

Analysis of waterbird population trends for the Somerset Levels & Moors SPA, its functionally linked land and the Bridgwater Bay coastal sites.

Ian Woodward & Graham Austin





BTO Research Report No. 747

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REPORT

Authors

Ian D. Woodward and Graham E. Austin

Report of work carried out by the British Trust for Ornithology
on behalf of Natural England

This analysis was funded by Natural England via funding that was secured from the Somerset Rivers Authority.

October 2022

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British Trust for Ornithology

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Published in October 22 by the British Trust for Ornithology
The Nunnery, Thetford, Norfolk, IP24 2PU, UK

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ISBN 978-1-912642-42-7

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EXECUTIVE SUMMARY

1. The Somerset Levels & Moors contains the largest area of lowland wet grassland in England and the Somerset Levels & Moors SPA is comprised of 12 SSSIs falling within an area of floodplains. The SPA is designated as a result of internationally important numbers of Bewick's Swan, Teal, Lapwing and Golden Plover and supports an important waterbird aggregation of around 99,000 individuals.
2. The Wetland Bird Survey (WeBS) is a long-running survey recording numbers of all waterbird species on wetland sites throughout the UK. WeBS 'Core Counts' record waterbird numbers, monthly throughout the year, although the main focus of WeBS is on wintering waterbirds (September to March for wildfowl and November to March for waders). The data can be used to assess population trends across the different SSSIs that make up the SPA, and for lower-level WeBS sectors for those SSSIs where counts are subdivided.
3. This study aims to produce a comprehensive analysis of wintering waterbird trends within the Somerset Levels and Moors SPA, in order to quantify the abundance and distribution of species within the SPA and its underlying SSSIs, and to compare trends across the different SSSIs and WeBS sectors and also assesses trends for 11 other functionally-linked wetland sites which are out with the SPA but within the wider area it covers, and for the important nearby site Bridgwater Bay and Steart Marshes which is also functionally-linked to the SPA,.
4. Smoothed population trends were generated using data from the period 1994/95/02 to 2019/20, and assessed for each of 26 waterbird species, consisting of the internationally and nationally important waterbird species that are features of Somerset Levels & Moors SPA or one of the 12 SSSIs that underpin the SPA, plus two additional species that have recently colonised the UK (Little Egret and Great White Egret).
5. Strong declines for Bewick's Swan and Dunlin can be attributed to broadscale distribution changes, most likely resulting from climate change, and Bewick's Swan can no longer be considered a regular wintering visitor to the area.
6. The analysis has identified Tealham & Tatham Moors and West Sedgemoor as two sites where declines across all three time periods could be driven by site-specific factors and hence these sites should be a priority for further investigation to assess whether changes to site conditions may have driven declines and (if appropriate) to put management actions into place to reverse these declines. Similarly, strong short-term declines at Wet Moor and West Moor mean that these sites should also be considered a priority for further research.
7. In contrast, a consistent pattern of strong increases across many (though not all) species has occurred at Moorlinch, Shapwick Heath and Westhay Moor, indicating that habitat conditions at these SSSIs has improved for waterbirds (at least relative to other sites).
8. These three SSSIs are currently the most important sites for wildfowl, along with West Sedgemoor, based on the mean of peak counts for the most recent five winters assessed in this report (2015/16–2019/20). As well as being important for wildfowl, West Sedgemoor remains the most important site for waders on the basis of the most recent five winters. However, numbers of wildfowl and some waders have decreased substantially at West Sedgemoor over that five winter period and, in the most recent winter (2019/20), counts were well below the levels that would be considered to be important..

9. The species of most concern on the SPA as a whole are Wigeon, Teal and Snipe, although in all three cases declines may be being driven partly by broadscale changes in distribution and partly site-specific factors and hence it is unclear to what extent they are influenced by local factors. Historically, West Sedgemoor SSSI has supported the vast majority of birds from these three species wintering on the Somerset Levels & Moors SPA. Consequently, the investigation into the drivers of waterbird declines on West Sedgemoor should focus on these three species.
10. It is possible that the habitat improvements in Bridgwater Bay following the creation of Steart Marshes may have attracted some Wigeon, Pintail and Teal that would otherwise winter on the Somerset Levels & Moors SPA. However, whilst such movements could potentially explain recent declines in Pintail on the Somerset Levels & Moors SPA, they do not explain the declines observed for the other two species (as the numbers of birds involved are small compared to the declines)
11. Some of the smaller sites which are outwith the SPA support high peak numbers of some species and occasional high peak counts occur at other non-SPA sites, most notably when unusual conditions have affected the wider area such as during flooding events. This demonstrates the importance of the wider network of functionally linked sites to the species which depend on the SPA, and highlights the need to consider all sites both within and outwith the SPA.
12. Furthermore, high waterbird counts at three sites outwith the SPA (Ham Wall North, Waltons & Loxtons and Ham Wall Reserve – Godwins) and only recently incorporated into WeBS, suggest that these sites support particularly important populations of several species of wildfowl.
13. To ensure ongoing monitoring and management action is targeted, it would be prudent to review the SSSI citations and to consider revising the list of species which are assessed at each SSSI for ongoing monitoring purposes, e.g. WeBS Alerts. Currently, there are many instances where species are not regarded as a site feature even though recent peak counts for a species on a SSSI have been greater than 10% of the peak count for the SPA as a whole.

1. INTRODUCTION

1.1. Background

Somerset Levels & Moors contains the largest area of lowland wet grassland in England (Natural England 2019) and is located in the floodplains of the Rivers Axe, Brue, Parrett, Tone and their tributaries. The SPA and Ramsar Site covers 6,394 hectares and includes 12 Sites of Special Scientific Interest (SSSIs), and is designated as an SPA as it regularly supports internationally important numbers of Teal and Lapwing, and nationally important numbers of Bewick's Swan and Golden Plover (see Appendix G for list of scientific names of all species referred to in this report). The SPA also qualifies as a wetland of international importance and supports around 99,000 individual waterbirds (five-year average of peak counts 2015/16–2019/20, Frost *et al.*, 2021).

Nine of the 12 SSSIs underpinning the SPA are in turn designated for their importance to a variety of different wildfowl species (the remaining three SSSIs have no designated avian features). In addition to the four species for which the SPA is designated, a further 20 species are listed as important features for one or more of these nine SSSIs (see Table 1).

In January 2021, Natural England secured funding from the Somerset Rivers Authority to deliver a programme of four separate projects. These projects were aiming to improve the understanding of the Somerset Levels and Moors SPA and how it could be better conserved. This analysis was commissioned as part of the monitoring protocol project, which seeks to design and implement a monitoring protocol for the SPA. The rationale behind this piece of work was that it will give a good baseline assessment of the current data and status of the wintering bird populations within the SPA, which can be used as the foundation for monitoring going forward.

The Somerset Levels & Moors SPA is underpinned by the various SSSIs assessed in this report and covers 6,395.47 hectares (JNCC, 2022). However, only around one-sixth of the area within the floodplains of the rivers Axe, Brue, Parrett, Tone, and their tributaries fall within boundaries of the Somerset Levels and Moors (Natural England 2014). As might be expected given that it falls within a floodplain, the remaining area out with the SPA includes other areas that become seasonally flooded, some of which are also monitored for WeBS. Although they are not part of the SPA, an understanding of trends for species using these sites is important as the relative habitat conditions on these sites may affect trends on adjacent SSSIs. In addition to the analysis covering the SSSIs which make up the SPA, this study also assesses results for 11 other functionally linked wetland sites which are outwith the SPA but within the wider area it covers, and for the important nearby site Bridgwater Bay and Steart Marshes which is also functionally linked to the SPA

Table 1 Designated features for Somerset Levels & Moors SPA and for nine of the 12 SSSIs which underpin the SPA. Three SSSIs (Westhay Moor, Westhay Heath and Shapwick Heath) are not designated for any avian features. Key: **F** - Assessed by WeBS Alerts (Woodward *et al.* 2019) (based on "list of features for WeBS Alerts" supplied in 2019 by Natural England); **A** - Additional species specifically referred to in the citation description e.g. under the qualifying assemblage (SPA) or aggregations (SSSI) of wintering waterbirds (see Appendix A for links to citation descriptions); **S** - Notable non-qualifying species mentioned in *European Site Conservation Objectives: Supplementary advice on conserving and restoring site features* (Natural England 2019).

SSSIs underpinning Somerset Levels and Moors SPA	Mute Swan (MS)	Bewick's Swan (BS)	Whooper Swan (WS)	Shoveler (SV)	Gadwall (GA)	Wigeon (WN)	Mallard (MA)	Pintail (PT)	Teal (T.)	Pochard (PO)	Tufted Duck (TU)	Little Grebe (LG)	Bittern (BI)	Little Egret (ET)	Great White Egret (HW)	Lapwing (L.)	Golden Plover (GP)	Whimbrel (WM)	Curlew (CU)	Black-tailed Godwit (BW)	Ruff (RU)	Dunlin (DN)	Jack Snipe (SN)	Snipe (JS)	Green Sandpiper (GE)	Redshank (RK)
Somerset Levels and Moors SPA	S	F		A	A	A		S	F				A	S	S	F	F	S	S		S			S	S	S
Catcott Edington and Chilton Moors SSSI		F		F	F	F	F		F							F	F	F				A		F		
Tealham and Tadham Moors SSSI		F		F	F	F	A	A	F	A						F	F					A		F		
Westhay Moor SSSI																										
Westhay Heath SSSI																										
Shapwick Heath SSSI																										
Moorlinch SSSI	A	F				F	A		F							F	F	F						F		
Kings Sedgemoor SSSI	A	F					F		F							F	F	A				F	F	F	F	A
Southlake Moor SSSI		F				F			F	A	A					A				F		A		A		
Curry and Hay Moors SSSI	F	F		F		F	F	F	F	F	F		F			F	F				F	F		F		
West Sedgemoor SSSI		A				F			F							F	F	F				F		F		
Wet Moor SSSI		F	F	F	F		F	F	F	F	F					F	F		F		F	F		F		F
West Moor SSSI	F	F		F		F	F	F	F	F	F	F				F	F		F		F	F	F	F		F

The SPA and Ramsar site cover only a small proportion of the area of the floodplain and much of the area outside the designated sites consists of farmed grassland which is too dry to support wetland wildlife for the full year but may be valuable at times during the annual cycle (Natural England 2019). The Wetland Bird Survey (WeBS) has developed, with considerable input from Natural England and other stake holders, a standardised approach to gaining an in depth understanding of wintering waterbird abundance trends on protected and other sites. Natural England require such an analysis for the Somerset Levels and Moors Special Protection Area (SPA), Sites of Special Scientific Interest (SSSIs) underpinning the SPA and a number of nearby sites counted by WeBS that may be functionally important to the SPA. The proposed analysis will inform a broader project to develop a monitoring protocol for the SPA by providing a better understanding of how the SPA and SSSIs are performing. This will update and expand knowledge of how the sites are performing beyond that which can be gleaned from the latest WeBS 'Alerts' Report (Woodward *et al.* 2019).

The aim is to produce a comprehensive analysis of wintering waterbird trends within the Somerset Levels and Moors SPA and other wetland sites in the immediate area, including the Bridgwater Bay SSSI, which are likely to be functionally important to the performance of the SPA.

1.2. Objectives

The main objectives of this work are to:

- Describe and quantify abundance and distribution of waterbirds within the SPA, SSSIs and WeBS count sector levels;
- To quantify how these may be changing over time;
- To consider the trends on the underpinning SSSIs in the context of the SPA;
- To consider the trends on the SPA in the context of the wider area.

These objectives will be addressed through consideration of a sector-level analysis of WeBS data across the Somerset Levels & Moors SPA and nearby sites, to provide a snapshot in time as to if and how trends differ between and within the 12 SSSIs that underpin the SPA. This will improve understanding of the fluctuations in numbers of waterbirds within the sites and inform the development of management plans and monitoring protocols on these sites and for the wider area. The specific aims of this work are therefore to:

- Identify the abundance trends for the short (5 years), medium (10 years) and long (24 years) term for 26 waterbird species, consisting of the internationally and nationally waterbird species that are features of either the Somerset Levels & Moors SPA, or of one or more of the SSSIs which underpin the SPA (Table 1). Trends will be calculated from WeBS Core counts for Somerset Levels & Moors SPA. Where sufficient data are available, trends for the SSSIs, will be compared with trends for the respective sites as a whole. Where SSSIs have been split into more than one count unit ('WeBS sector'), trends for each WeBS sector will also be compared to trends for the SPA. This work will identify those WeBS sectors where large numbers of species are declining or increasing contrary to or more rapidly than on the site as a whole.
- Identify WeBS sectors that support important proportions of the species on the site.

It is outside the scope of this report to identify potential drivers of change across the SPA such as changes in food supply or changes in the habitat condition of foraging and roosting habitats. Hence,

whilst potential drivers of change are discussed where relevant it is important to be aware that a full assessment has not been carried out.

2. METHODOLOGY

2.1. Waterbird Data

WeBS is responsible for several monthly or periodic monitoring schemes including the WeBS Core Counts, the WeBS LowTide Counts and the Non-estuarine Waterbird Survey. This report is based on data collected by the Core Count surveys.

The WeBS Core Count scheme is a long-running survey that monitors waterbird numbers on sites throughout the UK via monthly site visits, with numbers of all waterbird species being recorded (Frost *et al.*, 2021). The primary aim of the Core Count scheme is to provide abundance estimates for whole sites which then feed into population estimates, species indices and multi-species indicators. On coastal sites, WeBS Core Count visits are normally undertaken over high tide, the nominal date for survey visits chosen to correspond with spring high-tides when waterbirds are concentrated near the high-water mark or concentrated into high-tide roosts facilitating accurate counting. On large sites, such as Bridgwater Bay, where it is not feasible to make a single count for the entire site, synchronous counts of smaller count sectors are undertaken by teams of volunteer counters. These sector counts are routinely summed to give the overall site total, and during this process the completeness of the overall count assessed. This is required because all sectors are not necessarily counted on all occasions. This completeness assessment is species specific because the absence of data from a given sector would not be expected to affect the overall total equally for all species. Furthermore, completeness is assessed on a month by month, year by year basis using algorithms that allow for both seasonal and long-term trends in site usage. Thus a consolidated count for a site composed of multiple sectors is considered complete when those sectors counted on the month in question would be expected to hold at least 75% of the site total for the species in question for the season and year in question. Whilst the division of large sites into sectors has evolved principally in response to the practicality of undertaking counts, the divisions between sectors typically follow distinctive features of the environment. Thus, an analysis of waterbird trends on the individual sectors can inform in a biologically meaningful manner.

Twelve SSSIs which underpin the SPA were considered in this report (Figures 2.1.i and 2.1.ii and Appendix F). Some of these SSSIs are further divided into more than one WeBS sector for the purposes of WeBS counting (Figure 2.1.i and Appendix F. Note that for some sites (e.g., Moorlinch) the WeBS sites include some sectors that are outwith the SPA boundary.

Figure 2.1.i: Structural hierarchy of WeBS Core Count sectors on the Somerset Levels & Moors SPA. Note that sectors shaded pale grey are outwith the SPA boundary but counts are included as part of the SPA and SSSI as they are considered part of the functional unit that makes up the Moorlinch SSSI WeBS sector. Sectors with grey text were not counted during the period covered by this report

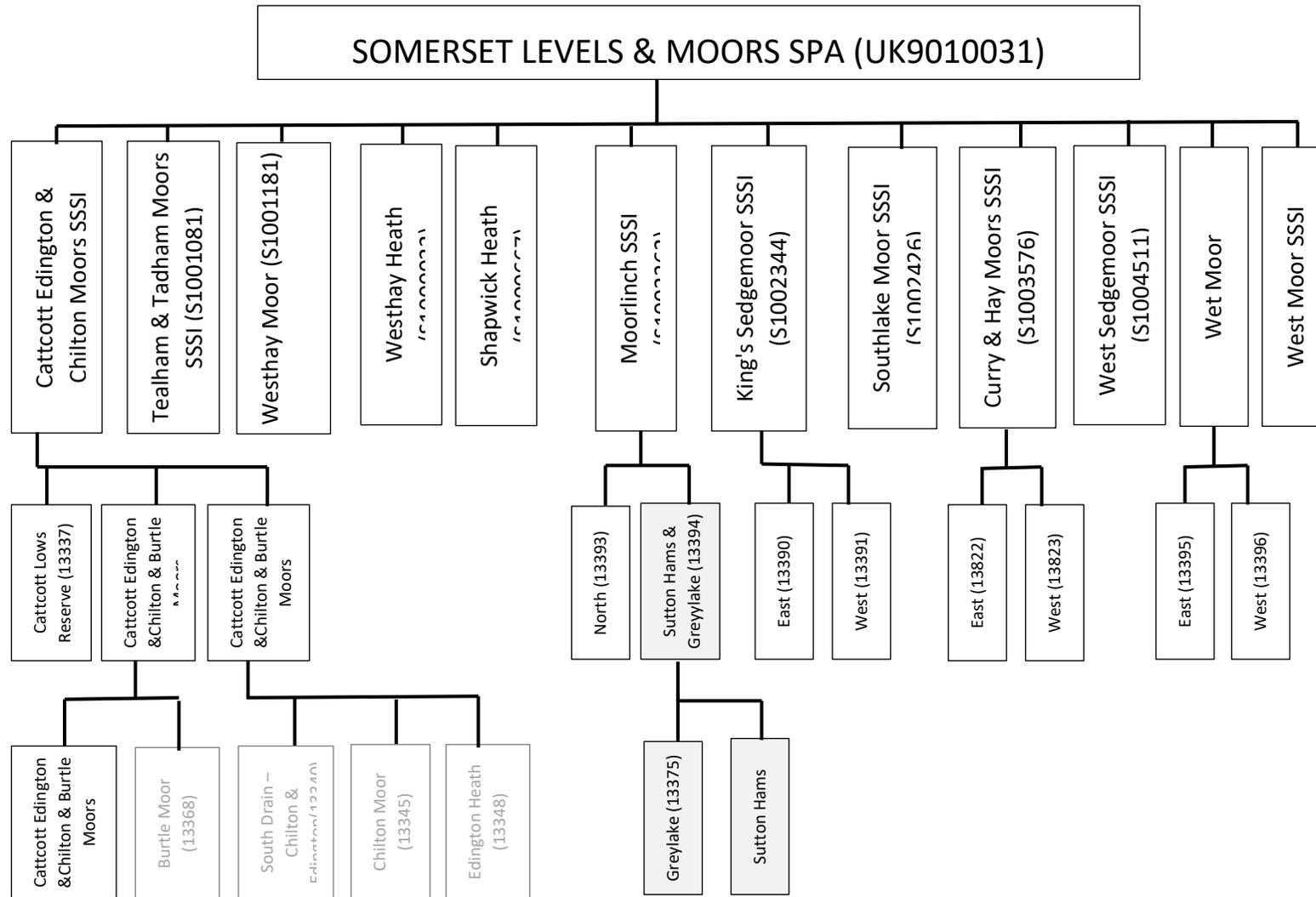
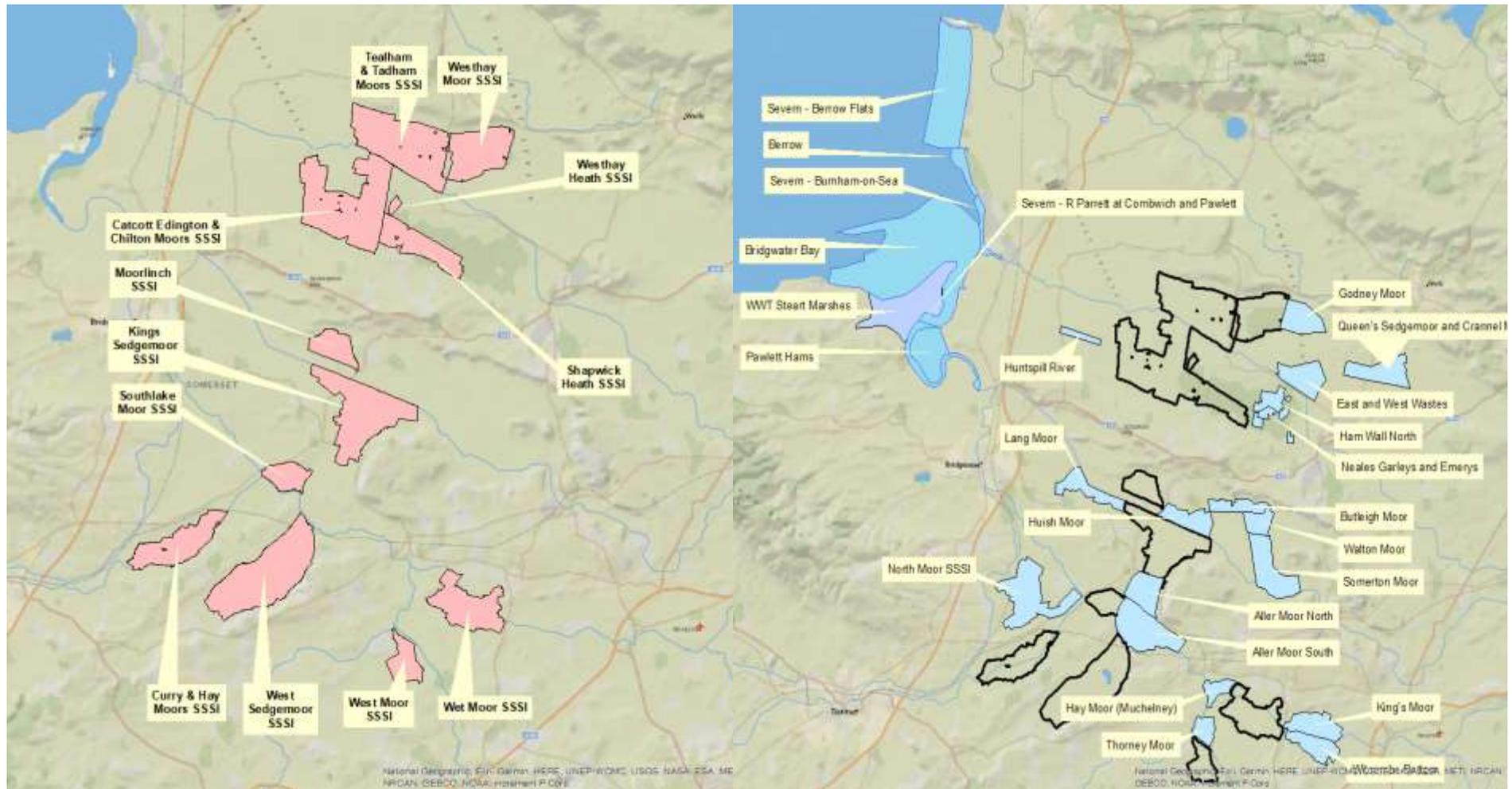


Figure 2.1.ii: Maps showing **Left:** location of the SSSIs that underpin the Somerset Levels & Moors SPA. Note that the WeBS site for Moorlinch (1002362) includes two sectors which are outwith the SPA boundary. **Right:** location of WeBS sectors of Bridgewater Bay and WWT Steart Marshes and those within the broad extremes of but not included within Somerset Levels & Moors SPA.



2.1.1. Smoothed waterbird trends and percentage change

The methodology used to produce smoothed site, regional and national trends as reported by WeBS Alerts (Woodward *et al.*, 2019) can be usefully extended to generate trends on smaller areas of interest such as single or appropriately grouped WeBS count sectors. It is, however, important to recognise that the numbers of birds underlying the observed trend on sectors are generally much lower than those underlying site trends reported by WeBS Alerts which, by definition, are at least equal to the national qualifying threshold for the site as a whole. Consequently, individual trends should not be 'over-interpreted'. For example, a 50% decline from 30 birds to 15 birds would give much less cause for concern than a 50% decline from 1000 to 500 birds the latter being much more likely to reflect a real and substantial loss of birds from an area than the former. However, whilst acknowledging this, a consistent pattern of decline across multiple species, even when the numbers involved for some of them are comparatively low, is strongly indicative of adverse factors affecting the sector in question, and the particular suite of species showing a decline in numbers can guide us in where to look for problems (for example, does the suite of species represent those known to be particularly sensitive to disturbance or those with similar ecological requirements).

Thus, using the latest available validated WeBS data (those to winter 2019/20 inclusive, as data for 2020/21 could not be used due to coverage issues as a result of COVID-19 'lockdowns'), following (Atkinson *et al.*, 2000, 2006), smoothed trends were fitted using Generalized Additive Models (GAMs) for the relevant species. The smoothing is to ensure that year-specific factors, such as poor conditions on the breeding grounds or particularly harsh weather on the wintering grounds, that are not related to changes in the quality of the sites themselves, do not contribute overly to the trend. Percentage change has been calculated for short- (5 year) medium- (10 year) and long-term (15 year). To ensure statistical robustness, percentage change is calculated with reference to the penultimate winter in the time series available to avoid referring to the end points of the smoothed trend (which are less robust). Consequently, percentage change to winter 2018/19 is reported. Declines of at least 25% but below 50% are flagged as medium-declines (or moderate declines), and declines of 50% or greater are flagged as high-declines. In contrast to the WeBS alerts system, we specifically do not use the terms medium- and high-Alerts because unlike the percentage change reported by WeBS Alerts, medium and high declines reported at the sector level do not constitute a formal WeBS Alert/Official Government Statistic. The corresponding percentage change required to balance the numbers to their former level following a decline are likewise termed medium- or moderate (at least 33% but below 100%) and high (100% or greater) increases.

Trends can only be fitted to the raw counts for species where sufficient data exist across the years being considered, and cannot be fitted for species which are recorded irregularly and/or in very low numbers in the Somerset Levels in winter (Whooper Swan, Curlew, Jack Snipe, Green Sandpiper and Redshank). In addition, trends are based on data from the winter period only when WeBS coverage is at its best. Robust WeBS trends cannot be fitted for species which are almost entirely recorded on passage (Whimbrel and Ruff). Wintering trends rely on the assumption that the number of individuals present at a site usually remains relatively stable for several weeks at a time (or longer) and hence monthly WeBS counts are representative of the wintering population. This is not the case during passage months: numbers can fluctuate on a daily basis as birds arrive and depart, so counts may vary by chance from year to year according to whether or not the count date happens to coincide with a peak in passage. In addition, passage birds are present for a relatively short but unknown length of time, which may also vary from year to year. Furthermore, WeBS coverage is patchier than in the core winter months. For all these reasons, numbers counted during passage months cannot be considered representative of the passage population in a particular year, and hence trends incorporating the passage period are not fitted.

The WeBS Alerts report (Woodward *et al.* 2019) appraises each SSSI/SPA based on data compiled at the whole WeBS site level. At the WeBS site level, time-series extend back to when the site was first monitored by WeBS. However, data held at the finer resolution of the WeBS sector typically extend back to the winter of 1993/94 (when the former National Wildfowl Survey and Birds of Estuaries Enquiry were first merged under the banner of WeBS). Consequently, as of winter 2019/20 there are typically 26 years of data available for sector level analyses and thus the longest period available to represent long-term change is 24 years (to avoid basing calculation on the less robust first and last year of the fitted trend). Although some of the SSSIs/sectors included in this report do have data from before 1993/94 we have standardised on 24 years to represent the long-term across all sites, in order to standardise the long-term period to be reported. In contrast, the WeBS Alerts long-term period has not been standardised but rather uses 25 years or the maximum where less are available. Consequently, there may be differences in which species/site trends could be assessed here and which were assessed for the last WeBS Alerts report, due to both different start dates (for example data from 1991/92 were included in the Alerts Assessment for Wet Moor SSSI) and end dates (there are now three additional years available at the end of the time series across most sites). Furthermore, data thresholds that must be met before fitting smoothed trends for Alerts (the results of which constitute Official Government Statistics) could be relaxed. Although doing so may be less robust than would be required for Alerts assessment, it is nonetheless informative for the objectives of this report.

2.1.2. Placing the smoothed waterbird indices into context

Once the smoothed indices for the SSSIs and for underlying sectors (where relevant) have been fitted the observed trends are placed in context of those for the Somerset Levels & Moors SPA as a whole. Following Banks & Austin (2004), the standard WeBS methodology as used to compare site trends with regional and national trends when reporting WeBS Alerts (Woodward *et al.* 2019) is extended here to compare sector trends with site trends and trends for a wider custom region. Where waterbird numbers of a given species on a given count sector follow those of the species across the site as a whole then the proportion of site numbers on the sector will remain constant. Any significant deviation from this gradient of zero would indicate that the waterbird populations on the relevant count sector are doing either better or less well than would be expected from the site trend. Consequently:

- where a decline on a sector reflects a decline across the site as a whole it is unlikely that the observed site trend is being driven by factors disproportionately affecting that sector. If this is true of the majority of sectors, then this may indicate that the observed site decline in the species in question is due to factors external to the site and are thus not due to site management issues *per se*;
- where a decline on a sector is more pronounced than that across the site as a whole, this may suggest that factors affecting that sector could be contributing to the overall decline;
- where a decline on a sector is less pronounced than the decline across the site as a whole, this suggests that relatively favourable conditions on that sector are helping buffer any site declines;
- where an increase on a sector is less pronounced than that across the site as a whole, this suggests that the sector is already at carrying capacity for the species in question or, if historically it supported greater numbers, that the quality of the sector to that species has diminished;
- where an increase on a sector is greater than that across the whole site, this suggests that trends on that sector are driving the increase across the site or that the sector in question is relatively attractive compared to the site as a whole when increased numbers arrive at the site due to external factors.

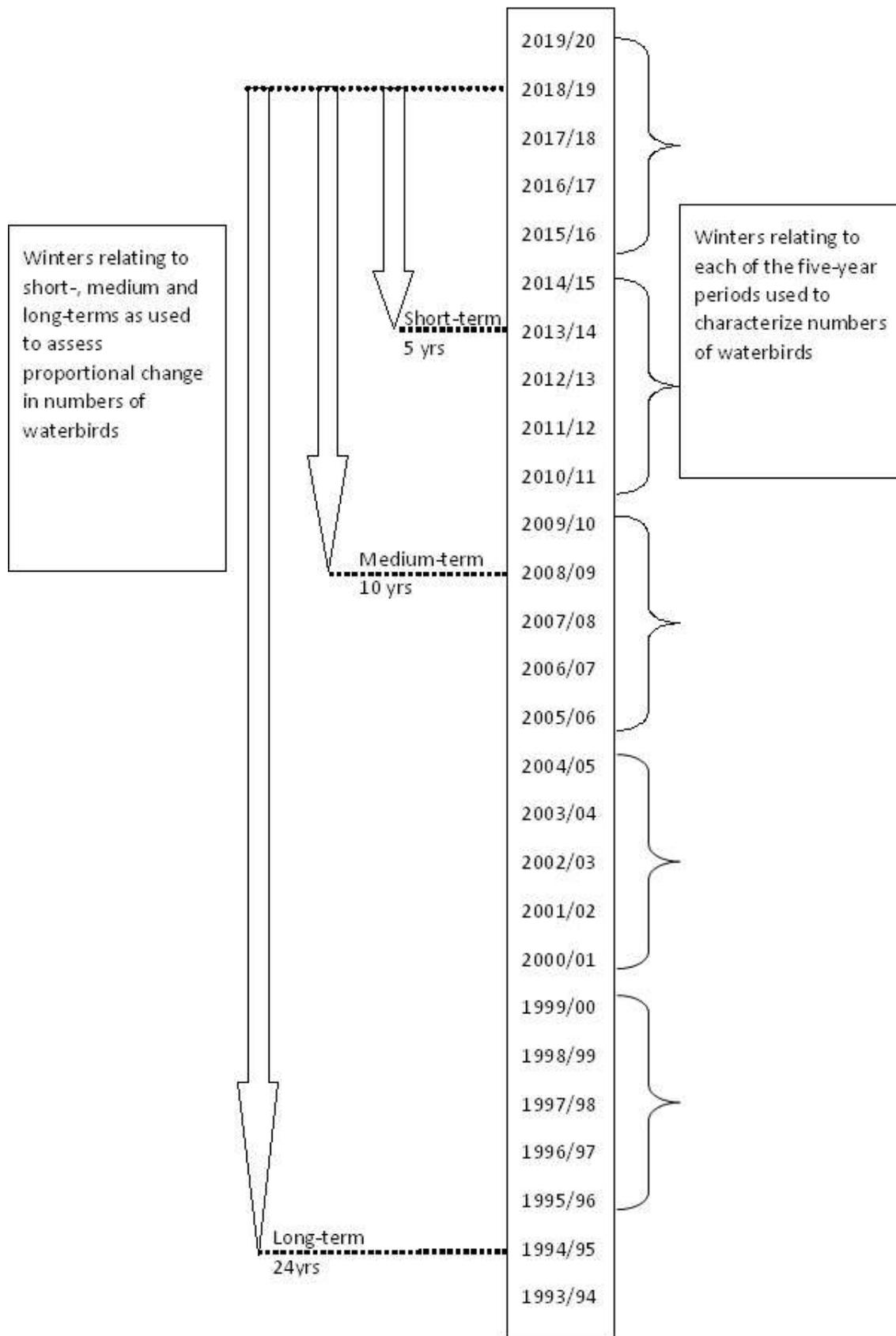
The comparisons between sectors and site are derived from a logistic regression model with a binomial error term. The resulting plots depict the percentage contribution of the sector to the site as a whole and the associated confidence limits represent both variation in this proportion between months in a given year and the underlying sample size (for example, we would be more confident of our estimate that a sector contributed 10% of the site total if 100 birds out of 1000 on the site were counted there than we would be if this was 10 out of 100). This is based on the winter period as routinely used for all WeBS reporting (Nov-Mar for waders and Sep-Mar for other species). Only data from months where counts consolidated across the site as a whole had been assessed as complete were used - following standard WeBS protocol described above.

Having considered the trends on the sectors, each in the context of trends across the site as a whole, it is important to consider the site trends in a broader context, as this can modify our interpretation of the pattern of change across sectors. In the Alerts report (Woodward *et al.* 2019) trends for the SPA and the underpinning SSSIs are compared with the WeBS Southwest Region (based on historic Environment Agency regions). Here, we compare the SPA trends with a custom region that is similar to the WeBS Southwest region but excludes Cornwall and north Gloucestershire but includes Wiltshire. The custom region thus comprises the UK administrative regions Somerset, Bath and N.E. Somerset, North Somerset, Bristol, South Gloucestershire, Wiltshire, Dorset and Devon, and therefore places the Somerset Levels in a more centralised position (Figure 1). Whilst this custom region is mostly used for interpretative purposes, a comparison of the SPA trend for each species with the WeBS Southwest region is also provided in Appendix B.

This comparison with the regional trend is especially important where there has been an increase or decline at the broader scale. Consequently:

- where there has been an apparent re-distribution of a species within the site (that is, declines on some sectors appear to be balanced by increases on other sectors), but the proportional contribution of the site to increasing regional numbers is declining, then this implies that those sectors with static or declining numbers are actually of concern because we would expect them to be increasing in parallel with the other sectors. Thus, in such cases, the apparent redistribution within the site is misleading and the species in question may be facing problems on those sectors not supporting an increase in numbers;
- where a species is in decline at the broader scale, we would expect declines on at least some of the sectors of the site regardless of whether birds are being affected by adverse factors locally. Thus, we would expect those sectors of least suitable habitat to a given species to be the first to show a decline in numbers.

Figure 2.1.2.v Schematic of reference winters used for reported waterbird numbers and change.



2.1.3. Interpretation of figures and tables

The BTO has prepared a guidance document 'Guidance to interpretation of Wetland Bird Survey within-site trends' (Austin & Ross-Smith 2014) to aid the interpretation of WeBS sector trend analyses. This document is also provided in the supplementary material accompanying this report. These guidelines give full details of analyses included in this report and the rationale behind them as an aid to the interpretations of numbers and trends on WeBS count sectors. In summary these include:

- proportional change in the numbers of each species at each SSSI assessed over the long-, medium- and short-terms (Table 2; for underlying values see sheet 'Aerexchange' in 'Appendix B - SPA and SSSIs WeBS trends.xlsx').
- means of peak counts of each species at each SSSI for the most recent five-winter period 2014/15–2019/20 (Table 3; for underlying values together with equivalent values for the previous four five-winter periods and the peak value in the most recent winter (2019/20), see sheet 'MOPs' in 'Appendix B - SPA and SSSIs WeBS trends.xlsx').
- the proportion of species assessed as falling into each of the five categories from high decline through to high increase (mapped pie-charts: Figures 3.1.i to 3.1.iii).
- for each species for each SSSI, graphs depicting both annual mean and annual peak numbers together with, where there are sufficient data, the smoothed trends through each. Accompanying each of these is a graph showing the proportional contribution of each sector to the overall numbers across the whole SPA. The equivalent graphs are also available for the whole SPA relative to the custom region and to the WeBS Southwest region (see individual species sheets in 'Appendix B - SPA and SSSIs WeBS trends.xlsx').
- density plots for each species across all sectors which focus attention on the most important areas for each species (see 'Appendix E – SSSI Species densities.xlsx').

As well as providing analyses for each of the SSSIs underpinning the Somerset Levels & Moors SPA, similar analyses are provided for underlying sectors within each SSSI, where such sectors exist and where there are sufficient data. These make a comparison between the sector results and those for the SSSI as a whole, to enable any variation in trends within the SSSI to be assessed as well as the relative importance of the different sectors.

Finally, graphs depicting annual mean and annual peak numbers and smoothed trends are also provided for a number of sites outwith the SPA but within the broad extent (Northern, Southern, Eastern & Western extremes of) the Somerset Levels & Moors (Appendix C). Trends on the SPA may be related to the trends at these sites for species for some species if individuals move between sites both inside and outside the SPA. Additionally, graphs are provided for the adjacent Bridgwater Bay & Steart Marshes (Appendix D) which also supports nationally important numbers of several of the species considered in this report. Due to the close proximity of this site to the Somerset Levels & Moors SPA it is likely that individual birds from some species will use both sites and hence trends on the SPA may be influenced by trends at Bridgwater Bay

3. RESULTS

3.1. Summary of SSSI Results

The trends of each species on each of the SSSIs within the SPA for which sufficient data are available are supplied digitally (Appendix B), together with plots comparing the SSSI trends with the site trends for Somerset Levels & Moors SPA. Plots comparing the individual count sector trends with the SSSI are also supplied for those SSSIs where the counts are broken down into more than one count sector. This series of plots puts each SSSI into the context of trends of the Somerset Levels as a whole, or each sector in the context of the SSSI as a whole. Plots are grouped by species and presented in taxonomic order, with the plots for each SSSI presented in the top half of the spreadsheet, and the plots for lower level sectors plotted below that, grouped by SSSI.

This information is summarised below (Table2) and the underlying values representing percentage change to each species on the Somerset Levels & Moors SPA and on the underlying SSSIs/sectors are available on an additional sheet in Appendix B (TableOfChange). Colour coding is used to represent declines or increases; species are listed in taxonomic order and sectors have been listed to represent their geographical proximity to each other. Caution is advisable in interpreting individual cells in these tables at face value. For example, a 50% decline (shown in red) could represent a decline from 10,000 to 5,000 birds or could be a decline from 20 to 10. Consequently, it is important to be aware of the numbers of birds involved (obtainable from the plots or the mean of peak numbers sheet in Appendix B. However, consistency between adjacent cells would suggest that either a group of species or a group of adjacent sectors have similar trends even when numbers of individuals involved are relatively low. Where this is the case, this may suggest that the trends represent real ecological changes. Note population trends cannot be assessed for all species due to the very low numbers or intermittent occurrence during the winter on the Somerset Levels & Moors SPA. Where trends cannot be assessed, graphs showing peak and mean counts are still presented.

This information is further summarised in map format, which better facilitates consideration of densities over time in a geographic context (see Appendix E in digital supplementary materials).

The importance of individual SSSIs or sectors for given species can be determined by considering the five-year mean of peak counts for the most recent five-year period (2014/15–2019/20) (Table 3) and underlying values are available in another additional sheet in Appendix B ('MOPs'); the importance of individual sectors to species clearly influences the level of concern regarding the characteristics of the trends. Peak counts from the four previous five-year periods and the most recent available winter (2019/20) are also provided in the same sheet, and sites with high peak counts in the current year are highlighted if they have not already been identified as important based on the mean of peaks for the most recent five years. This may help identify sites that may become more important for a species soon. However, caution is advisable in using only the counts from the most recent year to identify important sectors for given species rather than the five-year mean, as peaks from a single year are less robust against abnormal counts (e.g., caused by disturbance in an adjacent sector on the day of a count).

Table 2: Overview of population trends of waterbirds on the Somerset Levels and Moors SPA based on high-tide counts over the long- (1994/95–2018/19) the medium- (2008/09–2018/19) and the short- (2013/14–2018/19) terms. Cells are coloured to indicate trend status as follows: Red – a decline in numbers of at least 50%; Orange – a decline in numbers of at least 25% but less than 50%; White – a decline in numbers of less than 25% or an increase of less than 33%; Pale Green – an increase in numbers of at least 33% but less than 100%; Dark Green – an increase in numbers of at least 100%; Grey – insufficient data. See Appendix B for underlying values.

Table 2 i: Swans and ducks:

Site Code	Site Name	Mute Swan			Bewick's Swan			Whooper Swan			Shoveler			Gadwall			Wigeon			Mallard			Pintail			Teal			Pochard			Tufted Duck					
		Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term						
UK9010031	Somerset Levels and Moors SPA																																				
S1003888	Catcott Edington and Chilton Moors SSSI	↑	↑	↑							↓	↓	↑				↓	↓	↓		↑		↓	↓	↓	↓	↓	↓		↑							↑
S1001081	Tealham and Tadham Moors SSSI		↓														↓	↓	↓		↓	↓	↓	↓	↓	↓	↓	↓									
S1001181	Westhay Moor SSSI			↑							↑	↑	↑	↑	↑	↑	↑		↑		↓	↓				↑	↓	↓	↓	↓	↓	↑	↓	↓			
S1000032	Westhay Heath SSSI		↓											↑		↑			↑			↓				↓	↓	↓									
S1000667	Shapwick Heath SSSI		↓	↑							↑	↑	↑	↑	↑	↑	↑	↑	↑	↓	↓	↓				↓	↓	↓	↓	↓	↓	↓	↓	↓		↑	↑
S1002362	Moorlinch SSSI										↑	↑	↑				↑	↑	↑		↓	↑						↑									
S1002344	King's Sedgemoor SSSI	↑	↓														↓	↓	↓		↓						↑	↑									
S1002426	Southlake Moor SSSI																↓									↓	↑										
S1003576	Curry and Hay Moors SSSI			↑															↑	↓	↑					↓	↓		↓	↓							
S1004511	West Sedgemoor SSSI										↓	↓	↓				↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓						
S1004500	Wet Moor SSSI			↑													↓	↓	↑	↓	↓		↓	↓	↓	↓	↓	↓									
S1002677	West Moor SSSI	↓	↑	↑													↓	↑	↑	↓	↓					↓	↓	↑									

Table 2 ii: Waders:

Site Code	Site Name	Lapwing			Golden Plover			Whimbrel			Curlew			Black-tailed Godwit			Ruff			Dunlin			Jack Snipe			Snipe			Green Sandpiper			Redshank		
		Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term			
UK9010031	Somerset Levels and Moors SPA	↑		↓	↑	↑	↑						↑	↑	↑				↓	↓	↓				↓	↓	↓							
S1003888	Catcott Edington and Chilton Moors SSSI	↑																						↓	↑	↓								
S1001081	Tealham and Tadham Moors SSSI	↓	↓	↓	↓	↓	↓																	↓	↓	↓								
S1001181	Westhay Moor SSSI	↓	↓	↓																														
S1000032	Westhay Heath SSSI																																	
S1000667	Shapwick Heath SSSI		↓																					↓	↓	↓								
S1002362	Moorlinch SSSI	↑	↑	↑	↑	↑	↑														↓			↓	↓									
S1002344	King's Sedgemoor SSSI		↓	↓	↑	↑	↑																	↑	↓	↓								
S1002426	Southlake Moor SSSI		↑	↑																														
S1003576	Curry and Hay Moors SSSI		↓	↓																				↑	↑	↑								
S1004511	West Sedgemoor SSSI	↑			↑	↑	↑						↑	↑	↑				↓	↓	↓			↓	↓	↓								
S1004500	Wet Moor SSSI	↓	↓	↓	↓	↑	↑												↓	↓	↓					↑								
S1002677	West Moor SSSI	↓	↑	↓	↓	↓	↓																											

Table 2 iii: Other species (Little Grebe and herons)

Site Code	Site Name	Little Grebe			Bittern			Great White Egret			Little Egret		
		Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term	Short term	Medium term	Long term
UK9010031	Somerset Levels and Moors SPA	↑		↑									
S1003888	Catcott Edington and Chilton Moors SSSI												
S1001081	Tealham and Tadham Moors SSSI												
S1001181	Westhay Moor SSSI												
S1000032	Westhay Heath SSSI												
S1000667	Shapwick Heath SSSI												
S1002362	Moorlinch SSSI												
S1002344	King's Sedgemoor SSSI												
S1002426	Southlake Moor SSSI												
S1003576	Curry and Hay Moors SSSI												
S1004511	West Sedgemoor SSSI												
S1004500	Wet Moor SSSI												
S1002677	West Moor SSSI												

Table 3: The most important SSSIs for waterbirds on the Somerset Levels and Moors SPA, colour-coded to indicate reasoning:

Key to table 3:

	SSSI mean of peak counts over the last five winters (2015/16–2019/20) was at least 20% of the mean of peak counts for Somerset Levels & Moors SPA over the same period.
	SSSI mean of peak counts over the last five winters was between 10% and 20% of the mean of peak count for Somerset Levels & Moors SPA over the same period.
	SSSI mean of peak counts over the last five winters was less than 10% of the SPA mean of peak count, but the count for the most recent winter (2019/20) was greater than 20% of the five winter SPA mean of peak counts.
	SSSI mean of peak counts over the last five winters was less than 10% of the SPA mean of peak count, but the count for the most recent winter was between 10% and 20% of the five winter SPA mean of peak counts.

Table 3.i: Swans and ducks

Code	Site	Mute Swan	Bewick's Swan	Whooper swan	Shoveler	Gadwall	Wigeon	Mallard	Pintail	Teal	Pochard	Tufted Duck
aS1003888	Catcott Edington and Chilton Moors SSSI											
aS1001081	Tealham and Tadham Moors SSSI											
aS1001181	Westhay Moor SSSI											
aS1000032	Westhay Heath SSSI											
aS1000667	Shapwick Heath SSSI											
aS1002362	Moorlinch SSSI											
aS1002344	King's Sedgemoor SSSI											
aS1002426	Southlake Moor SSSI											
aS1003576	Curry and Hay Moors SSSI											
aS1004511	West Sedgemoor SSSI											
aS1004500	Wet Moor SSSI											
aS1002677	West Moor SSSI											

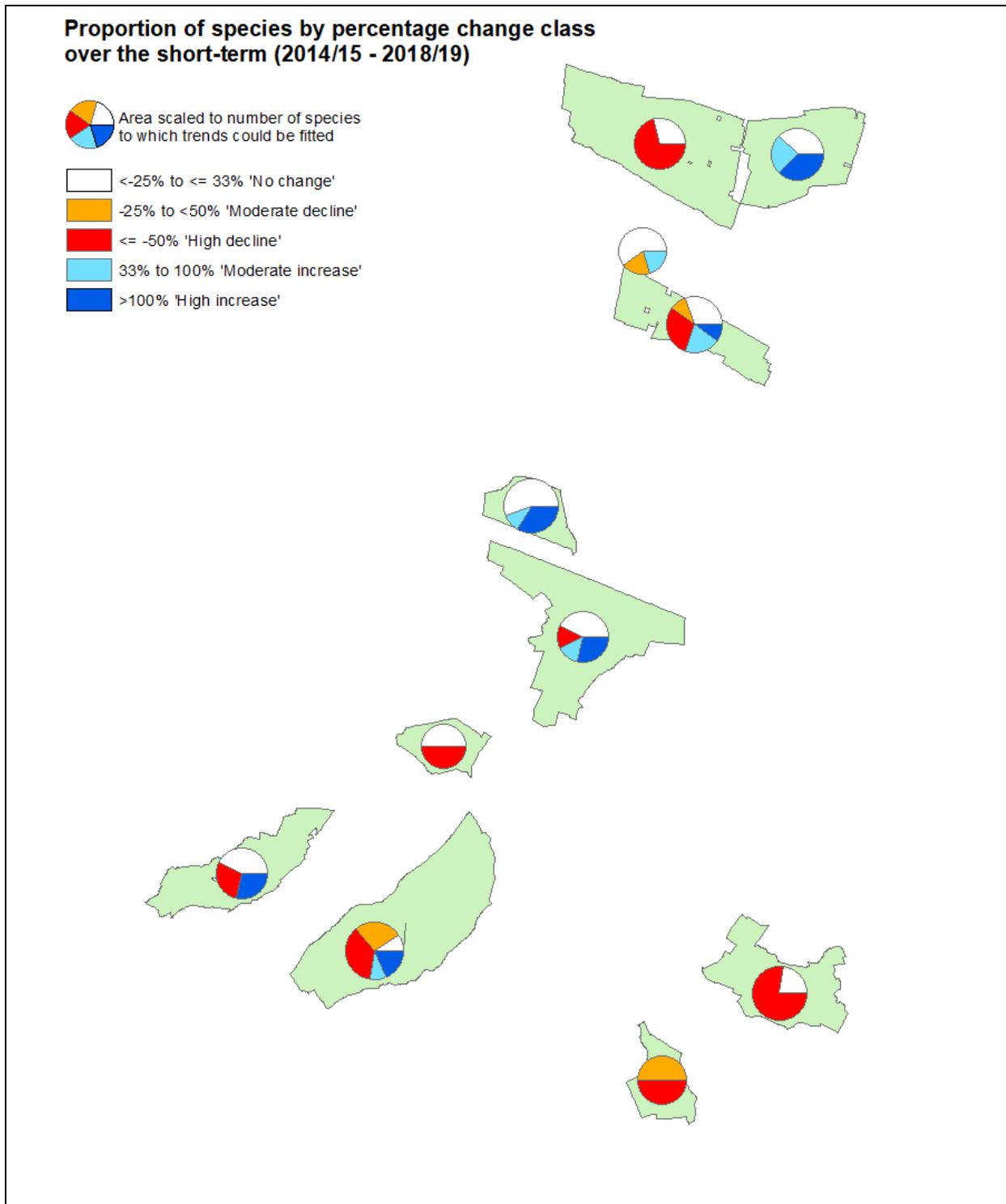
Table 3.ii: Waders

Code	Site	Lapwing	Golden Plover	Whimbrel	Curlew	Black-tailed Godwit	Ruff	Dunlin	Jack Snipe	Snipe	Green Sandpiper	Redshank
aS1003888	Catcott Edington and Chilton Moors SSSI											
aS1001081	Tealham and Tadham Moors SSSI											
aS1001181	Westhay Moor SSSI											
aS1000032	Westhay Heath SSSI											
aS1000667	Shapwick Heath SSSI											
aS1002362	Moorlinch SSSI											
aS1002344	King's Sedgemoor SSSI											
aS1002426	Southlake Moor SSSI											
aS1003576	Curry and Hay Moors SSSI											
aS1004511	West Sedgemoor SSSI											
aS1004500	Wet Moor SSSI											
aS1002677	West Moor SSSI											

Table 3.iii: Little Grebe and herons

Code	Site	Little Grebe	Bittern	Great White Egret	Little Egret
aS1003888	Catcott Edington and Chilton Moors SSSI				
aS1001081	Tealham and Tadham Moors SSSI				
aS1001181	Westhay Moor SSSI				
aS1000032	Westhay Heath SSSI				
aS1000667	Shapwick Heath SSSI				
aS1002362	Moorlinch SSSI				
aS1002344	King's Sedgemoor SSSI				
aS1002426	Southlake Moor SSSI				
aS1003576	Curry and Hay Moors SSSI				
aS1004511	West Sedgemoor SSSI				
aS1004500	Wet Moor SSSI				
aS1002677	West Moor SSSI				

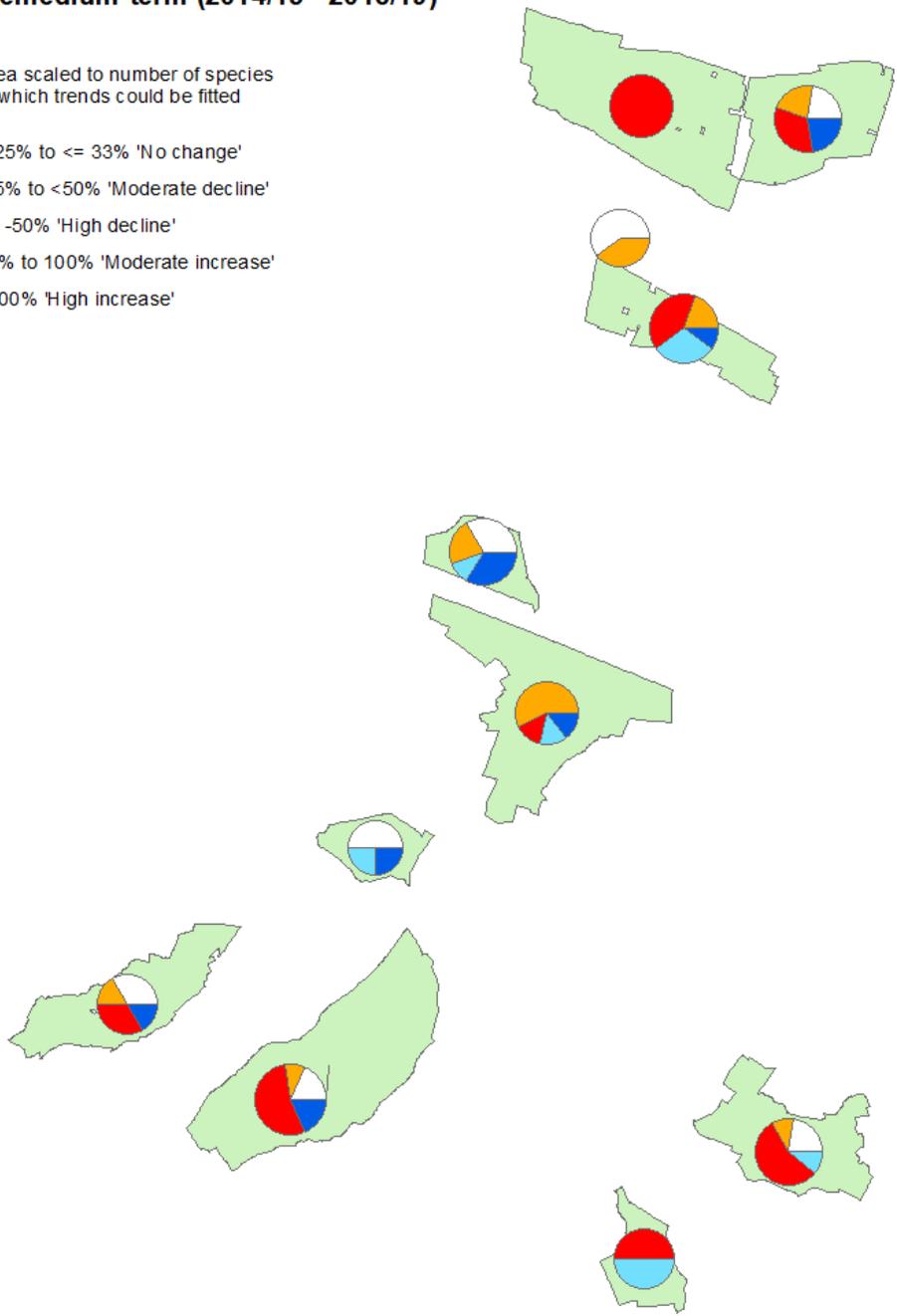
Figure 3.1 Proportion of species assessed for each of the short-, medium- and long-terms, that are classified as stable (white), moderate decline (orange), high decline (red), moderate increase (pale blue) & high increase (dark blue). Area of pie chart is proportional to number of species for which smoothed trends could be fitted and slices of pie charts are proportional to number of species in each class (meaning total area within each class across all SSSIs is proportional of total number failing within each class).



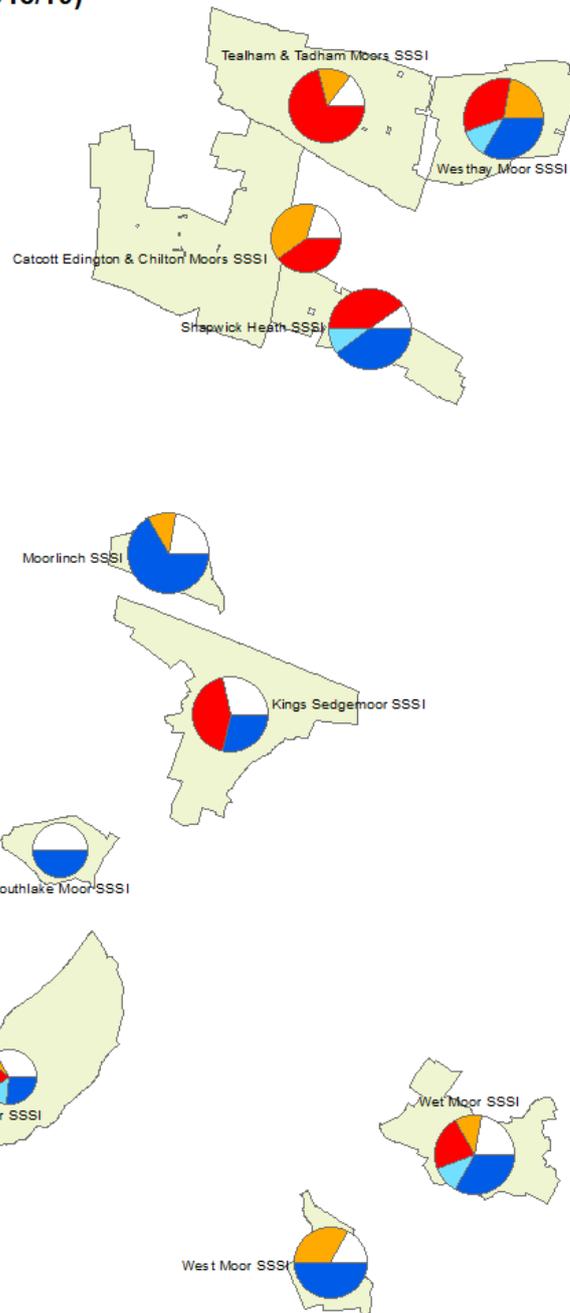
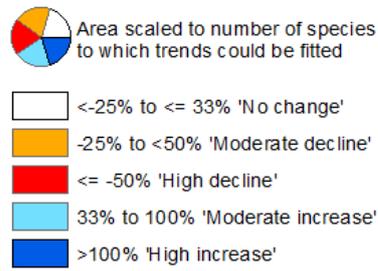
Proportion of species by percentage change class over the medium-term (2014/15 - 2018/19)

 Area scaled to number of species to which trends could be fitted

-  <-25% to <= 33% 'No change'
-  -25% to <50% 'Moderate decline'
-  <= -50% 'High decline'
-  33% to 100% 'Moderate increase'
-  >100% 'High increase'



Proportion of species by percentage change class over the long-term (2014/15 - 2018/19)



3.2. Sector level results

Five of the SSSIs underpinning the Somerset Levels & Moors SPA are further subdivided into lower level WeBS sectors, with data submitted separately for each sector. This means that, where sufficient data are available for a species, trends can be fitted for each sector on the site in order to assess whether the sector trends differ from the trend for the SSSI as a whole, and hence whether

there may be evidence that habitat suitability for a species may have deteriorated or improved on that part of the SSSI relative to the rest of the SSSI.

Sector level results are presented in Appendix B for the following SSSIs and are discussed (where relevant) in the species accounts and site summaries in Sections 4.1 and 4.2 respectively):

- Catcott Edington & Chilton Moors
- Moorlinch
- King’s Sedgemoor
- Curry & Hay Moors
- Wet Moor

3.3. Results for sites outwith the SPA

Sector levels results are presented in Appendix C for 11 sites (Table 4) and are discussed (where relevant) in the species accounts and site summaries in Sections 4.1 and 4.2 respectively). For these 11 sites, peak counts are also compared with the mean of peak counts for the SPA as a whole to identify non-SPA sites supporting potentially important numbers for a particular species.

Table 4: List of WeBS sites within the Somerset Levels & Moors outwith the SPA boundary

Sites for which trend graphs for one or more species are presented in Appendix C	Sites for which the time series was too short to support trends analyses	Sites for which waterbird numbers were insufficient to support trends analyses	Sites for which no data have been submitted
Thorney Moor (13327) King’s Moor (13329) Witcombe Bottom (13330) Hay Moor (Muchelney) (13370) North Moor SSSI (13332) Langmead and Weston Level SSSI (13360) Lang Moor (13342) East & West Wastes (13350) Butleigh Moor (13338) Huish Moor (13374) Walton Moor (13385)	Ham Wall North (13304) Waltons and Loxtons (13305) Neales Ganteys and Emerys (13306) Ham Wall Reserve – Godwins (13307) Aller Moor North (13324) Aller Moor South (13326) Queen's Sedgemoor (13361) Godney Moor (13358)	Gold Corner (13355) Tinney's Ground (13373)	Somerton Moor (13339)

Additionally, results are presented in Appendix D for Bridgwater Bay (including Steart Marshes). This area supports important numbers of waterbirds in its own right and there is likely to be movement of many individual birds between the SPA and Bridgwater Bay. Furthermore, the recent realignment /habitat improvements on Steart Marsh may now be attracting birds that would otherwise have

settled on sites within the Somerset Levels and Moors SPA. Hence, we would expect trends on Bridgwater Bay & Steart Marsh and those on the Somerset Levels and Moors SPA to be interrelated.

4. DISCUSSION AND CONCLUSIONS

4.1. Species trends

4.1.1. Mute Swan (*Cygnus olor*)

Qualifications: *Notable non-qualifying feature of Somerset Levels and Marshes SPA; Feature of Moorlinch SSSI; King's Sedgemoor SSSI; Specifically referred to in citations for Curry and Hay Moors SSSI, West Moor SSSI (from Table 1).*

Numbers of Mute Swan on the Somerset Levels & Moors declined between 2008/09 and around 2012/13 following a previous increase and have subsequently recovered following that decline (Appendix B). Numbers within the custom region have followed a broadly similar pattern and hence the proportion of the regional population supported by the Somerset Levels has remained relatively constant across the period considered by this report. The long-term trend is stable or increasing on all SSSIs, although there are declines on four SSSIs in the medium-term, reflecting the brief period of decline observed across the SPA and region.

The trends for the individual SSSIs are mostly stable or increasing, with substantial long-term increases occurring at the two sites for which Mute Swan is a feature (Curry & Hay Moors SSSI and West Moor SSSI). At Curry & Hay Moors, numbers have increased in the long-term on both East and West WeBS sectors, but recently there has been a slight decrease in both the short- and medium terms on the West sector (although this has not been of sufficient magnitude to exceed the 25% threshold to be considered a moderate decline). The trend graph for West Moor SSSI does show a brief drop in numbers occurred between 2006/07 and 2008/09 but numbers appeared to recover quickly.

Curry & Hay Moors has registered the highest counts over the most recent five winters (2015/16–2019/20), with the mean of peak counts representing more than 10% of the mean of peaks for the SPA as a whole. Two other SSSIs have held peaks of more than 10% of the SPA total over the same period (King's Sedgemoor and West Sedgemoor). Wet Moor recorded a peak count representing more than 10% of the SPA during the most recent winter (2019/20), although the five-year mean of peaks was below the 10% threshold for this SSSI.

Outwith the SPA, high peak counts of Mute Swan (more than 10% of the mean of peaks for the SPA for the period 2015/16–2019/20) have occurred at Witcombe Bottom several times since 2014/15, suggesting that this non-SPA site may be of some importance for this species.

4.1.2. Bewick's Swan (*Cygnus columbianus*)

Qualifications: *Feature of Somerset Levels and Moors SPA; Feature of Catcott Edington and Chilton Moors SSSI, Tealham and Tadham Moors SSSI, Moorlinch SSSI, King's Sedgemoor SSSI, Southlake Moor SSSI, Curry and Hay Moors SSSI, Wet Moor SSSI, West Moor SSSI; Additional species specifically referred to in the citation of West Sedgemoor SSSI (from Table 1)*

Numbers of overwintering Bewick's Swan have declined substantially over the long-term in both the south-west of England and the UK as a whole. The trend on the Somerset Levels & Moors SPA matches the wider regional and country trends and hence a higher level Alert for this species was raised for the SPA in the most recent WeBS Alerts report (Woodward *et al.* 2019). The trends presented in this report include three winters of additional data but the status of Bewick's Swan has

not improved and the species can effectively no longer be considered a regular winter visitor to the Somerset Levels & Moors SPA. As a result of this change in status, robust trends cannot be fitted for the species for any of the individual SSSIs within the SPA, and the graphs presented in Appendix B showing observations for the species at each site confirm that irregular occurrences of small numbers of Bewick's Swans at individual sites have become less frequent.

Bewick's Swan raised high alerts at all 16 UK sites for which it was assessed by Woodward *et al.* (2019) and for all four constituent countries of the UK. These widespread UK declines can be attributed to the fact that many birds no longer reach the UK but instead remain in Germany and other countries in the easterly parts of the wintering range, most likely as a consequence of climate change (Beekmann *et al.* 2019). Consequently, it is safe to say that the declines observed on the Somerset Levels & Moors SPA are not driven by local factors and do not indicate that habitat conditions on the SPA have worsened for this species. The abundance of this species on the SPA is unlikely to recover to previous levels unless further broadscale changes to wintering distribution occur in the future and reverse the recent pattern.

4.1.3. Whooper Swan (*Cygnus cygnus*)

Qualifications: *Feature of Wet moor SSSI (from table 1).*

In contrast to Bewick's Swan, Whooper Swan numbers have been increasing across the UK as a whole (Frost *et al.* 2021). The trend on the Somerset Levels & Moors SPA fits this pattern with records during WeBS counts being irregular on the SPA prior to 2000/01, but with small numbers present in most years subsequently. However, they are not yet seen regularly in sufficient numbers to enable trends to be formally assessed.

Shapwick Heath SSSI is the most regular site frequented by Whooper Swan with records in most winters from 2007/08. However, there have been no recent records at Wet Moor SSSI, where this species is mentioned on the SSSI citation (see Appendix A for links to SSSI citations).

The increases in the numbers of Whooper Swan wintering in the UK are believed to be driven by increases in the Icelandic population (Brides *et al.* 2021) and if this trend continues the wintering population in the Somerset Levels may show further increases in the future. This species frequents similar habitats to Bewick's Swan in the UK in winter and hence may use some of the locations that were formerly used by its near relative.

4.1.4. Shoveler (*Spatula cleat*)

Qualification: *Specifically referred to as a member of the waterbird assemblage in citation for Somerset Levels and Moors SPA; Feature of Catcott Edlington and Chilton Moors SSSI, Tealham and Tudham Moors SSSI, Wet Moor SSSI, West Moor SSSI (from Table 1).*

Numbers of Shoveler on the Somerset Levels & Moors SPA have fluctuated over the period covered by this report, following a slight increase between 1994/95 and 2000/01. This broadly matches the trend for the custom region suggesting that trends for the SPA are mostly driven by broadscale changes affecting the species rather than factors specifically affecting the SPA.

Within the SPA, high declines have occurred at West Sedgemoor SSSI, but these have been countered by high increases at Westhay Moor SSSI and Moorlinch SSSI and moderate increases at Shapwick Heath SSSI. Nonetheless, West Sedgemoor SSSI remains the most important site for

Shoveler within the SPA in terms of the average peak count for the most recent five year period (330), with Moorlinch SSSI also supporting more than 20% of the SPA peak count on average and Shapwick Heath more than 10%. However, the peak counts at West Sedgemoor have declined substantially and in 2019/20 the peak count was only ten individuals. Counts at Shapwick Heath and Moorlinch have continued to increase and were by far the two most important sites for the species in 2019/20. Although caution should be applied before reaching conclusions based on only the most recent year, the contrasting trends for these sites have been consistent for several years suggesting that a redistribution of the species across the SPA has occurred, which may indicate that there has either been a decline in habitat quality for this species at West Sedgemoor or, alternatively, may indicate that habitat quality at the other two sites has improved substantially so that these two sites are now preferred. High peak counts have also been recorded in recent years outwith the SPA boundary at Ham Wall North, and could possibly also suggest local redistribution of Shoveler, although it should be noted this site has only been counted since 2015/16.

It is noteworthy that none of the three most important sites for the species discussed above are among the five sites which have Shoveler as a feature. The most important of those five sites is Catcott Edington & Chilton Moors, where numbers have declined in the short- and medium- term, but increased over the long-term. The mean peak of 93 individuals at this site over the most recent five year period represents 8% of the peak for the SPA as a whole, and the peak in the most recent year (2019/20) was more than 10% of the SPA peak. Trends could not be fitted for any of the other sites with Shoveler as a feature, with the five year mean peaks counts remaining comparatively low at all four sites: Wet Moor SSSI (70 individuals), Curry & Hay Moors SSSI (74), Tealham & Tadham Moors (17); West Moor SSSI (2).

4.1.5. Gadwall (*Mareca strepera*)

Qualifications: *Specifically referred to as a member of the waterbird assemblage in citation for Somerset Levels and Moors SPA; Feature of Catcott Edington and Chilton Moors SSSI, Tealham and Tudham Moors SSSI, Wet Moor SSSI (from Table 1).*

Numbers of Gadwall have been generally increasing in the custom region since 1994/95, though with some fluctuations. The trend for the Somerset Levels & Moors SPA shows a similar pattern suggesting the trend can be attributed to broadscale changes in distribution for the species. Population changes can be assessed for three SSSIs (Westhay Moor, Westhay Heath, Shapwick Heath), all of which show increases across most or all time periods. Shapwick Heath and Westhay Moor are by far the most important sites for Gadwall, both supporting more than 20% of the SPA mean peak population over the most recent five year period (mean peak counts of 258 and 216 individuals respectively). The proportion of Gadwall using these two sites has fluctuated but is lower than it was during the 1990s and early 2000s. One possibility is that these two sites may have reached carrying capacity and that other sites within the SPA are becoming relatively more important for this species as numbers increase.

It is noteworthy that none of the three sites discussed above have Gadwall as a designated feature and trends could not be fitted for any of the three sites for which Gadwall was assessed for WeBS Alerts (Woodward *et al.* 2019). Peak numbers of Gadwall recorded at these three sites have been extremely low in comparison: Catcott Edington & Chilton Moors (mean peak count of 16 over the most recent five-year period); Wet Moor SSSI (11); Tealham & Tadham Moors SSSI (eight).

Outwith the SPA boundary, high peak counts have also been recorded in recent years at both Ham Wall North and Waltons & Loxtons. Although these sites have only been counted since 2015/16 both

appear to be important sites for this species and the birds using these sites are likely to be functionally linked to the SPA population.

4.1.6. Wigeon (*Mareca Penelope*)

Qualifications: Specifically referred to as a member of the waterbird assemblage in citation for Somerset Levels and Moors SPA; Feature of Catcott Edlington and Chilton Moors SSSI, Tealham and Tudham Moors SSSI, Wet Moor SSSI, West Moor SSSI, Moorlinch SSSI, Southlake Moor SSSI, Curry and Hay Moors SSSI, West Sedgemoor SSSI, West Moor SSSI (from Table 1).

The number of Wigeon within both the custom region and within the Somerset Levels & Moors SPA has remained relatively stable over the period covered by this report, but there has been a consistent decline in abundance across both the SPA and the custom region since 2015/16. The proportion of Wigeon wintering within the custom region that were recorded in the SPA show signs of a decline during this period, suggesting that these recent declines may have been driven by local factors affecting the SPA rather than broadscale changes in distribution. However, it should be noted that there are wide confidence limits around the estimated regional proportion of birds supported by the SPA, and hence there is some uncertainty about this conclusion.

The results for the SSSIs underlying the SPA show a mixed pattern for this species, with declines across all three time periods assessed at three SSSIs (Tealham & Tadham Moors; Kings Sedgemoor and West Sedgemoor) and increases at three (Westhay Moor, Shapwick Heath, Moorlinch and Curry & Hay Moors). Three SSSIs show mixed results with both declines and increases reported for different time periods (Catcott Edlington & Chilton Moors, Wet Moor, West Moor). In all three cases, increases have occurred over the long-term and declines have occurred over the short-term. Numbers have also fluctuated at the remaining SSSIs.

The most important sites for this species over the last five winters (2015/16–2019/20) have been West Sedgemoor (7,243 individuals) and Moorlinch (4,025). However, numbers at West Sedgemoor have declined substantially over that five year period and the peak at this site in 2019/20 was just 539 birds (3% of the five-year mean peak for the SPA as a whole). Both Shapwick Heath and Wet Moor SSSI have increased in importance in recent years, and both recorded mean peak counts of more than 10% of the SPA mean peak during 2015/16–2019/20 (3,104 and 2,691 individuals respectively). Wet Moor also recorded the highest peak count within the SPA in 2019/20 (5,348 individuals) although caution should be applied before assuming importance based on just one winter.

It seems likely that the recent decrease across the SPA as a whole may have been driven by the substantial decrease at West Sedgemoor SSSI, with some individuals likely relocating to other sites but others not doing so. The severity of the decline at this SSSI, along with declines in the other duck species at the site, suggests that factors on the SSSI are likely to be driving the declines and hence there would be merit in investigating whether there have been recent changes on the site which might have affected wintering populations.

Outwith the SPA, average numbers of Wigeon wintering at Bridgwater Bay and Steart Marshes have increased over the last ten years. This change could relate to habitat management including the creation of Steart Marshes, and some birds that would otherwise have wintered on the Somerset Levels & Moors SPA may now favour the Bridgwater Bay area. It is possible that this trend may continue but it should be noted that the peak counts at Bridgwater Bay (around 1,200 Wigeon) represent only a small proportion of the peak counts on the Somerset Levels and Moors SPA during

the period covered by this report (around 20,000–30,000 Wigeon). Therefore, the possible movement of some birds to Bridgwater Bay does not account for the extent of the decline within the SPA.

4.1.7. Mallard (*Anas platyrhynchos*)

Qualifications: Feature of Catcott Edlington and Chilton Moors SSSI, King's Sedgemoor SSSI, Curry and Hay Moors SSSI, Wet Moor SSSI, West Moor SSSI; Specifically referred to as a member of the waterbird aggregation in citation for Tealham and Tudham SSSI, Moorlinch SSSI (from Table 1).

Following increases up to around 2001/02, numbers of Mallard on the Somerset Levels & Moors SPA have declined. In 2019/20, numbers were slightly lower than they were in 1994/95 although the difference was not sufficient to be classed as a long-term decline (-18%). Numbers have also been declining across the custom region and the proportion of the region's Mallard supported by the Somerset Levels & Moors has remained broadly constant in spite of the declines, which suggests that the changes are driven by broadscale rather than local factors. Mallard from the continent make up a large proportion of the UK wintering population and the wintering numbers in the UK have been declining since the 1990s (Frost *et al.* 2021) even though breeding numbers have remained stable over that period (Harris *et al.* 2022) suggesting that fewer continental birds are wintering in the UK. This could be due to 'short-stopping', i.e., birds remaining further east during winter as a consequence of climate change (Sauter *et al.* 2010).

Declines have occurred across all SSSIs for at least one of the three time periods assessed, although there has been some variability in the timing of these declines and the trend graphs show fluctuations in numbers at different SSSIs. This suggests some movement between sites has occurred over time, which may indicate that some sites have improved or declined in suitability (at least relative to other sites) at different times during the period covered by this report.

In recent years, the two most important sites for the species are Moorlinch SSSI and West Sedgemoor SSSI, both of which have supported mean peak counts of more than 20% of the SPA population over 2015/16–2019/20. These show contrasting trends over the period covered by this report with consistent declines occurring at West Sedgemoor and shallow increases at Moorlinch until around 2002/03 with numbers there remaining relatively stable subsequently. Most Mallard at Moorlinch are usually observed on Greylake sector although North sector can also hold important numbers.

The species is not a designated feature at either of the two most important sites above but is a feature of five other SSSIs. The most important of these in terms of peak counts for the five most recent winters is Wet Moor SSSI, which supports around 5% of the SPA peak. Numbers have remained relatively stable at this site and at King's Sedgemoor and West Moor SSSI over the long-term, although at both Wet Moor and West Moor high declines have occurred over both the short- and medium-terms. Numbers have fluctuated at the other two sites designated for Mallard, with a strong decline in the late 1990s occurring at Catcott Edlington & Chilton Moors SSSI, followed by relative stability, and abundance peaking at Curry & Hay Moors SSSI in the early 2000s.

Whilst numbers have declined across the SPA as a whole due to broadscale factors, the changes within sectors suggest that different sectors have become more important (relative to others) at different times across the period covered by this report and hence that retaining a wide network of sites across the SPA may have helped ensure suitable habitat has been available for wintering Mallard throughout the period covered by this report.

Outwith the SPA, high peak counts of Mallard (more than 10% of the mean of peaks for the SPA for the period 2015/16–2019/20) occurred at Huish Moor in most winters between 2004/05 and 2009/10 inclusive, suggesting that this non-SPA site has potentially been important for this species in the past. However, numbers at the site have subsequently been well below 10% of the SPA total. Elsewhere outside the SPA, high peak counts have also been recorded more recently at both Ham Wall North and Waltons & Loxtons. Although these sites have only been counted since 2015/16 both appear to be important sites for this species and the birds using these sites are likely to be functionally linked to the SPA population.

4.1.8. Pintail (*Anas acuta*)

Qualifications: Notable non-qualifying feature of Somerset Levels and Marshes SPA; Feature of Curry and Hay Moors SSSI, Wet Moor SSSI, West Moor SSSI; Specifically referred to as a member of the waterbird aggregation in citation for Tealham and Tudham SSSI (from Table 1)

Numbers of Pintail wintering on the Somerset Levels & Moors SPA have fluctuated over the last 25 winters, with peaks around 2000/01, 2007/08 and 2013/14. A similar pattern occurs for the custom region although the peaks do not always correspond with those at the SPA making interpretation difficult but suggesting that the trends are most likely due to broadscale population changes rather than local site factors.

The abundance is currently at a low ebb, and consequently high declines are reported over the short- and medium- terms on the SPA, although numbers are stable over the long-term. Trends could be fitted for only three SSSIs, with the trend for Catcott Edington & Chilton Moors mirroring that of the SPA as a whole, whereas West Sedgemoor and Wet Moor show declines across all three time periods.

Given the recent history of abundance changes across the SPA, the current low numbers may simply be caused by ongoing fluctuations and numbers may recover naturally. However, it would be prudent to continue to carefully assess the counts for this species in the coming years and to undertake further investigation if numbers remain low or if further decreases occur.

West Sedgemoor is the most important SSSI for the species in recent years, supporting more than 20% of the population of the SPA, based on the mean of peak counts for the five year period 2015/16–2019/20. The three sites where the species is a designated feature (Curry & Hay Moors; West Moor and Wet Moor) also all recorded mean of peak counts representing more than 20% of the peak SPA population over the same period. At Curry & Hay Moors, both the East and West sectors record high peak numbers, whereas as Wet Moor Pintail mostly use the West sector. The Pintail at Catcott Edington & Chilton Moors use the Catcott Lows Reserve sector, though numbers here are now relatively small compared to other sites, following short- and medium-term declines.

Outwith the SPA, average numbers of Pintail wintering at Bridgwater Bay have increased substantially since 2010/11 and it is possible that some of the Pintail recorded in recent winters at Bridgwater Bay may be birds that would otherwise have wintered on the Somerset Levels & Moors SPA, and this may have contributed to the short- and medium-term declines reported for the SPA.

4.1.9. Teal (*Anas crecca*)

Qualifications: *Feature of Somerset Levels and Moors SPA; Feature of Catcott Edington and Chilton Moors SSSI, Tealham and Tadham Moors SSSI, Moorlinch SSSI, King's Sedgemoor SSSI, Southlake Moor SSSI, Curry and Hay Moors SSSI, SSSI West Sedgemoor SSSI, Wet Moor SSSI, West Moor (from Table 1)*

The number of Teal wintering on the Somerset Levels & Moors SPA has fluctuated over the last 25 winters, but there has been a downward trend since around 2010/11. The downward trend on the SPA is matched across the custom region suggesting it may be driven by broadscale population changes. However, the proportion of the region's Teal supported by the SPA appears to have decreased during the most recent five year period, so local factors could also be affecting numbers (though this is uncertain as there are wide confidence intervals around the proportional data).

The proportion of Teal wintering at nearby Bridgwater Bay has increased since around 2011/12, coinciding with the creation of Steart Marshes there as a coastal realignment project completed in 2014 (WWT, 2022), hence some birds that would otherwise have wintered on Somerset Levels and Moors SPA may have been attracted to the newly created site. However, as for Wigeon, the comparatively small increases at Bridgwater Bay do not account for the decreases of several thousand birds on the SPA.

Declines have occurred for Teal in one or more of the time periods across the majority of the SSSIs that make up the SPA. The two notable exceptions are Moorlinch SSSI and Kings Sedgemoor SSSI where substantial increases have occurred over the long-term following by stability over the medium- and short-terms. West Moor SSSI also shows substantial increases over the long-term although this is potentially misleading as the species was only recorded in very small numbers at both the start and end of the long-term period (e.g. a mean count of 8 birds was recorded in 2019/20). The short- and medium- term declines give a better indication of the current status of Teal at this site. The only other increases recorded for this species were at Southlake Moor SSSI (medium-term) and Westhay Moor SSSI (short-term), with the latter site showing a high decline over both the long- and medium- terms.

The vast majority of Teal using the SPA are found at West Sedgemoor or Moorlinch, with peak numbers over the most recent five year period (2015/16–2019/20) at these SSSIs representing 54% and 25% of the peak for the SPA as a whole respectively. The birds at Moorlinch are overwhelmingly using the Greylake sector.

It is unclear why Teal is declining in the southwest of England, although it is possible that distribution changes might be occurring as a result of climate as has occurred for some other duck and wader species. As discussed above, it is possible that movement of wintering birds to Steart Marshes could also have contributed towards declines on the SPA. However, given the scale of the declines further investigation into habitat conditions at key sites would be merited.

4.1.10. Pochard (*Aythya farina*)

Qualifications: *Feature of Curry and Hay Moors SSSI, Wet Moor SSSI, West Moor SSSI; Specifically referred to as a member of the waterbird aggregation in citation for Tealham and Tudham SSSI, Southlake Moor SSSI (from Table 1).*

Numbers of Pochard wintering on the Somerset Levels & Moors SPA have remained relatively stable over the 25 winters since 1994/95, with the exception of a peak in numbers which occurred between

1999/00 and 2004/05. The trend for the SPA contrasts with the trend for both the custom region and the south-west region which both show a reasonably consistent downward trend. Consequently, the Somerset Levels & Moors are becoming increasingly important for Pochard on a regional basis.

Trends can only be fitted for three of the SSSIs underpinning the SPA: Westhay Moor, Shapwick Heath and Curry & Hay Moors. All three of these sites show declining trends consistent with the decline observed across the custom region. Pochard at Westhay Moor overwhelmingly use the Westhay Moor & Godney Moor (West) sector. At Curry & Hay Moors, most historical records have been on the East sector although the only record in the most recent five winters (2 birds in January 2020) was on the West sector. Although these particular SSSIs have all show declining trends, these appear to have been balanced by higher counts on some of the other SSSIs in more recent winters (e.g. Wet Moor SSSI) and consequently the overall numbers across the SPA have remained relatively stable.

The most important SSSI for the species in recent years has been Shapwick Heath, where the mean of peak counts for the five year period 2015/16–2019/20 was more than 10% of the peak for the SPA as a whole. Elsewhere, Wet Moor SSSI registered a peak count in 2019/20 of more than 10% of the SPA; this may indicate that this SSSI is becoming more important for Pochard, though caution should be applied before identifying sites as important on the basis of a single year.

Outwith the SPA boundary, high peak counts have also been recorded in recent years at both Ham Wall North and Waltons & Loxtons. Although these sites have only been counted since 2015/16 both appear to be important sites for this species and the birds using these sites are likely to be functionally linked to the SPA population. It is possible that the declines noted above on the SSSIs within the SPA could relate to movement of birds from the SPA to these sites.

Widespread declines in Pochard abundance have occurred across western Europe since the 1980s although the causes remain unclear (Fox et al. 2016). Changes in wintering distribution, most likely driven by climate change, have been demonstrated for three other diving duck species, Tufted Duck, Goldeneye and Goosander (Lehikoinen et al. 2013); hence it is plausible that similar changes may also be contributed towards the high declines in the number of Pochard wintering in the UK.

4.1.11. Tufted Duck (*Aythya fuligula*)

Qualifications: *Feature of Curry and Hay Moors SSSI, Wet Moor SSSI, West Moor SSSI; Specifically referred to as a member of the waterbird aggregation in citation for Southlake Moor SSSI (from Table 1).*

Tufted Duck numbers have remained relatively stable on the Somerset Levels & Moors since around 1999/00, following an increase. Numbers across the custom region have been increasing consistently throughout this period and hence the proportion of the regional population has declined slightly. This may mean that the Somerset Levels & Moors is at carrying capacity for this species or alternatively that other sites in the region are comparatively becoming more attractive than the sites on the SPA for this species.

Trends can only be fitted for two of the SSSIs that make up the SPA. Shapwick Heath SSSI shows a strong increase over the long-term, moderate increase over the medium-term and stability in the short-term. In contrast, Westhay Moor SSSI, shows moderate declines in both the long- and medium-term and moderate increase in the short-term. It is hence possible that movement of birds may have occurred between these two sites, with Shapwick Heath now preferred. It is unclear

whether this could be due to a decline in habitat quality for this species at Westhay Moor or an improvement in the relative habitat quality at Shapwick Heath (or both). The more recent moderate increases at Westhay Moor suggest that, if habitat quality did decline at this site, this deterioration is no longer ongoing, although numbers of Tufted Duck using the SSSI remain much lower than they were historically. Tufted Duck at Westhay Moor are almost always observed on the Westhay Moor & Godney Moor (West) sector.

The peak counts for the most recent five year period (2015/16–2019/20) confirm that Shapwick Heath is now the preferred SSSI for Tufted Duck. The mean of the peak counts for this period represents 40% of the mean peak count for the SPA as a whole, and it was the only site where the five year mean of peak counts represented more than 10% of the mean peak count for the SPA. High peak counts in 2019/20 were recorded at three SSSIs (Catcott Edington & Chilton Moors; Westhay Moor; Wet Moor), though caution should be applied before identifying these sites as important on the basis of a single winter. Tufted Duck is mentioned on the SSSI citation as part of the waterbird aggregation at one of these three sites (Wet Moor). No birds were recorded during the last five winters at the other site for which it is mentioned on the SSSI citation (Southlake Moor), and only relatively small numbers were recorded on the other two sites which were assessed in the most recent Alerts report (Woodward *et al.* 2019) (Curry & Hay Moors and West Moor).

Outwith the SPA boundary, high peak counts have also been recorded in recent years at Ham Wall North, Waltons & Loxtons and Ham Wall Reserve - Godwins. Although these sites have only been counted since 2015/16 both appear to be important sites for this species and the birds using these sites are likely to be functionally linked to the SPA population.

4.1.12. Little Grebe (*Tathagatas ruficollis*)

Qualifications: *Feature of West Moor SSSI (from Table 1).*

Numbers of Little Grebe wintering on the Somerset Levels & Moors SPA have fluctuated over the last 25 winters, following an initial increase. The trend across the custom region also shows some fluctuations but with a slightly more consistent upward trend. Consequently, the proportion of the region's population supported by the SPA has decreased very slightly since around 2009/10, although there are wide confidence intervals around these proportions. A high increase has occurred in Little Grebe abundance over the long-term and a moderate increase over the short-term (with numbers stable over the medium-term).

Little Grebes are often thinly spread across suitable habitat and unobtrusive so are usually only recorded in small numbers during WeBS counts and may not be observed regularly on any particular WeBS sector, even if present. Consequently, trends could not be fitted for any of the SSSIs underpinning the SPA. The available data suggest that numbers may have declined at Shapwick Heath and Westhay Moor but increased at Catcott Edington & Chilton Moors and West Moor, but this should be treated with caution in view of the lack of sufficient data to produce trends.

All Little Grebe records at Westhay Moor have occurred on the Westhay Moor & Godney Moor (West) sector. Those at Catcott Edington & Chilton Moors have mostly been on the Catcott Lows reserve, but the species was also observed during WeBS counts in 2019/20 on the East sector.

The species is recorded in small numbers across many of the SSSIs that make up the SPA. It is a designated feature for only one site (West Moor SSSI) where (as mentioned above) recent WeBS

counts have been encouraging but it is difficult to reach a firm conclusion about the status of the species on the site.

Outwith the SPA, high peak counts have been recorded in recent years at Waltons & Loxtons and Ham Wall Reserve – Godwins. Whilst these sites have only been counted since 2015/16 the recent counts from these sites suggest they may be as important or possibly more important for this species than any of the individual sites within the SPA.

4.1.13. Lapwing (*Vanellus vanellus*)

Qualifications: *Feature of Somerset Levels and Moors SPA; Feature of Catcott Edington and Chilton Moors SSSI, Tealham and Tadham Moors SSSI, Moorlinch SSSI, King's Sedgemoor SSSI, Curry and Hay Moors SSSI, West Sedgemoor SSSI, Wet Moor SSSI, West Moor SSSI; Additional species specifically referred to in the citation of Southlake Moor SSSI (from Table 1).*

Lapwing is a feature of the Somerset Levels & Moors SPA as a whole and is widespread, being seen annually across almost all the SSSIs that underpin the SPA and on most of the individual sectors within those SSSIs that are subdivided, although on some sites and sectors it is recorded irregularly and only in small numbers.

The total numbers of Lapwing wintering on the Somerset Levels & Moors have shown some fluctuations but have remained relatively stable over the 25 winters to 2019/20, although numbers were slightly higher at the start of the period and the long-term trend for the SPA (-26%) is just above the threshold to classify change as a moderate decline. The trend for the custom region is broadly similar to that of the SPA, although it should be noted that the SPA supports a high proportion of the region's Lapwing (usually 70%–80%) and therefore the SPA trend has a strong influence on the regional trend.

The SSSI results show highly variable trends, with increases occurring at Moorlinch, Southlake Moor, Catcott Edington & Chilton Moors and West Sedgemoor, and decreases at Tealham & Tadham Moors, Wet Moor, Westhay Moor, Curry & Hay Moors, Kings Sedgemoor and Shapwick Heath. Numbers have fluctuated at West Moor with both declines and increases reported across the different time periods.

At Catcott Edington & Chilton Moors, the sector level results show that short-term increases have occurred on the Catcott Lows Reserve and Chilton Moor sectors (though the short-term increases on the latter of these two sectors do not compensate for long-term decreases there). In contrast, declines have occurred on the East, West and Burtle Moor sectors. These trends may indicate that changes in habitat suitability for Lapwing may have occurred within the site. Similarly, at Moorlinch, increases or stability on Greylake sector contrast with declines on Sutton Hams and North sectors.

By far the most important site for Lapwing is West Sedgemoor, with peak counts at this site reaching around 50% of the peak wintering population of the SPA, based on the five year mean of peaks for 2015/16–2019/20. Moorlinch SSSI also supports more than 20% of the SPA population (based on peak counts). Most of the Lapwing seen at Moorlinch are recorded on the Greylake sector although small numbers are also recorded on the other two sectors that make up the site (North sector and Sutton Hams sector).

These results suggest that, whilst numbers have remained relatively stable across the SPA as a whole, the species has moved between (and sometimes within) sites to take advantage of different

habitat conditions from winter to winter, which may indicate changes in relative habitat attractiveness across sites, This reflects the more nomadic nature of this species during winter in comparison to many of the other wader species considered in this report which are more faithful to wintering sites.

Outwith the SPA, high peak counts have occasionally been recorded at some of the non-SPA sites assessed in this report, usually for a single winter, again reflecting the opportunistic habits of this species (Appendix C).

4.1.14. Golden Plover (*Pluvialis apricaria*)

Qualifications: *Feature of Somerset Levels and Moors SPA; Feature of Catcott Edington and Chilton Moors SSSI, Tealham and Tadham Moors SSSI, Moorlinch SSSI, King's Sedgemoor SSSI, Curry and Hay Moors SSSI, West Sedgemoor SSSI, Wet Moor SSSI, West Moor SSSI (from Table 1).*

This species is a feature of the SPA as a whole and, like Lapwing, it can be found in large flocks numbering into the thousands and sometimes into the tens of thousands. However, it has a more restricted distribution than Lapwing with most birds usually being found at a small number of SSSIs, although small numbers are occasionally present away from these favoured sites.

Numbers of Golden Plover wintering on the Somerset Levels & Moors SPA have increased over the long-term, with particularly high peak counts of 26,000 and 39,000 recorded in 2018/19 and 2019/20 respectively. Consequently, strong increases have been recorded for the SPA across all three time periods considered. The trend for the custom region is broadly similar although it should be noted that the SPA supports a high proportion of the region's Golden Plover (usually 70%–90%) and therefore the SPA trend has a strong influence on the regional trend.

These strong increases have been focused predominantly on three sites: Moorlinch, Kings Sedgemoor and West Sedgemoor, with numbers also increasing at Wet Moor over the long-term but decreasing there in the short-term. In contrast, numbers have declined at both Tealham & Tadham Moors and West Moor with Golden Plover no longer wintering on the first of these two sites.

At Moorlinch, almost all Golden Plover are recorded on the Greylake sector. Both East and West sectors have been used at Kings Sedgemoor, although the West sector has recorded much larger peak numbers of Golden Plover over the most recent five winters, and numbers have declined in the short- and medium- terms on East sector but have increased across all periods on West sector.

This species often associates with Lapwing during winter and, as for Lapwing, West Sedgemoor is by far the most important site within the SPA for Golden Plover, with the mean peak for the most recent five-year period (2015/16–2019/20) representing around 82% of the SPA mean peak for the same period. Moorlinch SSSI was the only other site for which the mean peak count was greater than 10% of the mean peak for the SPA.

Away from the sites discussed above, Golden Plover is no longer recorded regularly during WeBS counts at Curry & Hay Moors or Catcott Edington & Chilton Moors. However, the species has occurred more regularly in small numbers in recent winters at Wet Moor, where numbers counted peaked at 900 in March 2016, although no birds were recorded there in 2019/20.

As for Lapwing, the changes in distribution across the site are likely to reflect changes in relative habitat condition across the site (and within the site at King's Sedgemoor) which could indicate

improvements in suitability on some sites and deterioration in suitability at others (or both). The substantial increases at West Sedgemoor, and to a lesser extent Moorlinch, suggest that the current conditions at these sites are particularly favourable for Golden Plover and can support very high numbers, so it does not necessarily follow those conditions have worsened at the sites where the species has decreased.

Outwith the SPA, high peak counts have occasionally been recorded at some of the non-SPA sites assessed in this report, usually for a single winter (Appendix C), again (like Lapwing) reflecting the opportunistic habits of this species. These counts also demonstrate the importance of the wider area to Golden Plover (and other species) in years when changes to habitat conditions occur across the SPA: Three of the high peak counts at non-SPA sites occurred in 2012/13 when the area suffered extensive flooding (at King's Moor, Witcombe Bottom and Huish Moor).

4.1.15. Whimbrel (*Numenius Phaseolus*)

Qualifications: Notable non-qualifying feature of Somerset Levels and Marshes SPA; Feature of Catcott Edington and Chilton Moors SSSI, Moorlinch SSSI, Curry and Hay Moors SSSI, West Sedgemoor SSSI, Wet Moor SSSI, West Moor SSSI; Additional species specifically referred to in the citation of King's Sedgemoor SSSI (from Table 1).

Whimbrel is a passage migrant on the Somerset Levels & Moors SPA, as is the case across most of the UK as a whole with the exception of a very small breeding population restricted almost entirely to Shetland.

WeBS data does not provide a robust data for monitoring numbers of birds on passage where daily turnover is of prime importance and not captured by monthly counts. That aside, WeBS records contain very few Whimbrel observations during passage periods across Somerset levels and Moors SPA. Consequently, no trends can be fitted for this species, occurrence is intermittent and then numbers recorded are very low and so no interpretation for this species based on WeBS data can be provided.

4.1.16. Curlew (*Numenius arcuate*)

Qualifications: Notable non-qualifying feature of Somerset Levels and Marshes SPA; Feature of Wet Moor SSSI, West Moor SSSI (from Table 1).

Curlew typically overwinter on estuaries rather than in inland areas and hence relatively few individuals winter within the Somerset Levels & Moors SPA each year, with average counts across the winter normally totalling fewer than ten individuals and peak counts fewer than 40. Consequently, there are insufficient data to produce trends for Curlew for the SPA as a whole or for any of the SSSIs underpinning the SPA. Peak counts usually occur in March which is the final month included within the WeBS winter period: the peak counts shown in the graphs in Appendix B are therefore likely to represent returning breeding birds or migrants rather than overwintering birds.

Two SSSIs have Curlew as a designated feature, in both cases this is as a breeding species: Wet Moor and West Moor. At both sites Curlew are irregularly recorded during the winter, with counts usually involving only one or two individuals and only rarely exceeding five, most recently at Wet Moor between 2008/09 and 2011/12.

During the WeBS winter period, the species is most often recorded at West Sedgemoor SSSI, where the five-year mean peak count between 2015/16 and 2019/20 was 16 individuals. As for the SPA as a whole, the vast majority of Curlew at this site are observed in March and Curlew are rarely present during midwinter.

4.1.17. Black-tailed Godwit (*Limosa limosa*)

Qualifications: *Feature of Southlake Moor SSSI (from Table 1).*

The numbers of Black-tailed Godwit recorded by WeBS Core counts on the Somerset Levels & Moors SPA has increased substantially since the late 1990s when few birds were recorded, and a mean peak count of 277 birds was recorded during 2015/16–2019/20. It should be noted that this included a particularly high peak count of 639 in 2018/19 (January count) and that numbers dropped off again to a peak of 107 in 2019/20 (November count). It is possible that the high peak in 2018/19 was exceptional, although numbers wintering across the custom region (and across the UK as a whole) have increased substantially (Frost *et al.* 2021) and hence large flocks could be observed more frequently in the future. The increases across the UK in winter have been driven by substantial increases and range expansion in the Icelandic breeding population, most likely driven by climate change (Alves *et al.* 2019).

The Black-tailed Godwit wintering on the Somerset Levels are normally observed at West Sedgemoor SSSI and are only irregularly seen at other SSSIs. Hence, the trend for West Sedgemoor broadly matches that for the SPA as a whole.

Although most wintering Black-tailed Godwit are observed on West Sedgemoor SSSI, the species is not a designated feature at this site but is named as a feature on the SSSI citation at Southlake Moor SSSI. Few birds have been observed during WeBS counts at the latter site in recent winters but, along with West Sedgemoor, it is identified as an important site as a result of an exceptional flock of 240 birds recorded during one count in January 2018.

4.1.18. Ruff (*Calidris pugnax*)

Qualifications: *Notable non-qualifying feature of Somerset Levels and Marshes SPA; Feature of Curry and Hay Moors SSSI, Wet Moor SSSI, West Moor SSSI (from Table 1).*

This species is predominantly recorded as a passage migrant on the Somerset Levels & Moors SPA and is recorded in insufficient numbers in winter to enable trends to be fitted for either the SPA as a whole or for any of the SSSIs which underpin it.

Numbers of Ruff overwintering on the SPA seem to have declined since around 2010/11. Peak counts of 20 or more birds seen in just over 50% of winters prior to that date, but the mean of peak counts dropped to 11 for 2010/11–2014/15 and to just three for 2016/16–2019/20.

Most of the Ruff recorded on the site have been observed at West Sedgemoor (where the few recent records have been) or at King's Sedgemoor.

Decreases in the number of Ruff on passage and in winter in the UK are believed to have been driven by a shift in breeding distribution from the European Arctic towards western Siberia. This has meant that fewer birds now migrate through western Europe. Deterioration in habitat quality on their main staging areas, particularly in the Netherlands, may have contributed to the observed distribution changes (Rakhimberdiev *et al.* 2011, Verkuil *et al.* 2012).

4.1.19. Dunlin (*Calidris alpina*)

Qualifications: *Feature of King's Sedgemoor SSSI, Curry and Hay Moors SSSI, West Sedgemoor SSSI, Wet Moor SSSI, West Moor SSSI; Additional species specifically referred to in the citation of Catcott Edington and Chilton Moors SSSI, Tealham and Tadham Moors SSSI, Southlake SSSI (from Table 1).*

The number of Dunlin overwintering on the Somerset Levels & Moors SPA has fluctuated since 1994/95 but has shown a general downward trend, which has been particularly apparent since 2014/15. Consequently, the number of Dunlin on the SPA was lower in 2019/20 than at any time during the 25 winters being assessed, and a strong decline has been recorded across all three time periods. The trend for the custom region is broadly similar to the SPA trend; hence the declines observed on the SPA are most likely due to broadscale distribution changes rather than site-specific issues. There is evidence that the wintering range of several wader species in Europe, including Dunlin, may be shifting towards the north-east in Britain and, on a wider scale, in Europe (Austin & Rehfisch 2005; Maclean *et al.* 2008).

The decline on the SPA is particularly apparent at both West Sedgemoor and Wet Moor, with strong long-term declines recorded at both sites (-88% in both cases). A moderate decline over the long-term was recorded at the only other site for which trends could be fitted (Moorlinch SSSI), with numbers stable at this SSSI in the short- and medium-terms.

Of these three sites, West Sedgemoor has historically been by far the most important. This has recently supported around three-quarters of the Dunlin using the SPA, based on a comparison of the most recent five year mean of peak counts for the SSSI and the SPA, with Moorlinch holding most of the remaining birds. However, in the most recent winter (2019/20), the peak count for Moorlinch (50 individuals) was higher than that for West Sedgemoor (18 birds).

At Moorlinch, the vast majority of records of Dunlin and all recent records have occurred on the Greylake sector. At Wet Moor, the West sector has been preferred in recent winters; however, peak numbers were similar of both sectors in the early 2000s and small numbers of Dunlin are occasionally still recorded on the East sector.

The species is also a feature at West Moor (as a member of the waterbird aggregation) but since January 1996 when 105 were counted, there have only been five records during WeBS counts, all of either one or two birds.

Outwith the SPA, high peak counts of Dunlin (more than 10% of the mean of peaks for the SPA for the period 2015/16–2019/20) have also occurred on several occasions during the period covered by this report at Hay Moor (Muchelney) and Huish Moor, suggesting that these sites may also provide potentially important habitat for the SPA population of this species, at least occasionally.

4.1.20. Jack Snipe (*Lymnocyptes minimus*)

Qualifications: *Feature of King's Sedgemoor SSSI, West Moor SSSI (from Table 1).*

Jack Snipe is highly cryptic and difficult to count; hence WeBS counts do not provide a reliable method for monitoring the species and there were insufficient data to produce trends for the SPA or for any of the SSSIs which underpin it. The peak count for the SPA was 20 birds in 2012/13, but it is likely that the total number of Jack Snipe wintering across the SPA is substantially greater. The limited numbers of records do not show a clear pattern and is it not possible to infer anything about

trends from these records. Counts are likely to depend strongly on weather conditions on survey dates (which can make birds more likely to be visible) and on whether observers make an effort to look specifically for this species if they know it is present on a site.

Jack Snipe is most consistently observed at Wet Moor SSSI, where it is found on the East sector.

The species is mentioned on the SSSI citation as a feature at two SSSIs (Kings Sedgemoor and West Moor), but has not been observed on WeBS counts over the period covered by this report. However, given the cryptic nature of the species this does not necessarily mean that it was absent and there is a high chance that it will be present but not detected during WeBS counts. Recent advances in technology may mean that it may become easier to monitor some cryptic species such as Jack Snipe in the future through the use of thermal imaging techniques: there has been some recent discussion of such techniques on online forums although no formal studies of methodology have so far been published.

Although Jack Snipe cannot currently be monitored robustly, it shares similar habitat preferences to Snipe and therefore, where changes in Snipe numbers on the SPA have been attributed to local factors, Jack Snipe abundance may have been similarly affected. Hence, it is likely that any actions taken to benefit Snipe will also benefit this species.

4.1.21. Snipe (*Gallinago gallinago*)

Qualifications: *Feature of Catcott Edington and Chilton Moors SSSI, Tealham and Tadham Moors SSSI, Moorlinch SSSI, King's Sedgemoor SSSI, Curry and Hay Moors SSSI, West Sedgemoor SSSI, Wet Moor SSSI, West Moor SSSI; Additional species specifically referred to in the citation of Southlake Moor SSSI; Notable non-qualifying feature of Somerset Levels and Marshes SPA (from Table 1).*

Numbers of Snipe overwintering on Somerset Levels & Moors SPA have shown a general declining trend since the mid-1990s albeit with some fluctuations in abundance during that period. The trend for the custom region is similar but the underlying decline is shallower and less clear-cut. Consequently, the proportion of the region's Snipe supported by the SPA has declined, particularly since around 2011/12.

Trends at most of the SSSIs for which sufficient data are available mirror the declines for the site as a whole. However, Curry & Hay Moors shows strong increases across all three time periods, and strong increases at Wet Moor over the long-term have been followed by stability in the medium- and short-terms. Numbers have been relatively stable at Moorlinch SSSI. A moderate increase has also been observed at Kings Sedgemoor over the short-term, although this does not fully reverse the long-term declines at this site.

The most important sites for Snipe are West Sedgemoor and Wet Moor, based on the mean peak count for the five most recent winters assessed (2015/16–2019/20). Moorlinch and Catcott Edington & Chilton Moors were the next most important sites based on recent winters. In 2019/20, Moorlinch recorded the highest peak count, however, and peak numbers at both West Sedgemoor and Wet Moor were substantially lower than the recent average. It would therefore be prudent to carefully assess WeBS counts in the coming winters to ascertain whether this represents a temporary or a longer term change in distribution within the SPA.

It should be noted that Snipe can be potentially affected by changes in water levels which may have an impact both on their presence at a site and on their detectability during WeBS counts. This could

explain the fluctuations in abundance for the SPA as a whole and those on some of the individual SSSIs. The difficulties in detecting Snipe (relative to most other wader and wildfowl species) make it more difficult to robustly interpret trends for this species. However, Snipe are counted widely across the SPA and in sufficient numbers to enable us to be confident that the declines observed across the SPA are likely to be genuine.

The differing site trends suggest that some redistribution between sites may have taken place (and may be ongoing), which could indicate that changes in relative habitat quality between different SSSIs has occurred, and the decline in the proportion of the region's Snipe using the SPA suggests that local factors could be affecting habitat suitability for this species on those SSSIs where a decline has been observed.

A substantial increase in the number of wintering Snipe at Bridgwater Bay occurred between 2014/15 and 2016/17, although this may have been temporary as numbers had declined again by 2019/20. However, the increases at Bridgwater Bay do not explain the declines on the Somerset Levels & Moors, as numbers on the SPA also increased slightly at the same time.

Three of the non-SPA sites (East & West Wastes, Walton Moor and Huish Moor) have recorded important peak numbers of Snipe on more than two occasions across the period covered by this report, with the five-year mean of peak count for Walton Hall for 2015/16–2019/20 (73) falling just below 10% of the mean of peak counts for the SPA for the same period. East & West Wastes has not been counted since 2016/17 and the high peak counts at Huish Moor occurred between 2007/08 and 2012/13 so it is unclear whether important numbers of waterbirds are still present at these sites. However, these records suggest that potentially important numbers of Snipe may be present outwith the SSSIs that fall within the SPA boundary and hence that the condition of non-SPA sites may also be important for this species.

4.1.22. Green Sandpiper (*Tringa ochropus*)

Qualifications: *Notable non-qualifying feature of Somerset Levels and Marshes SPA; Feature of King's Sedgemoor SSSI (from Table 1).*

Green Sandpiper is predominantly recorded as a passage migrant on the Somerset Levels & Moors SPA and is recorded in insufficient numbers in winter to enable trends to be fitted for either the SPA as a whole or for any of the SSSIs which underpin it.

Numbers of Green Sandpiper overwintering on the SPA have remained stable over the 25 winters covered by this report, averaging fewer than five birds across the winter months in most winters. Peak counts have been variable ranging from a low of three (on three different winters) to a high of 14 in 2008/09. Birds have been observed during winter on several different SSSIs with no clear preference shown for any site.

The species is a feature of King's Sedgemoor SSSI, but none were observed here during the most recent five winter period (2015/16–2019/20).

4.1.23. Redshank (*Tringa totanus*)

Qualifications: *Notable non-qualifying feature of Somerset Levels and Marshes SPA; Feature of Wet Moor SSSI, West Moor SSSI; Additional species specifically referred to in the citation of King's Sedgemoor (from Table 1).*

Redshank is only recorded in small numbers on the Somerset Levels & Moors SPA in winter and is recorded in insufficient numbers in winter to enable trends to be assessed for either the SPA as a whole or for any of the SSSIs which underpin it. Whilst one or two birds are occasionally recorded in midwinter, the vast majority are observed in late winter and are likely to be either returning breeders or migrants.

Apart from an unusually large peak count of 220 in January 2005 at Catcott Edington & Chilton Moors, the peak number of Redshank has averaged just under ten birds for most of the 25 winters covered by this report, and numbers appear to have further decreased recently with a mean peak count of just two birds being recorded for the most recent five winters (2015/16–2019/20). Most recent records of the species have occurred at Moorlinch SSSI.

The species is a feature at three sites, King's Sedgemoor, Wet Moor and West Moor, in all three cases as a breeding species. The only wintering record at these sites in the last ten winters was a flock of 20 at King's Sedgemoor in February 2014.

4.1.24. Bittern (*Botaurus stellaris*)

Qualifications: *Specifically referred to as a member of the waterbird assemblage in citation for Somerset Levels and Moors SPA; Feature of Curry and Hay Moors SSSI (from Table 1).*

Bittern is a designated feature on Curry & Hay Moors SSSI. The species is difficult to survey due to its cryptic habits, and hence WeBS counts cannot provide a robust assessment of wintering numbers for the SPA or any of the SSSIs as there are insufficient data. The WeBS data can provide a rough guide to the trend for this species across the SPA as a whole, however, provided it can be assumed that the probability of detecting any one individual has not changed over time. The data that are available do suggest that there have been substantial recent increases in numbers of Bittern recorded during winter on the site, based on the peak numbers of Bittern reported over the last ten years. However, whilst small numbers are recorded throughout the winter, it should be noted that peak counts usually occur in February or March. This late winter peak seems most likely to be due overwintering birds becoming more visible and easier to detect ahead of the breeding season (e.g. as resident males begin to boom), although it may include some migrants as well as wintering Bitterns. The biggest increases appear to have occurred at Shapwick Heath SSSI, although much greater caution should be applied to interpreting raw data at the site level than for the SPA as a whole.

These apparent increases on the SPA are in line with the increases observed in wintering numbers of Bittern across the UK as a whole (Frost *et al.* 2021).

4.1.25. Great White Egret (*Ardea alba*)

Qualifications: *Notable non-qualifying feature of Somerset Levels and Marshes SPA;*

Great White Egret is a recent colonist to the UK and the Somerset Levels & Moors SPA is the location of the first breeding record in the UK which occurred at Shapwick Heath in 2012 (Morgan *et al.* 2022). The Somerset Levels remains the most important UK breeding site, with 25 nests at ten separate locations in 2021 making up 10% of the UK total (Morgan *et al.* 2021). The first colonising birds appeared on the site in the late-2000s and numbers have continued to increase with a peak winter count of 62 in 2019/20 (March count). Some records now occur across almost all the SSSIs that make up the SPA, and the graphs show a clear increase in numbers of Great White Egret on the individual SSSIs and on the SPA as a whole although, due to the absence of the species at the start of the period of interest, there are insufficient data to formally assess trends.

4.1.26. Little Egret (*Egretta garzetta*)

Qualifications: *Notable non-qualifying feature of Somerset Levels and Marshes SPA;*

Little Egret is a recent colonist to the UK, first appearing in significant number in 1989 with the first confirmed nesting in Dorset in 1996 (Lock & Cook 1998), and the species has rapidly increased and expanded its range and now breeds throughout England and Wales (BTO Heronries Census data). The data from the Somerset Levels & Moors SPA show that wintering numbers began to pick up at the beginning of the current century and have stabilised after around 2007/08 at a mean count of around 40–60 birds across the winter, albeit with some fluctuations particularly in peak counts with an unusually high peak total count of 173 birds recorded in 2012/13 (March count).

Trends for Little Egret cannot be assessed for any of the individual SSSIs underpinning the SPA, but the graphs for most SSSIs show a similar pattern in the WeBS counts for the SPA as a whole with increases followed by broad stability, though the fluctuating numbers across different sites from year to year make the site trends much more difficult to interpret than the overall trend for the SPA (and consequently trend lines cannot be shown for individual sites).

Outwith the SPA, high peak counts of Little Egret (more than 10% of the mean of peaks for the SPA for the period 2015/16–2019/20) have occurred at King’s Moor during five of the winters since 2012/13, suggesting that this non-SPA site is potentially important for this species.

4.2. Site Accounts

4.2.1. Catcott Edington & Chilton Moors SSSI

The trends for Catcott Edington & Chilton Moors are difficult to interpret for the species that could be assessed. Mute Swan and Wigeon have performed better on this SSSI across all three time periods, but trends for Shoveler and Mallard were better than the SPA in the long-term but worse in the medium-term (with Shoveler also performing worse than the whole SPA in the short-term).

In comparison to the most recent Alerts report (Woodward *et al.* 2019) the three years of additional data for this site would not raise alerts against any additional species. However, the updated results show moderate declines for Wigeon in both the short- and medium-term (short-term only in the Alerts report) and a moderate decline is now also shown for Mallard in the medium-term, in addition to the high decline in the long-term previously reported.

Sector level results can only be assessed across the whole SSSI for Mute Swan and Lapwing. For Mute Swan, the long-term decline on Catcott Lows Reserve contrasts with the long-term increases on the site as a whole and on all other sectors. For Lapwing the sector results are variable and difficult to interpret although the data suggest the species may no longer use the Catcott and Edington and Chilton and Burtle Moors (west) sector. Results for duck species could only be fitted for the Catcott Lows Reserve due to sparsity of data on individual sectors; few ducks are found regularly outside this sector and consequently the sector trends for duck species match those for the SSSI as a whole.

These results suggest that conditions for waterbirds on the site have improved relative to the other SSSIs within the SPA in the long-term but may have deteriorated relative to other SSSIs in the short- and medium-term. The proximity of this site to other SSSIs where trends are improving (including Shapwick Heath and Moorlinch) may mean that declines for some species are due to these other sites becoming relatively more attractive to waterbirds rather than due to habitat conditions having deteriorated at Catcott Edington & Chilton Moors. However, it would be prudent to review the habitat on the site to assess whether declines may have not been driven or exacerbated by site-specific factors.

4.2.2. Tealham & Tadham Moors SSSI

The data for Tealham & Tadham Moors show strong declines across one or more of the three assessment periods for all seven species for which trends could be fitted. These include Mute Swan, Lapwing and Golden Plover, all of which have increased over one or more periods across the SPA as a whole.

In comparison to the most recent Alerts report (Woodward *et al.* 2019) the three years of additional data for this site would not change the results for those species for which results could be assessed in both reports (Bewick's Swan, Wigeon, Teal, Lapwing and Golden Plover). However, the current analysis shows that high declines have occurred for Snipe, which could not be assessed in the Alerts report due to more rigorous thresholds being placed on trend fitting. This means that declines have been reported in one or both reports for all eight species which are a feature of the site.

The consistent trend across all species suggests that environmental conditions have deteriorated at the site and may have driven or exacerbated the declines for at least some species. The fact that declines have affected a number of species with different habitat requirements should be regarded as a particular concern.

4.2.3. Westhay Moor SSSI

This site was not included in the most recent Alerts report (Woodward *et al.* 2019) as there are no designated avian features for the site.

The species trends for Westhay Moor SSSI are mixed and broadly match many of those for the SPA as a whole. However, there are some notable exceptions with increases in Wigeon and decreases in Lapwing both contrasting with the trends observed across the SPA as a whole. Increases in Shoveler and Gadwall on the SSSI have been greater than the overall increases across the SPA, and moderate short-term increases in Teal and Tufted also contrast with the SPA results.

These results suggest that conditions on the SSSI have improved for both dabbling ducks and diving ducks (at least in the short-term for the latter). This may have been at the expense of suitable habitat for Lapwing, although the increases for Wigeon, which often grazes on land, suggests that

some habitat potentially suitable for Lapwing may still be present (assuming that Wigeon are foraging rather than roosting on the site).

4.2.4. Westhay Heath SSSI

This site was not included in the most recent Alerts report (Woodward *et al.* 2019) as there are no designated avian features for the site.

Westhay Heath is used mostly by wildfowl and no trends could be fitted for any of the waders considered in this report. The trends broadly match those for the SPA as a whole although the increases in the numbers of Gadwall have been less strong than the overall increases, and a medium-term decrease in Mute Swan abundance contrasts with a long-term increases across the whole SPA. Long-term increases in the number of Wigeon on the site contrasts with SPA-level declines, but the SSSI is of relatively minor importance to this species as peak counts normally only number around 100 individuals (around 0.5% of the peak SPA population).

Whilst the data do not give strong cause for concern, they do suggest that conditions could have worsened slightly at the site for some species, at least relative to other sites within the SPA. In the case of Gadwall, it is possible that the site is at carrying capacity.

4.2.5. Shapwick Heath SSSI

This site was not included in the most recent Alerts report (Woodward *et al.* 2019) as there are no designated avian features for the site.

Trends at Shapwick Heath SSSI have broadly matched those for the SPA as a whole. Strong increases in Wigeon across all three time periods considered contrast with declines for the whole SPA, and the strong declines for Mallard across all three periods are more severe than the stability recorded for the SPA.

The data suggest that conditions on the SPA have remained suitable for most species of waterbird. The declines in Mallard across the SPA can be attributed to broadscale distribution changes for that species as discussed in the species account above. As overall numbers visiting the SPA are declining, the more severe decline on this SSSI does not necessarily mean that habitat conditions have worsened for Mallard, but does imply that conditions on this SSSI may be worse for the species relative to other SSSIs; hence the Mallard that are continuing to winter on the SPA are favouring other sites rather than Shapwick Heath.

4.2.6. Moorlinch SSSI

The data for Moorlinch SSSI show strong increases over the long-term for most species for which trends could be fitted, including both Mallard and Teal for which the trends contrast with the SPA level results. Long-term stability for Snipe and a moderate long-term decline for Dunlin are also encouraging results when compared to the strong declines for both species which have occurred across the SPA as a whole.

In the last Alerts report (Woodward *et al.* 2019) the only alert for this site was for Bewick's Swan which could not be assessed in this report due to insufficient data. The three years of additional data for this site would not change the results for any of the four species for which results could be assessed in both reports (Wigeon, Teal, Lapwing, Golden Plover). However, the current analyses

show that moderate declines have occurred in the medium-term for Snipe, which could not be assessed in the Alerts report due to insufficient data. As for Bewick's Swan, it seems likely that this has been caused by broadscale changes rather than site-specific factors.

The positive results for this SSSI suggest that habitat conditions for waterbirds on the site have improved over the long-term, at least relative to conditions on the other SSSIs within the SPA. Given that conditions on many other SSSIs appear to have remained reasonably favourable, it seems likely that there has been a real improvement in habitat suitability at Moorlinch SSSI.

The sector level results suggest that the increasing trends have been driven by increases on the Greylake sector, and that declines have occurred for most of the species for which trends could be fitted on the North sector and for the only species for which trends could be fitted on the Sutton Hams sector. This suggests that relative improvements in habitat conditions across the site may not have been uniform which could mean that habitat suitability on some parts of the site may have worsened. However, this contrast is perhaps to be expected as Greylake is a relatively new reserve which the RSPB took over in 2003 and which was previously arable farmland (www.rspb.org.uk/reserves-and-events/reserves-a-z/greylake; viewed 25/8/2022). Hence subsequent improvements to habitats at Greylake may have attracted birds from North sector due to the relative change in conditions, even if habitat has remained unchanged on North sector. Further assessment of habitat conditions may still be advisable, particularly on North sector, to confirm that it remains in good condition and will be able to support more waterbirds if site populations continue to increase and Greylake reaches carrying capacity for some species.

It should be noted, however, that although they are considered part of the same functional area and are counted as part of the Moorlinch SSSI WeBS site, Greylake and Sutton Hams sectors are both outwith the SPA boundary. Therefore, if the Moorlinch WeBS site corresponded strictly to the SPA boundary, general declines would be shown in this report rather than increases.

4.2.7. King's Sedgemoor SSSI

Trends can only be fitted for seven species for King's Sedgemoor SSSI, and are broadly similar to those for the SPA as a whole, although the increases for Teal contrast with declines across the SPA and short-term increases in Mute Swan are much stronger than the SPA results which are broadly stable for the same period. The results for Lapwing are worse than the overall SPA level results although the trend graphs show some fluctuations for this species and hence it is unclear whether this should be cause for concern and it would be prudent to keep a close eye on numbers of this species in the coming winters.

In comparison to the most recent Alerts report (Woodward *et al.* 2019) the three years of additional data for this site would not raise alerts for any additional species amongst those for which results could be assessed in both reports. However, the periods for which declines are observed have changed for both Mallard and Lapwing, with declines no longer recorded in the short-term for either species. The current analyses shows that a high decline has occurred in the long-term and a moderate decline in the medium-term for Snipe, which could not be assessed in the Alerts report due to insufficient data.

These results suggest that habitat conditions on the SSSI have remained reasonably favourable for waterbirds and may possibly have improved in the short-term relative to other SSSIs within the SPA. Declines in Wigeon and Mallard are most likely to be driven by broadscale or SPA-wide changes affecting these species rather than local factors specific to the SSSI.

4.2.8. Southlake Moor SSSI

Trends at Southlake Moor SSSI can only be assessed for four species. These show stability across all three time periods for Mute Swan, a strong decline in the short-term for both Wigeon and Teal (the latter of which reverses strong increases in the medium-term) and increases in the medium- and long-term for Lapwing.

In comparison to the most recent Alerts report (Woodward *et al.* 2019) the short-term alert for Wigeon changes from moderate to high with the three additional years' data available to this report. A high short-term alert would also be raised for Teal (for which the trend was stable in the last Alerts report). Unless numbers recover in the interim, it is likely that at such time the next Alerts report is published a more severe Alerts status will emerge for this site.

The site data show that few waterbirds were recorded on this site between 1994/95 and approximately 2008/09, after which counts increased substantially, particularly for Wigeon and Teal. However, declines in recent winters (since around 2016/17) have caused the high declines reported here. The consistency of these trends across different species suggests that SSSI conditions may have improved significantly for waterbirds in the late 2000s, at least in relation to other SSSIs, but that this relative improvement was only temporary.

Given that long-term trends remain positive, the environmental conditions of the site appear to be relatively healthy compared to the late 1990s. However, the WeBS counts suggest that the site can potentially support greater numbers of wildfowl, and hence further habitat research could be undertaken, both to assess the reasons behind the recent declines and to assess whether it is possible to maintain the higher population levels that have recently been observed for a longer period.

4.2.9. Curry & Hay Moors SSSI

Trends at Curry & Hay Moors SSSI can be fitted for six species, with four species showing slightly better trends than the SPA as a whole, of which Snipe is particularly notable as the strong increases at this site across all three time periods contrast with strong long-term declines across the SPA. Both Lapwing and Pochard record strong long-term declines, with Pochard appearing to no longer use this site.

At a sector level, there are insufficient data to assess trends on the West sector for Wigeon, Mallard and Teal, but the results for East sector are generally less favourable than those for the SSSI as a whole, suggesting that conditions may have worsened for dabbling ducks on the East sector, or that relative conditions may have improved on the West sector. Results for Mute Swan and Lapwing appear broadly similar on both the East and the West sectors.

In comparison to the most recent Alerts report (Woodward *et al.* 2019) the three years of additional data for this site does not change the list of species for which declines are observed at this site. However, the updated results show slight some changes, with Mallard and Lapwing showing declines for one fewer period (short-term in both cases), but Teal showing a decline for an additional period (medium-term). The additional data also enables trends to be evaluated for Snipe, which could not be assessed in the Alerts report due to insufficient data. This species shows high increases for all three periods so would not have raised any alerts based on the data up to 2019/20.

The results are therefore more encouraging than was the case at the time of the most recent Alerts report, suggesting that conditions may have improved slightly in the short-term. However, declines over one or more time periods are still reported for a majority of the species that could be assessed and it would be prudent to review sites conditions to ensure they still appear to be suitable, particularly for Lapwing as this species has increased in the short-term across the SPA as a whole.

4.2.10. West Sedgemoor SSSI

Trends for all five wader species which could be assessed at West Sedgemoor SSSI match the trends for the SPA as a whole, with strong declines observed for Dunlin and Snipe, strong increases for Golden Plover and Black-tailed Godwit and a moderate short-term increase for Lapwing. The SSSI is particularly important for Golden Plover and Black-tailed Godwit, supporting more than 80% of the peak SPA counts for both species (base on the most recent five winters (2015/16–2019/20)).

However, long-term declines were recorded for all five duck species which could be assessed with the declines being more severe in all five cases than the trend across the SPA. Most notable of these was Shoveler, for which the long-term high declines across all three time periods at West Sedgemoor contrast with a moderate long-term increase and short- and medium-term stability for the SPA. Numbers of Mute Swan were stable across all three time periods, although this again contrasts unfavourably with the SPA level results (moderate long-term increase).

At the time of the most recent Alerts report (Woodward *et al.* 2019) trends could only be assessed for three species at West Sedgemoor. Were the results of the Alerts report to be reassessed with the three years of additional data now available for this site (to 2019/20), Lapwing would no longer raise any alerts for the site but Dunlin would raise high alerts for all three time periods. Alerts would also be raised for all three time periods for three of the four species which could not be assessed by Woodward *et al.* (2019) due to insufficient data being available: Wigeon, Teal and Snipe. The remaining designated species, Whimbrel, is a passage migrant on the SPA and therefore it is still not possible to assess this species.

The declines for all five duck species suggest that habitat conditions on the SSSI may have deteriorated over the last 25 years for wildfowl. It is possible, however, that these changes may have enabled the site to support such large numbers of Golden Plover and Black-tailed Godwit (e.g. if they have been caused by changes in water levels). Hence it will be important to investigate whether or not this may be the case if considering potential actions to reverse the declines in wildfowl numbers, in order to avoid an accompanying negative impact on the waders.

4.2.11. Wet Moor SSSI

Many of the species trends at Wet Moor are similar to those for the SPA as a whole, but there are some differences with high declines for Mallard and Lapwing and, more notably, a high decline in the short-term for Golden Plover, all contrasting with the SPA trends. However, there has been a substantial increase in the abundance of Snipe in the long-term, which has been followed by stability in both the medium- and short-terms, which compares favourably with declines across the whole SPA. However, the trend suggests numbers of Snipe have decreased in the two most recent winters (2018/19 and 2019/20).

The sector level results are broadly similar for most species but suggest that trends have been slightly worse on the East sector of the site rather than on the West sector, in particular for Mallard which strong recent declines on the East sector but relative stability on West sector.

In comparison to the most recent Alerts report (Woodward *et al.* 2019) the three years of additional data for this site would cause additional alerts for one or more periods to be raised for Mallard, Pintail, Teal, Lapwing and Golden Plover and Dunlin, if the Alerts report was updated. Three of these species (Mallard, Pintail and Golden Plover) did not raise any alerts in Woodward *et al.* (2019). The additional data also enables trends to be evaluated for Snipe, which could not be assessed in the Alerts report due to insufficient data. This species shows high increases in the long-term and stability in the medium- and short-terms so would not have raised any alerts if the Alerts report covered the 25 years up to 2019/20.

The results are therefore difficult to interpret as they suggest that a decline in habitat suitability may have occurred for many species, but the site has also become more important for Snipe (partly as a result of the ongoing declines at other SSSIs within the SPA). The apparent decline of Snipe on this site in the two most recent winters should be considered of particular concern as, if sustained, it may lead to future Alerts also being raised for this species. Further investigation would be prudent to establish whether the decreases are simply due to fluctuations in counts for Snipe or whether they offer further supporting evidence that site conditions may have deteriorated more generally for all waterbirds, particularly on the East sector of the site.

4.2.12. West Moor SSSI

Trends for West Moor could be assessed for six species. For wildfowl, the site has performed better than the SPA as a whole in the long- and medium- terms, but worse in the short-term. The same is true for Lapwing but for Golden Plover the declines recorded over all three assessment periods contrast with strong increases over all three periods for the SPA.

In the most recent Alerts report (Woodward *et al.* 2019), trends could only be assessed for two of the 17 species designated as features of West Moor SSSI, with a moderate long-term Alert being raised for Lapwing and no alerts being raised for Golden Plover. Were the Alerts report to be re-run with the additional three years of data available to this report, alerts would be raised in one or more time periods for both of these species and also for all three additional species which can now be assessed (Mute Swan, Mallard and Teal).

These results suggest that the conditions of the site for waterbirds may have worsened relative to other SSSIs in the short-term after previously improving (relative to other sites). It is unclear whether these changes represent substantial changes in habitat suitability at the SSSI, as trends for most of the declining species broadly match those for the SPA for the wider region and the results for Golden Plover only represent around 1% of the birds using the SPA. However, it would be prudent to assess whether habitat conditions on the site may have driven some of the recent declines.

4.2.13. Other sites outwith the SPA

Trends could be fitted for one or more species at 11 WeBS sites which are located within the area within the broad extent of the SPA but outwith the SPA boundary (Appendix C).

These sites generally support relatively low numbers of waterbirds (as a proportion of the SPA population) reflecting their status compared to the SSSIs which make up the SPA. However, high peak counts do occasionally occur at these sites for some species such as Mute Swan, Mallard, Lapwing, Golden Plover, and Snipe, sometimes accounting for more than 10% of the SPA peak counts (see ‘High counts’ sheet in Appendix C). In many of these cases, some of the high counts occurred in 2012/13 and/or 2013/14 when the area was affected by severe flooding. These highlight the importance of the wider area to waterbirds, particularly at times when irregular events trigger changes in conditions across the wider area.

In a small number of cases high peak counts (relative to the SPA population) have occurred on several occasions at non-SPA sites and hence these sites may be potentially important for these species in the context of the SPA (Table 5).

Of particular note are three new sites in the Ham Wall area which are not part of the SPA and have only been counted since 2016/17 (Ham Wall North, Waltons & Loxtons and Ham Wall Reserve – Godwins). Trends could not be produced for these sites due to the short timescale, but these sites have regularly supported high numbers of wildfowl (relative to the SPA total). Most notably, the mean peak count for Gadwall at Ham Wall North for 2015/16–2019/20 would exceed the 1% threshold to qualify as a site of national importance. The wildfowl species occurring in high numbers on these sites are mostly stable or increasing on the SPA as a whole and hence it unlikely that the recent high counts on these non-SPA sites will affect the interpretation of SPA trends. However, it is possible that local movement of birds to these sites may have contributed to declines observed on nearby SSSIs, in particular for Mallard and Pochard.

It is also notable that high peak counts for Little Egret have been recorded on a number of non-SPA sites (Appendix C) as well as on five of the SSSIs that make up the SPA. This suggests that the wider functional habitat is particularly important for this expanding species.

Table 5: Non-SPA sites where high peak counts were recorded in three or more winters during the period covered by this report. A count is regarded as ‘high’ if it represents more than 10% of the mean peak count for the whole SPA during the period 2015/16–2019/20. See ‘High counts’ sheet in Appendix C for further details.

Site	Species with several peak counts exceeding 10% of the 5-year mean of peak counts for the SPA
Thorney Moor (13327)	Little Egret
King’s Moor (13329)	Little Egret
Witcombe Bottom (13330)	Mute Swan Little Egret
North Moor (13332)	Bewick’s Swan (all pre 2003/04) Snipe (all pre 1999/00)
East & West Wastes (13350)	Snipe
Hay Moor (Muchelney) (13370)	Bewick’s Swan (all pre 2004/05) Dunlin
Huish Moor (13374)	Mallard Golden Plover Dunlin Snipe

Site	Species with several peak counts exceeding 10% of the 5-year mean of peak counts for the SPA
Ham Wall North (13304)	Shoveler Gadwall Mallard Pochard Tufted Duck
Waltons & Loxtons (13305)	Gadwall Mallard Pochard Tufted Duck Little Grebe
Ham Wall Reserve – Godwins (13307)	Tufted Duck Little Grebe
Aller Moor South (13326)	Little Egret

One of the 11 WeBS sites outwith the SPA boundary, North Moor, is an SSSI for which seven waterbirds species are mentioned in the citation (Wigeon, Mallard, Teal, Lapwing, Golden Plover, Dunlin and Snipe). Trends for these species are difficult to interpret but numbers are generally low with the site used irregularly by higher numbers of some species.

Trends could not be fitted for 11 further non-SPA WeBS sites falling within the wider area covered by the Somerset Levels & Moors. For eight of these WeBS sites, the time series available was too short to enable trends analyses to be carried out, with the sites only being monitored from 2015/16 or later. These include areas where recent habitat management improvements have been carried out which could potentially attract increased numbers of waterbirds in the future, such the areas at and near Ham Wall Reserve in the Avalon Marshes

4.3. Broad patterns

4.3.1. Swans and dabbling ducks

Swans and dabbling ducks show mixed trends on the Somerset Levels & Moors SPA which generally correspond to regional and UK trends indicating that the changes are mostly driven by broadscale population changes. The declines in Bewick's Swan and Mallard can be at least partly attributed to 'short-stopping' and the increases in Mute Swan, Shoveler and Gadwall have been driven by regional population growth. Hence the declines do not necessarily represent deterioration in habitat quality; on the contrary at least some sectors are in suitable condition to support increases in some species.

However, declines which have also occurred across the SPA as a whole for both Wigeon and Teal are of greater concern as the proportion of the regional population wintering on the Somerset Levels has also declined, especially during the most recent five-year period, suggesting that local factors may be responsible for the observed changes. In the case of Teal, these declines have occurred across most sectors, whereas in the case of Wigeon there is a contrast between declines in some sectors and increases in others, indicating that movement of Wigeon has likely occurred between SPA sites. Like Wigeon and Teal, Pintail has also experienced recent declines across the SPA as a whole, but numbers of this species have fluctuated regularly over the period covered by this report; hence, it is too early to say if the recent decline is cause for concern or if it is simply a part of ongoing natural fluctuations.

It is also notable that, for several species of wildfowl, counts are often low (compared to other sites) at the SSSIs which are listed as features in Table 1, whereas they are often not listed as a feature for

SSSIs which are highlighted as important sites in Table 3 (on the basis of the mean of peaks counts over five winters 2014/15–2019/20). This occurs most notably for Shoveler where the total mean of peak counts for the five sites for which the species is a feature makes up 23% of the mean of peaks for the SPA as a whole, but the three most important sites (where Shoveler is not a feature) account for 63% of the SPA total). In some cases, this may reflect changes in distribution and the sites for which the species is listed as a feature may have held important numbers in the past, as is the case with Catcott Eddington & Chilton Moors for Shoveler, but in many cases the featured sites have held relatively low numbers throughout the period assessed by this report.

Broad patterns of distribution change, which may reflect changes to site conditions, can be detected by comparing the trends for wildfowl species on the same site. Strong declines, which are consistent across several species, have occurred at West Sedgemoor and at Tealham & Tadham Moors. The first of these two sites has recently continued to support important numbers of most wildfowl species in spite of these declines although counts had declined substantially by 2019/20. Strong declines have also occurred in the short- and medium terms at both West Moor and Wet Moor, although in both cases these recent declines follow earlier increases and the long-term trends are either stable or increasing. The consistent declines across all species suggest that site-specific factors could be affecting these sites. Given the proximity of many high quality sites across the SPA, it is also possible that conditions may remain unchanged at some SSSIs but that declines may have occurred if relative conditions have improved on adjacent or nearby sites. However, it would be prudent to assume that declines on the above sites have been caused by site-specific issues unless there is strong evidence to suggest otherwise.

In contrast, increases have occurred for several species at Westhay Moor, Shapwick Heath and Moorlinch. However, in these cases the changes are less straightforward as they are not consistent across all species, most notably at Shapwick Heath where strong declines have occurred for Mallard and Teal. However, both these species are declining across the SPA as a whole and hence the declines for these two species at this site may reflect broadscale changes rather than site-specific issues.

Analysis of lower level sector results suggest that the increases in wildfowl noted at Moorlinch have mostly occurred on the Greylake and Sutton Hams sectors, and that consistent declines have occurred on the North sector. All three sectors are included in the WeBS results for the SSSI (and therefore the SPA) as they are considered part of the same functional unit, but it is noteworthy that only the North sector actually falls within the SSSI (and SPA) boundary, and the other two sectors are outwith the SPA.

Outwith the SPA, recent increases at Bridgwater Bay for Wigeon, Pintail and Teal contrast with recent declines across the Somerset Levels & Moors SPA for these species and may indicate that the recent coastal realignment project and the creation of Steart Marshes could have caused some birds to move from the Somerset Levels & Moors SPA to Bridgwater Bay. However, whilst such local movement potentially could help explain the short- and medium-term declines for Pintail on the Somerset Levels & Moors SPA, it cannot account for the declines in the other two species, as the increases at Bridgwater Bay make up only a small proportion of the decrease on the SPA.

4.3.2. Diving ducks

The data suggest that conditions remain favourable for diving ducks on the Somerset Levels & Moors SPA, with abundance across the SPA as a whole remaining stable or increasing across all three timescales for Pochard and Tufted Duck. The overall stable trend for Pochard contrasts with substantial regional declines, suggesting that the conditions for Pochard on the SPA remain more

favourable than at other sites in the region. Hence, the declines at the three SSSIs for which trends can be fitted should not necessarily raise any concerns about the condition of these sites.

Information about the condition of individual sites for diving species is unclear, however, due to the sparsity of data. Many of the Tufted Duck and Pochard wintering on the site are found at Shapwick Heath which shows a positive trend for Tufted Duck, and numbers of this species at Westhay Moor have increased slightly recently (though they remain well down compared to the early 2000s).

Of more potential concern is the fact that there were insufficient data to produce trends for any of the three SSSIs for which both Pochard and Tufted Duck are features (Curry & Hay Moors; Wet Moor and West Moor). For the first of these sites, no Tufted Duck were seen during the most recent five-year period, suggesting conditions at the site may no longer be suitable for the species. Low numbers of individuals at the other two SSSIs could mean that conditions have also deteriorated at these sites, although it is also feasible that conditions remain favourable but are currently less favourable comparatively than Shapwick Heath.

Outwith the SPA, Pochard and Tufted Duck have been recorded in high numbers in the Ham Wall area (at Ham Wall North, Waltons & Loxtons and Ham Wall Reserve – Godwins). These sites have only been counted since 2015/16 and it is possible that movement from the SPA to these sites may have led to the site declines observed for Pochard, although this is unclear due to the lack of earlier counts from these sites.

4.3.3. Waders

The Somerset Levels & Moors SPA is particularly important as a breeding site for waders such as Curlew, Snipe and Redshank, and also supports a number of species during passage, including Whimbrel and Ruff. As an inland SPA, it supports fewer wader species during winter as many wader species take advantage of the resources offered by estuarine habitats at this time of year. Hence, as WeBS is a survey focused mostly on wintering populations, there are insufficient data to assess many of the wader species that are features of the SPA.

The four species in this category for which wintering trends for more than one SSSI could be fitted comprise two species which are stable or increasing across the SPA as a whole (Lapwing and Golden Plover) and two species which are declining (Dunlin and Snipe).

The two increasing species, both of which are features of the SPA as a whole, show similar habitat requirements in winter, when they form large flocks and often forage in short grassland, including both wetland habitats and agricultural fields. Both these species have shown recent increases which have been particularly strong in the case of Golden Plover. It should be noted that both species are nomadic and that numbers wintering in the UK can fluctuate from year to year, and hence the recent picture may reflect these changes rather than changes to habitat conditions on the SSSIs.

Increases for both species at Moorlinch match the increases seen for duck species, suggesting that habitat suitability for waterbirds has genuinely improved on this site. This is reinforced by the fact that trends for Dunlin and Snipe are stable at Moorlinch despite overall declines for both species across the SPA as a whole. As for ducks, however, the sector results suggest that these increases have occurred on Greylake sector which, although included as part of Moorlinch for WeBS, is outwith the SPA boundary.

In contrast, strong declines for Lapwing and Golden Plover (and also for Snipe) have occurred at Tealham & Tadham Moors. These declines are in line with those recorded for duck species at this SSSI and reinforce the suggestion that habitat conditions on the site have worsened. The results for

Wet Moor are also similar to those for duck species suggesting site-specific factors have affected this SSSI in the short-term, although the trend for Snipe on this site is more positive.

The strong decreases for Dunlin and Snipe at West Sedgemoor match the results for wildfowl, but increases have occurred for Lapwing, Golden Plover and Black-tailed Godwit here. It is possible that these changes may reflect changes in habitat towards conditions that are more favourable for these three wader species and less suitable for wildfowl and Snipe, i.e. drier habitats.

Results elsewhere do not match up with those for duck species, but are often also variable between the different wader species, making them more difficult to interpret.

4.3.4. Little Grebe and Herons

Insufficient data were available to compare SSSI results for Little Grebe or for the three heron/egret species.

4.4. Conclusions

The trends are generally encouraging for the Somerset Levels & Moors SPA as a whole with a majority of the 16 species assessed showing stable or increasing trends over the long-term. The strong declines for Bewick's Swan and Dunlin can be attributed to broadscale distribution changes, most likely resulting from climate change, and Bewick's Swan can no longer be considered a regular wintering visitor to the area. The strong declines reported for Pintail are uncertain as regular fluctuations in abundance have occurred for this species, but it would be prudent to closely follow the fortunes of this species in the coming years for signs of a recovery in order to confirm that the recent decrease represents another such fluctuation rather than an ongoing decline.

Three species (Wigeon, Teal and Snipe) show declines that mirror declines across the custom region but are stronger than the corresponding regional declines and hence cannot necessarily be fully explained by broadscale distribution changes. One of these species (Teal) is a designated feature for the SPA as a whole. As regional declines are occurring for three species, it is difficult to ascertain to what extent site-specific factors might be impacting on the SPA trends, particularly for Snipe which is more difficult to monitor robustly through WeBS counts due to its cryptic habits.

A consistent pattern of strong increases across many (though not all) species has occurred at Moorlinch, Shapwick Heath and Westhay Moor, indicating that habitat conditions at these SSSIs has improved for waterbirds (at least relative to other sites). It is notable that two of these SSSIs are within the Avalon Marshes where recent conservation work and habitat restoration has been managed by a partnership of various conservation organisations and enabled by substantial funding from the National Lottery and other sources (<http://avalonmarshes.org/our-work/>; viewed 6/9/2022). The third WeBS site (Moorlinch) has also benefited from substantial habitat creation at Greylake RSPB reserve which was formerly arable farmland.

However, the SSSI results show that consistent strong declines for many species, including Wigeon, Teal and Snipe, have occurred over all three time periods at Tealham & Tadham Moors and at West Sedgemoor, implying that site-specific factors may be driving declines on these SSSIs. In the case of Tealham & Tadham Moors, declines have affected all species assessed, suggesting that a deterioration in habitat conditions may be affecting all waterbird species at this site. At West Sedgemoor, the strong increases which have occurred for Lapwing, Golden Plover and Black-tailed Godwit suggest that a change in habitat conditions may have occurred to favour these species rather than dabbling ducks and Snipe. A similar consistent pattern of strong declines for many species has occurred in the short-term at both Wet Moor and West Moor, including Wigeon and Teal at both

sites. It is unclear why these site declines have occurred given that Tealham & Tadham Moors is within the Avalon Marshes and West Sedgemoor is an RSPB reserve. It is possible that the improvements at neighbouring sites have impacted on numbers at Tealham & Tadham Moors, and at West Sedgemoor management may have focused on improving conditions for breeding waders rather than wintering birds.

As a result of the recent strong increases, Moorlinch, Shapwick Heath and Westhay Moor are currently the most important sites for wildfowl, along with West Sedgemoor, based on the mean of peak counts for the most recent five winters assessed in this report (2015/16–2019/20). As well as being important for wildfowl, West Sedgemoor remains the most important site for waders on the basis of the most recent five winters. However, numbers of wildfowl and some waders have decreased substantially at West Sedgemoor over that five winter period and, in the most recent winter (2019/20), counts were well below the levels that would be considered to be important. This reinforces the suggestion given above that habitat conditions may have changed and driven some declines at this SSSI.

Whilst many of the Web's sites outwith the SPA generally support relatively low numbers of waterbirds (as a proportion of the SPA population) high counts do sometimes occur at many of these sites and they play an important role supporting SPA features as part of the wider functionally linked habitat. Furthermore, recent counts at three new WeBS sites (Ham Wall North, Waltons & Loxtons and Ham Wall Reserve – Godwins) suggest that these sites support particularly important populations of several species of wildfowl.

It is possible that habitat improvements at some sites (both within and outwith the SPA) may have caused some redistribution of wintering birds and hence driven declines at other nearby SSSIs even if conditions at the nearby SSSIs have not changed. It will be important to maintain a network of sites in good condition for waterbirds, to ensure a variety of sites and habitats are available to support different species and to increase the potential carrying capacity of the SPA.

Similarly, as discussed above, it is possible that the habitat improvements in Bridgwater Bay following the creation of Steart Marshes may have caused some Wigeon, Pintail and Teal that would otherwise winter on the Somerset Levels & Moors SPA to favour Bridgwater Bay. However, whilst such movements could potentially explain recent declines in Pintail on the Somerset Levels & Moors SPA, they do not explain the declines observed for the other two species (as the numbers of birds involved are small compared to the declines).

Following the abundance changes over the period covered by this report, it is notable that, in some cases, important populations of some species on the SPA occur at sites where they are not a feature (Table 6), whereas numbers are often relatively unimportant at sites where species are noted as a feature. Notably Shapwick Heath and Westhay Moor are now two of the most important sites on the SPA for wintering waterbirds even though neither site mentions wintering waterbirds in the SSSI citation. It would therefore be sensible to review which species are of key importance at each SSSI based on the counts over the last five winters.

Table 6: Important waterbird populations at SSSIs within the Somerset Levels & Moors SPA. The table shows SSSIs where the mean of peak counts over the last five winters (2014/15–2019/20) or the peak count in the most recent winter (2019/20) exceeded 1% of the most recent population estimate (Frost *et al.* 2019). Sites are in italics if the species is not currently a designated feature at the SSSI. Sites are listed in parentheses if the 1% threshold has been exceeded in the most recent year but not across the last five winters (site designation is normally based on a five-year period rather than a single winter). Full details of the peak counts can be viewed on the Mean of Peaks worksheet (‘MOPs’) in Appendix B.

Species (1% threshold from Frost <i>et al.</i> 2019)	Sites with mean of peak counts exceeding qualifying threshold over the last five winters (2015/16–2019/20) or (in parentheses) the most recent winter (2019/20)
Shoveler (190)	<i>Moorlinch SSSI</i> <i>West Sedgemoor SSSI</i> <i>(Shapwick Heath SSSI)</i>
Gadwall (310)	Ham Wall North <i>(Westhay Moor SSSI)</i> <i>(Shapwick Heath SSSI)</i>
Wigeon (4,500)	West Sedgemoor SSSI <i>(Wet Moor SSSI)</i>
Pintail (200)	Curry & Hay Moors SSSI
Teal (4,300)	West Sedgemoor SSSI
Lapwing (6,200)	Moorlinch SSSI West Sedgemoor SSSI
Golden Plover (4,000)	West Sedgemoor SSSI

On a related note, the current WeBS site at Moorlinch is made up of the functional unit that is considered to reflect the area used by waterbirds at the site and therefore includes areas which are outside the SPA, most notably Greylake sector (RSPB reserve), most likely as a result of discussions surrounding WeBS data requests in the past. It would therefore be prudent to review whether any changes need to be made to the SSSI (and SPA) boundary or whether the extralimital sectors should be excluded from future analyses (including, in due course, the next Alerts report).

Finally, it is important to note that whilst this report assesses wintering waterbirds, some of the species covered here are designated or mentioned on the SSSI or SPA citation as breeding or passage species rather than as wintering species. Whilst wintering data and trends for these species are presented in this report, where available, assessment for these species must be based on the relevant data which are not presented here. In the case of breeding species, consistent records may be available through records in the county bird reports and/or records held from reserve surveys, but robust records for passage numbers requiring a higher frequency of counts than the WeBS monthly visits (ideal daily) and estimates of turn-over which require individually marked birds would be more difficult to obtain.

5. RECOMMENDATIONS

SSSI and sector level analysis of WeBS data from the Somerset Levels & Moors SPA has highlighted areas and species on the SPA with declining trends. In order to gain a greater understanding of these changes it would be important to conduct further research into the causes of these declines.

The analysis has identified Tealham & Tadham Moors and West Sedgemoor as two sites where declines across all three time periods could be driven by site-specific factors and hence these sites should be a priority for further investigation to assess whether changes to site conditions may have driven declines and (if appropriate) to put management actions into place to reverse these declines. Similarly, strong short-term declines at Wet Moor and West Moor mean that these sites should also be considered a priority for further research.

The species of most concern on the SPA as a whole are Wigeon, Teal and Snipe, although in all three cases declines may be being driven partly by broadscale changes in distribution and partly by site-specific factors and hence it is unclear to what extent they are influenced by local factors that could be mitigated through site management. Historically, West Sedgemoor SSSI has supported the vast majority of birds from these three species wintering on the Somerset Levels & Moors SPA. Consequently, the investigation into the drivers of waterbird declines on West Sedgemoor should focus in particular on these three species.

To ensure ongoing monitoring and management action is targeted, it would be prudent to review the SSSI citations and to consider revising the list of species which are assessed at each SSSI for ongoing monitoring purposes, e.g. WeBS Alerts. Currently, there are many instances where species are not regarded as a site feature even though recent peak counts for a species on a SSSI have been greater than 10% of the peak count for the SPA as a whole. The same species are named on the citation for other SSSIs where numbers have historically always been much lower (at least for the period covered by this report).

Similarly, to aid the interpretation of future monitoring data, it would be prudent to review the SSSI boundary and the WeBS site boundary for Moorlinch to ensure that these match and that they represent an appropriate functional geographical unit that encompasses the birds wintering on the site.

Finally, there are a large number of additional sites which fall within the area that makes up the area covered by the Somerset Levels & Moors but are outwith the SPA boundary. Changes in the number of birds at these sites are likely to be related to changes on the SPA and could influence trends at nearby SSSIs. The WeBS data available suggest that some of these sites are currently relatively unimportant and support low numbers of waterbirds, compared to the SSSIs which make up the SPA. However, some of these sites do support high peak numbers of some species and occasional high peak counts occur at many of the other non-SPA sites, most notably during periods when unusual conditions have affected the wider area such as during flooding events. This demonstrates the importance of the wider network of functionally-linked sites to the species which depend on the SPA, and highlights the need to consider all sites both within and outwith the SPA in order to ensure that wider habitat conditions remain favourable for the SPA features.

Additionally, many of the sites outside the SPA are not monitored or are counted irregularly. If it can be done without affecting coverage of the higher priority sites within the SPA, it would be helpful to attempt to ensure more regular coverage of as many of these non-SPA sites as possible to enable

potential changes in their status or functional importance to existing SSSIs to be identified in the future.

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Appendix A: SPA and SSSI features

See Excel spreadsheet: 'Appendix A – SPA and SSSI features.xlsx'

Appendix B: SPA and SSSI WeBS trends

See Excel spreadsheet: 'Appendix B – SPA WeBS trends.xlsx'

Appendix C: Other Non-SPA WeBS site trends

See Excel spreadsheet: 'Appendix C – Other Non-SPA WeBS Site trends.xlsx'

Appendix D: Bridgwater Bay and WWT Steart Marshes Site trends

See Excel spreadsheet: 'Appendix D – Bridgwater Bay and WWT Steart Marshes Site trends.xlsx'

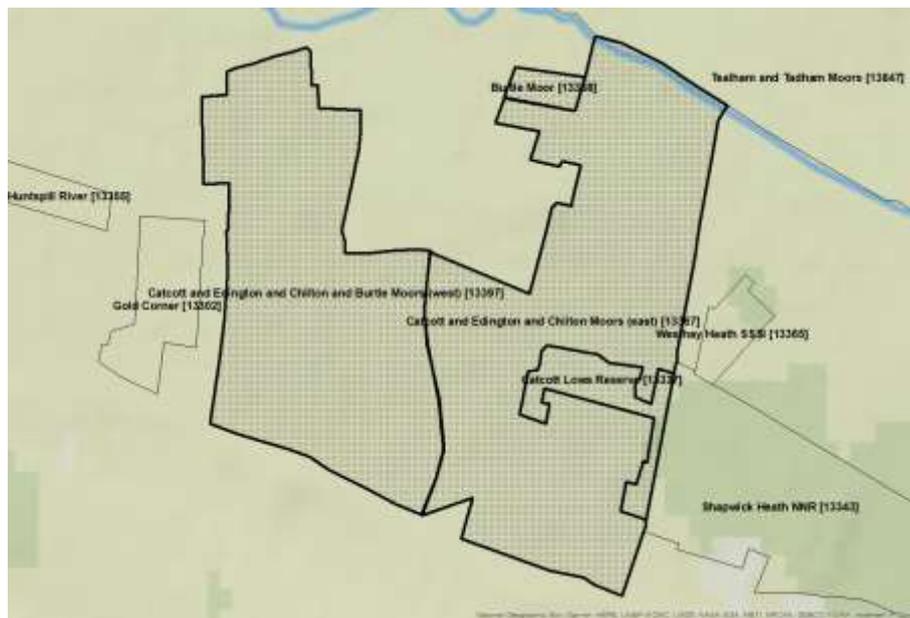
Appendix E: SSSI Species density plots

See Excel spreadsheet: 'Appendix E – SSSI Species densities.xlsx'

APPENDIX F: Details of SSSIs/WeBS sectors

The relationship between SSSI boundaries and WeBS count sector boundaries are detailed below.

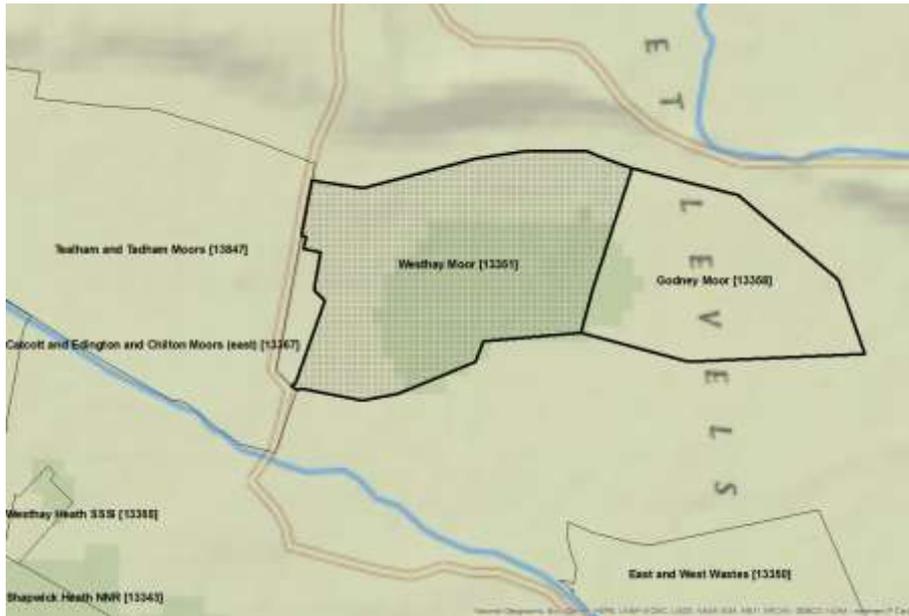
Catcott Edington and Chilton Moors SSSI. For analytical purposes (including WeBS Alerts) data from three WeBS count sectors are included when assessing trends for Catcott Edington and Chilton Moors SSSI. These are Catcott and Edington and Chilton and Burtle Moors (West) [13397] Catcott Lows Reserve [13337] and Catcott and Edington and Chilton and Burtle Moors (East) [13398] which between them follow strictly the boundary of the designated site. WeBS sector Catcott and Edington and Chilton and Burtle Moors (West) has been monitored by WeBS continuously from winter 2001/02 (although no data has been obtained since 2019/20). Catcott Lows Reserve has been monitored continuously since winter 1993/94. Catcott and Edington and Chilton and Burtle Moors (east) was monitored continuously since winter 2006/07. Since winter 2015/16 this last sector has been divided into Burtle Moor [13368] and the corresponding Catcott and Edington and Chilton Moors (East) [13367]. Catcott and Edington and Chilton Moors (East) continues to be monitored but unfortunately no data have been received for Burtle Moor following the split.



Tealham and Tadham Moors SSSI. For analytical purposes (including WeBS Alerts) data for Tealham and Tadham Moors SSSI are derived from a single WeBS sector, Tealham and Tadham Moors [13847], which follows strictly the boundary of the designated site. This sector has been monitored continuously by WeBS since winter 1993/94.



Westhay Moor SSSI. Westhay Moor SSSI has not been notified for any waterbird features and consequently has never been assessed for WeBS Alerts. Nonetheless, Westhay Moor has been monitored continuously by WeBS since winter 1993/94 as a single sector, Westhay Moor (SSSI) [13351], that follows strictly the boundaries of the designated site. As of 2017/18 the adjoining Godney Moor [13358], which lies outwith Somerset levels and Moors SPA, has been revived as a WeBS site and monitored separated from Westhay Moor. Prior to 1993/94 these two sectors had been monitored as a single unit.



Westhay Heath SSSI. Westhay Heath SSSI has not been notified for any waterbird features and consequently has never been assessed for WeBS Alerts. Nonetheless, Westhay Heath has been monitored continuously by WeBS since winter 1993/94 as a single sector, Westhay Heath SSSI [13365], that follows strictly the boundaries of the designated site.



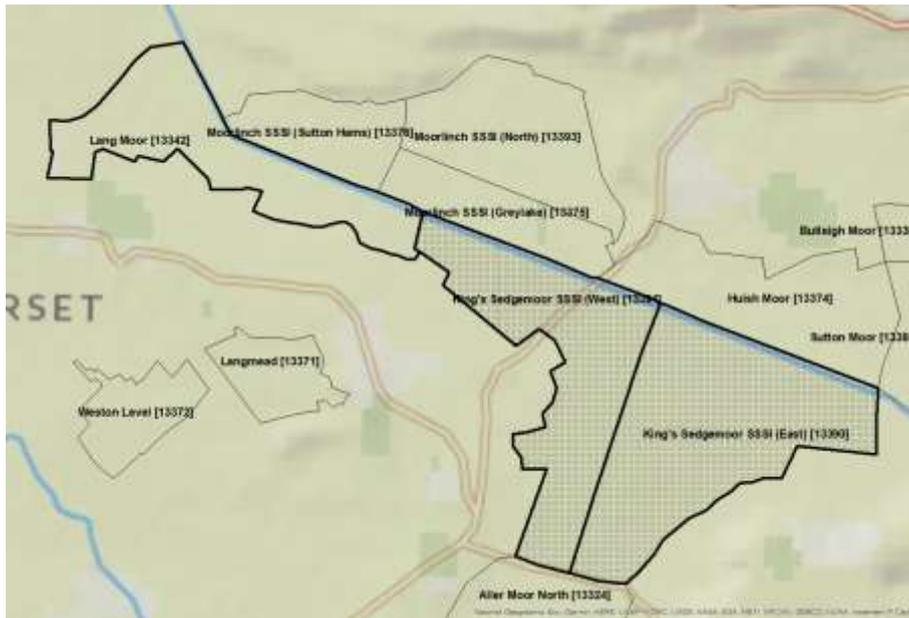
Shapwick Heath SSSI. For analytical purposes (including WeBS Alerts) data for Shapwick Heath SSSI are derived from a single WeBS sector, Shapwick Heath NNR [13341], that encompasses the entirety of the designated site extending slightly beyond the boundary to the extreme east to Ashcott Corner. Although there is a cluster of small WeBS count sectors beyond the eastern boundary of the designated site none have sufficient time series of data to support analyses. This site has been monitored by WeBS since 2093/94 with a three-winter gap between 1997/98 and 1999/00.



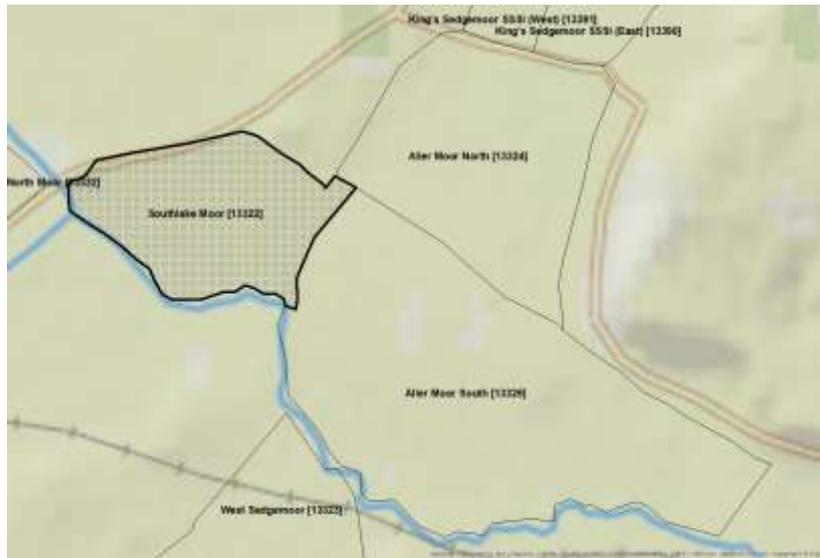
Moorlinch SSSI. For analytical purposes (including WeBS Alerts) data derived from three WeBS count sectors are included when characterising waterbird trends for Moorlinch SSSI. These are Moorlinch SSSI (North) [13393], Moorlinch SSSI (Sutton Hams) [13376] and Moorlinch SSSI (Grey Lake) [13375]. The boundary of Moorlinch SSSI (North) follows strictly the boundary of the designated site. The other two neighboring WeBS sectors, adjoin the boundary of the designated site and treated as a functional component of the SSSI. Prior to winter 2000/01 all three sectors were counted as a single unit, Moorlinch [13394]. Thereafter Moorlinch SSSI (North) was monitored separately from the other two sectors which remained undivided until winter 2014/15.



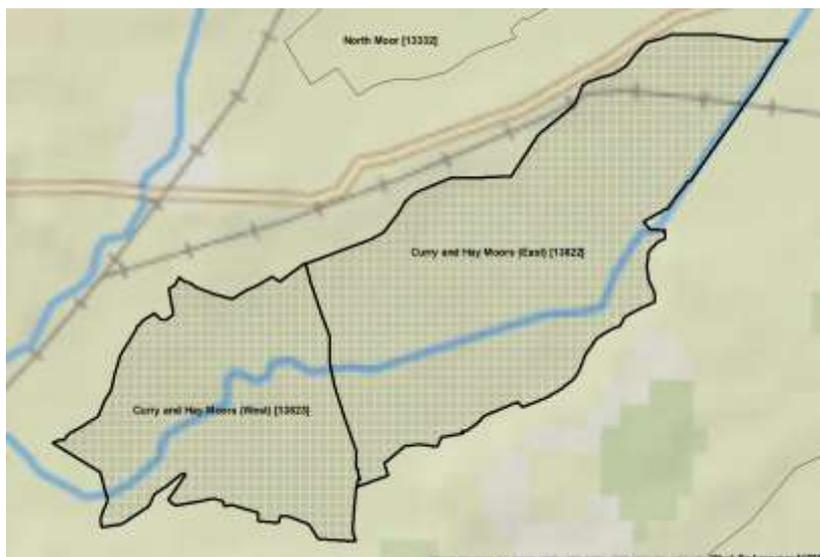
King's Sedgemoor SSSI. For analytical purposes (including WeBS Alerts) data for King's Sedgemoor SSSI are derived from two WeBS count sectors. These are King's Sedgemoor SSSI (East) [13390] and King's Sedgemoor SSSI (West) [13391] which between them follow strictly the boundary of the designated site. The overall site has been monitored by WeBS since winter 1993/94. However, prior to winter 2000/01 the east and west sectors were treated as a single unit, King's Sedgemoor [13341]. The neighboring area of Lang Moor [13342], which adjoins the SSSI at the westward extreme and has been monitored by WeBS since 1995/96, could potentially be considered a functional component of King's Sedgemoor SSSI (or alternatively Moorlinch SSSI).



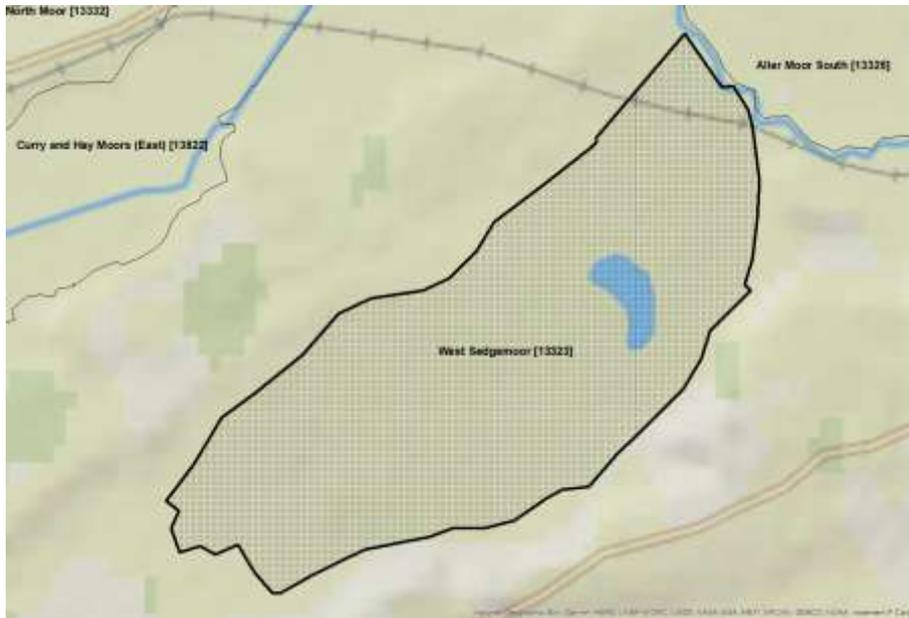
Southlake Moor SSSI. For analytical purposes (including WeBS Alerts) data for Southlake Moor SSSI are derived from a single WeBS sector, Southlake Moor (SSSI) [13322], which follows strictly the boundary of the designated site. This sector has been monitored since winter 1993/94 with two, two-winter gaps in coverage (2011/12–2012/13 & 2019/20–2020/21). WeBS has also monitored the adjacent Aller Moor [13320] since winter 1993/94 with a gap from 2012/13 to 2013/14, since when it has been monitored as two sectors, Aller Moor North [13324] and Aller Moor South [13326]. Aller Moor could potentially be considered a functional component of Southlake Moor SSSI.



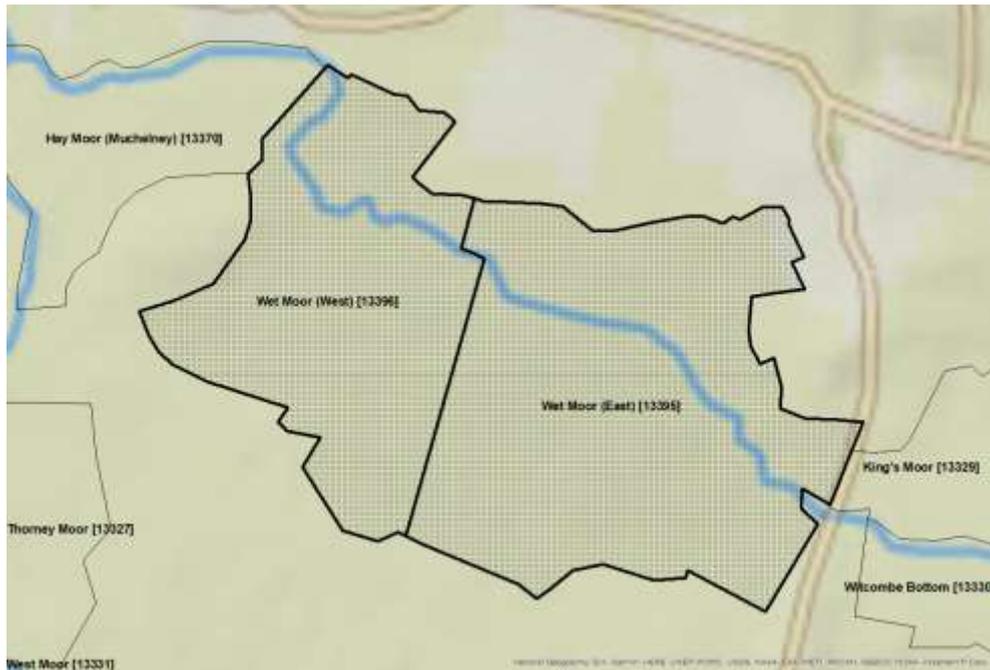
Curry and Hay Moors SSSI. For analytical purposes (including WeBS Alerts) data for Curry and Hay Moors SSSI are derived from two WeBS count sectors. These are Curry and Hay Moors (East) [13822] and Curry and Hay Moors (West) [13823] which between them encompass the entirety of the designated site extending slightly beyond the SSSI boundary to the south of Hay Moor between Longmoor End Cottage and Longmoor House. The site has been monitored continuously since 1993/94 but prior to 2002/03, this entire area was monitored as a single unit, Curry and Hay Moors (SSSI) [13321].



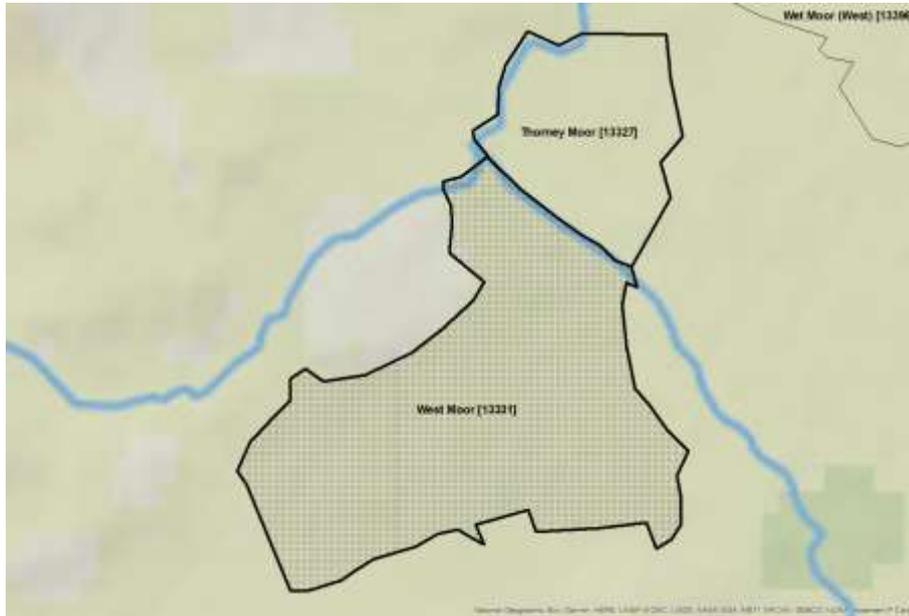
West Sedgemoor SSSI. For analytical purposes (including WeBS Alerts) data for West Sedgemoor SSSI are derived from a single WeBS sector, West Sedgemoor (SSSI) [13323] which follows strictly the boundary of the designated site. This sector has been monitored continuously since winter 1993/94.



Wet Moor SSSI. For analytical purposes (including WeBS Alerts) data for Wet Moor SSSI are derived from two WeBS count sectors. These are Wet Moor (East) [13395] and Wet Moor (West) [13396] which between them encompass the entirety of the designated site extending slightly beyond the SSSI boundary to the north of Long Sutton Main Drain, south-east of Hay Moor, and to the east, north of Long Sutton Main Drain, and west of Little Load. This site was monitored continuously from 1993/94 initially treated as a single unit, Wet Moor (SSSI) [13328], until 1999/00. WeBS also monitors the adjacent site King's Moor [13329] and Witcombe Bottom [13330] which could be considered functional components of Wet Moor SSSI.



West Moor SSSI. For analytical purposes (including WeBS Alerts) data for West Moor SSSI are derived from a single WeBS sector, West Moor (SSSI) [13331], that encompasses the entirety of the designated site extending beyond the SSSI boundary to the south-west to include fields either side of Westmoor main Drain as far as New Road. This sector has been monitored since winter 1993/94 with a two-winter gap from 2009/10–2010/11. Since winter 2016/17, WeBS has also monitored the adjacent Thornley Moor to the north-east of the designated site and could be considered as a functional component of West Moor SSSI.



APPENDIX G: Scientific names

Common name	Scientific name
Mute Swan	<i>Cygnus olor</i>
Bewick's Swan	<i>Cygnus columbianus (bewickii)</i>
Whooper Swan	<i>Cygnus cygnus</i>
Shoveler	<i>Spatula clypeata</i>
Gadwall	<i>Mareca strepera</i>
Wigeon	<i>Mareca Penelope</i>
Mallard	<i>Anas platyrhynchos</i>
Pintail	<i>Anas acuta</i>
Teal	<i>Anas crecca</i>
Pochard	<i>Aythya farina</i>
Tufted Duck	<i>Aythya fuligula</i>
Goldeneye	<i>Bucephala clangula</i>
Goosander	<i>Mergus merganser</i>
Little Grebe	<i>Tachybaptus ruficollis</i>
Lapwing	<i>Vanellus vanellus</i>
Golden Plover	<i>Pluvialis apricaria</i>
Whimbrel	<i>Numenius phaeopus</i>
Curlew	<i>Numenius arquata</i>
Black-tailed Godwit	<i>Limosa limosa</i>
Ruff	<i>Calidris pugnax</i>
Dunlin	<i>Calidris alpina</i>
Jack Snipe	<i>Lymnocyptes minimus</i>
Snipe	<i>Gallinago gallinago</i>
Green Sandpiper	<i>Tringa ochropus</i>
Redshank	<i>Tringa tetanus</i>
Bittern	<i>Botaurus stellaris</i>
Great White Egret	<i>Ardea alba</i>
Little Egret	<i>Egretta garzetta</i>



Image: Sarah Kelman. Cover image: Graham Catley

Analysis of waterbird population trends for the Somerset Levels & Moors SPA, its functionally linked land and the Bridgwater Bay coastal sites.

This study produces a comprehensive analysis of wintering waterbird trends within the Somerset Levels and Moors SPA, in order to quantify the abundance and distribution of species within the SPA and its underlying SSSIs, and to compare trends across the different SSSIs and WeBS sectors. It also assesses trends for 11 other functionally-linked wetland sites out with the SPA but within the wider area, and for the important nearby site Bridgwater Bay and Steart Marshes which is also functionally-linked to the SPA.

Smoothed population trends were generated using data from the period 1994/95/02 to 2019/20, and assessed for each of 26 waterbird species, consisting of the internationally and nationally important waterbird species that are features of Somerset Levels & Moors SPA or one of the 12 SSSIs that underpin the SPA, plus two additional species that have recently colonised the UK (Little Egret and Great White Egret). Strong declines for Bewick's Swan and Dunlin can be attributed to broadscale distribution changes, most likely resulting from climate change, and Bewick's Swan can no longer be considered a regular wintering visitor to the area.

The analysis has identified Tealham & Tatham Moors and West Sedgemoor as two sites where declines across all three time periods could be driven by site-specific factors and hence these sites should be a priority for further investigation. Similarly, strong short-term declines at Wet Moor and West Moor mean that these sites should also be considered a priority for further research.

In contrast, a consistent pattern of strong increases across many species has occurred at Moorlinch, Shapwick Heath and Westhay Moor, indicating that habitat conditions at these SSSIs has improved for waterbirds (at least relative to other sites). These three SSSIs are currently the most important sites for wildfowl, along with West Sedgemoor. As well as being important for wildfowl, West Sedgemoor remains the most important site for waders on the basis of the most recent five winters.

Wooward, I. & Austin, G. (2022). Analysis of waterbird population trends for the Somerset Levels & Moors SPA, its functionally linked land and the Bridgwater Bay coastal sites. BTO Research Report 747.

ISBN : 978-1-912642-42-7



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