Identification of Functionally Linked Land supporting Special Protection Areas (SPAs) waterbirds in the North West of England

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Bowland Ecology

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Further information

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Executive summary

‘Functionally linked land’ (FLL) is a term often used to describe areas of land or sea occurring outside a designated site which is considered to be critical to, or necessary for, the ecological or behavioural functions in a relevant season of a qualifying feature for which a Special Areas of Conservation (SAC)/ Special Protection Area (SPA)/ Ramsar site has been designated. These habitats are frequently used by SPA species and supports the functionality and integrity of the designated sites for these features.

There is a requirement for competent authorities to consider the importance of functionally linked habitats in Habitats Regulation Assessments (HRAs) when assessing new plans or projects to ensure the Conservation Objectives for the site can still be delivered. The impact of the loss of functionally linked land on European sites can be difficult to determine as there is often limited information available.

This project has been commissioned to map potential areas of Functionally Linked Land used by water birds in the North West. The aim of this project is to collate evidence from existing bird records to create maps showing important supporting habitats and improve understanding of which bird species are using these sites. This report will help to ensure the current geographical spread of supporting habitats across the north west are maintained and enhanced to ensure the integrity of the SPA sites are protected in the long term.

Bowland Ecology has undertaken this project in partnership with Natural England.

Contents

Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

1. Introduction

Functionally linked land (FLL) is supporting habitat beyond the boundary of a focal area, such as a designated site, that is connected to the life and reproduction of a population for which a site has been designated or classified. This land will be important to the continuing survival, reproduction and viability of the species population associated with a designated site.

This study aims to map potentially important FLL at a regional scale connected to six SPAs in the North West, using existing bird data collated from various sources, to improve Natural England's understanding of where FLL is located and which species are using these areas.

The following Special Protection Areas (SPA) are included study:

- Dee Estuary SPA;
- Mersey Narrows & North Wirral Foreshore SPA;
- Mersey Estuary SPA;
- Liverpool Bay SPA;
- Ribble & Alt Estuaries SPA; and
- Morecambe Bay & Duddon Estuary SPA.

2. Methodology

2.1 Definitions

For the purpose of this study, FLL is defined as: **areas of land occurring within 20 km of an SPA, that are regularly used by significant numbers of qualifying bird species**.

This definition has been developed and agreed with Natural England. A buffer of 20 km has been used based on the distance Pink-footed Geese tend to travel from their roost sites within an SPA site (see Section 2.3.a for more information).

For the purpose of this study:

A **significant** number of birds has been defined as 0.5% of the GB population or 1000 individuals.

The first of four Stage 1 criteria for designating SPAs states an area must support 1% of the GB population of a qualifying species. In collaboration with Calum Booth (RSPB) and Natural England it was decided that, for the purposes of this project an area should support at least 0.5% of the GB population of a qualifying species, or 1000 birds, to be considered FLL.

This provides a good threshold for data inclusion when applied to the suite of data used in this project.

A threshold of 0.5% of the **whole** GB population has been used, rather than 1% of the qualifying population for **each separate SPA**. Because the SPA population of individual species varies across the North West, using a separate threshold for each SPA would require associating each area of land in the North West with a specific SPA based on distance and would therefore not take account of birds moving between SPA's. For example, Pink-footed Geese, can travel up to 20 km in a day and it would be reasonable to suggest that these birds can cross over boundaries of different SPA associated FLL. While this study is limited by not considering the varying SPA populations, using a single threshold simplifies the approach, making the analysis much less time-consuming and resulting in a single set of outputs.

Regular usage is defined as being used by significant numbers of birds for 7 or more years since 2010.

Defining regular usage means counting the number of times a significance threshold is surpassed. Stroud *et al.* (2001) defined 'regular' as when a threshold is met in two thirds of the season for which adequate data are available. This project includes data from 2010, so 7 or more years has been used as a regularity threshold as this covers roughly two thirds of the seasons for which data is available, in accordance with Stroud *et al.* (2001). However, this proved to be a high threshold for this study as most of the data available had not been collected in a regular way. Therefore, areas have been mapped as moderate or low FLL even if the threshold for regularity was not met.

The definition of **qualifying bird species** includes both non-breeding qualifying species and assemblage qualifying species, as mentioned in the citations of the SPAs included in this study (Appendix 2). The species list has been decided on with help from Paul Ellis (Fylde Bird Club).

2.2 Methodology

The steps taken to carry out this project are as follows:

1. Data holders were contacted, including: British Trust for Ornithologists (BTO), Royal Society for the Protection of Birds (RSPB), Wetland Bird Survey (WeBS) counters and local bird groups, and existing available data was collated (please see Appendix 1 for copyright and licencing information). The datasets used in this study are as follows:
   - BTO WeBS Core Counts;
   - BTO BirdTrack Data;
   - Fylde Bird Club Data;
   - Data held by the Lancashire County Bird Recorder;
   - Lancaster and District Birdwatching Society (LDBWS) maps and data;
   - Supplied maps and data for the Dee Estuary from Colin Wells, Richard Smith and Neil Friswell;
   - Habitat data from the Centre of Ecology and Hydrology (CEH), specifically the Land Cover Map 2015 (LCM15).
2. This data was analysed to extract any usable records and converted into formats for use in GIS systems. This process involved filtering data to fit the definitions of significant and regular, as described above. If a recorded count was greater than or equal to the threshold for that particular species, it was included in the data set.
3. Individual data sets were used alongside habitat data, in order to create a final FLL vector layer showing polygons of FLL, labelled as high, moderate and low confidence FLL. This final layer can be scrutinised in GIS systems in order to show which species regularly visit these sites in significant numbers.

The data handling process for each dataset is discussed in more detail below.

2.3 Data Handling

This study into FLL looks at several different data sources as evidence for FLL. There are a number of caveats associated with each data source, these are outlined in the 'Results and Discussion' section of the report.

a) Vector (polygon) data:

WeBS core count data since 2010 was provided by the BTO and has been verified according to the definition of FLL described in the methodology. This data is considered to be of a high quality, as it is generally collected in a systematic way, meaning any WeBS sectors found to have significant and recurring counts were considered to have high confidence as FLL.

1. The WeBS sector boundaries polygon layer was acquired from the BTO. This was then examined in QGIS 3.16.3, and any WeBS sectors outside the SPA's, and within 20 km of the SPA's, were extracted. A 20 km limit due to time constraints was chosen with help from Calum Booth and Steve White, based on the distance Pink-footed Geese tend to travel from their roost sites within an SPA site. In the future, all WeBS sectors outside the 20 km boundary should also be considered.
2. The WeBS monthly core count data associated with these sectors was downloaded from the BTO WeBS database. The core counts were chosen to reflect the non-breeding counts relevant for this study.
3. Not all WeBS sectors had data from within the last 10 years. These sectors are shown as 'no data' on the maps, with a recommendation of further survey needed.
4. The data was then verified according to the thresholds of significance described above. Then, for each WeBS sector, the number of significant counts for each species and for each year was tallied for each WeBS sector using pivot tables in excel.
5. The total number of years where significant numbers of any species occurred was also counted, to identify those sectors that have not been visited regularly by a single species, but rather an assemblage of birds.
6. Those sectors with significant counts associated, and with regularly returning species, either individual species or assemblages, were uploaded into QGIS as high potential FLL. Any sectors with significant counts only were labelled as moderate FLL. Any sectors with no significant counts were labelled as low FLL, and the two types of no data – either not existing in the BTO database, or not requested at all (as they are outside the scope of this study), were defined accordingly.

b) Other polygon data

For some areas, FLL was mapped by other organisations, which provided local insight and higher spatial accuracy. Lancaster and District Birdwatching Society provided Bowland Ecology with hand drawn paper maps of potential FLL covering the entirety of their area, evidenced by their own bird data collected over the last 10 years. These were then digitised by Bowland Ecology to create the maps shown in this report (Appendix 3). The areas are labelled according to the following criteria provided by LDBWS:

1. High – regularly surveyed areas known to be FLL with precise field level data to evidence this.
2. Moderate - less well-watched areas known to be FLL anecdotally, sometimes with few specific counts to evidence it, but with a reasonably good overview of species presence / absence.
3. Low - thought to be FLL but better access / further surveys needed.

Maps were also provided by local experts for the Dee Estuary area. These consisted of polygons drawn on paper maps outlining areas that they knew anecdotally to be FLL, supported by a description and maximum counts. This anecdotal evidence has been mapped using GIS systems (Appendix 8).

The areas mapped that were associated with significant numbers of qualifying species were included in the Final FLL layer.

c) Point data

Fylde Bird Club and West Lancs Flora and Fauna Society provided their bird data for the species included in this study for the last 10 years, and this has been used alongside the BTO BirdTrack data to create maps showing significant bird counts. This data has poor spatial accuracy so can only be displayed at tetrad level.

The excel spreadsheets containing the point data were first filtered to include only SPA qualifying species since 2010, with the significance thresholds applied. Next, the spatial information associated with each significant record was interrogated to identify the spatial resolution. On the whole, the point data had poor spatial resolution, and thus the majority could only be plotted at tetrad level. The data was plotted by counting the total number of significant visits occurring in each tetrad. These maps are shown in Appendix 5-7.

Where more accurate 6 figure grid references were available (841 points) for the Fylde and County Bird Recorder datasets, these data were uploaded separately into the GIS system for further interrogation at field level to support the final FLL map layer.

d) Habitat data

The Centre for Ecology and Hydrology (CEH) Land Cover Map 2015 (LCM15) habitat vector layer was analysed to extract suitable habitats for water birds. The habitats included in the final FLL maps are arable and horticulture, and improved grassland.

The analysis of the habitat data involved counting the number of point data with accurate grid references that were located within each habitat type, in order to identify the habitats that are used most by water birds. The results of this calculation showed that ~80% of the 841 points were located in either arable or improved grassland, therefore these habitats have been shown in the final FLL maps.

e) Final Functionally Linked Land Map

Point data records with 6 figure grid references accurate to 100m were extracted from the Fylde Bird Club and County Bird Recorder datasets (841 points in total). These were used alongside the WeBS maps to draw polygons around any fields containing significant counts. All the fields that overlapped the 100 m square containing the point (the area covered by the grid square reference provided) were included in the polygon, as it can be assumed that that point could be located anywhere within that area. If polygons overlapped or were touching, they were combined to create a larger polygon. A series of rules were used to determine the ‘functionality’ level of each polygon:

1) Regularity – whether a polygon contains counts covering more than two thirds of the seasons of this study – minimum 7 years (Stroud and others, 2001)
2) Location accuracy – whether there is confidence that the significant count occurred within that polygon; and
3) Multiple counts – whether a point contains more than 1 significant count (see explanation below).

If a polygon meets the criteria of a rule, using the WeBS/point data as evidence, ‘Yes’ is written in the adjacent column, and 1 point would be given to the final ‘Functionality Score’. If the point does

not meet the criteria, then 'No' is inputted and 0 points are given. This method results in an overall functionality score between 0 and 3. Any polygons with a functionality score of 3 are definitely FLL, scores of 0, 1 or 2 increase in likelihood, but more data is needed to confirm this as definite FLL.

Multiple counts – this column differentiates between polygons containing 1 significant count, and polygons containing multiple significant counts. This has been included to lower the functionality score of areas only visited once, as this is most often a single Great White Egret count, which is an assemblage species.

More information about each polygon of FLL can be found in the attribute table when viewed in a GIS system. This includes a list of data sources used to map each individual polygon, a list of species that regularly visit that FLL polygon, and a list of occasional visitors to that polygon. A 'Justification/comments' column has also been included, which explains when decisions have been made to map polygons in that way, and a 'Further Recommendations' column, which offers advice on how to improve the maps in the future.

A distinction has been made between areas of FLL visited in significant numbers for 7 or more years by a single species, and areas of FLL visited in significant numbers for 7 or more times in total, but by an 'assemblage' of species. The former means that the area of FLL is important for the life cycle of one or more specific species, whereas the latter means that the area of FLL is important as it regularly supports a variety of different birds in significant numbers, yet no single species meets the regularity threshold on its own. This difference is shown in the 'Regular Species' column of the attribute table, either by listing the different species regularly using the site, or by writing 'assemblage'.

3. Results and Discussion

The **first** output of this study is a set of maps showing the individual datasets mapped separately, with FLL labelled either as high, moderate and low potential areas for the polygon data, or the number of significant visits to a tetrad for the point data. An example of each map is shown in this report and is further explained below (the full maps can be found in Appendix 3-9).

3.1. Drawing title: LDBWS FLL Plans (Figure 1)

a) Overview

These maps show coloured polygons representing different levels of potential FLL at individual field level:

- Dark pink showing high potential;
- Pink showing medium potential; and
- Pale pink showing low potential.

These maps have been produced on paper by the Lancaster and District Bird Watching Society, and have been digitised by Bowland Ecology.

Individual fields are classified as high, moderate and low potential FLL based on the number of birds recorded by the LDBWS. The map location is shown in the bottom left corner of each map. These maps also link to an excel spreadsheet which records the maximum number of each SPA qualifying

species that has been recorded in each field since 2010. The associated data can be viewed in GIS systems.

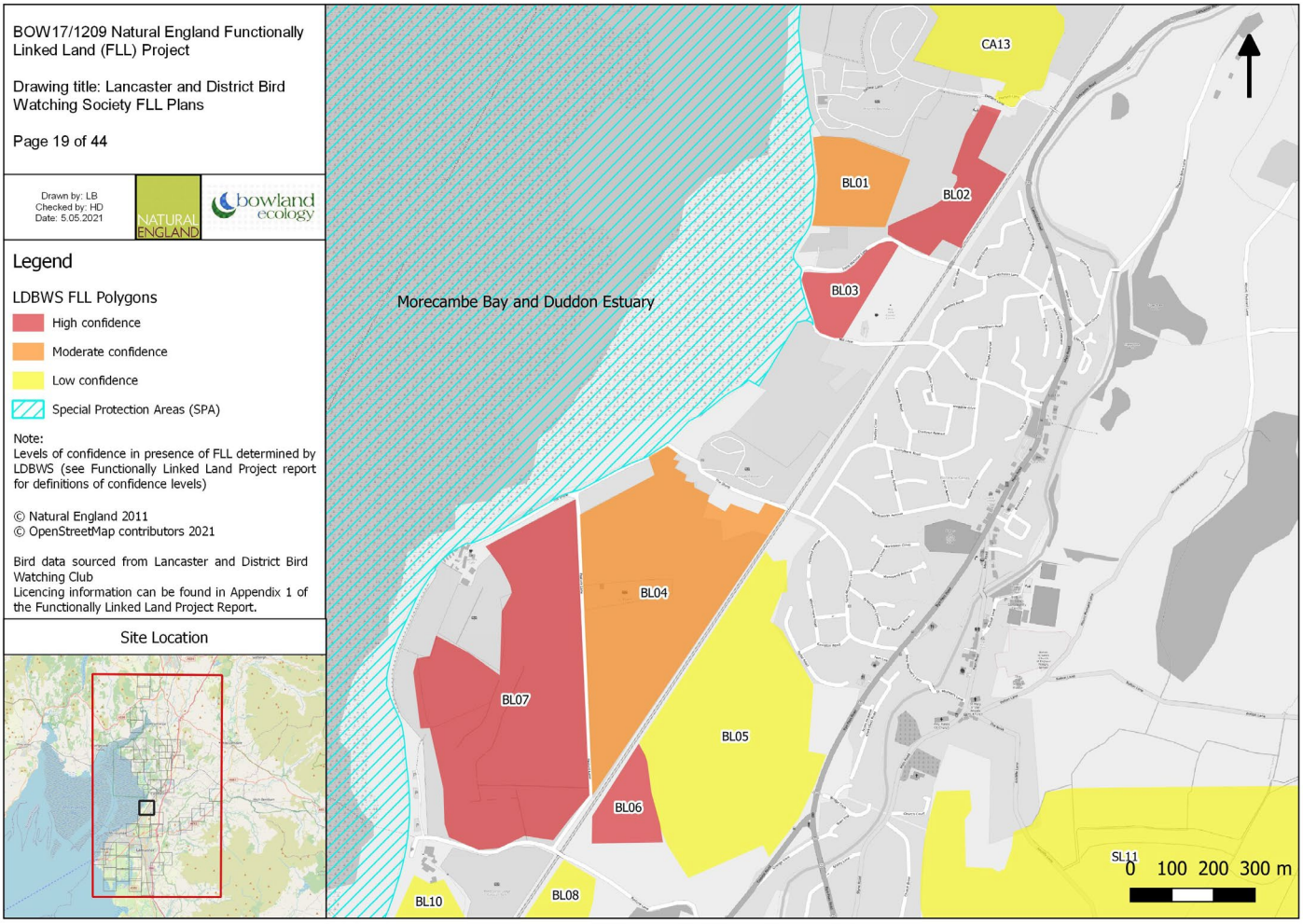

Figure 1 - LDBWS FLL map

a) More information

While the levels of potential have been determined by LDBWS, Bowland Ecology can filter this data to reflect their standard definition of significant and regular, i.e. 0.5% of GB population, this filtered data has been used to produce the Final FLL map.

3.2. Drawing title: WeBS sector FLL (Figure 2)

a) Overview

These maps show the WeBS sectors for the Northwest, categorised as high (red), moderate (orange) and low (yellow) potential FLL, and no data WeBS sectors. The low data WeBS sectors are either: outside of the 20 km study area so not requested (green) or within the study area but data was missing from the BTO database (blue). The data for these maps comes from the BTO WeBS monthly core counts since 2010.

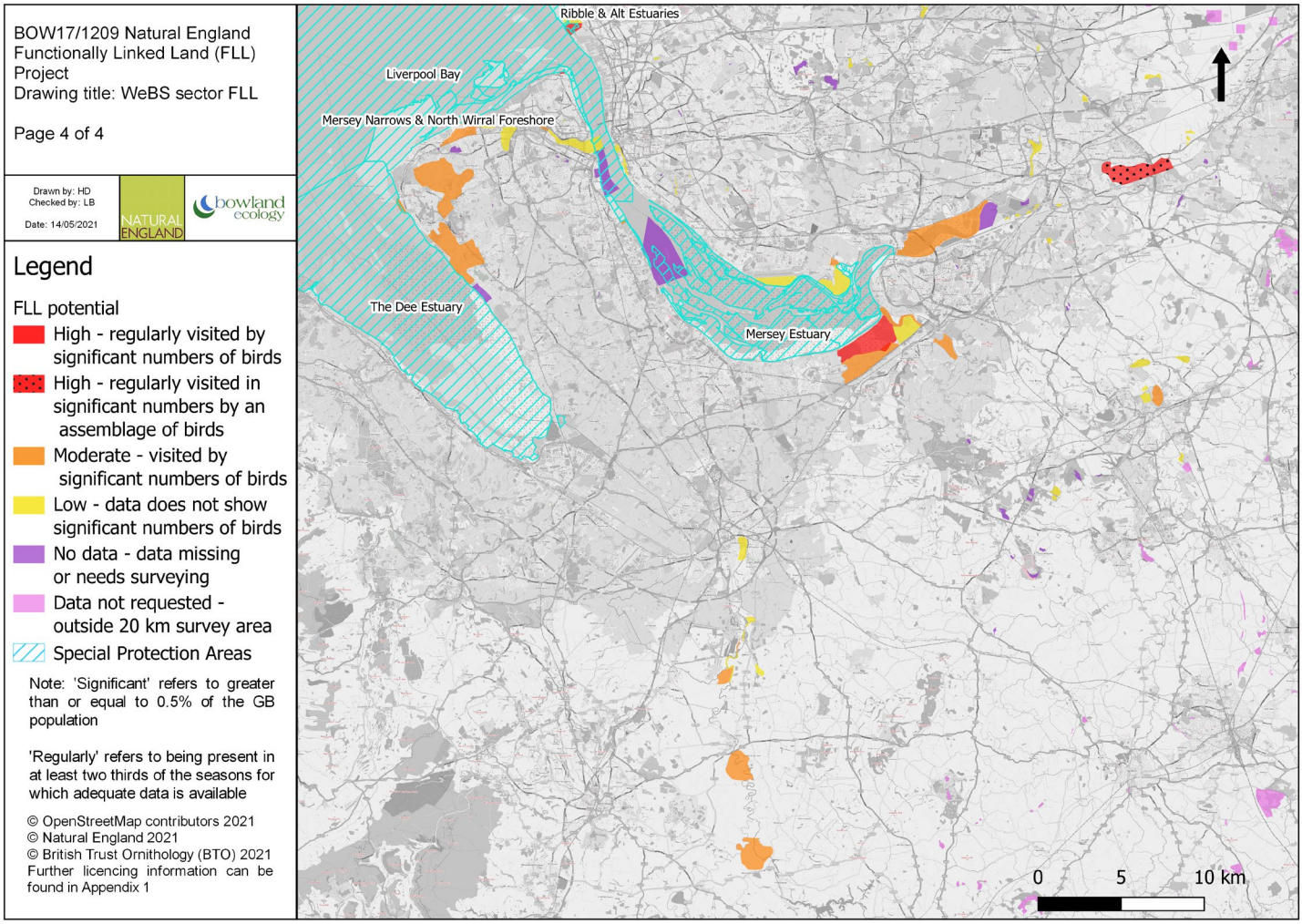

Figure 2 - WeBS sector FLL map example

a) More information

The WeBS sector monthly core count data was filtered to show only SPA qualifying species. The number of times each sector showed a count that met the 0.5% GB threshold was then calculated.

- The red sectors show areas that are regularly visited by significant numbers of species and have therefore been given a label of high FLL potential. This means that these sectors have been visited by SPA qualifying waterbirds in numbers of at least 0.5% of the GB population, in 7 or more years since 2010.
- Orange sectors have significant counts associated with them, however the data suggests

they haven't been visited as regularly as the high potential areas. This means that these sectors have been visited by at least 0.5% of the GB population of SPA qualifying species, but have been visited in less than 7 years since 2010.

- The yellow sectors show low potential for FLL, this means the data suggests there are no significant counts meeting the 0.5% GB threshold since 2010.
- Finally, the blue sectors show 'no data' areas, for which the counts could not be accessed so no comment on FLL potential could be made. The no data polygons also cover areas outside of 20km from the SPA (green sectors), which was the original cut off point for requesting WeBS data due to limited time.

These maps show the WeBS sectors labelled as varying degrees of potential FLL, with a solid evidence base to support this label. They are also useful to identify which WeBS sectors are well counted, and which are not.

3.3. Drawing title: BirdTrack Data FLL Tetrads (Figure 3)

a) Overview

This map shows the total number of significant counts within each tetrad from the BTO BirdTrack data set, meeting the 0.5% GB population threshold shown at tetrad level (2 x 2 km squares). Darker colours represent greater numbers of significant counts recorded since 2010. The data is from the BTO BirdTrack data set.

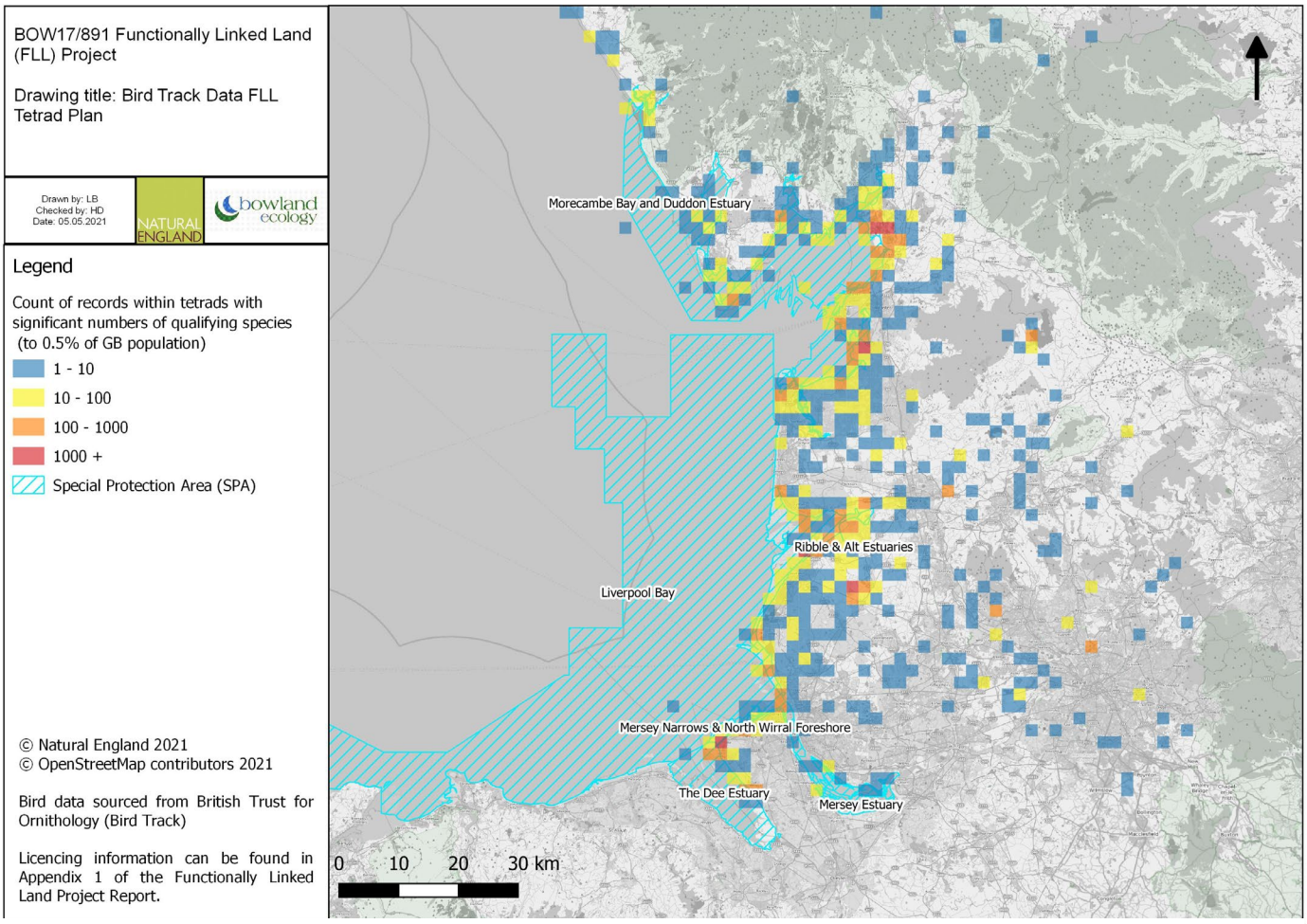

Figure 3 - Bird Track Data FLL

b) More information

Significant bird counts at the 0.5% significance level were extracted for all the SPA qualifying species, and plotted on a map. The number of points within each tetrad has then been counted, with the number of significant counts displayed as a graduated colour scheme shown in the legend. The BirdTrack data has poor spatial resolution and thus has been portrayed at tetrad level (2x2km squares).

Regularity is not included in these maps, however it can be assumed that darker tetrads are likely to be visited regularly by at least one species or an assemblage of birds.

3.4. Drawing title: Fylde FLL Tetrads (Figure 4)

a) Overview

Similar to the BTO BirdTrack data, this map shows the Fylde bird club data, displayed at tetrad level. The data has also been filtered to only show SPA qualifying species, with the total number of counts meeting the 0.5% GB population threshold shown for each tetrad.

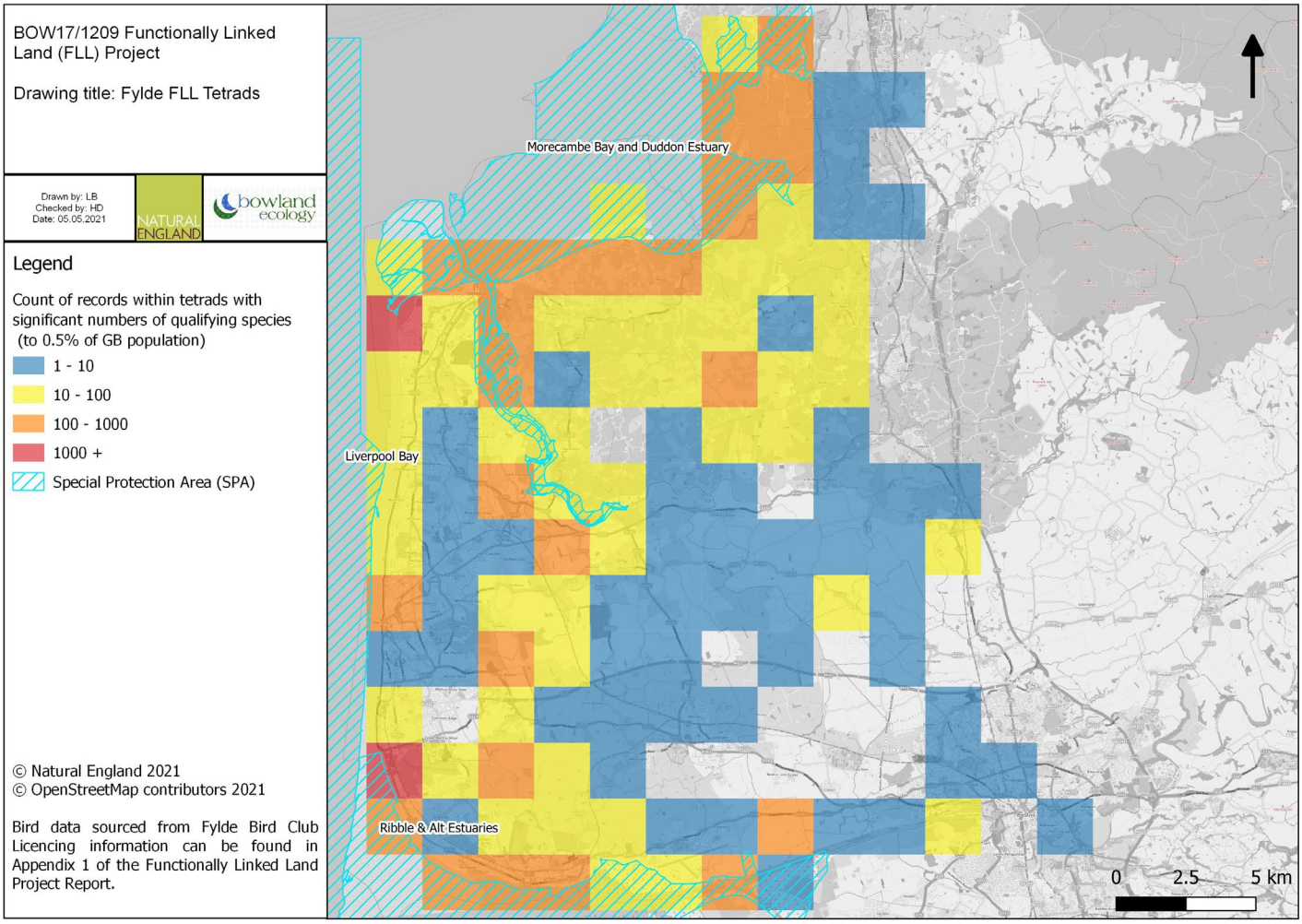

Figure 4 - Flyde Bird Club FLL map

3.5. Drawing title: County Bird Recorder Data (Figure 5)

a) Overview

This map shows the County Bird Recorder Data, displayed at tetrad level. The data has been filtered to only show SPA qualifying species and counts with spatially data accurate to tetrad level, with the total number of counts meeting the 0.5% GB population threshold shown for each tetrad.

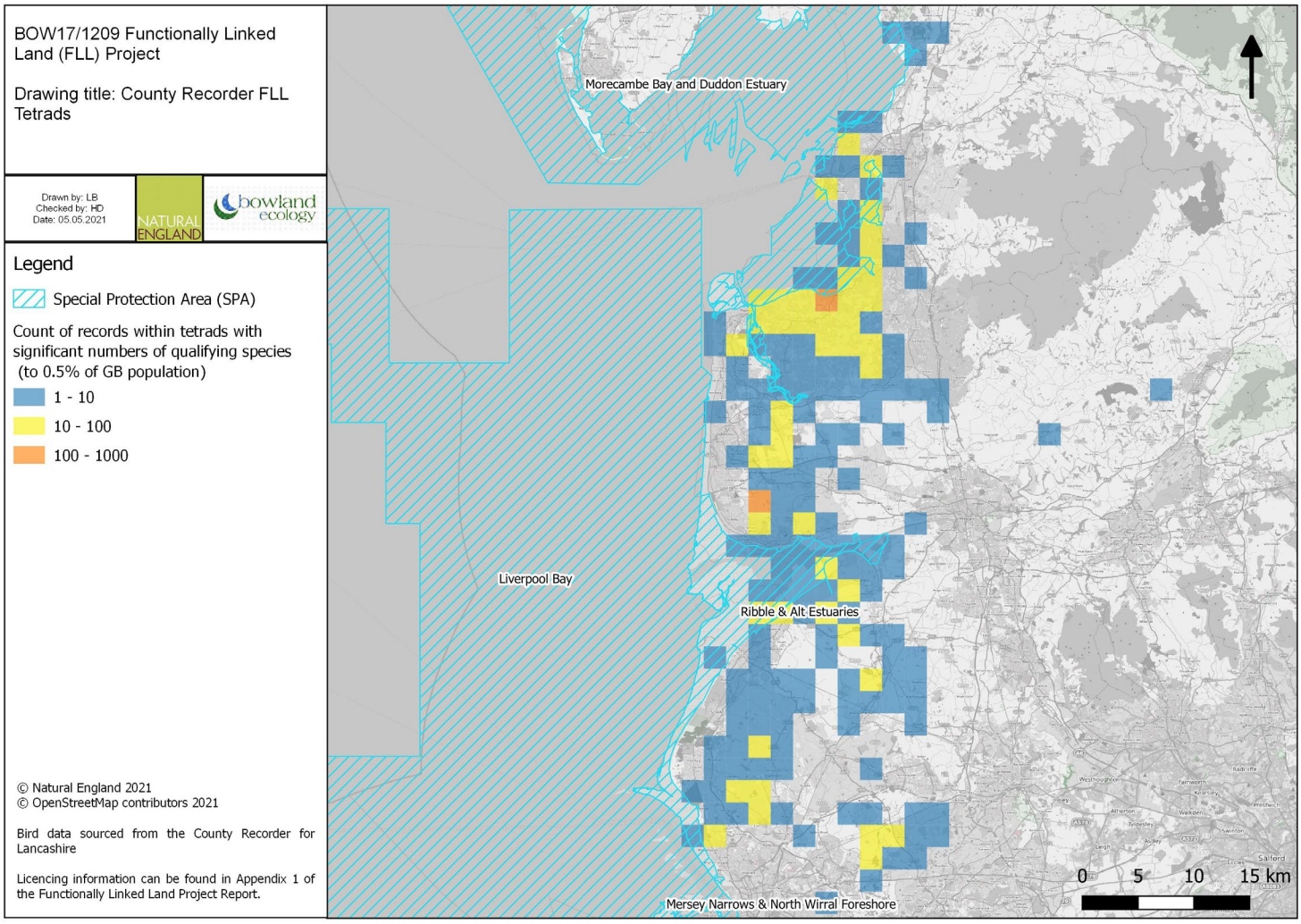

Figure 5 - County bird recorder FLL map

3.6. Drawing title: Dee Estuary maps (Figure 6)

a) Overview

This map shows land around the Dee Estuary, identified by a local expert as being FLL. The polygons were first mapped on paper, before being digitised by Bowland Ecology. These areas have been chosen as they are known to be visited by qualifying species.

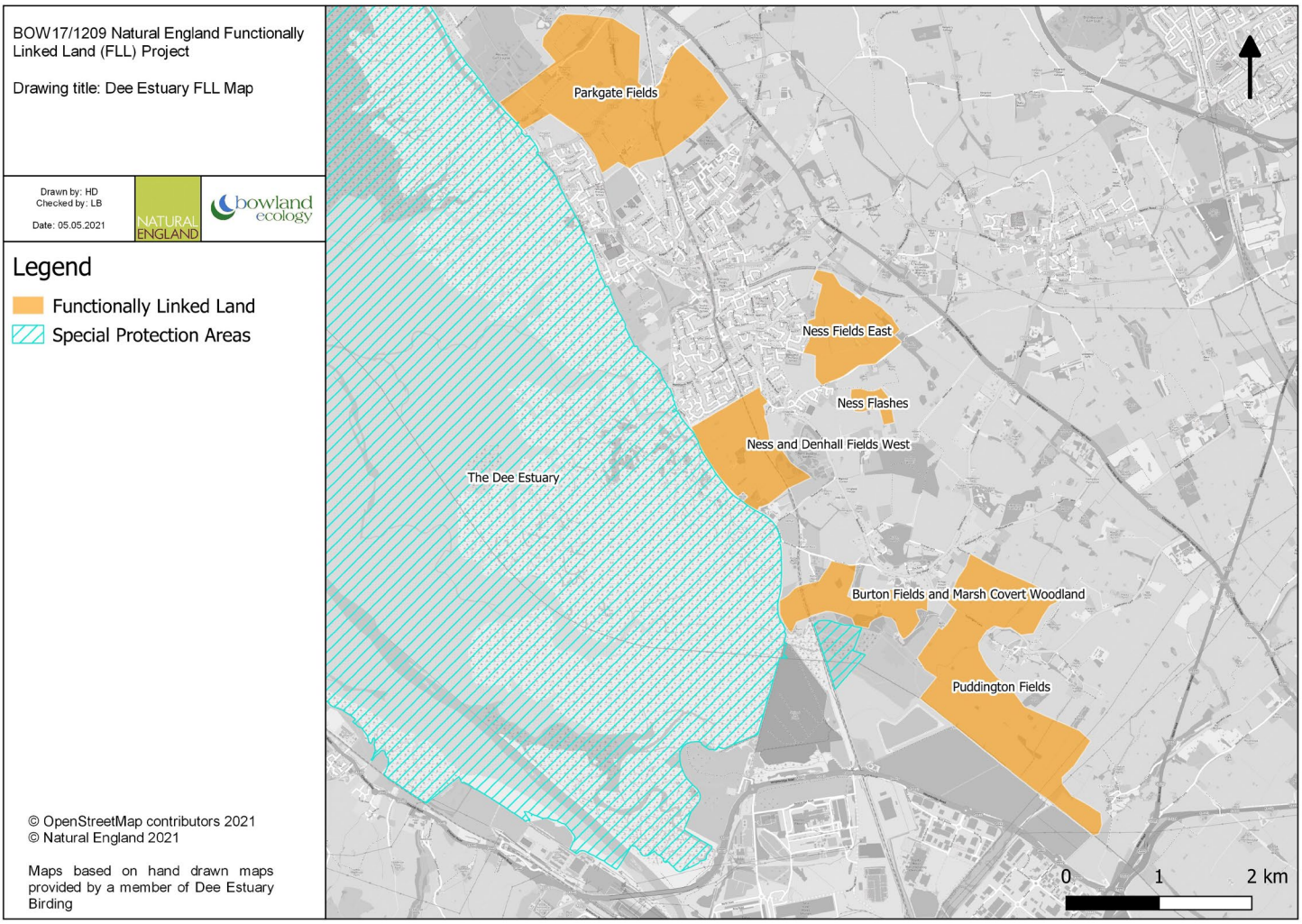

Figure 6 - FLL as mapped by a local expert (Dee Estuary Birding)

The **second** output of this project is the final FLL map, which combines these datasets and highlights areas with associated significant counts.

3.7. Drawing title: Functionally Linked Land (Figure 7)

a) Overview

This final map shows FLL as high, moderate and low confidence, defined by a 'functionality score' of 0-3. This map has been produced using the BTO WeBS sector data, the Fylde Bird Club data, data from the Lancashire county bird recorder, the LDBWS and Dee Estuary polygons containing significant counts according to the 0.5% of GB population threshold and the LCM2015 habitat data.

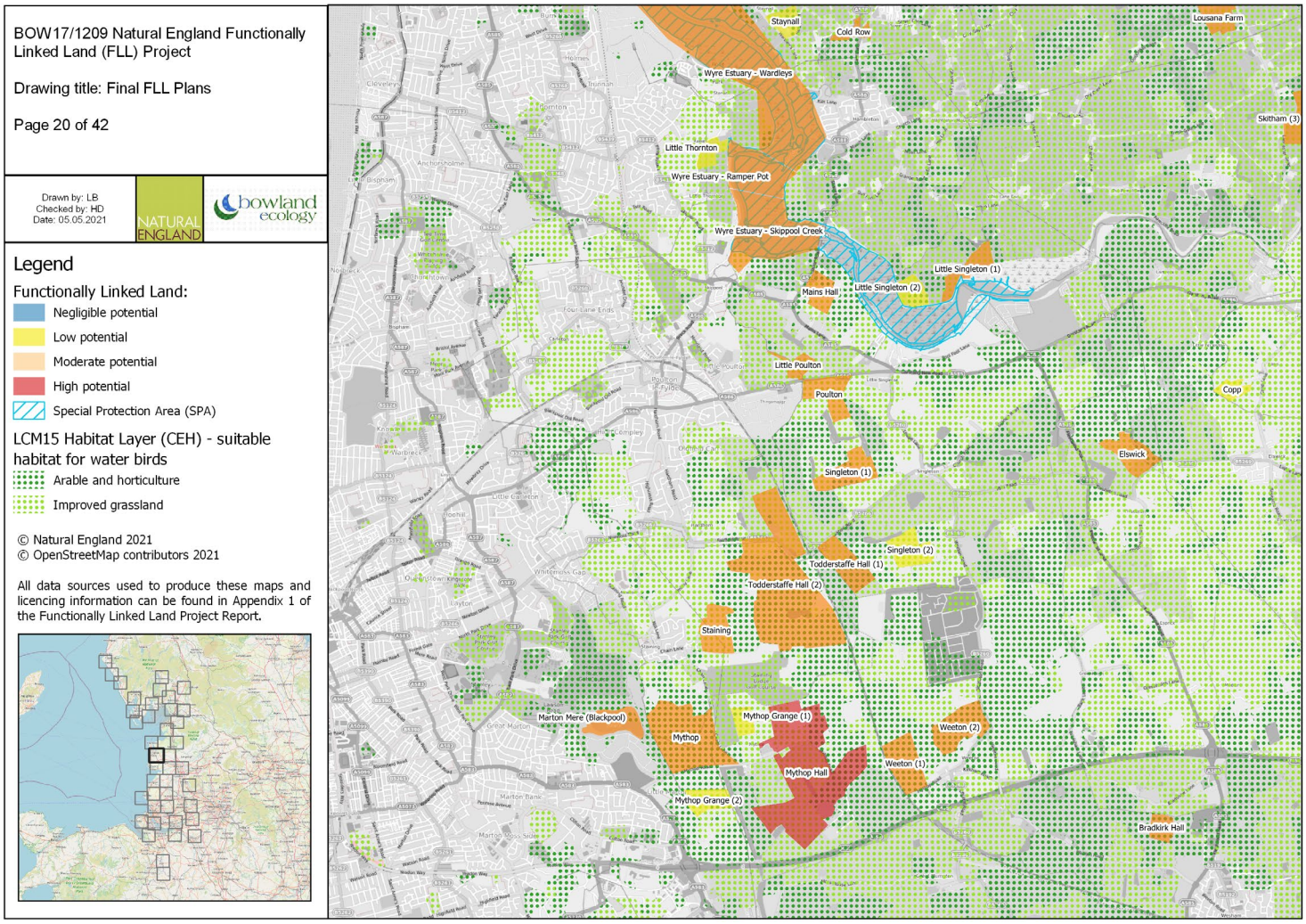

Figure 7 - Functionally Linked Land (datasets combined) example

a) More information

High potential areas, with a score of 3 and shown as red polygons, are areas where significant numbers of SPA qualifying species are regularly visiting, and there is high confidence in both the reliability of the data and the accuracy of the location of the polygon.

Moderate potential areas with a score of 2 and displayed as orange polygons show where significant numbers of water birds are visiting, but where a piece of information is missing that would otherwise yield a high degree of confidence. This could be that there is not enough data to suggest that the site is being visited regularly, or confidence is low in the exact location of this polygon.

Low potential areas with a score of 1, mapped as yellow polygons, show where some aspect of the evidence base suggests that there is a potential for FLL, as there are one or more significant counts recorded in the area. However, some information relating either to regularity of use or location accuracy is missing, and there may be only one significant record located in the polygon.

Negligible potential areas with a score of 0, mapped as blue polygons, show areas with a single significant count and poor location accuracy. More data is needed to identify the FLL potential.

The LCM15 habitat layer from CEH shows arable and horticulture, and improved grassland habitats. This layer can be used to infer functional linkage by users of these maps, for example if a cluster of fields containing significant counts occur within a larger area of the same habitat, the user might infer that those species could also be using the surrounding fields.

This map is most useful when used within a GIS system. Clicking on a polygon brings up the attribute table showing how the functionality score of that polygon has been decided, the species visiting, further recommendations on how to improve confidence in this data, and many other pieces of information.

4. Conclusions

The maps produced by this study can be used to help improve Natural England's understanding of the spatial distribution of qualifying SPA bird populations utilising FLL and as part of the evidence base used when advising on casework applications. This information will help Natural England to provide advice to local planning authorities and developers on the potential impacts of development on FLL. It will also inform strategic mitigation/compensation areas, targeting of biodiversity net gain and habitat creation and enhancement opportunities.

The information does not negate the requirement to undertake a Habitat Regulation Assessment in compliance with the Conservation of Habitats and Species (Amendment) Regulations 2019. In addition to the information included in this report, local authorities and developers will still be required to provide evidence to demonstrate a development proposal would not result in an adverse effect on the SPA site whether it be inside or outside FLL areas, for example, undertake a desk-based study and/or conduct bespoke bird surveys. The limitations set out below need to be considered when using the maps.

5. Limitations

5.1. Definition of FLL

The definition of FLL used in this study was designed to take account of the project aims, distribution of sites and birds, availability of data, and time constraints. Other ways of defining FLL may be more appropriate if circumstances differ. This includes the LDBWS FLL definition, which takes account of survey effort and local knowledge, and identifies more areas of potentially important FLL. However, it does not systematically apply numeric thresholds based on national population levels to indicate if areas of land are functionally linked to SPAs at a regional scale and is more subjective as it relies on expert judgement.

5.2. Species list

This study was based on the qualifying species listed for six SPAs in the North West. This would likely differ if a different suite of SPAs was being considered. To ensure the correct species are included, it is important that SPA citations are carefully consulted. Consideration should be given to the inclusion of additional species/populations that have been recommended through the SPA Review process (https://jncc.gov.uk/our-work/special-protection-areas-overview/#spa-reviews) (JNCC, 2020).

Areas of FLL mapped in the study vary in terms of how many and which species they are likely to be important for. Some areas are based on records of multiple species and multiple counts, whereas some are based only on a single species count, which in some cases is for a species that forms part of the qualifying assemblage rather than an individually listed qualifying species. Further, some species included in this study are only featured in one of the six SPA citations, so may not be appropriate when mapped in regions other than that particular SPA. Users can interrogate the GIS maps to determine which species underpin each area of FLL.

5.3. Regularity

Regularity of use is strongly influenced by the size of sites that have been recorded. Large WeBS sectors are more likely to have records of birds visiting for more than 7 years, compared to individual fields, as they provide a larger area of suitable habitat. Combining smaller adjacent polygons helps address this, however where there are gaps between polygons it is uncertain how best to map the larger area without making assumptions. Clusters of significant fields that are regularly visited would show up on the final maps if these were combined into a single larger polygon, but this might include areas of FLL that are of low importance, which the final maps do not show.

Further, the definition of regularity is one of two definitions proposed by Stroud and others (2001), so in the future it is recommended that both definitions are used together to provide a more comprehensive understanding of regularity.

5.4. Limitations of data

The maps of FLL produced in the study are dependent on the availability and completeness of the underpinning bird records. It is known that recording has not been systematic and survey effort has varied significantly from area to area, with many areas under-recorded. It is important that the maps produced should be seen as indicative rather than comprehensive; there are undoubtedly others important areas of FLL for birds that are not shown. For example, much of the arable land south of Chester is critical feeding habitat for Pink-footed Geese, which are regularly spotted flying away from the Dee SPA in this direction and seen feeding on the arable land here (in discussion with Neil Friswell). It is important to emphasise that gaps in the maps do not mean a lack of birds, but rather, a lack of data, and gaps should be viewed as areas where survey effort should be focussed. Further, some of the bird counts used in the reports may be overflying records, and while an effort has been made to remove these during data analysis, in some cases they are not identified as overflying and therefore may still be included in the data.

Land use change means that FLL is constantly changing as well. Different crops are planted each year, dog walking, recreation or other activities may disturb birds, and habitats may have changed since the 2015 land cover map used in this study. Displaying FLL as a static habitat could therefore

be misleading. The maps can be updated when new data becomes available, supplemented by knowledge provided by local bird experts.

The different data sets used within this study have differing levels of survey effort. For example, some, such as the WeBS data, are regularly and systematically surveyed, while others are more opportunistic, such as the BirdTrack counts. Variation exists within data sets as well, with some WeBS sectors not being visited for some years. This was not accounted for in the map of FLL produced but should be taken into consideration.

Many of the WeBS sectors cover a large area, meaning smaller scale sites within WeBS sectors cannot be interrogated separately. Breaking these WeBS sectors down into smaller areas could be useful, particularly those where only part of the sector falls within an SPA. In these cases, it is impossible to know whether the significant counts are only occurring within the SPA itself, or whether there are FLL areas adjacent to the SPA that potentially could be included within the SPA boundary.

6. Recommendations for future study

While lots of water bird data exists, only a small percentage of records could be used for this study, due to a lack of accurate spatial data. Many records only identify the tetrad they were counted in, and in order to map FLL at field level, at least a 6-figure grid reference is required. It is recommended that bird clubs, WeBS counts and BirdTrack place an emphasis on recording accurate grid references with bird count data in the future.

The LDBWS maps are the most useful maps as they comprehensively cover the Lancaster area. Detailed FLL maps require local knowledge of an area, and so another recommendation is to provide funding for other bird clubs to repeat LDBWS's approach and map the areas visited by their members, along with a confidence rating of potential for FLL.

This study only focuses on the presence of data, however there are lots of aspects of FLL that should be investigated. In discussion with Kane Brides (WWT), the importance of bird tagging was emphasised as the best way to understand bird behaviour and patterns. Tagging different species and seeing how they use different habitats inland would aid understanding of functional linkage. Further, this study looked only at non-breeding bird data, therefore future study could incorporate supporting habitats for breeding waders and seabirds.

Data from local records centres was not included due to potential overlap and time constraints, however, these could be a good resource to include if the data has good grid references associated and can be checked for repeated records. Additional data sets such as the cropped habitat data (UKCEH Land Cover® *plus*: Crop) could be used to get an insight into how crop type can affect different bird species presence and provide detailed information on the supporting habitat type.

Finally, there is potential to map habitat creation and enhancement opportunities where the maps show high bird usage and/or suitable habitat.

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Royal Society for the Protection of Birds (RSPB) The RSPB Wildlife Charity: Nature Reserves & Wildlife Conservation

Joint Nature Conservation Committee (JNCC) JNCC - Adviser to Government on Nature Conservation, in association with The Wildfowl & Wetlands Trust (WWT) WWT (Wildfowl & Wetlands Trust) | WWT, with fieldwork conducted by volunteers.

BirdTrack Data were provided by the British Trust for Ornithology (BTO). BirdTrack | BTO - British Trust for Ornithology BirdTrack is organised by the BTO for the BTO, RSPB, BirdWatch Ireland, SOC and WOS.

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