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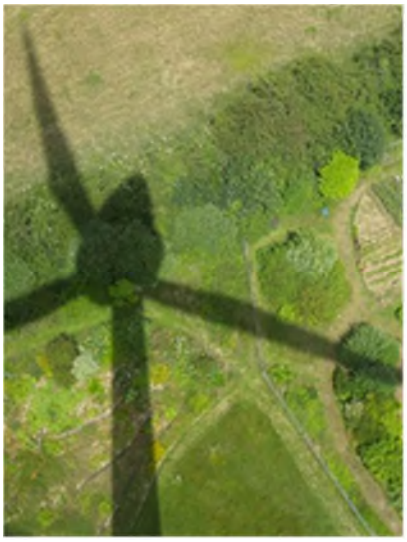
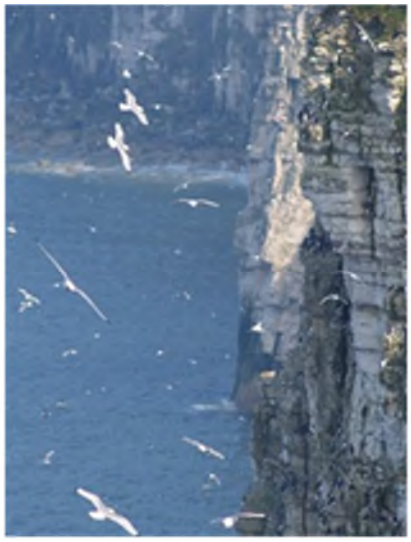


Salisbury Plain SSSI Breeding Bird Survey 2015

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1. Summary and Main Recommendations

1.1 Summary

1.1.1 Natural England is undertaking an investigation into the current status of the breeding bird populations on Salisbury Plain Site of Special Scientific Interest (SSSI). This is in order to contribute to the SSSI Integrated Site Assessment between 2014 and 2016.

1.1.2 Natural England commissioned Thomson Ecology Ltd on the 18th March 2015 to undertake a Breeding Bird Survey (BBS) of Salisbury Plain SSSI. Specifically, this required field surveys of the Salisbury Plain SSSI in order to identify population trends among bird species in a manner to allow comparison with previous breeding bird surveys in 2000 and 2005.

1.1.3 Thomson Ecology Ltd carried out the surveys between 14th April and 29th June 2015 visiting 100 grid-squares on early and late visits. Seventy-one bird species were recorded.

1.1.4 Raw (maximum) counts and associated trends were analysed for fifty species over the three survey years. Results show that since 2000 there has been significant increases in eight species of conservation interest (blackcap, chiffchaff, corn bunting, cuckoo, goldfinch, song thrush, tree pipit and yellowhammer) and significant declines in six species of conservation interest (greenfinch, lapwing, linnet, reed bunting, whinchat and whitethroat). Due to limitations in the survey methodology for the species and the availability of better figures, lapwing can be discounted. Four other species (blackbird, carrion crow, great tit, and pheasant) showed significant increases, while five others (chaffinch, kestrel, meadow pipit, willow warbler and wood pigeon) showed significant declines. Populations of most of the remaining species have stayed relatively stable since 2000.

1.1.5 Density trends were analysed using the DISTANCE 6.2 software package. Results indicated a significant increase in blackcap and corn bunting densities and significant declines in linnet, reed bunting, whinchat and whitethroat densities. However, raw counts and associated trends, presented above, are thought to be more reliable than density trends.

1.1.6 Corn bunting and quail have populations on the SSSI that are over 1% of current UK national figures.

2. Introduction

2.1.1 Natural England commissioned Thomson Ecology Ltd on the 18th March 2015 to undertake a Breeding Bird Survey (BBS) of Salisbury Plain Site of Special Scientific Interest (SSSI). The BBS is needed to inform the SSSI Integrated Site Assessment (ISA) of 2014-16, and in particular to show how key bird species are faring on Salisbury Plain SSSI, especially in respect of Defence Infrastructure Organisation (DIO) and Higher Level Stewardship (HLS) scrub management and grazing programmes. This will help inform DIO's revised Super Unit Management Plans of 2014-2016.

2.2 Background

2.2.1 Salisbury Plain SSSI is 19,690 hectares in area. It is situated within the Salisbury Plain Ministry of Defence (MoD) Army Training Estate (ATE) which is approximately 40,000 hectares in area and is the largest military training area in the United Kingdom. The ATE supports the largest area of unimproved chalk grassland in north-west Europe. The continued military occupation at the site has restricted agricultural intensification, resulting in the development of large areas of ecologically valuable unimproved grassland.

2.2.2 The Salisbury Plain ATE also incorporates a Special Area of Conservation (SAC) and Special Protection Area (SPA). The designated or notified features include approximately 14,000 hectares of calcareous grassland, the SPA birds: stone-curlew (*Burhinus oedicnemus*), hen harrier (*Circus cyaneas*), quail (*Coturnix coturnix*) and hobby (*Falco subbuteo*), and an SSSI feature: a breeding birds assemblage of lowland dry grasslands. The primary reasons for its designation as an SAC were for its:

- Juniper (*Juniper communis*) formations;
- Semi-natural dry grasslands and scrubland facies (including recognition as an important orchid site); and
- Marsh fritillary *(Eurodryas arinia*) butterfly.

2.2.3 The Salisbury Plain SSSI, SAC and SPA are high priorities for Natural England's Somerset, Avon & Wiltshire Area Team, forming an important part of the Government's Biodiversity 2020 strategy. This builds on the Natural Environment White Paper and aims to provide a comprehensive picture of how the UK is implementing international and EU commitments (HM Government, 2011).

2.2.4 It should be noted that Salisbury Plain was historically more extensively wooded. Woodland is constantly regenerating across the site in the form of downland scrub. Historical woodland clearance and farming practices meant that there was little woodland or even scrub left by the 19th century. Limited agricultural management in the ATE has allowed scrub to recolonise; a process that seems to have accelerated since 1993 when the SSSI Citation stated that, "... large expanses of the chalk grassland remain open with very little invasion of woody species" (Nature Conservancy Council 1993). Since 2001 the EU LIFE project has restored grazing to large areas and cleared substantial amounts of scrub and plantation woodland (Stanbury et al. 2005).

2.2.5 A number of the bird species that breed on Salisbury Plain SSSI are of conservation interest. They are on the Birds of Conservation Concern (BoCC) red list (Eaton *et al*, 2015), are species of principal importance (SPI) in England, listed under Section 41 of the Natural Environment and

Rural Communities (NERC) Act 2006 (HM Government 2006) and/or are listed in the Salisbury Plain SSSI Citation and Favourable Condition Tables as part of an assemblage of breeding bird species on lowland dry grassland (Stanbury *et al.* 2005). Many species are in more than one of these categories. They can be seen in Table 1 below.

Table 1: Species of Conservation Interest

English Name	Scientific Name	Red List	SPI	SSSI Assemblage
Blackcap	*Sylvia atricapilla*			•
Bullfinch	*Pyrrhula pyrrhula*		•	•
Chiffchaff	*Phylloscopus collybita*			•
Corn Bunting	*Emberiza calandra*	•	•	•
Cuckoo	*Cuculus canorus*	•	•	•
Curlew	*Numenius arquata*	•	•	
Dunnock	*Prunella modularis*		•	
Garden Warbler	*Sylvia borin*			•
Goldcrest	*Regulus regulus*			•
Goldfinch	*Carduelis carduelis*			•
Grasshopper Warbler	*Locustella naevia*	•	•	•
Greenfinch	*Chloris chloris*			•
Grey Partridge	*Perdix perdix*	•	•	•
House Sparrow	*Passer domesticus*	•	•	
Lapwing	*Vanellus vanellus*	•	•	•
Lesser Redpoll	*Acanthis cabaret*	•	•	
Lesser Whitethroat	*Sylvia curruca*			•
Linnet	*Carduelis cannabina*	•	•	•
Long-eared Owl	*Asio otus*			•
Long-tailed tit	*Aegithalos caudatus*			•
Marsh Tit	*Pocile palustris*	•	•	
Mistle Thrush	*Turdus viscivorous*	•		
Nightingale	*Luscinia megarhynchos*	•		•
Quail	*Coturnix coturnix*			•
Reed Bunting	*Emberiza schoeniclus*		•	•
Short-eared Owl	*Asio flammeus*			•
Skylark	*Alauda arvensis*	•	•	
Song Thrush	*Turdus philomelos*	•	•	
Spotted Flycatcher	*Muscicapa striata*	•	•	
Starling	*Sturnus vulgaris*	•	•	
Stonechat	*Saxicola rubicola*			•
Stone-curlew	*Burhinus oedicnemus*		•	•
Tree Pipit	*Anthus trivialis*	•	•	•
Turtle Dove	*Streptopelia turtur*	•	•	•
Whinchat	*Saxicola rubetra*	•		•
Whitethroat	*Sylvia communis*			•
Willow Tit	*Poecile montanus*	•	•	
Yellowhammer	*Emberiza citrinella*	•	•	

2.3 The Brief and Objectives

2.3.1 The aim of the BBS was to record all bird species within the chalk grassland and scrub habitats on Salisbury Plain SSSI. Population trends among bird species were then to be analysed so as to allow comparison with previous BBS of Salisbury Plain ATE in 2000 and 2005.

2.3.2 The summarised aims of this project were to:

- Carry out a BBS on Salisbury Plain SSSI, visiting a minimum of two thirds of the 1km grid-squares surveyed in 2005 (minimum 100 out of 157 grid-squares), spread across the chalk grassland and scrub habitats within the SSSI.
- Identify appropriate 1km survey squares that will:

  a) replicate previous survey squares;

  b) cover a representative range of habitats (chalk grassland, scrub, edge) across the West, Centre and East of Salisbury Plain; and

  c) not include areas outside of the SSSI.
- Produce a report to show density estimates for each species and discussion of population trends.

2.3.3 To achieve these aims Thomson Ecology was contracted to:

- Devise a method that will mirror that of the national BBS (Gilbert et al., 1998) and the 2005 survey on Salisbury Plain ATE (Stanbury *et al.*, 2005).
- Analyse field results using DISTANCE 6.2 software;
- Provide a digitised database of survey results and information;
- Provide digitised maps and graphs (ideally in ArcMap 9.x format) to illustrate population trends; and
- Incorporate the DISTANCE 6.2 analysed information and digitised maps into a report in the form of an electronic and three bound paper copies which will include the following:

  a) Aims and methodology, highlighting any limitations and constraints on the findings.

  b) Results including density estimates, and so population estimates, for each species, allowing comparison between survey years, using the method described in Buckland et al. (1993), using DISTANCE 6.2 software.

  c) Discussion on trends on Salisbury Plain SSSI and nationally.

2.3.4 Accordingly, this report provides an introduction to the project, outlines the methodology employed, presents summary results and descriptions for each species and provides brief comments on the issues encountered during the fieldwork.

2.4 Limitations

2.4.1 The early survey visits were completed by two surveyors while the late survey visits were completed by three surveyors. Therefore the early visits took a longer period of time (40 days) than the late visits (29 days). This might have affected recording of some species.

2.4.2 The BBS methodology is not ideal for curlew, grey partridge, lapwing and stone-curlew so counts and trends for those species can be largely discounted. As in the 2005 report (Stanbury *et al.* 2005), while the raw count figures are reliable, density and population estimates for most species should be treated with caution. This is especially the case here as distance bands were altered before DISTANCE 6.2 analysis (see Section 4.4.2).

2.4.3 Results do not take into account differences in surveyors, weather or bird detectability between the three survey years.

2.5 Surveyors

2.5.1 The survey was carried out by Stephen Hewitt, Robert Blackler, Mari Roberts and Emily Power.

3. Methodology

3.1 Breeding Bird Survey (BBS)

3.1.1 The aim of this project was to repeat the 2000 and 2005 methodology as closely as possible, to maximise the comparability of the data. The original project followed national British Trust for Ornithology (BTO) BBS methods (Gregory *et al.* 1996). This uses a distance sampling technique that is less time-consuming than territory mapping methods, and as a result, larger areas can be covered.

Survey area and sampling strategy

3.1.2 The survey area was Salisbury Plain SSSI which is 19,690 hectares (196.9km^2) in extent. It comprised one hundred 1km grid-squares, with two further grid-squares surveyed only on early visits. Surveyed grid-squares can be seen in Appendix 1 and Figure 1. This area was substantially smaller than that surveyed in 2000 (141 grid-squares) and 2005 (157 grid-squares). However all 102 squares had been surveyed in 2005 and transect lines followed as closely as possible those that had been done before. Due to military restraints these squares were not entirely random (Stanbury *et al.* 2005) and were thus split into the five survey areas of similar habitat shown in Figure 1.

Working on military ranges

3.1.3 Before conducting any surveys, all fieldworkers were given a safety briefing by the Ministry of Defence (MoD) to highlight working protocols on the ranges, and be issued with permits. Daily liaison with MoD Range Control was essential to determine access for the following day. In addition to standard Personal Protective Equipment (PPE) a mobile phone, reflective jacket, and first aid kit were always carried.

Fieldwork

3.1.4 BBS methodology consists of two parallel 1km transects, 250m in from the edge of each survey grid-square and running north-south or east-west. These transects are split into ten 200m sections. In standard BBS methodology birds are recorded in three distance bands (0-25m, 25-100m, 100m+). However, in common with the 2005 BBS (Stanbury *et al.* 2005), birds were allocated to one of five distance bands (0-10m, 10-25m, 25-100m, 100-250m, 250m+) so that more accurate population estimates could be obtained and to aid comparison between the two surveys. Bird vocalisations (singing or calling) were noted using the standard BTO symbols and sex was also noted where possible. A full list of BTO species codes used in the report can be found in Appendix 2.

3.1.5 In BBS three visits to each survey square are usually entailed; a preliminary visit to set up a survey route, an early season visit and a late season visit. In this survey, the transect lines followed those previously mapped 2000 and 2005. However squares were still visited prior to the early visit, in order to identify any potential health and safety issues on the route and in order to carry out habitat recording (see section 3.1.7). There was at least a four week gap between

early and late bird survey visits to each survey square. The dates of the two survey visits in 2015 were:

- Early visit: 14th April – 24th May
- Late visit: 1st June – 29th June

3.1.6 Fieldwork usually started between 6am and 7am and each recorder covered two to three squares in a morning. The last square was started no later than 9am. Surveys were not done in suboptimal weather conditions.

Habitat recording

3.1.7 In order to aid comparison of results between survey years, habitat recording followed the methodology undertaken in the previous surveys. Habitats were recorded along each 200m-transect section and up to 100m either side of each transect line. They were recorded firstly using the standard national BBS recording form (BTO, 2015) and secondly through recording of further habitat features such as plantation, cultivation, grazing, scrub, topography and vegetation height. Details of the additional habitats recorded can be found in Appendix 3. The raw habitat data will be submitted to Natural England separately from this report.

3.2 Data Analysis

Population trends between 2000 and 2015

3.2.1 Population trends between 2000 and 2015 were investigated using both raw count data (i.e. number of birds recorded) and density estimates. Raw counts were taken to be the maximum count of each species in each grid-square on either the early or late visits. Raw counts are thought to be more reliable than density estimates and are used by the national BBS. Greater weight should therefore be given to these data (Stanbury *et al.* 2005). Density estimates were calculated using DISTANCE 6.2 software.

Distance sampling

3.2.2 During a sampling survey a proportion of the birds present will go unrecorded. Generally the proportion of undetected birds increases with increasing distance from the transect line, due to birds being hidden and remaining invisible and inaudible to the surveyor. The proportion of undetected birds differs between species due to size differences, i.e. sparrows are less apparent with increasing distance than geese; and behaviour, i.e. some species take flight while still at some distance from a surveyor while others remain unseen on the ground. The Distance sampling methodology aims to produce a model of the relationship between detectability of birds and the distance from the transect, so as to calculate an estimated density. This estimate will include undetected, and therefore otherwise excluded birds, giving a truer representation of the numbers of birds present. Such an analysis necessarily includes some assumptions, namely that: all birds on the transect line are detected; birds are detected at their initial location; and distances are measured accurately.

3.2.3 The survey data were analysed using the computer software DISTANCE 6.2 (Thomas *et al*, 2005). Detailed information on distance sampling and the analysis methods can be found in Buckland *et al*. (1993) and Bibby *et al*. (2000).

3.2.4 In the 2005 report migrant species were analysed separately. In this report migrant species were analysed in the same way as resident species.

3.2.5 The collection of data in five distance bands, rather than the BTO's three (see Section 3.1.4), allowed more robust density estimates to be calculated for a number of species using distance analysis.

4. Results

4.1 All species recorded

4.1.1 A list of the 102 grid-squares surveyed in 2015 can be found in Appendix 1 and a full list of the seventy-one species recorded can be found in Appendix 4.

4.2 Trends in raw count data

4.2.1 Direct comparison was made between the 91 grid-squares surveyed in all three years (2000, 2005 and 2015). Table 2 shows the number of each species recorded in 2000, 2005 and 2015, *excluding birds in flight*. At this stage of analysis raw counts were reached by taking the maximum count for each species in each grid-square from the early and late survey visits, thus avoiding double-counting individual birds. This differed from the approach taken in 2000 and 2005, when early and late visit counts were added together (A. Stanbury pers. comm.). Thus, to aid comparison here, maximum counts for 2000 and 2005 were also calculated and can be seen in Table 2.

Table 2. Number of individuals (maximum counts) of each species recorded in 2000, 2005 and 2015, split into the five survey areas, *excluding birds recorded in flight*.

Species	Survey Area																	
	1			2			3			4			5			Totals		
	Year																	
	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015
B.	32	49	44	6	13	9	21	30	29	19	12	18	28	40	41	106	144	141
BC	9	5	29	0	3	7	8	8	37	2	3	10	9	16	56	28	35	139
BF	2	0	2	0	0	0	2	0	0	1	0	0	0	2	2	5	2	4
BO	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
BT	21	38	24	5	10	6	12	33	17	6	6	5	19	40	22	63	127	74
BZ	6	11	5	0	1	1	4	7	5	0	0	1	1	7	10	11	26	22
C.	44	47	100	12	7	18	40	22	34	11	10	28	33	49	81	140	135	261
CB	4	12	62	6	0	9	11	6	27	5	9	36	13	7	74	39	34	208
CC	4	8	21	0	2	2	10	2	22	0	1	6	9	11	28	23	24	79
CD	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4
CH	180	208	95	21	23	15	124	118	58	31	45	28	99	110	84	455	504	280
CK	6	1	11	1	0	0	0	0	3	2	1	4	5	4	10	14	6	28
CT	0	1	0	1	0	0	7	10	3	0	0	0	6	11	5	14	22	8
CU	0	0	0	0	0	0	0	0	0	0	0	0	0	3	18	0	3	18
D.	20	7	11	1	1	0	7	7	13	8	3	6	10	24	18	46	42	48
FF	21	0	0	102	0	0	0	0	0	0	0	0	0	0	0	123	0	0
G.	7	6	7	2	0	3	5	7	7	5	6	3	2	7	9	21	26	29
GC	12	4	7	0	1	0	8	5	13	0	0	0	10	4	15	30	14	35

Species	Survey Area																	
	1			2			3			4			5			Totals		
	Year																	
	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015
GH	23	38	20	0	0	1	6	6	2	14	17	14	2	1	0	45	62	37
GO	14	15	23	0	3	0	9	21	15	0	4	4	6	9	20	29	52	62
GR	12	7	3	0	0	0	6	0	1	0	0	0	2	0	1	20	7	5
GS	1	2	2	0	0	1	0	2	4	0	0	1	2	2	1	3	6	9
GT	0	63	37	0	6	8	0	32	21	0	16	14	0	34	35	0	151	115
GW	1	4	1	0	0	0	5	10	7	1	2	1	10	12	6	17	28	15
HS	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	6	0	0
HY	0	1	0	0	0	0	2	0	0	0	0	0	1	0	0	3	1	0
J.	0	0	2	0	0	4	1	1	3	0	0	0	0	1	7	1	2	16
JD	110	113	113	2	8	4	89	51	105	36	42	41	7	11	59	244	225	322
K.	8	6	3	3	2	0	4	3	0	7	0	4	9	1	5	31	12	12
KT	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
L.	20	4	1	0	0	0	5	4	2	0	0	0	14	19	10	39	27	13
LI	186	129	114	4	13	2	60	27	40	86	76	47	40	57	37	376	302	240
LR	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
LT	4	1	3	0	0	0	6	3	6	0	2	4	8	3	18	18	9	31
LW	3	1	2	0	0	0	2	2	1	1	1	2	7	9	3	13	13	8
M.	8	7	5	1	0	1	3	10	5	0	1	1	7	7	11	19	25	23
MA	10	4	0	0	0	0	0	0	0	4	0	0	6	5	0	20	9	0
MG	75	38	49	12	5	5	29	25	19	10	20	7	47	49	58	173	137	138

Species	Survey Area																	
	1			2			3			4			5			Totals		
	Year																	
	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015
MH	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0
ML	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
MO	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
MP	587	688	211	35	51	13	115	147	74	257	270	105	244	250	79	1238	1406	482
MT	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
N.	1	1	1	0	0	0	0	1	0	0	1	0	1	0	0	2	3	1
P.	2	3	5	0	0	0	8	4	0	5	2	0	13	14	0	28	23	5
PH	44	24	64	5	4	1	21	28	40	8	30	18	18	26	40	96	112	163
PW	10	3	3	0	1	0	7	2	0	0	0	0	3	5	4	20	11	7
Q.	6	13	9	0	2	0	1	3	1	4	10	2	3	9	8	14	37	20
R.	20	33	26	3	4	5	20	29	25	6	9	4	50	41	32	99	116	92
RB	37	46	15	2	0	0	9	10	11	18	24	11	7	13	3	73	93	40
RL	10	12	15	0	0	5	4	4	3	1	4	1	11	15	6	26	35	30
RN	0	0	3	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5
RO	174	85	183	83	0	51	139	0	84	27	1	0	257	0	274	680	86	592
RT	7	2	1	0	2	0	0	3	3	0	1	2	2	1	0	9	9	6
S.	844	1172	1029	162	199	122	412	488	402	470	660	423	656	734	555	2544	3253	2531
SC	38	36	27	0	1	0	14	7	10	20	17	17	13	13	5	85	74	59
SD	6	20	2	3	0	1	4	7	2	4	4	5	5	3	10	22	34	20
SE	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	3	0	0

Species	Survey Area																	
	1			2			3			4			5			Totals		
	Year																	
	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015	2000	2005	2015
SF	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
SG	8	29	8	1	0	0	17	0	43	0	186	43	21	18	20	47	233	114
SH	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	1	2	0
SL	0	1	4	0	6	2	2	0	0	2	0	0	6	12	1	10	19	7
SN	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
ST	9	18	19	1	0	2	3	12	7	4	2	5	9	12	14	26	44	47
TC	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3	0
TD	0	2	0	0	1	0	0	4	0	1	0	0	0	0	0	1	7	0
TN	0	0	0	0	0	0	0	2	0	0	0	0	0	2	3	0	4	3
TO	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	2	1	0
TP	29	44	44	7	6	11	11	11	18	4	6	11	12	14	9	63	81	93
W.	7	2	6	0	0	0	0	0	1	6	0	3	0	0	6	13	2	16
WC	95	68	27	1	0	1	22	10	23	69	48	44	17	13	12	204	139	107
WH	237	204	152	12	12	11	101	75	85	106	100	96	80	78	68	536	469	412
WP	87	125	81	20	48	7	72	86	59	31	41	16	123	147	99	333	447	262
WR	109	66	80	15	14	8	39	40	56	31	29	28	61	55	61	255	204	233
WT	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4	0	0
WW	70	65	29	9	4	1	50	30	23	25	35	9	48	59	25	202	193	87
Y.	87	97	148	17	17	14	80	42	46	24	37	43	74	60	85	282	253	336

4.3 Statistical testing of raw (maximum) count trends

4.3.1 Generalized Linear Mixed Models (GLMMs) were used to evaluate any changes in raw (maximum) counts between 2000 and 2015, including the data for 2005. GLMMs were fitted to the maximum count of each species in each grid square using the Genstat (Payne *et al.* 2009) procedure GLMM with a Poisson error distribution and log link function. Because some species were more variable than would be expected on the basis of a Poisson distribution, the residual variance was estimated from the data.

4.3.2 When testing for statistically significant differences in a dataset with large numbers of species, multiple areas and three time periods, the numbers of tests can be very large, leading to a high risk of type 1 errors (i.e. mistakenly identifying a difference as significant when it is not). To reduce the extent of this problem, formal statistical tests were carried out for the linear trend of each species over the period 2000-2015 (including the data for 2005), rather than comparing individual time periods (Steve Langton pers. comm.).

4.3.3 The species listed in Table 3 showed a statistically significant linear increase or decrease over the period 2000-2015. Analysis of variance was used where GLMMs failed to converge. Birds of conservation interest (see Table 1) are shown in bold.

Table 3: Significant Trends identified through Generalized Linear Mixed Models.

	Increasing	Declining
Overall	Blackbird, **Blackcap**, Carrion Crow, **Corn Bunting**, **Chiffchaff**, **Cuckoo**, **Goldfinch**, Great Tit, Pheasant, **Song Thrush**, **Tree Pipit**, **Yellowhammer**	Chaffinch, **Greenfinch**, Kestrel, **Lapwing**, **Linnet**, Meadow Pipit, **Reed Bunting**, **Whinchat**, **Whitethroat**, Woodpigeon, Willow Warbler
Area 1	**Blackcap**, Carrion Crow, **Corn Bunting**, **Chiffchaff**, Great Tit, Pheasant, **Yellowhammer**	Chaffinch, **Greenfinch**, Lapwing, **Linnet**, Meadow Pipit, **Reed Bunting**, **Whinchat**, **Whitethroat**, Willow Warbler
Area 2	**Blackcap**	None
Area 3	**Blackcap**, **Corn Bunting**, **Chiffchaff**, Pheasant	Chaffinch, Meadow Pipit, **Grey Partridge**, Pied Wagtail, Willow Warbler, **Yellowhammer**
Area 4	**Blackcap**, Carrion Crow, **Corn Bunting**, **Yellowhammer**	**Linnet**, Meadow Pipit, **Whinchat**, Willow Warbler
Area 5	**Blackcap**, Buzzard, Carrion Crow, **Corn Bunting**, **Chiffchaff**, Great Tit, Jackdaw, Pheasant	Meadow Pipit, Robin, **Skylark**, Willow Warbler

4.3.4 In Table 4 below the counts only refer to survey sections visited in all three years. Significant linear trends (P<0.05) over the period 2000-2015 are highlighted in either red to indicate declines or green to indicate increases. The significance levels are shown in the 'sig' columns (*** = P<0.001, **= P<0.01, * = P<0.05, NS = not significant, - = no results due to insufficient

data or model failure). Results are only shown for species where the total maximum count was at least 30 individuals over all areas and years.

Table 4. Total maximum counts (N) of each species recorded in all years, along with percentage change per annum (%chg), estimated from the GLMM and excluding birds recorded in flight.

		Area 1		Area 2		Area 3		Area 4		Area 5		All areas	
Species	N	%chg	sig	%chg	Sig	%chg	sig	%chg	sig	%chg	sig	%chg	sig
S.	8328	0.84	NS	-2.14	NS	-0.42	NS	-1.18	NS	-1.30	**	-0.40	NS
MP	3126	-6.20	***	-5.88	NS	-3.12	*	-5.63	***	-6.83	***	-5.83	***
WH	1417	-2.92	***	-0.62	NS	-0.89	NS	-0.63	NS	-1.11	NS	-1.70	***
RO	1358	1.29	NS		-	-2.68	NS		-	2.73	NS	0.48	NS
CH	1239	-4.22	***	-2.38	NS	-4.91	***	-1.21	NS	-1.27	NS	-3.31	***
WP	1042	-1.00	NS	-5.72	NS	-1.58	NS	-4.35	NS	-1.70	NS	-1.96	*
LI	918	-3.12	*	-4.52	NS	-2.31	NS	-3.96	*	-1.03	NS	-2.91	***
Y.	871	3.77	***	-1.35	NS	-3.49	*	3.34	*	1.34	NS	1.46	*
JD	791	0.15	NS	1.22	NS	2.04	NS	0.68	NS	16.53	**	2.19	NS
WR	692	-1.74	NS	-4.12	NS	2.64	NS	-0.64	NS	0.15	NS	-0.37	NS
C.	536	6.21	***	4.01	NS	-0.54	NS	7.59	*	5.87	**	4.84	***
WW	482	-5.61	***		-	-5.09	**	-6.05	*	-4.30	**	-5.38	***
WC	450	-7.93	***		-	1.32	NS	-2.85	*	-2.19	NS	-4.19	***
MG	448	-2.52	NS	-5.88	NS	-2.78	NS	-2.98	NS	1.46	NS	-1.34	NS
SG	394		-		-		-	0.54	NS		-		-
B.	391	1.46	NS	1.22	NS	1.65	NS	0.17	NS	2.06	NS	1.49	*
PH	371	3.86	*	-9.47	NS	4.20	*	2.12	NS	5.17	**	3.65	***
R.	307	0.92	NS	3.18	NS	0.92	NS	-3.02	NS	-2.91	*	-0.73	NS
CB	281	18.90	***	5.99	NS	8.43	**	14.40	***	16.41	***	14.43	***
GT	266	5.19	*	10.93	NS	5.88	NS	7.80	NS	8.97	**	6.85	***
BT	264	-0.10	NS		NS	0.28	NS	-1.27	NS	-0.32	NS	-0.15	NS
TP	237	2.18	NS	3.71	NS	3.71	NS	6.75	NS	-2.12	NS	2.36	*
SC	218	-2.30	NS		-	-1.83	NS	-0.96	NS	-5.98	NS	-2.39	NS
RB	206	-5.58	**		-	1.28	NS	-3.44	NS	-5.16	NS	-4.02	***
BC	202	10.88	***	15.62	**	12.65	***	11.87	**	13.12	***	12.51	***
GH	144	-1.61	NS		-	-6.71	NS	-0.29	NS		-	-1.72	NS
GO	143	3.59	NS		-	1.70	NS	8.75	NS	8.34	NS	4.21	*
D.	136	-3.76	NS		-	4.72	NS	-1.27	NS	2.12	NS	0.44	NS
CC	126	11.07	***		-	8.75	*		-	8.45	***	9.82	***
FF	123		-		-		-		-		-		-
ST	117	3.78	NS		-	2.12	NS	2.70	NS	2.67	NS	3.15	*
RL	91	2.64	NS		-		-		-	-4.06	NS	0.52	NS
GC	79	-3.28	NS		-	4.58	NS		-	4.54	NS	2.20	NS
L.	79	-21.75	*		-	-5.88	NS		-	-2.55	NS	-7.06	*
G.	76	0.21	NS		-	1.79	NS	-3.49	NS	7.19	NS	1.96	NS

Species	N	Area 1		Area 2		Area 3		Area 4		Area 5		All areas	
		%chg	sig	%chg	Sig	%chg	sig	%chg	sig	%chg	sig	%chg	sig
SD	76	-5.58	NS		-	-4.52	NS		-		-	-1.25	NS
Q.	71	1.22	NS		-		-	-4.52	NS	4.03	NS	0.42	NS
M.	67	-3.10	NS		-	0.71	NS		-	3.39	NS	0.89	NS
GW	60	-2.19	NS		-	0.97	NS		-	-3.49	NS	-1.52	NS
BZ	59	-1.98	NS		-	0.53	NS		-	9.58	*	2.87	NS
LT	58	-1.08	NS		-	0.85	NS		-	8.26	NS		-
P.	56		-		-	-19.35	*		-		-		-
K.	55	-6.30	NS		-	-15.97	NS		-		-	-6.46	**
CK	48		-		-		-	6.75	NS	5.85	NS	7.00	**
CT	44		-		-	-5.26	NS		-	-1.98	NS	-3.86	NS
PW	38	-8.54	NS		-	-24.97	**		-		-	-6.95	NS
SL	36		-		-		-		-		-		-
LW	34		-		-		-		-	-5.30	NS	-3.26	NS
GR	32	-8.95	*		-		-		-		-	-9.71	*
W.	31	0.00	NS		-		-		-		-	3.56	NS

4.4 Density changes from 2000 to 2015

4.4.1 The second method of investigating population change was calculating density estimates for both years, using the DISTANCE 6.2 software.

- To obtain comparable density estimates for 2000, 2005 and 2015 only data from sections surveyed in all three years were used.
- This method should, in theory, compensate for differences in recorder, weather, and any changes in bird detectability over the two survey years.
- In 2000 and 2005, only data up to 100m from the survey line were used to calculate densities. In order to standardise this, data from 2015 were treated the same way (i.e. the 0-10m and 10-25m distance bands were combined and the 100-250m and 250m+ distance bands were ignored). This resulted in two categories, 0-25m and 25-100m (but see also section 4.4.2).
- The 2000 and 2005 data were reanalysed to maximise comparability.
- Densities were calculated for each of the five areas of Salisbury Plain SSSI, along with a Global densities estimate. This was carried out using the Global detection function i.e. using all the species data to calculate a detection function and then using that to work out a density estimate for each area. Areas with fewer than 20 individuals in either year were excluded due to small sample sizes.
- Results were considered significant if the bootstrap confidence limits did not overlap.
- The survey effort for each of the areas in 2000, 2005 and 2015 was as follows. Area 1: - 196.8km; Area 2: - 58.4km; Area 3: - 61.2km; Area 4: - 83.6km Area 5: - 155.2km; All: - 555.2km.

4.4.2 Bird counts for 2015 were first entered into DISTANCE 6.2 software in the distance bands recorded in the raw data, but with the 0-10m and 10-25m distance bands combined and anything over 100m ignored (as in Stanbury *et al.* 2005). However this consistently produced very high density estimates for most species. Further analysis of the data showed that proportionally many more birds were recorded in the lower distance bands in the 2015 survey than in 2000 and 2005. This was most likely due to surveyors overestimating the size of distance bands in the field. When birds in the 10-25m distance band were reallocated to the 25-100m distance band, analysis produced much more realistic density estimates for most species. The 0-10m band then effectively became the 0-25m category. The original distance bands were retained for skylark as these produced relatively more accurate results.

4.4.1 Table 5 shows significant changes in density between 2000 and 2015. Table 6 shows significant changes in density between 2005 and 2015. Table 7 presents density estimates for all species for 2000, 2005 and 2015, along with the percentage change.

Table 5: Significant Density Trends for 2000-2015 identified through Distance 5 analysis. Birds of conservation interest (see Table 1) are shown in **bold**.

	Increasing	Declining
Overall	**Blackcap, Corn Bunting, Skylark**	Chaffinch, **Linnet**, Meadow Pipit, **Reed Bunting**, **Stonechat**, **Whinchat**, **Whitethroat**, Woodpigeon, Willow Warbler.
Area 1	**Skylark**	Chaffinch, **Linnet**, Magpie, Meadow Pipit, **Whinchat**, **Whitethroat**,
Area 2	**Skylark**	Meadow Pipit, **Whitethroat**,
Area 3	**Skylark**	Chaffinch, Meadow Pipit, **Whitethroat**
Area 4	**Skylark**	**Linnet**, Meadow Pipit, **Whinchat**, **Whitethroat**,
Area 5	**Skylark**	Meadow Pipit, **Whinchat**, **Whitethroat**,

Table 6: Significant Density Trends for 2005-2015 identified through Distance 5 analysis. Birds of conservation interest (see Table 1) are shown in **bold**.

	Increasing	Declining
Overall	**Corn Bunting**, Wren.	Blue Tit, Great Tit, Meadow Pipit, **Reed Bunting**, Red-legged Partridge, **Whitethroat**, Woodpigeon, Willow Warbler
Area 1	None	Blue Tit, Chaffinch, Meadow Pipit, **Whinchat**, **Whitethroat**, Woodpigeon,
Area 2	None	Meadow Pipit
Area 3	Wren	Chaffinch, Meadow Pipit,
Area 4	None	Meadow Pipit, **Whinchat**,
Area 5	Wren	Blue Tit, Chaffinch, Meadow Pipit,

4.4.2 In Table 7 changes in density between surveys are shown in yellow. The “No. of Birds” column includes the sum of the number of individuals recorded from 0-100m on both early and late visit counts for each of the 91 grid-squares surveyed in all three years. Hence numbers differ considerably from the raw maximum counts in Table 2 above. In Table 7 bLCL equals the Bootstrap Lower Confidence Limit and bUCL equals the Bootstrap Upper Confidence Limit. Statistically significant density trends are shown in either red or green.

Table 7. Species density trends between 2000 and 2015.

		2000	2005	2015		2000	2005	2015			2000	2000	2005	2005	2015	2015
Species Code	Area	No. of Birds	No. of Birds	No. of Birds	Change in No. 2000 - 2015	Density Estimate (km^2)	Density Estimate (km^2)	Density Estimate (km^2)	Change in Density (2005 to 2015)	Overall Change in Density (2000 to 2015)	bLCL	bUCL	bLCL	bUCL	bLCL	bUCL
B.	1	29	49	45	55%	2.12	1.72	1.98	15%	-7%	0.89	3.5	1.26	2.72	1.22	3.18
B.	All	77	123	156	103%	1.82	1.79	2.04	14%	12%	1.21	2.54	1.41	2.47	1.72	2.38
BC	All	28	17	167	496%	0.57	N/A	2.18		282%	0.3	0.97	N/A	N/A	1.87	2.51
BT	1	22	54	30	36%	1.51	3.12	1	-68%	-34%	0.61	2.67	1.93	4.67	0.61	1.91
BT	5	24	54	27	13%	1.64	6.37	1.69	-73%	3%	0.93	3.26	3.84	9.98	0.95	3.29
BT	All	75	165	91	21%	1.58	4.36	1.4	-68%	-11%	0.98	2.28	3.31	5.47	0.95	2.06
C.	1	38	37	80	111%	3.78	1.27	2.57	102%	-32%	2.3	5.47	0.93	1.79	2.05	3.13
C.	3	41	22	29	-29%	4.3	2.94	2.28	-22%	-47%	2.43	6.71	1.32	5.24	1.65	3.98
C.	5	20	45	84	320%	2.76	4.49	4.27	-5%	55%	1.17	4.73	2.59	6.76	3.51	5.07
C.	All	112	118	239	113%	3.1	2.33	2.94	26%	-5%	2.25	4.03	1.69	3.08	2.61	3.97
CB	All	31	28	276	790%	0.56	0.62	3.46	458%	518%	0.31	0.99	0.33	1.11	3.09	3.87
CC	All	17	15	88	418%	N/A	N/A	1.17	N/A	N/A	N/A	N/A	N/A	N/A	0.92	1.38
CH	1	165	245	126	-24%	7.27	8.75	3.12	-64%	-57%	5.13	9.64	6.98	10.69	3.3	5.12
CH	2	30	28	22	-27%	10.42	8.72	6.48	-26%	-38%	5.42	16.3	4.66	14.75	2.96	13.4
CH	3	169	146	88	-48%	16.2	10.84	5.85	-46%	-64%	12.66	20.13	7.97	14.01	4.85	6.85
CH	4	38	55	36	-5%	3.61	4.76	2.78	-42%	-23%	2.1	6.33	3.31	7.07	1.93	3.7
CH	5	114	127	116	2%	8.06	7.56	5.61	-26%	-30%	5.47	10.96	5.57	10.34	4.75	6.54
CH	All	516	601	388	-25%	8.87	8.31	4.56	-45%	-49%	7.59	10.22	7.14	9.59	4.18	5.01

		2000	2005	2015		2000	2005	2015			2000	2000	2005	2005	2015	2015
Species Code	Area	No. of Birds	No. of Birds	No. of Birds	Change in No. 2000 - 2015	Density Estimate (km^2)	Density Estimate (km^2)	Density Estimate (km^2)	Change in Density (2005 to 2015)	Overall Change in Density (2000 to 2015)	bLCL	bUCL	bLCL	bUCL	bLCL	bUCL
D.	All	50	44	60	20%	0.77	0.6	0.81	35%	5%	0.5	1..24	0.44	1.01	0.61	1.04
GC	All	33	14	43	30%	0.74		0.59	N/A	-20%	0.38	1.22			0.42	0.82
GH	1	20	34	25	25%	1.03	1.58	0.85	-46%	-17%	0.46	1.87	0.87	2.58	0.53	1.17
GH	All	31	48	43	39%	0.62	0.71	0.57	-20%	-8%	0.33	1.06	0.49	1.13	0.41	0.74
GO	All	28	62	62	121%	0.75	1.22	0.8	-34%	7%	0.31	1.38	0.79	1.79	0.64	1.3
GT	All	0	170	132	N/A	N/A	4.18	2.28	-45%	N/A	N/A	N/A	3.24	5.28	1.61	3.13
JD	3	48	44	55	15%	6.74	3.01	5.58	85%	-17%	4.2	9.67	2.19	4.73	3.4	8.27
JD	All	182	89	221	21%	2.22	1.14	2.67	134%	20%	1.84	2.72	0.93	1.46	2.3	3.42
LI	1	196	158	136	-31%	11.62	10.08	4.64	-54%	-60%	9.3	14.03	7.97	12.38	3.52	6.38
LI	3	41	36	44	7%	7.36	5.15	3.23	-37%	-56%	3.98	11.44	2.47	8.87	2.37	5.56
LI	4	152	92	55	-64%	16.08	12.74	4.6	-64%	-71%	12.61	20	8.86	17.29	3.27	6.87
LI	5	46	56	48	4%	5.56	8.36	4.5	-46%	-19%	3.41	8.19	5.56	11.66	2.39	7.21
LI	All	438	355	285	-35%	10.45	9.28	4.13	-55%	-60%	9.05	12.04	7.83	10.72	3.21	5.08
M.	All	16	22	25	56%	N/A	0.3	0.34	13%	N/A	N/A	N/A	0.19	0.58	0.22	0.55
MG	1	50	31	35	-30%	2.41	1.12	1.1	-2%	-54%	1.52	3.64	0.81	2.7	0.75	1.57
MG	5	33	53	71	115%	2.62	3.59	3.75	4%	43%	1.45	4.43	2.43	5.37	3.01	4.48
MG	All	122	124	134	10%	2.61	1.99	1.77	-11%	-32%	1.83	3.46	1.49	2.73	1.48	2.06
MP	1	820	1036	293	-64%	24.69	20.08	8.03	-60%	-67%	22.54	27.03	18.23	21.93	7.4	9.31
MP	3	80	201	110	38%	16.08	15.38	7.05	-54%	-56%	11.08	21.45	12.11	18.9	5.96	8.08

		2000	2005	2015		2000	2005	2015			2000	2000	2005	2005	2015	2015
Species Code	Area	No. of Birds	No. of Birds	No. of Birds	Change in No. 2000 - 2015	Density Estimate (km^2)	Density Estimate (km^2)	Density Estimate (km^2)	Change in Density (2005 to 2015)	Overall Change in Density (2000 to 2015)	bLCL	bUCL	bLCL	bUCL	bLCL	bUCL
MP	4	426	418	167	-61%	26.47	18.32	10.77	-41%	-59%	23.5	29.86	15.59	21.21	8.98	13.8
MP	5	362	354	109	-70%	28.95	18.19	6.23	-66%	-78%	25.43	32.9	15.6	20.92	4.78	8.66
MP	All	1740	2071	695	-60%	24.91	18.75	7.39	-61%	-70%	23.34	26.61	17.59	20.01	7.01	8.2
PH	All	57	64	119	109%	1.5	1.55	1.59	3%	6%	0.84	2.23	0.94	2.24	1.34	2.17
R.	1	21	32	33	57%	1.34	1.13	1.59	41%	19%	0.57	2.43	0.78	2.18	0.92	2.69
R.	3	20	30	27	35%	4	2.9	2.24	-23%	-44%	1.71	7	1.6	4.97	1.59	4.06
R.	5	55	48	42	-24%	3.91	3.39	2.39	-29%	-39%	2.32	6.28	2.11	5.34	1.76	3.18
R.	All	106	124	111	5%	2.29	1.94	1.49	-23%	-35%	1.6	3.03	1.44	2.63	1.26	2.02
RB	All	68	88	45	-34%	1.79	1.78	0.66	-63%	-63%	1.11	2.56	1.2	2.51	0.46	1.13
RL	All	22	37	34	55%	0.79	1.76	0.61	-65%	-23%	0.4	1.32	1.06	2.66	0.37	1.03
S.	1	921	1502	1327	44%	19.77	28.82	33.65	17%	70%	17.81	21.98	25.7	31.87	30.64	36.73
S.	2	197	252	185	-6%	24.03	38.91	45.13	16%	88%	19.34	29.28	29.19	48.94	36.61	54.25
S.	3	331	636	537	62%	22.03	33.45	42.32	27%	92%	18.79	25.5	28.42	38.6	37.65	46.97
S.	4	704	852	643	-9%	26.35	38.89	45.44	17%	72%	23.67	29.12	33.61	44.04	41.24	50.2
S.	5	768	1009	726	-5%	27.21	36.65	39.72	8%	46%	24.72	29.76	32.4	41.24	36.19	43.62
S.	All	2921	4251	3418	17%	23.73	33.67	38.94	16%	64%	22.51	24.93	31.49	35.89	37.12	40.83
SC	1	37	42	25	-32%	2.16	1.23	2.57	109%	19%	1.13	3.35	0.84	1.65	1.27	4.13
SC	4	22	24	24	9%	2.59	3.37	1.86	-45%	-28%	1.25	4.92	1.63	5.72	1.24	3.54
SC	All	80	83	65	-19%	1.97	1.11	0.92	-17%	-53%	1.37	2.67	0.89	1.47	0.7	1.43

		2000	2005	2015		2000	2005	2015			2000	2000	2005	2005	2015	2015
Species Code	Area	No. of Birds	No. of Birds	No. of Birds	Change in No. 2000 - 2015	Density Estimate (km^2)	Density Estimate (km^2)	Density Estimate (km^2)	Change in Density (2005 to 2015)	Overall Change in Density (2000 to 2015)	bLCL	bUCL	bLCL	bUCL	bLCL	bUCL
SD	All	18	25	21	17%	N/A	0.51	0.29	-43%	N/A	N/A	N/A	0.26	0.88	0.16	0.64
ST	All	15	22	49	227%	N/A	0.39	0.67	72%	N/A	N/A	N/A	0.19	0.81	0.49	0.86
TP	All	44	67	98	123%	0.97	1.04	1.32	27%	36%	0.54	1.48	0.74	1.64	1.09	1.57
WC	1	90	70	32	-64%	3.45	2.56	1.2	-53%	-65%	2.53	4.75	1.88	3.95	0.74	1.61
WC	4	100	51	56	-44%	8.69	6.04	4.02	-33%	-54%	5.86	12.6	3.52	8.99	3.16	4.81
WC	All	211	144	132	-37%	5.48	2.38	1.73	-27%	-68%	4.23	6.86	1.73	3.14	1.44	2.03
WH	1	264	249	228	-14%	10.21	8.92	6.14	-31%	-40%	8.14	12.48	7.02	10.93	5.54	6.73
WH	3	87	100	113	30%	15.61	8.75	8.08	-8%	-48%	11.36	20.33	6.13	12.45	6.54	11.36
WH	4	193	124	148	-23%	15.59	9.97	8.11	-19%	-48%	12.18	19.11	7.35	13.26	7.13	8.99
WH	5	96	102	92	-4%	8.95	6.54	4.77	-27%	-47%	6.15	12.37	4.52	9.34	3.89	5.6
WH	All	653	587	594	-9%	11.52	8.27	6.3	-24%	-45%	10.14	12.92	7.01	9.72	5.93	6.67
WP	1	72	140	65	-10%	4	8.54	3.07	-64%	-23%	2.54	5.5	6.52	10.79	2.05	4.52
WP	3	75	96	64	-15%	10.17	7.74	6.73	-13%	-34%	7	13.56	5.61	10.54	4.29	9.6
WP	5	143	156	108	-24%	17.9	8.18	5.21	-36%	-71%	12.52	24.9	6.23	10.73	4.49	6.92
WP	All	339	489	259	-24%	8.74	7.39	3.81	-48%	-56%	7.15	10.83	6.2	8.5	3.08	4.77
WR	1	116	67	107	-8%	4.27	2.28	3.32	46%	-22%	3.19	6.01	1.77	3.48	2.71	3.99
WR	3	39	31	64	64%	3.56	2.44	4.65	91%	31%	2.4	6.35	1.73	3.77	3.71	5.6
WR	4	41	30	41	0%	3.13	2.4	3.11	30%	-1%	2.21	5.46	1.6	3.59	2.35	4.67
WR	5	64	51	82	28%	3.54	2.47	4.25	72%	20%	2.66	4.59	2.09	2.9	3.48	5.03

		2000	2005	2015		2000	2005	2015			2000	2000	2005	2005	2015	2015
Species Code	Area	No. of Birds	No. of Birds	No. of Birds	Change in No. 2000 - 2015	Density Estimate (km^2)	Density Estimate (km^2)	Density Estimate (km^2)	Change in Density (2005 to 2015)	Overall Change in Density (2000 to 2015)	bLCL	bUCL	bLCL	bUCL	bLCL	bUCL
WR	All	282	189	302	7%	3.62	2.47	3.66	48%	1%	3.16	4.73	2.12	2.89	3.28	4.04
WW	1	54	65	35	-35%	1.85	2.77	1.2	-57%	-35%	1.38	2.95	1.81	4.23	0.82	1.58
WW	3	30	26	26	-13%	2.7	2.06	2.1	2%	-22%	1.68	5.19	1.35	3.56	1.37	2.98
WW	5	42	57	38	-10%	3.51	3.13	2.12	-32%	-40%	1.88	5.58	2.3	4	1.34	2.9
WW	All	165	200	112	-32%	2.85	2.56	1.48	-42%	-48%	2.06	3.78	2.24	3.21	1.21	1.78
Y.	1	82	112	211	157%	2.79	4.73	6.1	29%	119%	2.21	3.9	3.33	6.47	5.42	6.82
Y.	3	84	58	66	-21%	10.49	8.75	4.83	-45%	-54%	6.72	13.87	5.78	12.32	4.09	7.19
Y.	4	39	48	60	54%	5.49	4.96	4.46	-10%	-19%	2.83	8.82	3.05	7.47	3.57	5.51
Y.	5	79	72	105	33%	6.15	4.96	5.31	7%	-14%	3.9	8.55	3.34	7.3	4.45	6.23
Y.	All	299	311	462	55%	5.52	5.62	5.36	-5%	-3%	4.39	6.78	4.54	6.72	4.96	5.76

Comparison of raw count and density analyses

4.4.3 In general, the significant density trends correlate with the significant raw (maximum) count trends. In terms of birds of conservation interest (see Table 1) blackcap and corn bunting show overall density increases while linnet, reed bunting, whinchat and whitethroat show overall density declines. Stonechat also shows a significant overall density decline between 2000 and 2015, and while raw (maximum) count trends for this species are not significant, they are nearly significant at p<10% (Steve Langton pers. comm).

4.4.4 However due to inherent problems with Distance analysis and the alteration of distance bands the density estimates and subsequent population estimates in this report should be treated with caution. Additionally, species like skylark and meadow pipit which sing in flight, are especially difficult to accurately assign to distance bands in the field.

4.4.5 Raw counts are thought to be more reliable for determining trends and are used by the national BBS (Stanbury *et al.* 2005). Therefore the raw (maximum) counts in Table 2 and trends in Table 4 should be prioritised when examining bird population changes on the SSSI.

4.4.6 However the density estimates for 2015 have been used to produce population estimates for the SSSI and these can be found Tables 9 and 10 in Section 4.6 below.

4.5 Comparison of Raw (Maximum) Counts with National Trends

4.5.1 As in the 2005 report (Stanbury et al. 2005), trends in raw counts were compared with national trends for England from the UK BBS. These comparisons can be seen in Table 8 below.

4.5.2 In Table 8 trends are highlighted in green for those species that show increases on Salisbury Plain SSSI and contrary declines across England. Trends are highlighted in red for those species that show declines on Salisbury Plain SSSI and contrary increases across England. Species with less than 80 records in all three survey years are excluded from this table.

4.5.3 *It should be noted that these trends are by no means directly comparable as the SSSI trends are percentage changes per year for the period 2000-2015 while the national trends are an eighteen year percentage change between 1995 and 2013 (see Section 4.3.2).*

Table 8. Comparison of Salisbury Plain SSSI raw (maximum) count trends with figures for the whole of England.

Species	Maximum counts 2015	SSSI Trend per annum 2000-2015	Trend for England 1995-2013
Blackbird	141	1.49	18
Blackcap	139	12.51	115
Blue Tit	74	0.15	2
Carrion Crow	261	4.84	24
Corn Bunting	208	14.43	-36
Chiffchaff	79	9.82	90
Chaffinch	280	-3.31	5
Dunnock	48	0.44	15
Grasshopper Warbler	37	-1.72	-40
Goldfinch	62	4.21	106
Great Tit	115	6.85	30
Jackdaw	322	2.19	60
Linnet	240	-2.91	-27
Magpie	138	-1.34	-1
Meadow Pipit	482	-5.83	-11
Pheasant	163	3.65	31
Robin	92	0.73	15
Reed Bunting	40	-4.02	28
Red-legged Partridge	30	0.52	7
Rook	592	0.48	-13
Skylark	2531	-0.4	-23
Stonechat	59	-2.39	6
Song Thrush	47	3.15	10
Tree Pipit	93	2.36	-49
Whinchat	107	-4.19	-38
Whitethroat	412	-1.7	36
Woodpigeon	262	-1.96	41
Wren	233	-0.37	5
Willow Warbler	87	-5.38	-37
Yellowhammer	336	1.46	-25

4.6 SSSI Population Estimates

Density estimates of males

4.6.1 The proportion of males in the 2015 bird populations was calculated from the raw data for early and late visits added together. Unsexed birds were discounted from the analysis as some might have been males. As in 2005 the analysis excluded non-singing species that are difficult to sex.

4.6.2 These proportions were then compared with the overall 2015 density of individuals (presented in Table 7) to calculate the density of males in each bird population. As noted above (sections 4.4.2 and 4.4.5) for most species birds in the 10-25m band were reallocated to the 25-100m band before DISTANCE 6.2 analysis. The exceptions to this were garden warbler, skylark and quail where existing distance bands produced more realistic results. Densities of individual birds and males can be found in Table 9 below.

4.6.3 The density of males was multiplied by the area of the Salisbury Plain SSSI (196.9km^2) to give an estimate of breeding pairs or territories on the SSSI. These total population estimates are shown in Tables 9 and 10 below. They are generally lower than in the 2005 report as those were calculated for the entire Salisbury Plain ATE area (296.54km^2) (Stanbury *et al.* 2005).

4.6.4 Compared with raw maximum count figures (see Table 2) some density and population figures seem to be underestimates (blue tit, goldfinch, linnet and meadow pipit in particular) and so these should be regarded only as minimum populations. As in the 2005 report, woodland species will generally be underestimated as grid-squares with over 50% woodland were excluded from the survey.

Table 9: Density estimates of males (singing and non-singing) in proportion to overall density of individuals on Salisbury Plain SSSI.

Species	No. of males	Density of Males (km^2)	DLCLb	DUCLb	Density of Individuals (km^2)	Proportion of males	Total SSSI Population Estimate (pairs/territories)
B.	136	1.98	1.72	2.38	2.04	97	390
BC	189	2.18	1.87	2.51	2.18	100	429
BT	41	1.33	0.95	2.06	1.4	95	262
CB	273	3.46	3.09	3.87	3.46	100	681
CC	102	1.17	0.92	1.38	1.17	100	230
CH	314	4.29	4.18	5.01	4.56	94	844
D.	58	0.81	0.61	1.04	0.81	100	159
GC	43	0.59	0.42	0.82	0.59	100	116
GH	47	0.56	0.41	0.74	0.57	98	110
GO	30	0.70	0.64	1.3	0.8	88	139
GT	56	2.05	1.61	3.13	2.28	90	404
GW	15	0.21	0.11	0.32	0.21	100	41
LI	165	3.06	3.21	5.08	4.13	74	602
M.	14	0.34	0.22	0.55	0.34	100	67
MP	557	7.39	7.01	8.2	7.39	100	1455
Q.	17	0.38	0.17	0.76	0.4	94	74
R.	110	1.49	1.26	2.02	1.49	100	293
RB	39	0.50	0.46	1.13	0.66	75	97
RL	3	0.37	0.37	1.03	0.61	60	72
S.	3687	38.94	12.95	13.26	38.94	100	7667
SC	32	0.58	0.7	1.43	0.92	63	114
SD	5	0.21	0.16	0.64	0.29	71	41
ST	56	0.67	0.49	0.86	0.67	100	132
TP	117	1.32	1.09	1.57	1.32	100	260
WC	109	1.59	1.44	2.03	1.73	92	313
WH	550	6.11	5.93	6.67	6.3	97	1203
WP	156	3.81	3.08	4.77	3.81	100	750
WR	324	3.66	3.28	4.04	3.66	100	721
WW	119	1.48	1.21	1.78	1.48	100	291
Y.	408	4.61	4.96	5.76	5.36	86	908

SSSI Population Estimates Compared to UK Population Estimates

4.6.5 Table 10 gives Salisbury Plain SSSI population estimates for thirty species. These are primarily singing species or those in which males and females are readily distinguishable.

4.6.6 Table 10 shows that two species have populations on the SSSI over 1% of the UK national total; these are quail and corn bunting. The same species were recorded as having over 1% of their UK populations on Salisbury Plain ATE in 2005 (Stanbury *et al.* 2005).

4.6.7 In 2005 the stonechat population on the ATE was also *possibly* over the 1% threshold but raw count analysis (see Tables 2 and 4) shows probable (though non-significant) declines in stonechat on the SSSI since then. Whinchat was over the 1% threshold in 2005 but there has been a significant decline in the species on the SSSI since then. Grasshopper warbler was also over the 1% threshold in 2005 but raw count analysis shows a non-significant decline since both 2000 and 2005. Crucially, for all three of these species the national population estimate has been revised upwards considerably since 2005 (Musgrove *et al.* 2013).

4.6.8 At 6.19% of the national total the corn bunting figure is possibly slightly high. However raw count trends show a considerable and highly significant increase per year on the SSSI since 2000 (Table 4) so this figure should not be dismissed without further study.

Table 10: Species population estimates for the Salisbury Plain SSSI and comparison with UK figures.

Species	Density of males on SSSI (km2)	SSSI (196.9km2) Population 2015 (Pairs/Territories)	ATE (296.54km2) Population 2005 (Pairs/Territories) from Stanbury *et al.* 2005	UK Population from Musgrove *et al.* 2013	% of UK Population
Quail	0.38	74	97	540	13.70
Corn Bunting	3.46	681	276	11000	6.19
Grasshopper Warbler	0.56	110	121	16000	0.69
Whinchat	1.59	313	429	47000	0.67
Skylark	38.94	7667	10938	1500000	0.51
Tree Pipit	1.32	260	200	88000	0.30
Stonechat	0.58	114	150	59000	0.19
Linnet	3.06	603	1523	430000	0.14
Yellowhammer	4.61	908	955	710000	0.13
Whitethroat	6.11	1203	2969	1100000	0.11
Red-legged Partridge	0.37	73	329	82000	0.09
Meadow Pipit	7.39	1455	5153	2000000	0.07
Reed Bunting	0.5	98	215	250000	0.04
Mistle Thrush	0.34	67	67	170000	0.04
Blackcap	2.18	429	43	1200000	0.04
Garden Warbler	0.21	41	111	170000	0.02
Chiffchaff	1.17	230	91	1200000	0.02
Goldcrest	0.59	116	53	610000	0.02
Stock Dove	0.21	41	72	260000	0.02
Great Tit	2.05	404	715	2600000	0.02
Wood Pigeon	3.81	750	1802	5300000	0.01
Chaffinch	4.29	845	1797	6200000	0.01
Willow Warbler	1.48	291	578	2400000	0.01
Goldfinch	0.7	138	388	1200000	0.01
Song Thrush	0.67	132	87	1200000	0.01
Wren	3.66	721	907	8600000	0.01
Blackbird	1.98	390	319	5100000	0.01
Blue Tit	1.33	262	878	3600000	0.01
Dunnock	0.81	159	122	2500000	0.01
Robin	1.49	293	413	6700000	0.00

5. Discussion

5.1.1 This discussion is primarily concerned with species of conservation interest present on the plain. For the purposes of this report species of conservation interest are defined as red listed species on the BoCC list (Eaton et al, 2015), SPI and/or those listed in the Salisbury Plain SSSI criteria as part of an assemblage of breeding bird species on lowland dry grassland (Stanbury *et al.* 2005). A list of these species and their conservation status can be found in Table 1 above.

5.1.2 As in the 2005 report, for a few species the statistical analysis produced conflicting results after the modelling of raw counts and the modelling of density trends, with one method suggesting increases and the other declines. Discussion is focussed on the raw (maximum) counts and associated trends which are thought to be more reliable than density estimates and are used by the national BBS (Stanbury *et al.* 2005).

5.2 Species not recorded in 2015

5.2.1 Of the 37 species of conservation interest, seven were not recorded at all in the 2015 BBS. These species were house sparrow, long-eared owl, short-eared owl, spotted flycatcher, marsh tit, turtle dove and willow tit. These species were not present in the 100 survey grid-squares; however this does not mean they are now absent from Salisbury Plain. They may be nocturnal, locally distributed or present in very small numbers. In the same survey squares in 2000 and 2005 they were only recorded in small numbers (<8), if at all.

Turtle Dove (TD)

5.2.2 The lack of turtle doves reflects national trends for England, where there was a 91% decline between 1995 and 2013 (Harris *et al.* 2015). However turtle doves are probably still present on the plain in small numbers annually (Sarah Grinstead and Nick Adams pers. comm.). Issues on migration are probably the main causes of decline in this species. There were too few records in the survey squares in the three survey years to do statistical analysis for this species.

5.3 Statistically Significant Trends for Species of Conservation Interest

Blackcap (BC)

5.3.1 Blackcap has greatly increased on Salisbury Plain SSSI since 2000 (12.51% per year) and this is to be expected when national trends for a similar period are taken into account (Harris *et al.* 2015). The species has significantly increased across all five survey areas of the plain. Blackcaps increased by 115% across England between 1995 and 2013 (Harris *et al.* 2015). However blackcap seems to have increased at an even greater rate than this on Salisbury Plain. Density trends also show a significant increase on the SSSI (see Table 7).

Chiffchaff (CC)

5.3.2 Chiffchaff has also increased on Salisbury Plain SSSI since 2000 which is broadly in line with national trends. The population has significantly increased in Areas 1, 3, 5 and overall. This species increased by 90% across England between 1995 and 2013 (Harris *et al.* 2015). Chiffchaff would most likely show a significant density increase except that numbers in 2000 and 2005 were too low to analyse.

Corn Bunting (CB)

5.3.3 Corn bunting increases on Salisbury Plain SSSI have been remarkable and defy national trends which show a 36% decline in England from 1995-2013 (Harris *et al.* 2015). Corn buntings have increased significantly on all survey areas of the plain except Area 2 and have shown a 14% increase per annum since 2000. This increase may be due to the success of targeted agri-environment schemes on and around the plain. There has been an expansion of range into the main body of the SSSI since 2005, as is evident in Figure 3c (map). Corn bunting is one of the two species with over 1% of its national population within Salisbury Plain SSSI (see Table 10) and density trends also show a significant increase since 2000 (see Table 7).

Cuckoo (CK)

5.3.4 Cuckoo appears to have had a very good year on Salisbury Plain SSSI which is contrary to recent national trends which show a 68% decline across England from 1995-2013. Their numbers are up on 2000 and 2005. However with only 28 birds recorded in 2015, 14 in 2000 and six in 2005 this trend (while significant) should be treated with caution. Additionally, calling (properly *singing*) cuckoos move around considerably, making accurate counting difficult. Figure 2l shows cuckoo maximum counts by grid-square

Goldfinch (GO)

5.3.5 According to raw (maximum) counts goldfinch numbers have more than doubled on Salisbury Plain SSSI since 2000 but increased more modestly since 2005. They show a 4.21% increase per annum since 2000. Trends for England show a 106% increase between 1995 and 2013 (Harris *et al.* 2015). The goldfinch SSSI population estimate (based on density figures) shows a decline since 2005 and should be considered a minimum figure.

Greenfinch (GR)

5.3.6 Greenfinch has declined by three-quarters on Salisbury Plain SSSI since 2000 (from a maximum count of 20 to a maximum count of five) which is a greater decrease than the 29% decline seen in England between 1995 and 2013 (Harris *et al.* 2015). However such low numbers mean trends (while statistically significant) should be treated with caution. Greenfinch is listed only on the SSSI assemblage list and is not a red-listed species or SPI. It is an unusual species to include on the assemblage list as it is not particularly associated with downland habitats and is present on the plain in only small numbers.

Lapwing (L.)

5.3.7 Due to limitations in the BBS methodology for the species, changes in lapwing population should be assessed using the Wessex Stone-curlew Project data (as in Stanbury *et al.* 2005).

Linnet (LI)

5.3.8 The significant decline in linnets noted in the 2005 report (Stanbury *et al.* 2005) has continued and matches trends for the UK, England and the south-west of England (Harris *et al.* 2015). Scrub clearance will not help this species. They declined significantly in Areas 1 and 4 as well as overall and density trends also show a significant decline. However the 2015 population figure for Salisbury Plain SSSI (based on density figures) still seems to be an underestimate (see Table 10) and should be considered as only a minimum figure. Figure 2h shows linnet maximum counts by grid-square and Figure 3f shows linnet population change since 2000.

Reed Bunting (RB)

5.3.0 Reed bunting has declined significantly since 2000, showing a 4.02% decline per annum. This is in contrast to trends for England which show a 28% increase between 1995 and 2013 (Harris *et al.* 2015). Clearance of scattered scrub and increased grazing of rank grassland might have negatively affected this species. The density trends also show a significant decline (see Table 7). Reed buntings are a species that have an inconspicuous song and can be highly variable in song output from year to year so the significant trends in this report should be treated with caution. Figure 2j shows reed bunting maximum counts by grid-square and Figure 3h shows reed bunting population change since 2000.

Song Thrush (ST)

5.3.1 Song thrush numbers have almost doubled on Salisbury Plain SSSI since 2000 but have increased only slightly since 2005. Overall they show a significant 3.15% increase per annum. Trends for England show a 10% increase between 1995 and 2013. Figure 2n shows song thrush maximum counts by grid-square and Figure 3k shows song thrush population change since 2000.

Tree Pipit (TP)

5.3.2 Tree pipit numbers have increased by almost a half since 2000 and more modestly since 2005, showing a 2.36% increase overall per annum. This is notable as the species declined by 49% in England between 1995 and 2013 (Harris *et al.* 2015). The tree pipit trend on site is difficult to reconcile with the scrub clearance and grazing since 2000. Figure 2k shows tree pipit maximum counts by grid-square and Figure 3i shows tree pipit population change since 2000.

Whinchat (WC)

5.3.3 According to the raw (maximum) count figures whinchat shows a significant overall decline since 2000. This is in line with national trends (Harris *et al.* 2015). The 2000 report predicted that the reintroduction of grazing would cause whinchat declines while the 2005 report indicated a

density decline in whinchats in grazed areas (14%) greater than that experienced overall (Stanbury *et al.* 2005). Between 2000 and 2015 whinchat also showed significant raw (maximum) count declines in Areas 1 and 4. Density trends correlate with the raw count trends, showing a significant decline across Salisbury Plain SSSI between 2000 and 2015 (see Table 7).

5.3.4 A recent study on Salisbury Plain SSSI provides further evidence for whinchat declines on site (a 30% decline in breeding pairs between 2010 and 2014) and states that the species prefers structurally diverse grassland with tussocks and scattered perches (Taylor 2015). Nocturnal predation is suggested as a key factor in their decline on the SSSI (Taylor 2015). Furthermore, whinchat has declined nationally even in 'preferred' habitats (Henderson *et al.* 2014).

5.3.5 However at 313 pairs on the SSSI (196.9km^2) the 2015 whinchat population estimate compares favourably with the 429 pairs estimated for the entire ATE (296.54km^2) in 2005 (Stanbury *et al.* 2005). Taylor (2015) also found that the longer-term population trend on Salisbury Plain was relatively stable, despite recent declines and concern for the future viability of the species on the plain. A future population decline is predicted due to reduced breeding success, adult survival and first year survival and lack of recruitment of immigrant birds into the population (Taylor 2015). Figure 2b shows whinchat maximum counts by grid-square and Figure 3a shows whinchat population change since 2000.

Whitethroat (WH)

5.3.6 Whitethroat shows a continuous decline since 2000, although between 2000 and 2005 this was non-significant (Stanbury *et al.* 2005). This is in contrast with national and regional trends (Harris *et al.* 2015) so site specific conditions are probably at play. Like whinchat, whitethroat has declined significantly in Area 1 of the plain as well as overall. Density trends also show a significant decline (see Table 7). Clearance of scattered scrub and increased grazing will reduce nesting habitat for this species.

Yellowhammer (Y.)

5.3.7 Yellowhammer decreased slightly (though non-significantly) between 2000 and 2005 but this report shows a significant increase across the SSSI when compared to both 2000 and 2005 figures. The species has increased by 1.46% per year since 2000 which defies national and regional trends. It has also increased in Areas 1 and 4. Area 3 is an anomaly, showing significant yellowhammer declines in raw maximum count since 2000. However, raw maximum counts show a slight increase in numbers in this area since 2005 (see Table 2). As with corn bunting, successful agri-environment schemes on the margins of the plain might have played a role in the overall increase. It is difficult to reconcile this trend with scrub clearance on the plain since 2000.

5.3.8 The population estimate supports the conclusion of a general increase in yellowhammer with 908 pairs on the SSSI (196.9km^2) in 2015 compared to 955 pairs on the entire ATE (296.54km^2) in 2005. Figure 2i shows yellowhammer maximum counts by grid-square and Figure 3g shows yellowhammer population change since 2000.

5.4 Non-significant Trends for Species of Conservation Interest

Bullfinch (BF)

5.4.1 Bullfinch numbers were low in all three survey years but their population seems relatively stable (see Table 2).

Curlew (CU)

5.4.2 Eighteen curlews were recorded in this survey which is an increase on numbers recorded in the same squares in 2000 and 2005. The RSPB is likely to have more accurate data on curlew numbers on the SSSI.

Dunnock (D)

5.4.3 Dunnock numbers have remained remarkably stable between the three surveys with 46 in 2000, 42 in 2005 and 48 in 2015. Figure 2m shows dunnock maximum counts by grid-square and Figure 3j shows dunnock population change since 2000.

Garden Warbler (GW)

5.4.4 Garden warbler appears to have declined slightly since 2005 but the raw (maximum) count is very close to that in the year 2000 (see Table 2). Across England garden warbler declined by 28% between 1995 and 2013 (Harris *et al.* 2015).

Grey Partridge (P)

5.4.5 The BBS methodology is not ideal for monitoring grey partridge populations (Stanbury *et al.* 2005). Thus, while this report shows large declines since 2000 (Table 2), and these are significant in Area 3 (Table 4), these figures should be treated with caution and a specific survey of grey partridges would be advised. However grey partridges have declined nationally in recent decades (Harris *et al.* 2015). Figure 2g shows grey partridge maximum counts by grid-square.

Goldcrest (GC)

5.4.6 Goldcrest appears to have increased slightly on Salisbury Plain SSSI since 2000 which correlates with similar non-significant trends for England (Harris *et al.* 2015).

Grasshopper Warbler (GH)

5.4.7 Grasshopper warbler declined by 40% across England between 1995 and 2013 (Harris *et al.* 2015). However there was an apparent (though not significant) increase on Salisbury Plain SSSI between 2000 and 2005. Raw (maximum) count trends show a slight, non-significant decline on the SSSI since 2000 (see Table 2). Grasshopper warblers are an elusive species that sing persistently for only a short period after arriving on migration. As there were only two surveyors

on site in early May 2015 some singing grasshopper warblers might have been missed due to an inability to cover enough grid-squares during this key period. Thus the apparent grasshopper warbler trends in this report should be treated with caution.

5.4.8 At 110 pairs the population estimate based on DISTANCE 6.2 analysis compares well with 2005 numbers for the entire ATE (121). Grasshopper warbler now has less 1% of its national population within Salisbury Plain SSSI but this is largely due to the national population estimate being revised upwards since 2005 (Musgrove *et al.* 2013). Figure 2c shows grasshopper warbler maximum counts by grid-square.

Lesser Redpoll (LR)

5.4.9 Only one lesser redpoll was recorded in the 2015 survey and none in the 2000 or 2005 surveys.

Lesser Whitethroat (LW)

5.4.10 Lesser whitethroat may have declined slightly on Salisbury Plain SSSI since 2000 but from a very low baseline (see Table 2). The species has shown some declines in south-west England in the same period but these are also not statistically significant. This is another elusive species and some individuals might have been overlooked.

Long-tailed Tit (LT)

5.4.11 Long-tailed tit appears to have increased on Salisbury Plain SSSI since 2000 (see Table 2). Non-significant increases have been recorded for England and the south-west in a similar period (Harris *et al.* 2015).

Mistle Thrush (M.)

Mistle thrush was added to the BoCC red-list in 2015. The population appears stable on Salisbury Plain SSSI with 23 individuals recorded in 2015, 25 in 2005 and 19 in 2000 (Table 2). Across England there was a 41% decline between 1995 and 2013 (Harris *et al.* 2015).

Nightingale (N)

5.4.12 Only one nightingale was recorded in this survey in comparison with two in 2000 and three in 2005 in the same survey squares. Nightingale declined by 37% in England between 1995 and 2013 (Harris *et al.* 2015). Nightingales are certainly present on the plain in higher numbers than those recorded in 2015. However a key grid-square containing breeding nightingales was not included in the 2015 survey (due to the random selection process). This survey square is at grid reference SU0449 near Westdown Camp (Andrew Bray pers. comm.).

Quail (Q)

5.4.13 With at least 20 records in the 91 grid-squares quail appears to have declined since 2005 but shown an increase since 2000 (see Table 2). Density calculations give an estimated population

of 74 quail on the SSSI in 2015 (see Table 9) which is not far off the 94 recorded for the entire ATE in 2005. It should be noted that quail numbers fluctuate annually and 2005 was a particularly good year for the species on Salisbury Plain (Stanbury *et al.* 2005). Quail has well over 1% of their national population on the SSSI (see Table 10). Figure 2a shows quail maximum counts by grid-square.

Skylark (S.)

5.4.14 According to raw maximum count data skylark appears to have declined very slightly on the SSSI since 2000 but more noticeably since 2005 (Table 2). While overall trends are non-significant there has been a significant decline per annum in Area 5. In contrast, density trends show a significant increase since 2000 (Table 7) but these should be treated with caution. With the increase in grazing and scrub clearance (which should have improved habitat for skylarks) the decline in raw count figures is difficult to interpret. Singing skylarks are notoriously difficult to count accurately and differences in individual observer estimates can be important (Stanbury *et al.* 2005). Figure 2f shows skylark maximum counts by grid-square and Figure 3e shows skylark population change since 2000.

Starling (SG)

5.4.15 Starling numbers have increased on the SSSI since 2000 but declined since 2005 (see Table 2).

Stonechat (SC)

5.4.16 Table 4 shows a non-significant decline in stonechat since 2000 which contradicts trends for the UK and England (Harris *et al.* 2015). Density trends show a significant overall decline since 2000 (Table 7). Clearance of scattered scrub may have removed nesting habitat on the plain for this species. Stonechats generally prefer taller, relatively denser scrub than whinchats (Henderson *et al.* 2014). However at 114 pairs the population estimate for Salisbury Plain SSSI in 2015 compares favourably with the 150 pairs on the ATE in 2005. Figure 2e shows stonechat maximum counts by grid-square and Figure 3d shows stonechat population change since 2000.

Stone-curlew (TN)

5.4.17 Changes in stone-curlew population should be assessed using the Wessex Stone-curlew Project data (Stanbury *et al.* 2005).

5.5 Other Species Showing Significant Trends

Chaffinch (CH)

5.5.1 According to analysis of raw maximum counts chaffinch (*Fringilla coelebs*) has declined by 3.31% per annum since 2000. This is contrary to trends for the UK and England (Harris *et al.* 2015) and is possibly due to scrub clearance on Salisbury Plain SSSI since then. Density trends also show a significant decline (see Table 7).

Meadow Pipit (MP)

5.5.2 Meadow pipit (*Anthus pratensis*) has shown highly significant declines across Salisbury Plain SSSI since 2000 and 2005. Trends for the UK and England show non-significant declines while regional south-west trends show a non-significant increase (Harris *et al.* 2015). Meadow pipit prefers rank grassland for nesting. The 2000 report predicted that reintroduction of grazing on the plain would have a detrimental impact on meadow pipit and the 2005 report found a significant decline in meadow pipits in grazed survey sections. The 2005 report also noted that cutting may have had an adverse effect on meadow pipit. ATE east, where most cutting takes place, saw the largest decline in meadow pipit between 2000 and 2005 (Stanbury *et al.* 2005). Table 4 also shows that the greatest declines per annum since 2000 have occurred in Area 5 (ATE east).

5.5.3 This is a difficulty in terms of habitat management as a complete lack of grazing and cutting would eventually allow open areas to scrub over and the habitat would become unsuitable for meadow pipit. Low intensity, mixed sheep and cattle grazing might be a better option for meadow pipit than that currently employed (Evans *et al*. 2006).

5.5.4 Figure 2o shows meadow pipit maximum counts by grid-square.

Willow Warbler (WW)

5.5.5 Willow warbler (*Phylloscopus trochilus*) numbers have declined significantly across the SSSI since 2000 and this decline is significant for all areas except possibly Area 2. This correlates with wider trends as there has been a general decline in England and a shift in population to the north and west of the British Isles (Harris *et al*. 2015).

Remaining Species

5.5.6 According to analysis of raw (maximum) counts, blackbird (*Turdus merula*), carrion crow (*Corvus corone*), great tit (*Parus major*) and pheasant (*Phasianus colchicus*) have increased significantly per annum since 2000. At 141, blackbird raw maximum counts were very similar to those in 2005 (144). Kestrel (*Falco tinnunculus*) and woodpigeon (*Columba palumbus*) have declined significantly since 2000. However at 12 birds, kestrel numbers are identical to those recorded in the same grid-squares in 2005 (see Table 2).

6. Conclusions and Recommendations

6.1.1 According to analysis of raw (maximum) counts since 2000, across the entire Salisbury Plain SSSI there has been statistically significant increases in eight species of conservation interest. These species are blackcap, chiffchaff, corn bunting, cuckoo, goldfinch, song thrush, tree pipit and yellowhammer. After analysis through DISTANCE 6.2 software (where possible), density trends for blackcap and corn bunting also show significant increases.

6.1.2 According to analysis of raw (maximum) counts since 2000, across the entire Salisbury Plain SSSI there has been statistically significant declines in six species of conservation interest. These species are greenfinch, lapwing, linnet, reed bunting, whinchat and whitethroat. The BBS is not the best method for monitoring lapwing and alternative population figures and trends are available for this species on the SSSI. After analysis through DISTANCE 6.2 software, density trends for linnet, reed bunting, whinchat and whitethroat also show significant declines. However, when the difference in survey areas is taken into account, the whinchat population estimate is quite similar to that in 2005.

6.1.3 According to analysis of raw (maximum) counts, since 2000, across the entire Salisbury Plain SSSI there has been significant increases in four further species (blackbird, carrion crow, great tit, and pheasant) and significant declines in five further species (chaffinch, kestrel, meadow pipit, willow warbler and wood pigeon).

6.1.4 Populations of most other species can be regarded as relatively stable on the SSSI although further apparent (non-significant) trends for species of conservation interest are discussed in section 5 above.

6.1.5 Two species (corn bunting and quail) have populations on the SSSI that are over 1% of current UK national figures. These species were also estimated to have over 1% of their national population on the ATE in 2005 (Stanbury *et al.* 2005). Grasshopper warbler, stonechat and whinchat no longer have more than 1% of their UK population on the SSSI but this is primarily due to national population estimates being revised upwards since 2005 (Musgrove *et al.* 2013).

6.1.6 The trends for individual species are likely to be linked to a number of different complex factors, which include habitat management and habitat change. It could be suggested that scrub clearance and increased grazing since 2000 has contributed to the significant declines evident in thicket and scattered scrub species such as chaffinch, linnet, reed bunting, whinchat and whitethroat. This is especially notable when SSSI trends contradict national ones, as for chaffinch, reed bunting and whitethroat. Stonechat also shows a worrying maximum count decline that is close to significant. However other broadly scrubland species (blackbird, blackcap, chiffchaff, goldfinch, song thrush, tree pipit and yellowhammer) have shown significant increases on the SSSI or have stable populations (e.g. dunnock and wren numbers are very similar to those in 2000 and 2005).

6.1.7 It is beyond the scope of this report to recommend habitat management techniques over such a large area and for such a diverse range of species. However a few points can be made. Many birds on the plain, including current key conservation species, have differing and conflicting

habitat requirements. The best option to preserve populations close to what they are at present is to maintain a mosaic of open grassland, scattered scrub and thicket. It should also be borne in mind that the various types of scrub and wooded areas are clearly the most biodiverse areas on the SSSI for birds.

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8. Appendix 1: Survey Squares

102 grid squares surveyed in 2015		
ST8848	ST9949	SU1145
SU1052	SU0046	SU1146
SU1145	SU0047	SU1148
SU1146	SU0146	SU1246
ST9145	SU0147	SU1247
ST9146	SU0148	SU1650
ST9148	SU0244	SU1653
ST9246	SU0246	SU1748
ST9247	SU0345	SU1751
ST9248	SU0346	SU1752
ST9250	SU0350	SU1753
ST9346	SU0351	SU1754
ST9348	SU0353	SU1845
ST9349	SU0354	SU1848
ST9446	SU0448	SU1849
ST9447	SU0547	SU1850
ST9448	SU0550	SU1851
ST9545	SU0551	SU1852
ST9547	SU0554	SU1946
ST9548	SU0647	SU1948
ST9549	SU0649	SU1949
ST9550	SU0651	SU1950
ST9645	SU0653	SU1951
ST9646	SU0747	SU1952
ST9647	SU0754	SU2046
ST9649	SU0849	SU2049
ST9746	SU0853	SU2050
ST9748	SU0946	SU2051
ST9749	SU0953	SU2151
ST9846	SU0954	SU2251
ST9848	SU1047	ST9847*
ST9849	SU1048	SU1151*
ST9945	SU1049	*early visits only
ST9947	SU1051	
ST9948	SU1052	

91 grid squares surveyed in all three years		
ST8848	SU0148	SU1653
ST9046	SU0244	SU1748
ST9049	SU0246	SU1751
ST9050	SU0345	SU1752
ST9148	SU0346	SU1753
ST9246	SU0350	SU1754
ST9247	SU0351	SU1845
ST9248	SU0353	SU1848
ST9250	SU0354	SU1849
ST9346	SU0448	SU1852
ST9348	SU0547	SU1946
ST9349	SU0550	SU1948
ST9446	SU0551	SU1949
ST9447	SU0554	SU1951
ST9448	SU0647	SU1952
ST9545	SU0649	SU2046
ST9547	SU0651	SU2049
ST9550	SU0653	SU2050
ST9645	SU0747	SU2051
ST9647	SU0754	SU2151
ST9649	SU0849	SU2251
ST9746	SU0853	
ST9748	SU0946	
ST9749	SU0953	
ST9846	SU0954	
ST9848	SU1047	
ST9849	SU1048	
ST9945	SU1049	
ST9947	SU1051	
ST9948	SU1052	
ST9949	SU1145	
SU0046	SU1146	
SU0047	SU1148	
SU0146	SU1246	
SU0147	SU1247	

9. Appendix 2: Species codes used in the report

Code	Species	Code	Species	Code	Species
B.	Blackbird	L.	Lapwing	SG	Starling
BC	Blackcap	LI	Linnet	SH	Sparrowhawk
BF	Bullfinch	LR	Lesser Redpoll	SL	Swallow
BO	Barn Owl	LT	Long-tailed Tit	SN	Snipe
BT	Blue Tit	LW	Lesser Whitethroat	ST	Song Thrush
BZ	Buzzard	M	Mistle Thrush	TC	Treecreeper
C.	Carrion Crow	MA	Mallard	TD	Turtle Dove
CB	Corn Bunting	MG	Magpie	TN	Stone-curlew
CC	Chiffchaff	MH	Moorhen	TO	Tawny Owl
CD	Collared Dove	ML	Merlin	TP	Tree Pipit
CH	Chaffinch	MO	Montagu's Harrier	W.	Wheatear
CK	Cuckoo	MP	Meadow Pipit	WC	Whinchat
CT	Coal Tit	MT	Marsh Tit	WH	Whitethroat
CU	Curlew	N.	Nightingale	WP	Woodpigeon
D.	Dunnock	P.	Grey Partridge	WR	Wren
FF	Fieldfare	PE	Peregrine	WT	Willow Tit
G.	Green Woodpecker	PH	Pheasant	WW	Willow Warbler
GC	Goldcrest	PW	Pied Wagtail	Y.	Yellowhammer
GH	Grasshopper Warbler	Q.	Quail		
GO	Goldfinch	R.	Robin		
GR	Greenfinch	RB	Reed Bunting		
GS	Great-spotted Woodpecker	RL	Red-legged Partridge		
GT	Great Tit	RN	Raven		
GW	Garden Warbler	RO	Rook		
HS	House Sparrow	RT	Redstart		
HY	Hobby	S.	Skylark		
J.	Jay	SC	Stonechat		
JD	Jackdaw	SD	Stock Dove		
K.	Kestrel	SE	Short-eared Owl		
KT	Red Kite	SF	Spotted Flycatcher		

10. Appendix 3: Habitat recording

During the first visit, along with the general BBS habitat form (BTO 2015), the following habitat characteristics were recorded for each 200m section. The boundaries for the habitat recording being 100 metres either side of the transect line (i.e. the recorded area was 200x200m).

Grazing: -
0 = No evidence of grazing
1 = Evidence of past grazing (probably within last 8 months; determined by presence of dung or sward characteristics)
2 = Recent grazing (with in the last month)
3 = Current grazing

Stock Type- **S**= Sheep **C**=Cows **H**=Horses **N**=Not relevant

Is there a visible margin around the Grazing Units?
0=No 1=Yes 2=Not relevant.

Plantation, Burnt, and Cultivation Cover
0 = 0% cover 1=1-20% cover 2=21-40% cover 3=41-60% cover
4 = 61-80% cover 5=81-100% cover.
Crop type was also recorded Wheat **(W),** Barley **(B),** Oil Seed Rape **(R),** Peas **(P)**, Beans (**BN**); Linseed **(L),** Maize **(M)**, Rotational Set-aside (**RS**); Long term Set-aside **(LS)**; Oats **(O)** etc

Sown Date W= Winter S= Spring N= Not relevant

Woodland next to crop 0= No 1=Yes 2= Not relevant

Sward height
1= 0-5cm 2= 6-15cm 3= 16-30cm 4= 30+cm

Scrub Type
Broadleaved **(B),** Bramble **(BR)** or gorse **(G)**.

Two factors were to be recorded for each scrub type, over 1 metre in height, as well as an overall abundance score.
Abundance
0= No scrub 1= 0-5 bushes 2= 5-10 bushes 3= 10-50 bushes
4= <NS cover 5= 11-30% cover 6= 31-50% cover 7= >50% cover
And whether it is scattered bushes **(S)**, forms thickets (area >25m^2) **(T)** or both **(ST)**.

Roads/Tracks
Is there a road or surfaced track within the recorded area of the section? 0=No 1=Yes

11. Appendix 4: All Bird Species Recorded in 2015

All species recorded in 2015 including birds in flight	
Blackbird	Magpie
Blackcap	Merlin
Bullfinch	Montagu's Harrier
Barn Owl	Meadow Pipit
Blue Tit	Mute Swan
Buzzard	Nightingale
Carrion Crow	Nuthatch
Corn Bunting	Grey Partridge
Chiffchaff	Pheasant
Collared Dove	Pied Wagtail
Common Gull	Quail
Chaffinch	Robin
Cuckoo	Reed Bunting
Coal Tit	Red-legged Partridge
Curlew	Raven
Dunnock	Rook
Green Woodpecker	Redstart
Goldcrest	Skylark
Grasshopper Warbler	Stonechat
Goldfinch	Stock Dove
Greenfinch	Starling
Great-spotted Woodpecker	Sparrowhawk
Great Tit	Swift
Garden Warbler	Siskin
Grey Heron	Swallow
Hobby	Song Thrush
Jay	Stone-curlew
Jackdaw	Tree Pipit
Kestrel	Wheatear
Red Kite	Whinchat
Lapwing	Whitethroat
Linnet	Woodpigeon
Lesser Redpoll	Wren
Long-tailed Tit	Willow Warbler
Lesser Whitethroat	Yellowhammer
Mistle Thrush	

Further information

Natural England evidence can be downloaded from our **Access to Evidence Catalogue**. For more information about Natural England and our work see **Gov.UK**. For any queries contact the Natural England Enquiry Service on 0300 060 3900 or e-mail **enquiries@naturalengland.org.uk** .

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