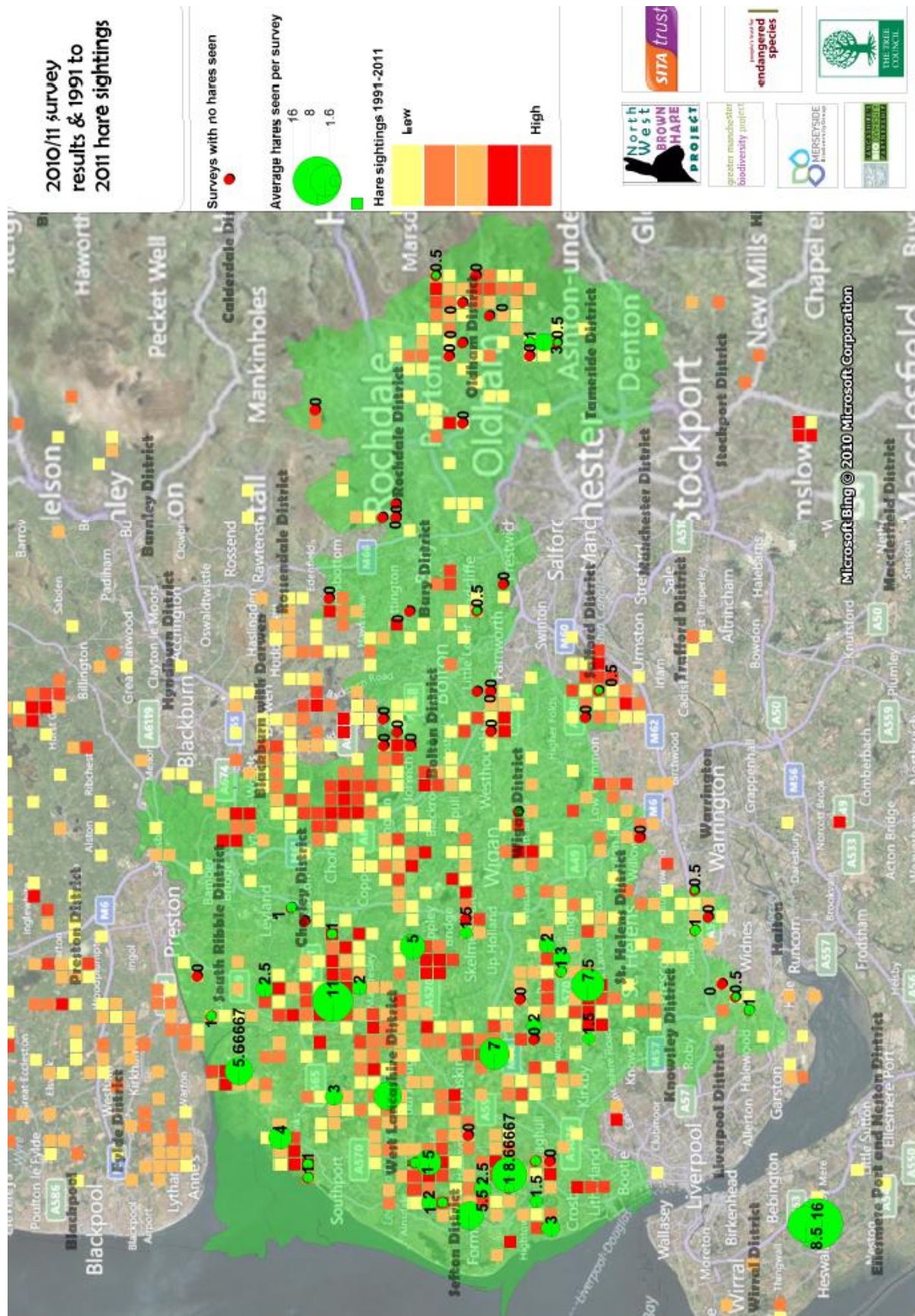
Results show that South Lancashire and Merseyside hare strongholds seem to be in the arable former wetland/mossland and flat sandy farmed landscapes, as described in the North West Landscape Character Framework (Porter et al, 2009). Greater Manchester seems to have three main strongholds; upland/moorland fringe around the Saddleworth area of Oldham, another upland/moorland fringe area around Anglezarke Reservoir near the West Pennine Moors and the Manchester Mosses area around Wigan and Salford.

The NWBHP survey results strongly correlate with the BTO BBS total hare sightings per transect over the 15 years, illustrated by maps 3 & 4. The greatest number of sightings were recorded in the sandy farmland and wetland landscapes of the Sefton Coast and South Lancashire. The BBS data also supports records of good populations around Saddleworth, the Manchester Mosses and the Anglezarke region of the West Pennine Moors.

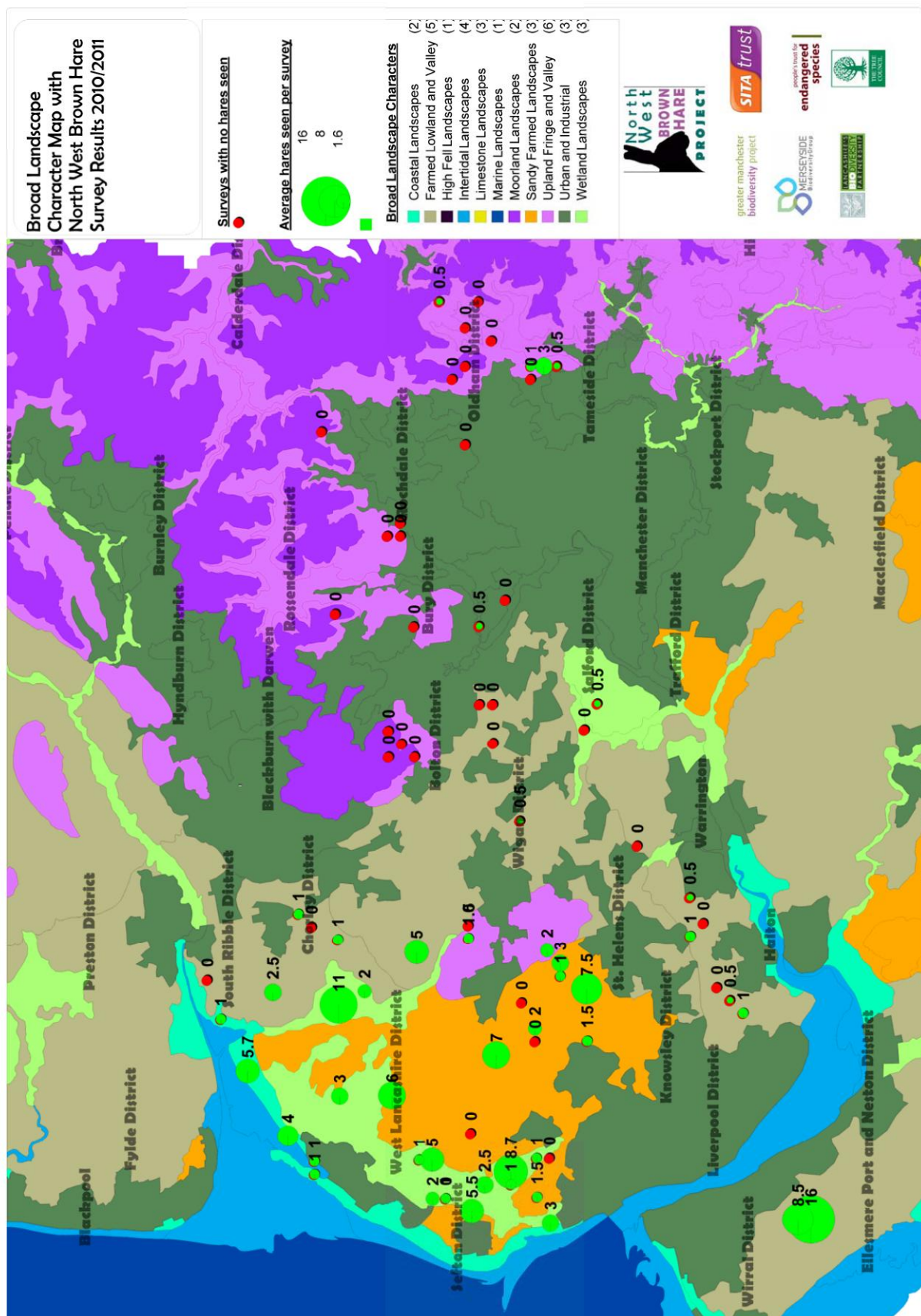
The majority of the positive NWBHP surveys have been in the arable west of the region. However, this doesn't tell the full story. The denser heather, bilberry and purple moor grass of the moorland areas and rolling hills of the upland fringe and valleys mean that surveyors have poorer lines of sight compared to the flat expanses of arable farmland. Hares propensity to sit on top of hillocks and retreat to the other side when disturbed, is likely to make recording them more difficult in the topographically varied survey areas.

In addition, a brown hare survey has not been completed in Greater Manchester (GM) before and so the GM surveyors may not be familiar with looking for hares or knowing where they are most likely to see them. The majority of surveyors in South Lancashire and Merseyside are into their 3rd or 4th year of surveying. Because the densities are generally higher in South Lancashire and Merseyside, surveyors will be more used to seeing hares and are therefore more likely to know what they should be looking out for.

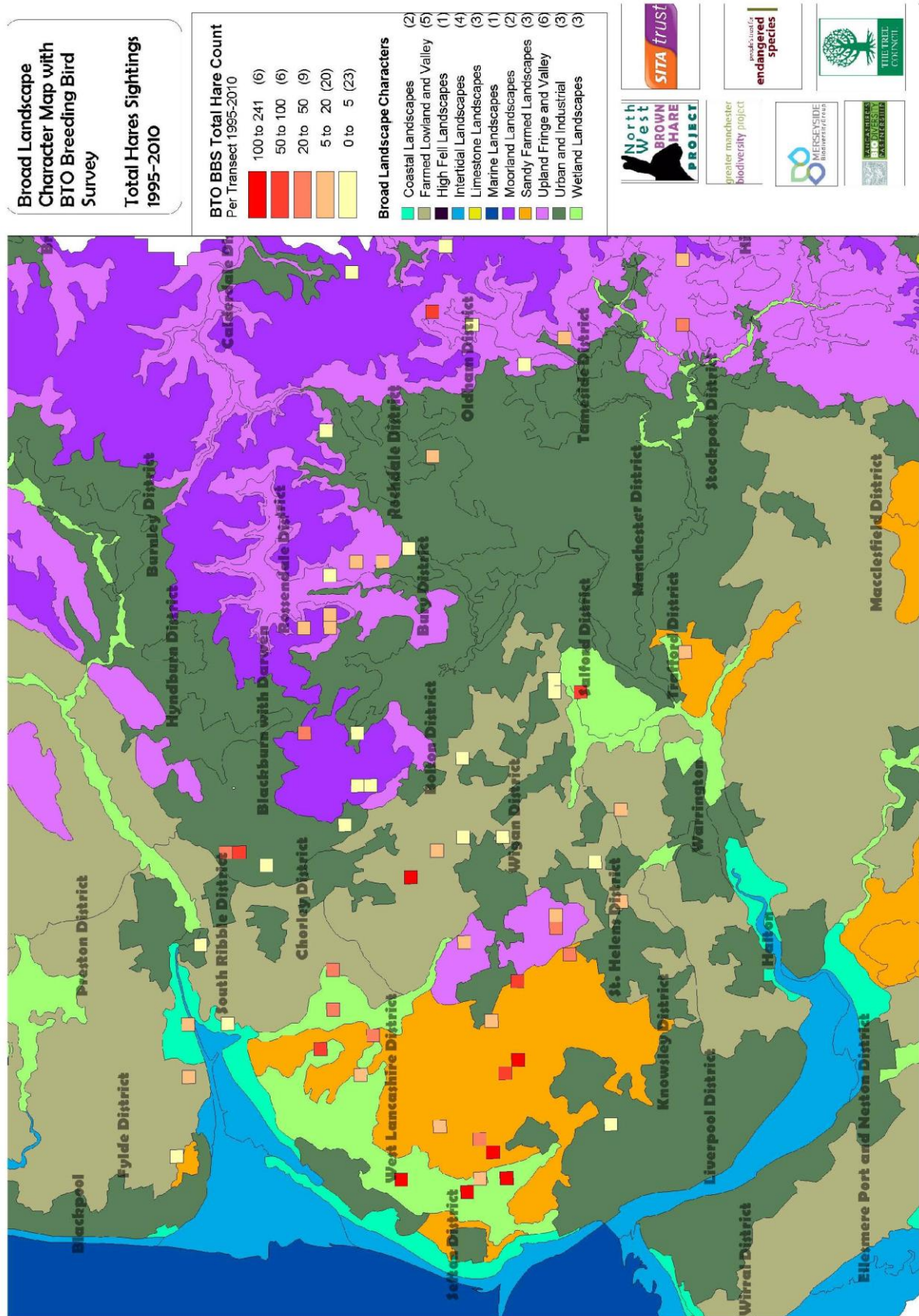
Map 2: 2010/11 NWBHP survey results & 1991 to 2011 hare sightings



Map 3: Broad Landscape Character Map with NWBHP survey results 2010/11



Map 4: Broad Landscape Character Map with BTO Breeding Bird Survey Total Hare Sightings 1995-2010



As a result of the surveys and examination of general hare records, six areas have been highlighted by the project to focus on for future work and to produce management plans for:

- North East Oldham (Initially with Oldham MBC)
- Wigan Green Heart/Salford Mosses (Wigan Leisure Trust, Lancs WLT and Natural England)
- South St Helens/Knowsley (initially with St Helens Council)
- West Pennine Moors into North Bolton, (Lancs WLT & United Utilities)
- Area between Martin Mere/Meresands Wood (Wildfowl and Wetlands Trust and Lancs WLT)
- Lunt Meadows near Sefton (Lancs WLT & Environment Agency)

Management plans for each site will be used as a way of engaging land owners and guiding potential habitat improvements with the aim of looking to extend and/or link populations within these areas.

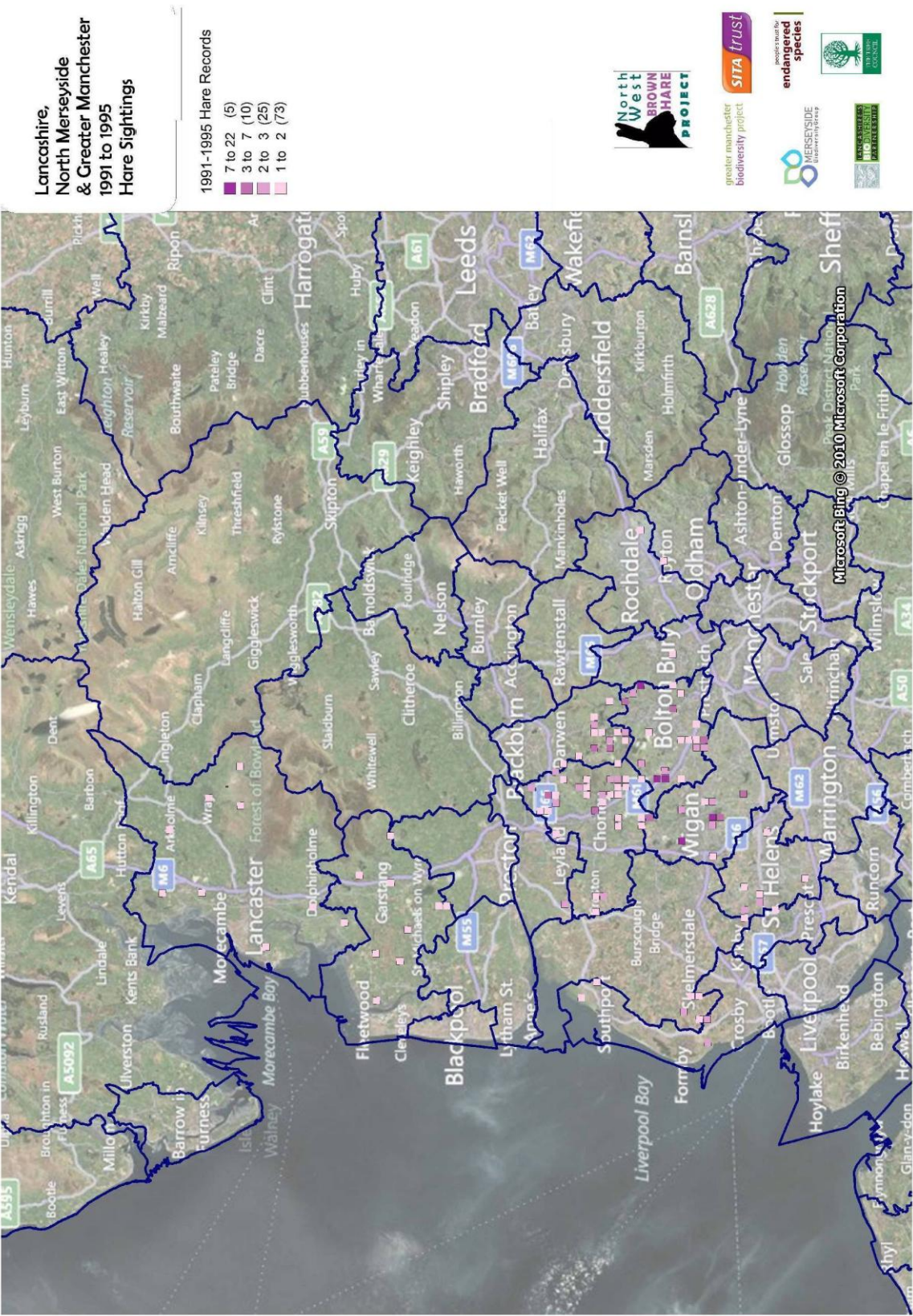
4.0 Discussion on brown hares records for Lancashire, Greater Manchester and North Merseyside

Between 1991 and 2000 there have been 851 sightings of one or more hares passed to local record centres, between 2001 and 2010 there were 2207 records provided. I would suggest that this does not indicate a large increase in hare numbers but rather a considerable increase in survey effort. Changes in technology, peoples access to mediums such as the internet and the promotion of brown hare recordings through projects such as the NWBHP are all likely to be contributing factors.

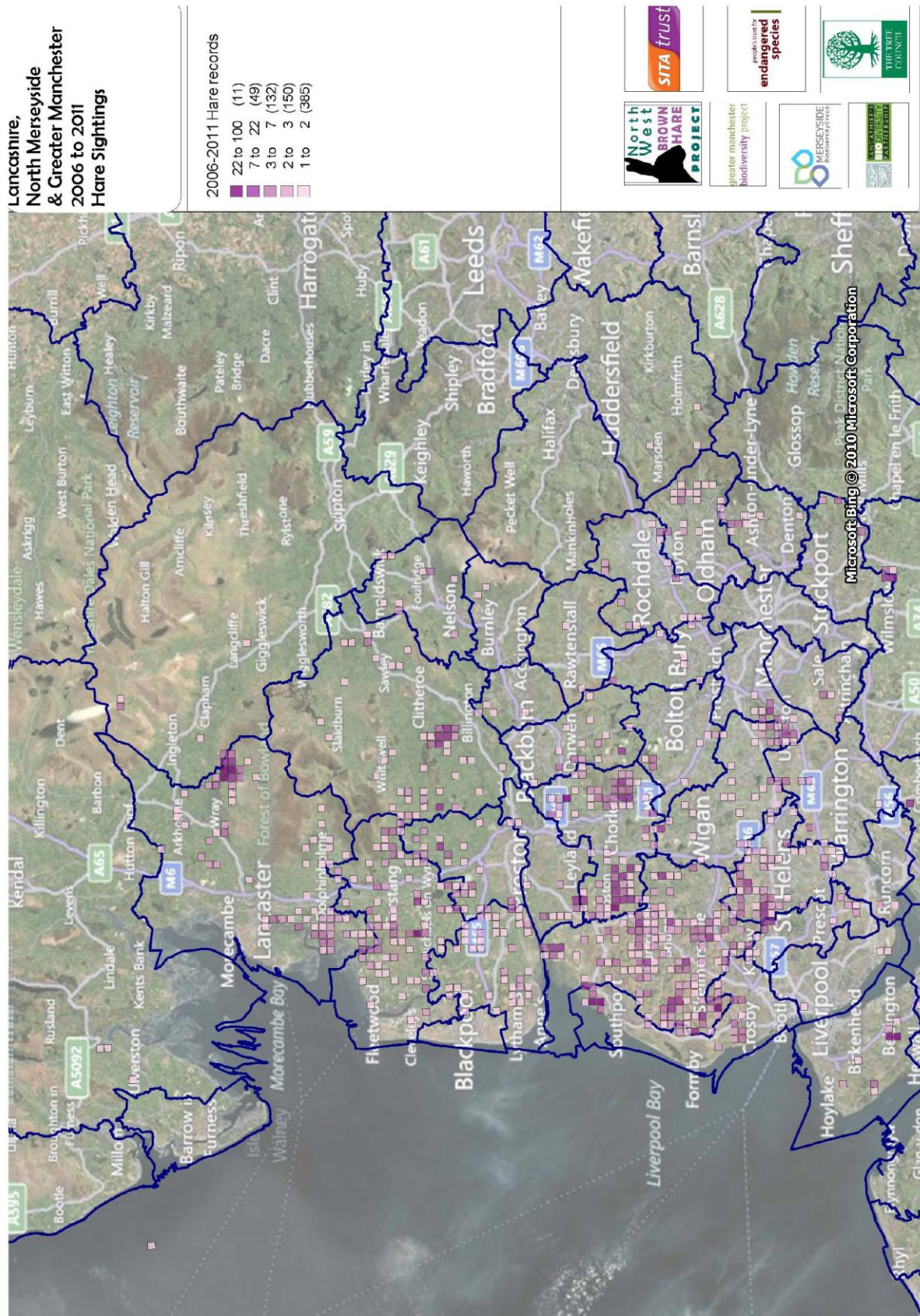
Varying degrees of biological recording and effort between areas can provide misleading evidence of a lack of brown hare in certain areas. However, it should not be said that isolated records that come together to make up a record centre data have little use. Recent hare records have been very useful as a means of identifying populations and guiding survey effort for the NWBHP.

Because of a lack of comparable, continuous records, it is difficult to compare year on year brown hare records. What is apparent from the records and is often over looked when discussing the reasons for hare decline is the number of historic brown hare records that would now be recorded in built up areas. Changes in land management by farmers is often cited as the major cause of brown hare decline, yet habitat loss and fragmentation due to residential, commercial or industrial development is often over looked. Historic brown hare records shown on map 7 serve to illustrate this point where historic hare records are overlaid on a modern area photograph showing urbanisation.

Map 5: Lancashire, North Merseyside & Greater Manchester 1991 to 1995 Brown Hare Sightings



Map 6: Lancashire, North Merseyside and Greater Manchester 2006 to 2011 Brown Hare Sightings



Map 7: Recent hare records for Bolton's Reebok Stadium



5.0 North West Brown Hare Project Survey results and DISTANCE calculations

Over the whole project area, the density of brown hares calculated by total number of hares observed per 1km square surveyed was 1.77 Hares/km sq, while the estimated density (per km square) calculated by *DISTANCE(D)* was 2.41. When compared to Lancs WLT surveys across Lancashire and Merseyside Biobanks surveys, these figures could be considered low.

However, the figures from Biobank's North Merseyside survey are the only recent figures that can be compared to those of the NWBHP survey. If we look at the NWBHP survey results from North Merseyside in isolation, the density of hares calculated by total number of hares observed per 1km square (hares/ km sq) surveyed was 2.54 compared to Biobank's survey result of 2.85hares/km sq in 2010, the difference would not be seen to be significant.

Table 1: Summary of Lancs WLT, Merseyside Biobank and the NWBHP survey results

Lancashire		
Year	Hares/km sq	DISTANCE Density (D)
2006	6.29 Hares/ km sq	5.69(D)
2005	2.25 Hares/ km sq	2.56 (D)
2003	4.9 Hares/ km sq	5.56 (D)
2002	5.47 Hares/ km sq	7.54(D)
Merseyside Biobank		
Year	Hares/km sq	
2008	5.6 Hares/km sq,	
2009	2.75 Hares/km sq	
2010	2.85 Hares/km sq	
North West Brown Hare Project Survey (North Merseyside only)		
Year	Hares/km sq	
2011	2.54 Hares km/sq	

Table 2: Summary of NWBHP survey results 2010/11 in DISTANCE

	D	D LCL	D UCL	N	N LCL	N UCL	CV	ESW	ns	nh	Total Effort	Hares/km sq
Wetland (mossland)	4.99	4.02	6.18	115	92	142	10.78	91.38	23	64	65.83	2.78
Urban and Industrial	1.29	0.58	2.87	18	8	40	31.67	57.125	14	6	40.49	0.43
Upland Fringe and Valley	0.87	0.46	1.63	17	9	33	28.35	101.91	20	12	62.04	0.60
Sandy Farmed	2.68	1.78	4.03	67	44	101	20.7	164.57	25	64	71.45	2.56
Moorland	n/a	n/a	n/a	n/a	n/a	n/a	n/a	300	14	1	49.24	0.07
Farmed Lowland and Valley	2.4	1.96	2.94	65	53	79	10.12	133.49	27	58	90.49	2.15
Coastal & Intertidal	3.64	2.34	5.65	44	28	68	21.68	125.82	12	34	30.56	2.83
Whole area	2.41	2.1	2.77	326	284	375	175.2	118.57	135	239	410.1	1.77

D = estimated density (per km square) calculated by *DISTANCE*

D LCL = Density lower 95% confidence limit

D UCL = Density upper 95% confidence limit

N = estimated abundance over pooled transects

N LCL = Abundance lower 95% confidence limit

N UCL = Abundance upper 95% confidence limit

CV = coefficient of variance;

ESW = estimated strip width (m) from transect line where the number of animals missed within is equal to the number of animals recorded beyond

ns = number of sample transects analysed by *DISTANCE*

nh = total number of hares recorded from pooled transects

total effort = total length of pooled transects (km)

hares/km square = density of hares calculated by total number of hares observed per 1km square surveyed

6.0 Discussion on distance results

A set of baseline data stratified against a measurable landscape scale is now in place. While it is too early to see any trends in population gains or losses, the survey has provided a much more comprehensive picture of hare distribution within the survey area. The work completed in 2011 will mean that future surveys will benefit from being easier for volunteers to complete, can be repeated year on year with little time or cost to the organiser and cover a wide geographical area. Surveys by different organisation can now be compared with greater ease through the use of a common stratification using broad landscape characters.

It should be highlighted however, that a number of variables within the survey technique mean that the density estimates for the area are not likely to be a true representation of the actual density.

Large areas of land within a survey square may not be visible because of obstructions such as woodland or increased elevation. This is especially true for the upland fringe and valley regions and moorland regions. This effect means that the estimated strip width (ESW) should be lower than the figures produced in DISTANCE, with densities actually being higher than those reported by DISTANCE.

Hiby et al (2001) discussed the problems of using distance sampling along curved line transects for estimating abundance of populations. The survey is completed along a curving path which covers the whole square and not along one or a number of straight lines along the square. Because hares are recorded at such a long distance, this has the effect of brown hares being under recorded in relation to the amount of effort assigned. This is discussed in more detail in the DISTANCE sampling archives (JISCMail - DISTANCE-SAMPLING Archives. 2011)

As discussed in chapter 3, most of the transects have used footpaths to survey the sites. There is evidence that some animals will actively avoid paths, meaning that the transects routes may under represent the local population.

Surveyors are asked to complete the surveys as close to dusk or dawn as possible, in the hope that hares will be detected as they leave their forms in transit to feeding grounds or have already arrived to feed.

However, it maybe that hares are still in their forms at the time of the survey and so will only be detected or flushed at close distances to the transect, which will again skew the density calculations.

7.0 Current and future of the North West Brown Hare Project

The project and its volunteers are currently in the middle of the autumn survey season. The winter months will be spent assisting the RSPB at Dovestones with surveying for mountain hare, running an open farm event with the Twite Recovery Programme and producing management plans for the areas highlighted by the project.

Some of the mapping and analysis is already helping to assist conservation efforts in the region. The project has contributed to a Higher Level Stewardship application in Wigan and a successful Lancs Wildlife Trusts lottery bid to purchase Little Wooden Moss. The results will also be used to inform the Wigan Mosses and Meres Stage 2 Nature Improvement Area bid, a Lancs Wildlife Trusts Heritage Lottery Bid for conservation work on the West Pennine Moors and Natural England's potential designation of the West Pennine Moors as a Site of Special Scientific Interest.

A potential project is also being considered with Martin Mere and Mere Sands Woods to connect the two areas by approaching land owners in between and promoting government environmental stewardships schemes. Some hedgerow planting and footpath/signage improvement will also take place to reduce disturbance in the area.

The spring will see another round of surveying and survey training events, further implementation of management plans and a focus on how all the work completed by the project can be used to secure further funding and take the North West Brown Hare Project to the next stage.

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