Salisbury Plain SSSI
Integrated Site Assessment 2014-15

Wiltshire Conservation Team
Natural England, December 2016

NATURAL ENGLAND

Contents

List of tables

List of figures

List of plates

An Introduction

Salisbury Plain is an extensive chalk plateau in the middle of Wiltshire, with the biggest area of unimproved chalk grassland in north-west Europe. It is owned, mainly, by the Ministry of Defence (MoD) and managed by Defence Infrastructure Organisation (DIO).

Salisbury Plain Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Special Protection Area (SPA) cover 19,690 hectares (ha), which is about half of the wider military training area – see Figure 1. It is notified for 25 features: chalk grassland, the Nine Mile River, juniper habitat, rare plants, invertebrates including marsh fritillary butterfly and fairy shrimp, and birds including stone curlew and wintering hen harrier.

The SSSI Favourable Condition Tables (FCT) list the notified features, with attributes and targets for managing and monitoring each. The FCT has undergone considerable development over the years, including some refinement of the features in 2015, based on the legal document, the Citation (see Appendix 1 – Salisbury Plain SSSI Citation).

Condition Assessment, now called Integrated Site Assessment (ISA), of these features, at unit level, was last carried out in 2008; and the aim of this project was to do a representative and robust, fresh, assessment of a significant proportion of the SSSI over two fieldwork seasons in 2014 and 2015.

On the Plain, DIO ecologists oversee the grazing, scrub management, stone-curlew plots, juniper exclosures and general conservation management; whilst military training, from a nature conservation perspective, has a big influence on bare ground creation and recovery levels. Natural England is the statutory body and has recently taken on greater responsibility for monitoring on the Plain. All parties have an interest in working towards the Government's 'Biodiversity 2020' target for SSSIs.

A core part of this assessment was the chalk grassland, which was carried out, in-house, by the Wiltshire Conservation Team (WCT) and Natural England Field Unit (NEFU), covering two thirds of the SSSI during the summers of 2014 and 2015. The other third is not yet freshly assessed, including much of the Central Impact Area and the Nine Mile River.

At the same time, the other notified features were assessed through a variety of surveys and biological records:

- Natural England specially commissioned surveys – bryophytes (Sharon Pilkington), breeding birds assemblage and quail (Thomson Ecology), Duke of Burgundy butterfly (Martin Townsend), tor-grass (Centre for Ecology and Hydrology (CEH)).
- Natural England Field Unit – tuberous thistle.
- DIO commissioned research and management plans - marsh fritillary (CEH), juniper.
- Wiltshire Botanical Society records, Wiltshire & Swindon Biological Records Centre – rare plant assemblage.
- Wiltshire Butterfly Conservation and the three Salisbury Plain conservation groups (Imber, Westdown & Larkhill, Bulford) – adonis blue, brown hairstreak and fairy shrimp.
- Wiltshire Ornithological Society – hen harrier, hobby.
- Royal Society for Protection of Birds – Wessex Stone-curlew Recovery Programme – annual reports.

Integrated Site Assessment and 'Bio2020 programme' reporting is at the SSSI unit level. Within each unit, each notified feature present is given a condition status, along with explanatory text, and reported in Natural England's Conservation Management System (CMSi). For a unit to achieve overall Favourable condition, all features within that unit must achieve Favourable condition.

However, it was not considered possible or necessary to survey everything everywhere, given the scale of the SSSI, rather aim for an appropriate level of survey of each feature, whether at grassland parcel, unit or whole site level; then interpolate to the unit-level condition status judgements. For example, the chalk grassland, a key feature, was surveyed relatively intensively, by randomly selecting an average of four National Vegetation Classification (NVC) polygons or parcels per unit and carrying out a 'Rapid ISA'.

For the notified breeding birds assemblage, a Breeding Birds Survey (BBS, national method) was done in 100 x 1km squares, allowing direct comparison with the previous 2005 and 2000 surveys, using statistical analyses of raw count data and density estimates to demonstrate population trends. In other words, the survey was not based on units and did not cover the whole SSSI but produced representative and reliable results that could be used, perhaps, to refine grazing and scrub management across the whole site.

At the other end of the scale of survey effort, it seemed reasonable to rely on volunteer recorder data e.g. fine-leaved sandwort that occurs along many track edges and is relatively widespread, or, Adonis blue butterfly that occurs on better quality grassland and impact craters across the site, and is relatively widespread and mobile.

The results for each SSSI unit and notified feature are presented and summarised in this report, along with references to the specialist surveys and other detail.

Condition Threats, which are perceived risks to feature condition (whether currently in Favourable condition or Unfavourable Recovering), were a particularly important output from this project and have been recorded on Natural England's Conservation Management System (CMSi) and within a Salisbury Plain SSSI Site Condition Plan.

B Chalk grassland

1.1 SAC features assessed:
Annex 1 habitat, H6210 - dry grasslands and scrubland facies: on calcareous substrates.

Annex 1 habitat, H6211 - semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) (important orchid sites).

SSSI features assessed:
Chalk grassland - CG2 *Festuca ovina-Avenula pratensis* grassland
Chalk grassland - CG3 *Bromus erectus* grassland
Chalk grassland - CG4 *Brachypodium pinnatum* grassland
Chalk grassland - CG5 *Bromus erectus – Brachypodium pinnatum* grassland
Chalk grassland - CG6 *Avenula pubescens* grassland
Chalk grassland - CG7 *Festuca ovina – Hieracium pilosella – Thymus praecox/pulegioides* grassland
Chalk heath - H8 *Calluna vulgaris – Ulex gallii* heath

Units where features present:
See Appendix 2 – Location of features by SSSI unit; and Figure 2 - Chalk grassland and other habitats present on Salisbury Plain, from the mid-90s National Vegetation Classification (NVC) survey.

1.2 Method

The method used for assessing the chalk grassland and general surveyor instructions can be found in:

- Grinsted S. *Salisbury Plain SSSI – Chalk Grassland Rapid ISA – project brief and instructions.* May 2015, Natural England. Location: SSSI files, Natural England.

Other sources of information used were:

- Natural England *Salisbury Plain SSSI Favourable Condition Tables*. January 2016, Natural England.
- Grinsted S. *Salisbury Plain SSSI Site Condition Plan.* April 2016, Natural England.
- Pywell et al. (1998) *Ecological survey of Salisbury Plain Training Area 1996-7.* NERC contract report to MoD, DEO.
- Pywell et al. (2006) *Assessing floristic change on Salisbury Plain between 1996 and 2004.* Defence Estates, English Nature.
- Pywell et al. (2012) *Ecological Monitoring of the Defence Training Estate Salisbury Plain: 2007-2011.* Defence Infrastructure Organisation, Centre for Ecology and Hydrology.
- Defence Infrastructure Organisation. Second 5 Yearly Report (2008 – 2012) (Combined with the Ninth Annual Report 2012) on the Implementation of

Commitments Arising from the Environmental Appraisal of Post Strategic Defence Review of Training on Defence Training Estate Salisbury Plain. March 2014, Defence Infrastructure Organisation.

- Defence Infrastructure Organisation. *Super Unit Management Plans 2010-2015,* April 2011, DIO

This element of the ISA assessed the chalk grassland notified features and invertebrate assemblage 'proxy' habitats (see Part G – Invertebrates).

The method was based on 'Rapid ISA' (as opposed to Detailed ISA), intending that experienced surveyors would relatively quickly assess large areas of chalk grassland, without necessarily doing stops or quadrats, whilst still recording systematically against each attribute and target. Such an overview of current condition would complement an on-going research/monitoring study being carried out by CEH, based on 757 x $20m^2$ permanent plots across the Plain.

The aim was to spend an average of 3-5 man days per SSSI unit (average size of surveyed units was 165 ha). We started by looking through the paperwork for the unit to get an overview of the habitats and species present, and the conservation management activities taking place. Then, we drove around the whole unit to do the following:

- Take 5 to 7 representative photos of that unit, recording each photo location, direction and a reference number on the basemap.

- Assess bare ground cover (localised) (%) at the whole unit level – both on the ground and using the aerial photographs.

- Assess scrub cover (%) at the whole unit level – both on the ground and using the Super Unit Management Plan (SUMP) and HLS maps, and aerial photographs (2009 and 2014).

Then, we visited a representative number of grassland parcels for each of the notified CG features present in that unit e.g. CG2, CG3, CG5, CG6, CG7, also 'CG/MG mosaics' and 'transitions', to carry out a Rapid ISA, completing one survey form per grassland parcel. Trimble Juno GPSs were essential equipment for navigating to the correct grassland parcels and capturing any new biological records.

The 1996 NVC survey is considered to be the SSSI baseline, so we worked to this map, whilst also carrying with us some later updates for parts of the Plain. The NVC map was marked up prior to survey to ensure randomisation – although there was scope to do extra parcels if particular issues were spotted, needing reporting. The associated mid-90s NVC survey cards were included in the packs for reference.

The surveyors followed the Rapid ISA method, doing ten stops if helpful and using DAFOR (Dominant, Abundant, Frequent, Occasional, Rare) scores for each of the indicator species seen, at the end of the structured walk. They wrote a short summary based on the attributes and made good use of Condition Threats e.g. mentioning NVC type, whether it was mandatory or non-mandatory attributes that were failing or at risk of failing, and including any Higher Level Stewardship (HLS) follow-up needed.

At the same time, rare plant maps were used to help locate rare species, although we did not go out of our way to search for these. Marsh fritillary 'core areas' were shown on maps, to aid informed commentary.

On HLS agreement areas, management options were assessed, which were mainly scrub control i.e. capital works, also a few areas of grassland restoration i.e. annual revenue, on the Plain.

DIO's SUMPs, which show scrub control polygons and grazing 'special restrictions', also helped in interpreting and assessing current scrub cover and grassland management priorities.

Then, using the completed Rapid ISA forms and our wider assessments of bare ground and scrub, we completed a devised 'Unit Summary Sheet' – summarising the overall condition of each notified chalk grassland feature present in that unit, ready for input to Conservation Management System (CMSi). In addition, there was space to mention any obvious 'gain' since the mid-90s NVC survey e.g. plantations had been removed or grassland type had changed for the better – as additional information, to help ensure that the positives were captured as well as any negatives.

Constraints to the project included the wet spring in 2014 and on/off rainfall in 2015, which produced lots of grass growth, meaning tall swards and a knock-on litter layer, if the farmers had not responded with increased grazing.

Some of the chalk grasslands, particularly the CG3d sub-community and the 'CG/MG mosaics' and 'transitions' were quite variable in quality – sometimes not meeting even the 'bottom-rung' FCT targets, other times being much better than these. The FCT does not particularly differentiate between the CG3 and CG/MG communities because of this variability but does set a higher standard, in terms of positive indicator species, for the CG3a sub-community. Therefore, at all times, the Rapid ISA forms were completed 'down the line' against what was found in that parcel, along with experienced surveyors providing commentary and Condition Threats. In instances of swards that were below or well above 'the bar', the past NVC cards were used to help understand what the grassland was like then compared with now - and ultimate condition status judgements made accordingly; however, this project was not about measuring change, it was more of a snapshot of condition.

This element of the ISA was managed by Sarah Grinsted (Lead Adviser, WCT), with Jo Chesworth (NEFU) in 2015, and with administrative and logistical support from Elaine Mayner (Support Adviser) throughout. Preparation included survey form creation on Integrated Site Assessment Toolkit (ISAT), ArcGIS map production, liaison with Range Operations, range safety briefings and passes, vehicle hire, accommodation booking and other general logistics.

1.3 Results

Using the above method, 73 x SSSI units (n = 73, average size = 165 ha, s.d. = 318 ha) were assessed - spread across the West, Centre and East, covering a total of 12,035 ha (just under two thirds of the SSSI). This involved six staff from WCT and thirteen staff from NEFU (in the second season), taking a total of 190 man fieldwork days, averaging 2.6 man days per unit. An average number of four Rapid ISA forms were completed per unit, totalling 282 survey forms, along with the wider assessment at unit level.

The same team spent another 10 man days on a tuberous thistle survey – see Part D – Rare Plants.

This left 26 SSSI units as not yet re-assessed.

The data from the Rapid ISA forms were entered onto ISAT and subsequently reports taken, in the form of spreadsheets, allowing calculations against the variables, by NVC type.

At the same time, a Site Condition Plan was developed, which captured the ISA year, condition status of each feature at unit level, and Condition Threats at both grassland parcel (using 1996 NVC polygon/parcel numbers) and whole unit level. Note that Condition Threats were applied by the surveyors, to both Favourable and Unfavourable features, where there was a perceived risk to features from land management change or other processes.

a) Attribute: extent

This attribute has been considered at the whole site level - with the FCT recognising that a certain amount of flux in chalk grassland communities is acceptable, as long as overall amounts of valued habitats do not decline, particularly the rarer communities.

Whilst extent was not systematically assessed as part of the fieldwork, the Trimble Juno gps's, loaded with the 1996 NVC polygons, allowed for a good awareness of polygon boundaries. Mostly these polygons were found to hold true, even though 20 years old, along with a degree of change in places in either direction (positive or negative), as noted on some of the Rapid ISA forms. We noted 15 grassland parcels (out of the 282 surveyed) where negative community change or loss of extent had occurred, with Condition Threats and Unfavourable condition status being applied to nine units.

The following is some analysis based on ArcGIS:

The whole SSSI is 19,689.91 ha, which includes site fabric e.g. improved grassland, arable, plantations, training features and hard standings; whilst built-up areas are outside of the SSSI boundary e.g. Imber Village, New Zealand Farm Camp, Beacon Hill radio masts etc.

The SSSI Citation says: '*12,933 ha of chalk downland'*, which was based on the 1985 and 1992 surveys carried out by the England Field Unit – more information can be found in the background Criteria Sheet. Subsequently, shortly after SSSI designation (in 1993), in 1996/7, CEH/DE/English Nature did a full NVC survey across the SSSI and wider military training area. This recorded the following chalk grassland hectarages within the SSSI (figures provided from DIO's ArcGIS):

CG1 = 21.85, CG2 = 546.26, CG3 = 8395.98, CG4 = 2.64, CG5 = 1.67, CG6 = 178.61, CG7 = 15.86, chalk heath = 14.44, CG mosaics (CG2/CG3 etc.) = 660.44, CG/MG mosaics and transitions = 3278.88, CG unclassified = 69.1, burnt chalk grassland = 15.66, bare chalk = 46.47. Total = 13,247.86 ha

Note that the 1996 NVC survey also recorded other habitats of varying conservation value within the SSSI, which are not notified e.g. MG5 *c*.80 ha, MG1 *c.* 2,957 ha.

In 2003/4, some further NVC survey was completed on parts of the area. Therefore, the combined NVC surveys produce the most up-to-date figures for the SSSI, with figures in brackets indicating change since the 1996 survey (figures provided from DIO's ArcGIS):

CG1 = 11.64 (-10.21), CG2 = 511.85 (-34.41), CG3 = 9675.18 (+1279.2), CG4 = 6.28 (+ 3.64), CG5 = 3.15 (+1.48), CG6 = 179.82 (+1.21), CG7 = 31.69 (+15.83), chalk heath = 14.44 (no change), CG mosaics (CG2/CG3 etc.) = 483.03 (-177.41), CG/MG mosaics and transitions = 3376.5 (+97.62), CG unclassified 41.68 (-27.42), burnt grassland 5.4 (-10.26), bare chalk 50.91 (+4.44), Total = 14,391.57 ha

The study by CEH to assess floristic change (Pywell et al., 2004) and the further NVC updates mentioned above, have shown that the total area of chalk grassland habitat on the SSSI had increased from 12,933 ha at notification (the baseline) to 14,391.57ha. This increase was presumably largely due to the Farm Management Plans implemented between 1998-2000, which significantly changed the farm operations and grazing to deliver conservation objectives. They safeguarded existing SSSI features and put in place measures to enhance mesotrophic grasslands, with a total area of 7,500ha (both on and off the SSSI) having new restrictions, especially avoiding fertiliser use. In addition, a significant number of plantations have been removed from the SSSI, both under the LIFE Project in the early 2000s and subsequently as part of DIO's programme to restore Bulford and Warminster Danger Areas - again increasing the total area of grassland with scope for recovery to valued chalk grassland.

These two major influences – natural reversion and plantation removal – have significantly increased the area of grassland under positive conservation management, which is gradually resulting in the increasing CG hectarages; although, much of this increase is likely to be relatively species-poor, with upright brome, a determining species for the community classification, and some herbs, moving relatively quickly, whilst full community assemblage is predicted to take about 100 years (Pyewell et al., 2004).

At the same time, there is a tendency for localised waxing and waning of grassland quality and extent due to the other main influences: grazing, weather, military vehicle disturbance, scrub management, fires and shell craters. For example, false oat-grass (*Arrhenatherum elatius*) (when frequent/abundant) is an indicator of under-grazing (and previous disturbance) that alters the community classification from CG3 to MG1, but equally can change in the other direction, once sufficient grazing is re-established. Similarly, CG7 may naturally succeed to CG2 grassland, and CG2 grassland is prone, especially on the Plain, to invasion by upright brome (if indeed, it never had upright brome). Military vehicle disturbance and bomb craters, where amounting to temporary disturbance followed by recovery, leave bare chalk and soil, and compaction, that often develops into valued CG7 grassland.

b) Attribute: bare ground – localised (% cover) (target 2-4%)

This attribute was assessed at the unit and whole site level.

Bare ground (localised) and scrub are attributes for a range of notified features, and tend to flux across the site, which is inevitable and should be accepted as long as there is balance to processes such as grazing/neglect, disturbance/rest and scrub control/re-growth, as affected by both conservation management and military training intensity. Therefore, whilst these two attributes were recorded on the grassland parcels, in line with the 'Rapid ISA' survey forms, they were assessed at unit or even wider level.

It was not possible to accurately quantify bare ground, even with two sets of aerial photography to hand, only give impressions. The number of units that were seen to be within and outside target range = 55, 18 respectively. The number of units that were seen to have too much bare ground = 2, the number of units with too little bare ground = 16. The latter were all on the outskirts of the SSSI.

The FCT target is 2-4% cover for the Plain as a whole, recognising that a balanced level of military vehicle disturbance across the site has many benefits for the habitats and wildlife. Only two units were seen to have excessive bare ground – those on the Cross Country Driver Area – but the condition status judgement for these units was not compromised, given the wider trend for insufficient bare ground, and the whole-site level target. Condition Threats were applied to the 16 units seen to have too little bare ground.

The Centre for Ecology & Hydrology (CEH) did some analysis (Pywell et al., 2012) finding that *the overall trend over 14 years has been a decline in bare ground area across most parts of the Plain. Disturbance has become more concentrated to major routes. Some training features have received continuous, high disturbance but not expanded e.g. CCDA. Others have expanded e.g. Western demonstration area.*

Whilst there is apparently, currently, a downward trend in bare ground, the army re-basing programme has potential to increase pressure on the Plain's resources, with increased military vehicle disturbance. The re-basing will result in more troops living in the area but the army's allocation and management procedures, using exercise Weighting Factors, will continue to be implemented. Bare ground is discussed further under 'conservation management'.

c) Attribute: negative indicator species - scrub

This attribute was assessed at the unit and multi-unit level e.g. particular parts of the Plain can be allowed to have more scattered scrub to benefit birds and Duke of Burgundy butterfly; and the dense scrub target is generally at site level.

The FCT attribute and target is: negative indicator species – scrub, target: 0 to 25% scattered scrub cover, 3-5% dense scrub cover.

The number of units within and outside target range at ISA = 66, 7 respectively. The number of units with overall too much scrub = 7, the number of units with too little scrub = 0. The number of resulting Condition Threats = 34 at grassland parcel level, 7 at unit level.

Due to the significant amount of scrub control carried out since 2010, the bulk of the units were within target range, apart from three units at the far western end of the Plain and four units on Beacon Hill. These seven units are all classed as being in Unfavourable condition for scrub and other reasons, as identified in the SP Site Condition Plan and Appendix 5 - Condition status of features at unit level. A relatively large number of Condition Threats were applied to grassland parcels across the Plain, mainly to highlight small areas of scrub falling outside of the management plans – but not necessarily compromising overall condition status at unit level (at present). Scrub is discussed further under 'conservation management'.

d) NVC type: Chalk grassland - CG2 *Festuca ovina-Avenula pratensis* grassland

This grassland community was considered at the grassland parcel level. This project surveyed 37 parcels of CG2 grassland, within the 73 assessed SSSI units.

Attribute results for CG2 (for bare ground (localised) and scrub, see above):

(i) Bare ground (within sward) (target: <10%): n = 37, mean = 3.2%, s.d. = 3.6%
(ii) Litter (target: <25 % cover): n = 37, mean = 13.2%, s.d. = 18.3%
(iii) Sward height (target: 2-10cms): n = 37, mean = 8.9cms, s.d. = 8.1cms
(iv) Proportion of herbs to grasses (target: 40-90%): n = 37, mean = 67.3%, s.d. = 18%
(v) Positive indicator species (target: at least 4F, 3O): n = 37, mean = 5.7 Abundant/Frequent, 3.3 Occasional.

The assessment found that 20 (54%) of the 37 parcels assessed met all mandatory targets i.e. they were in Favourable condition; however, of these, 13 did not meet one or more non-mandatory targets – sward height too high (x 9), bare ground (within sward) not enough or too much (x 5), and litter too high (x 4).

The other 17 parcels did not meet one or more mandatory and sometimes non-mandatory targets i.e. they were in Unfavourable condition – frequency of +ve indicators and proportion of herbs to grasses inadequate (x 12 parcels), negative indicator species (upright brome) too high (x 12), cover of scrub too high (x 7) and extent loss (x 3).

Of the 37 parcels assessed, 16 (43.2%) were given Condition Threats for under-grazing, six for scrub encroachment, four for tor-grass and one for weeds.

e) NVC type: CG3 *Bromus erectus* grassland

This grassland community was considered at the grassland parcel level. This project surveyed 194 CG3 grassland parcels, within the 73 assessed SSSI units.

Attribute results for CG3 (for bare ground (localised) and scrub, see above):

(i) Bare ground (within sward) (target: < 10%): n = 194, mean = 2.4%, s.d.= 2.5%
(ii) Litter (target: <25 % cover): n = 194, mean = 23.0%, s.d. = 22.9%
(iii) Sward height (target: 2-25 cms): n = 194, mean = 17.4cms, s.d.= 9.8cms
(iv) Proportion of herbs to grasses (target: 40-90%): n = 194, mean = 50.3%, s.d. = 18.9%
(v) Positive indicator species (target: at least 2F, 4O): n = 194, mean = 4.7 Abundant/Frequent, 4.2 Occasional.

The assessment found that 135 (69.6%) of the 194 parcels assessed met all mandatory targets i.e. they were in Favourable condition; however, of these, 46 did not meet one or more non-mandatory targets – sward height too high (x 36), litter too high (x 21), within sward bare ground not enough (x 1).

The other 59 parcels did not meet one or more mandatory and sometimes non-mandatory targets i.e. they were in Unfavourable condition – frequency of +ve indicators and proportion of herbs to grasses inadequate (x 49 parcels), negative indicator species (weeds) too high (x 17), cover of scrub too high (x 13) and extent loss (x 2); sward height too high (x 39), litter too high (x 33), within sward bare ground not enough (x 1).

Of the 194 parcels assessed, 50 (25.8%) parcels were given Condition Threats for under-grazing, 19 for scrub encroachment, three for weeds and three for tor-grass.

Within sward bare ground was possibly not adequately assessed, given the FCT target was '< 10%', when actually, it is suggested, there should be a lower threshold too. The FCT now says 'pockets of bare ground' – and will need a numerical target.

f) NVC types: 'CG/MG mosaics and transitions' and 'CG unclassified' grasslands

This grassland community was considered at the grassland parcel level. This project surveyed 37 CG/MG grassland parcels, within the 73 assessed SSSI units.

Attribute results for CG/MG (for bare ground (localised) and scrub, see above):

(i) Bare ground (within sward) (target <10%): n = 37, mean = 2.1%, s.d. = 2.7%
(ii) Litter (target: <25 % cover): n = 37, mean = 20.6%, s.d. = 18.5%
(iii) Sward height (target: 2-25 cms): n = 37, mean = 15.5cms, s.d. = 8.0cms
(iv) Proportion of herbs to grasses (target: 40-90%): n = 37, mean = 45.3%, s.d. = 15.9%

(v) Positive indicator species (target: at least 2F, 4O): n = 37, mean = 3.9 A/F, 5.5 O.

The assessment found that 15 (40.5%) of the 37 parcels assessed met all mandatory targets i.e. they were in Favourable condition; however, of these, five did not meet one or more non-mandatory targets – sward height too high (x 5), litter too high (x 1).

The other 22 parcels did not meet one or more mandatory and sometimes non-mandatory targets i.e. they were in Unfavourable condition – graminoids cover/frequency too high (x 18), +ve indicators and proportion of herbs to grasses inadequate (x 12), negative indicator species (weeds) too high (x 7), cover of scrub too high (x 1) and extent loss (x 1); sward height too high (x 14) and litter too high (x 9).

Of the 37 parcels assessed, 12 (32.4%) were given Condition Threats for under-grazing, four for scrub encroachment and four for weeds.

g) NVC types: CG4 *Brachypodium pinnatum* grassland, CG5 *Bromus erectus – Brachypodium pinnatum* grassland

These grassland communities were considered at both grassland parcel and a wider level (see below).

Although these communities are considered part of the notified features they are of lower value and must not be allowed to expand at the expense of the other chalk grassland features. On the Plain, tor-grass tends to occur as dense patches within the other CG communities, therefore CG4 and CG5 are largely not mapped and have not been assessed as communities in their own right. This project recorded tor-grass as a Condition Threat on eight grassland parcels, within six units – but this invasive grass tends to be very localised and did not affect the overall condition status judgement of any unit surveyed.

This project did not cover the Central Impact Area (unit 170), which is known to have a significant and possibly increasing coverage of tor-grass. This is discussed further below.

h) NVC type: CG6 *Avenula pubescens* grassland

This grassland community was considered at the grassland parcel level. This project surveyed 11 CG6 grassland parcels, within the 73 assessed SSSI units.

Attribute results for CG6 (for bare ground (localised) and scrub, see above):

(i) Bare ground (within sward) (target <10%): n = 11, mean = 2.2%, s.d. = 1.9%
(ii) Litter (target: <50% cover): n = 11, mean = 15.5%, s.d. = 10.5%
(iii) Sward height (target: 5-50 cms): n = 11, mean = 20.9cms, s.d. = 9.3cms
(iv) Proportion of herbs to grasses (target: 30-90%): n = 11, mean = 40.1%, s.d. = 10.8%
(v) Positive indicator species (target: at least 2F, 2O): n = 11, mean = 2.2 Abundant/Frequent, 2.2 Occasional.

The assessment found that 3 (27%) of the 11 parcels assessed met all mandatory and non-mandatory targets i.e. they were in Favourable condition.

The other 8 parcels did not meet one or more mandatory and sometimes non-mandatory targets i.e. they were in Unfavourable condition – frequency of +ve indicators and proportion of herbs to grasses inadequate (x 6 parcels), cover of scrub too high (x 1) and negative indicator species (weeds) too high (x 1).

Of the 11 parcels assessed, two (18.2%) were given Condition Threats for under-grazing, one for weeds and one for suspected fertiliser use.

i) NVC type: CG7 *Festuca ovina – Hieracium pilosella – Thymus praecox/pulegioides* grassland

This grassland community was considered at the grassland parcel level. This project surveyed four CG7 grassland parcels within the 73 assessed units.

Attribute results for CG7 (for bare ground (localised) and scrub, see above):

(i) Bare ground (within sward) (target <15%): n = 4, mean = 13.3%, s.d.= 8.6%
(ii) Litter (target: <5% cover): n = 4, mean = 12.5%, s.d.= 21.7%
(iii) Sward height (target: <5 cms): n = 4, mean = 10.5cms, s.d. = 14.2cms
(iv) Positive indicator species (target: at least 2F, 4O): n = 4, mean = 3 Abundant/Frequent, 1.8 Occasional.

The assessment found that three (75%) of the four parcels assessed met all mandatory targets i.e. they were in Favourable condition; however, of these one did not meet one non-mandatory target - within-sward bare ground was too high.

The other one parcel did not meet one mandatory target i.e. it was in Unfavourable condition - slightly excessive scrub.

Of the four parcels assessed, two were given Condition Threats highlighting habitat loss due to natural succession, two for scrub encroachment and one for tor-grass.

j) NVC type: Chalk heath - H8 *Calluna vulgaris – Ulex gallii* heath

Considered at grassland parcel level.

Chalk heath was present on 14 ha, on two grassland parcels, in the mid-90s NVC. This project surveyed both these parcels, in order to refine the FCT, ready for ISA and a wider assessment of unit 170. One Condition Threat was applied, in the meantime, for scrub encroachment.

k) Attribute: negative indicator species - tor-grass

An investigation was commissioned by Natural England:

- Redhead J., S. Grinsted, F. Mitchell and L. Ridding. *Tor-grass mapping feasibility study.* October 2015. Centre for Ecology & Hydrology and Natural England.

(i) Method:

As part of the wider chalk grassland assessment, this feasibility study investigated the potential for using aerial photography to assess tor-grass (*Brachypodium rupestre*) cover and rate of change. It considered using aerial photography to support field survey and visual estimation without any prior field survey. The fieldwork was carried out by CEH and Natural England, the aerial photography analyses by CEH.

Potential 200 m x 200 m squares were identified from local knowledge of *B. rupestre* occurrence, representing the West, East and Centre of the Plain. On the ground, all patches > one metre square were surveyed and digitally mapped onto Trimble Juno handheld computers. The resulting digital maps were combined and manually corrected, and overlain on aerial photography datasets - nine datasets were available for analyses. Image handling and analysis was performed in ArcGIS and ENVI (v5.1, Exelis).

(ii) Results:

Twenty squares with some cover of *B. rupestre* were surveyed. Several additional squares were found to contain large patches of either *B. sylvaticum* or *Festuca arundinacea,* both of which appeared similar to *B. rupestre* to surveyors from a distance and which were thus mapped to give information on potential sources of misidentification in aerial photography. Aerial photography prior to 2000 showed little *B. rupestre* even within areas currently identified as contiguous patches. This is unsurprising, as in the 1996-1997 NVC survey data *B. rupestre* is not present in a large number of NVC communities, and is usually recorded as occasional or rare in the communities where it does occur. In many cases, areas which did have *B. rupestre* in the NVC survey were searched by field surveyors and found to have no extant cover, potentially due to changes in scrub management and grazing, or earlier mis-identification. Aerial photographs of this age are thus unlikely to be of use in determining extant cover, although they do provide an important baseline from which to date the current expansion of *B. rupestre.*

Examination of aerial photography from around 2002 onwards clearly shows that, in areas with high overall cover or large, dense patches, *B. rupestre* is detectable from aerial photography by the human eye (i.e. manual interpretation of aerial imagery), especially if the contrast of the imagery is slightly increased (i.e. increasing the difference between the darkest and lightest colors in the image). Bright green (summer) or pale (spring) patches fall within the boundaries of mapped polygons, and the comparison of the two seasons aids in distinguishing *B. rupestre* from bare ground (which remains pale all year round). However, smaller or less dense patches are often difficult to distinguish, even in the most recent imagery.

It was clear that the extent of *B. rupestre* had undergone significant expansion over the past ten years, in the Central Impact Area. Although areas are frequently visible between 2003 and 2007, they do not approach the current extent and correspond well to the boundaries of the mapped polygons until 2008 or later. For these reasons, it was decided to concentrate detailed analysis on the three most recent datasets: 2008, 2010 and 2014.

The variation between patches of *B. rupestre* seen within each imagery dataset make it unlikely that an automated detection process would be successful, as consistent spectral targets within aerial photography datasets would be hard to find. Running a pixel-based supervised maximum likelihood classification, with training data derived from field surveyed patches for *B. rupestre,* and manually digitized scrub and bare ground areas, confirmed this, with much confusion between pixels from patches of *B. rupestre* and other grasslands, although scrub and bare ground were generally well separated from *B. rupestre.*

It appeared that *B. rupestre* and other grasslands are so variable in spectral characteristics that the relative ease of manual detection (which is achieved by looking for differences between a potential *B. rupestre* patch and its local surroundings) is simply not reproducible when examining all pixels across the surveyed squares. Instead, it is based on other cues available to the human eye such as patch shape, texture, contrast with local surroundings and proximity to local landscape features, which are not taken into account in a per pixel analysis of the colour bands.

(iii) Conclusion:

The study concluded that large patches (over 100 m^2) of *B. rupestre* are readily identifiable from aerial photography, mostly using the red, green and blue bands alone. The aerials from August 2010 were particularly good. However, smaller patches are frequently missed. Despite this, 100m^2 of *B. rupestre* per hectare is only 1% cover, so patches are very likely to

be detected before they reach the threshold for condition assessment failure (10%). Thus manual interpretation of RGB aerial imagery to detect spread of existing *B. rupestre* patches or to monitor areas at particular risk or vulnerability to invasion should be a useful tool, especially in the already high cover areas of the Central Impact Area.

This study is to be followed up, to obtain the best possible measure of tor-grass coverage on the Plain, making use of both the existing aerial photography and potentially requisitioning more. The Central Impact Area has not yet been subject to a full ISA.

1.4 Conservation management

Evidence for Unfavourable Recovering status, in respect of the chalk grassland, is based on DIO's individual Farm Management Plans with the 45 tenant farmers, their Super Unit Management Plans, Higher Level Stewardship agreements, military training levels and other conservation management; which is all in place – and subject to proper implementation by all parties, including advice from Natural England.

For a feature to be truly 'recovering', as well as having the right conservation management in place, we must understand the effect of management on habitat change – both what is typical of chalk grassland and what is happening on the Plain. Whilst this assessment has provided a measure of condition, or a snapshot, it does not quantify change in sward quality and has provided only limited insights in this respect. Both the baseline NVC survey and the ISA method may allow change detection at a coarse level but no better than this; whereas the research/monitoring study that DIO commissioned CEH to undertake, based on 757 x 20m^2 permanent plots across the Plain, has been designed to more accurately assess change over a long period – although the focus of the study is on measuring change due to military training disturbance.

a) Scrub management

Scrub management on the Plain is carried out by DIO, Landmarc Support Services, Natural England and the tenant farmers.

Defence Infrastructure Organisation's SSSI improvement programme has funded and overseen significant scrub management, as guided by their SUMPs; whilst Landmarc Support Services have provided follow-up, via their 'asset management programme', which is funded and approved by DIO.

Over the last five years (2010/11 – 2014/15), DIO have completed scrub control and management costing £467,496 (and a further £92,210 in 2015/16, when there was no split between maintenance and improvement work); whilst Landmarc Support Services carried out follow-up maintenance costing £310,500 over the same five-year period – on the SSSI.

Natural England has 15 Higher Level Stewardship (HLS) agreements (ten year periods) with tenant farmers on the Plain, which are largely geared towards scrub management on chalk grassland and archaeology (less so grazing, which is already covered by the FMPs). Over the last five years (2010 – 15), Natural England HLS agreements have funded scrub management, carried out by the tenant farmers, on 5,429 ha, costing £1,019,427.

The tenant farmers also have 'voluntary' scrub management plans, which highlight the easier, toppable areas of scrub on open grasslands, that they are expected to manage on an on-going basis, also with some individual tenants covering steeper slopes and taking on denser areas with no funding.

Overall, scrub management and control has increased, with the Salisbury Plain LIFE Project in the early 2000s, DIO's SSSI improvement programme and the current Higher Level

Stewardship agreements, which has achieved a more balanced situation in respect of chalk grassland and other interests – and has been the main factor improving the condition status of the chalk grassland. Now, the impetus must be to maintain the previously cleared areas and continue with a balanced scrub programme on the rest of the SSSI.

Balancing scrub management for chalk grassland, birds and other interests is a significant challenge on the Plain, given the differing requirements of these habitats and species, the size of the area, and the time and money needed – which is not necessarily available year-on-year.

b) Grazing, weather

Grazing coverage on Salisbury Plain increased soon after SSSI designation in 1993 and again expanded with the introduction of the Single Payment Scheme in 2005 and new grazing licenses. These were following a long period of neglect on some areas since army occupancy e.g. especially on the West, less so the East. Now grazing is implemented through DIO's Farm Management Plans (FMPs) with their *c.*45 tenant farmers, using a system of temporary pennings - which are *c.*8 ha in size, electric fenced and generally in place for two to three weeks. This is a unique system that combines short bursts of management with periods of rest. Grazing is recorded by Land Wardens and subsequently the GIS team – although this lapsed in 2013 and DIO are in the process of setting up a new system with the farmers. Also, farm checks are carried out by DIO land agents and conservation staff.

The FMPs set three levels of grazing: 'without restriction', 'within guidelines' and 'special restrictions'. The first requires long grass margins, otherwise no constraint on timing or stocking levels; the second requires long grass margins and specifies maximum (not minimum) stocking levels; and the third requires long grass margins and sets specific management within mapped polygons e.g. grazing may be restricted to only 30 or 50% of that area per year, which may be for any or all of the species requiring lighter grazing and longer grass. Such 'special grazing restriction' polygons are a relatively small proportion of the grassland in places, larger in others. The basic stocking rate on the chalk grassland is 0.3 Livestock Units per ha per year. The proportion of winter to summer grazing appears to be about 50:50, based on the FMPs. Ultimately, grazing is controlled through the number of temporary pennings a farmer is allowed or utilizes at any one time.

The grazing must cater for both maintaining/improving botanical diversity and those species needing a lighter touch. For example, marsh fritillary requires tall devil's-bit scabious and grassy tussocks, including over the winter period; whinchat needs grass tussocks and light scrub in the valleys; hen harrier requires tall, tussocky grass for roosting in winter, at the heads of valleys; tuberous thistle requires light grazing (and occasional disturbance) and Duke of Burgundy particularly favours 'successional' habitat. The challenge is to cater for all of these interests, whether on the same area, different areas or rotating around areas.

Where grazing is working well, it is maintaining the valued CG communities and also moving the MG1 and CG/MG swards towards CG3, a higher value NVC community, and increasing the overall CG hectarage. In some places, species-rich grasslands on thin soils are relatively self-sustaining, regardless of grazing levels.

Of the 282 grassland parcels surveyed, 83 (29.4%) had Condition threats from under-grazing applied - whether due to failed mandatory (sward composition) and/or non-mandatory attributes (sward structure). At the parcel level, these might not always have taken account of grazing special restrictions, where some swards would be expected to look under-managed in some years. Surveyors were given maps showing the location of special grazing restrictions but might have ignored these or just taken the view that the chalk

grassland was not being sufficiently grazed to maintain the botanical interest. At unit-level, condition status judgements did take some account of the general grazing levels throughout the unit.

Looking at the distribution of threats from under-grazing, there are foci here and there, although no particular geographical emphasis. There does not appear to be a correlation with 'grazing special restrictions', although some do coincide. See Figures 4-6 which demonstrate the locations and types of Condition Threat on the West, Centre and East.

Grazing coverage has increased over time, with the introduction of the farm plans in the late 90s, the start of the Single Payment Scheme in 2005 and extended grazing licences, and DIO's work to introduce grazing into the live firing areas. Almost all of the Plain is now covered by tenancy agreements and grazing licences, apart from the north-west section of the CIA and Beacon Hill. On Beacon Hill, lack of livestock grazing, with reliance on rabbits, is resulting in the decline on some of it, of the CG2 and CG3 grasslands.

The farmers are expected to follow their farm plans and cover all their licence area, including any less accessible areas; however, remote or difficult locations that are trickier to electric fence or transport water bowsers to, are sometimes at risk of being neglected or ignored. Past grazing maps produced by DIO, based on Land Wardens' recording of grazing pennings, have shown on-going lack of grazing coverage on some significant-sized areas e.g. immediately west of Westdown Camp, the valleys north of Imber, Bishopstrow Down and west of Southdown track. In other words, it appears that some farmers are better than others at ensuring they cover their whole area.

In terms of achieving a desired end-of-season sward structure, this depends on pennings duration, including any re-visits, and livestock numbers – and ultimately, farmer understanding and attitude towards getting the right sward structure. The FMPs are obviously an important reference point, for both farmers and conservation bodies, and have been in place since the late 90s, with updates in 2009/10. They represent a significant improvement on the earlier situation when little or no grazing was taking place on the West, Centre and other live firing ranges. It is considered that the plans do properly emphasise avoiding over-grazing (which is arguably worse than under-grazing) but do not adequately emphasise litter removal and sometimes leaving pockets of bare ground, for perpetuating or enhancing botanical diversity. Presumably, this is because of a reliance on military vehicles to create the desired disturbance, once known as 'tank grazing'. It is considered that a better description of the desired end-swards, including catering for other interest features, with photographs, might help farmers' understanding – either as an appendix to the FMPs or as a separate document.

The annual and rotational (special grazing restriction) grazing regimes are different, in that the former should aim for a well-grazed sward with both short areas and tussocks, a little litter, and small pockets of poaching (for example); whilst the latter should aim for harder grazing, when it occurs, to encourage devil's-bit scabious and other plant species to regenerate. The proportion of winter and summer grazing is another important factor – if livestock are not taking down winter litter levels sufficiently, due to unpalatability, for example. Whilst the plans must be fit-for-purpose, the farmers' understanding, expertise and co-operation are key for balancing grazing according to the terrain, weather and consequent grass growth, and the conservation interests.

Rainfall varies, increasingly so, but it appears that the tenant farmers do not necessarily respond to changing grazing requirements on the SSSI - in fact, presumably keep stock closer to home during high rainfall and more grass growth. This may partly explain excess litter on 68 (24.1%) out of 282 grassland parcels surveyed, following high rainfall in spring

2014 and on-and-off rainfall throughout summer 2015. Part of the problem is herd size, which presumably cannot change or adapt quickly, and is subject to many factors; also the number of pennings that a farmer is allowed or utilizes at any one time.

The higher fertility, reverting grasslands, which are relatively species-poor, are likely to 'improve' only slowly or stay the same, especially if not grazed regularly. 'Restoration grazing' could be used to move such static grasslands forward but the scale of the Plain makes such fine-tuning difficult.

Long grass margins between grazing pennings are a requirement, for the benefit of invertebrates, field voles and barn owls, however, some farmers have stopped doing these.

Overall, this assessment found grazing levels to be insufficient on some areas, partly related to high rainfall and excessive grass growth over the last two summers, and also longer-term neglect on some areas. The recommendations are:

- Regular monitoring of grazing pennings – coverage, frequency and intensity - and feedback to the farmers.

- Consider increasing the number of grazing pennings for selected farmers.

- A straightforward, illustrated guide for farmers, on conservation grazing on the Plain.

  The Farm Management Plans do not mention or emphasise avoiding under-grazing, rather they focus on avoiding over-grazing, which presumably was more of a concern at the time, with a reliance on military vehicle disturbance for bare ground. A new guide could be appended to these or sent separately.

- Further Site Checks by Natural England, to assess individual farmers' grazing and scrub control, and the Special Grazing Restriction areas.

- Natural England enforcement letters, where appropriate.

c) Natural reversion

As already discussed above, under 'extent', natural reversion processes are increasing the overall amount of CG grassland - CG/MG and MG1 to CG3.

d) Plantation removal

Plantation removal has increased the overall grassland area, on Sidbury Hill and many other locations on the Plain. This assessment recorded 18 units (out of the 73 assessed) where some degree of plantation removal had occurred. The long-term recovery of these grasslands is being monitored, in part, through the CEH permanent quadrats.

e) Military vehicle disturbance

The recent Defence Infrastructure Organisation 'second five-year report' (DIO, 2014) provides detail on military training levels - which directly affect bare ground levels.

Military training activity is a key influence on bare ground and the chalk grassland habitat with the potential for both negative and positive effects depending on the overall training load and type. Broadly speaking, high frequency use of military vehicles off stone tracks may result in chalk grassland loss and fragmentation, whereas moderate frequency or temporary use of military vehicles at the edges of and off stone tracks has a positive effect.

In an ideal world, we would have a described or quantified sustainable level or range of military training activity, in order for us to compare and monitor creeping change and significant new proposals; but this is difficult given the variety of ways exercises make use of the huge training area, the varying responses of the environment according to wetness and the continuing evolution of military training. However, the five-year report does provide a relatively consistent measure of actual military training activity over the period – by whole site, sub-area and month. The revised approach using average instead of aggregated WF is more meaningful. The averaging of large amounts of data hides much variance and extremes. For example, the number of times the WF 100 is exceeded may be a useful indicator of pressure on the Plain. Natural England considered that the overall amount of and types of training, as long as this is calculated and presented consistently, is a suitable indicator. One must bear in mind that it is the overall amount of training that is reflected in the amount of long-term bare ground due to on-going trawl of vehicles, whereas occasional or erratic bursts of activity followed by recovery can produce some excellent habitats.

The 'summary of Weighting Factors 2008 to 2012' graphs give the impression of a relatively even keel to military training activity over the five-year period which is reassuring; a monthly fluctuation that shows particular pressure in February/March when stone-curlews are settling and vulnerable to disturbance; and a relatively even activity level across the numbered sub-areas, with the East being busiest.

Bare ground is an extremely important habitat on the Plain for rare plants, insects and fairy shrimp, although overall cover of bare ground must be kept within an upper as well as lower limit to avoid loss of chalk grassland. The SSSI Favourable Condition Tables set limits of 2-4% bare ground cover. In practical terms, this requires an agreed and stable training load that keeps chalk tracks open and spreads out onto track edges and chalk grassland in places; not an overall increased or 'excessive' training load that increases the long-term trawl along tracks and over grassland, expanding the permanently bare areas. The same applies to the impact craters, in that the initial bare chalk, when allowed time to recover (3-10 years?), provides a high-value short sward chalk grassland with rare plants.

Monitoring bare ground cover using aerial photo analysis was attempted by MoD but proved difficult and unduly expensive, and this action was closed by the Environmental Steering Group – whilst keeping open on-going aerial photography across the Plain for other purposes. In the meantime, DIO are compiling aerial photos over time, for *c.*20 specific locations, mainly training features, which allow a visual appraisal of bare ground change.

f) Shell craters

The on-going succession of shell craters in the Central Impact Area (CIA) and elsewhere, and the subsequent successional processes, provide some excellent habitats - with short sward CG2 and CG7 grasslands, patches of devil's-bit scabious, rare plants - including early gentian, and lichens. It is thought the craters provide refuges from the wild fires, for marsh fritillary butterflies.

g) Fires

Wild fires in the CIA help to produce species-rich swards in places, by removing thatch build-up – and the CEH work here has shown pronounced cyclicity of devil's-bit scabious; but, they are an unreliable and potentially hazardous management tool, and possibly promote tor-grass. Currently, there are no particular control measures or monitoring of wild fires, as this is difficult to achieve and they have not been deemed a problem - apart from when smoke drifts into nearby villages.

h) Tor-grass

From a recent analysis of aerial photography, tor-grass appears to have substantially increased on Central Impact Area, since the mid-90s. There is currently no tor-grass control, other than grazing and compaction by vehicles along tracks, which needs further investigation – although may be extremely difficult to achieve.

1.5 Condition status

Using the ISAT reports, which provide the actual measures and 'pass/fails' for each attribute, for each grassland parcel surveyed, 176 (62.2% of all parcels surveyed) passed all mandatory attributes and were therefore in Favourable condition.

This leaves 106 (37.6%) parcels that failed one or more mandatory attributes. The main mandatory attributes failed were: proportion of herbs to grass and positive indicators (79 parcels, 28%), negative indicators (upright brome, false oat-grass) (x30 parcels), negative indicators (weeds) (x25) and scrub (x23).

The main non-mandatory attributes failed (applies to both Favourable and Unfavourable parcels) were: sward height (x103) and litter (x68).

This result can be compared against the English Nature condition assessment in 2002. Then, 43% of the grassland parcels surveyed passed all mandatory attributes, with the same measure increasing to 62% in 2015. Also in 2002, 61% of the grassland parcels surveyed passed the positive indicator targets, with the same measure increasing to 72% in 2015. This suggests an overall improvement in chalk grassland quality over the 12 year period – despite the under-grazing highlighted more recently.

It should be noted that the FCT sets relatively low targets for positive indicators, compared to some other SSSIs, and that the above results indicate actual averages only just above these.

Ultimately, condition status judgements are required at feature and unit level; therefore, the results from multiple grassland parcels had to be considered as one. This was often straightforward, given single farmers' grazing and scrub management practises over large areas; however where good quality grassland parcels were present along with poorer quality grassland, the approach taken was that if any significant (large, less common community) parcel failed mandatory attributes, then the whole feature (and subsequently the unit) failed.

In fact, the proportion of both grassland parcels and units 'passing' the assessment, in respect of the chalk grassland, was virtually the same: approx. 60:40 pass/fail.

Another issue was the sometimes species-poor CG3d and 'CG/MG mosaics and transitions' parcels, which are considered part of the notified features but did not meet the positive indicator targets. This was usually due to grassland history prior to designation, rather than inappropriate management subsequent to designation. The issue is partly due to the NVC key defining any sward with >10% upright brome as CG3 (apart from CG8), whereas Common Standards Monitoring generic targets for CG3 require two Frequent and four Occasional positive indicator species as a minimum. Such transition or reverting grasslands that were previously ploughed or semi-improved are often apparent by their uniformity i.e. a mix of common species, perhaps including a low number of positive indicator species (e.g. *Lotus corniculatus*), that is consistent across the parcel but without any occurrence of the more demanding chalk specialists; whilst mosaics may be more variable than this, with better quality grassland patches amongst false oat-grass dominated patches, for example. Therefore, the approach taken was to record 'down the line' against the attributes and targets on the specific Rapid ISA form, then compare these results against the mid-90s NVC cards. If the swards had not declined in quality and the correct management was in place,

they would not compromise the overall condition status judgement for that feature, at unit level - even if the mandatory targets had not been met. However, Condition Threats could be used to highlight such swards, especially if it appeared that the reversion process was slow-moving and more intensive grazing or other restoration measures would be of benefit.

Scrub was discussed with DIO and, given the recent substantial reduction in scrub cover, it was agreed that a wider-than-unit level approach would be used, for arriving at a condition status judgement. In the event, only seven units were found to have excess scrub at unit level – and these were Unfavourable for other reasons too. Scrub was more often seen to be a potential risk at parcel level, in which case Condition Threats were recorded, without compromising the unit condition status.

Given the above complexities and to help ensure consistency and clarity, a 'decision tree' for deciding condition status was used as shown in Figure 3. The decision tree makes the standard distinction between mandatory and non-mandatory targets i.e. those targets that must be met or the grassland parcel 'fails' (e.g. herb/grass ratio, number of +ve indicators) or are mere warnings that management is not adequate (sward height, litter). Thus, most parcels, for each NVC type present in the unit, must pass the mandatory attributes, to achieve Favourable condition status; whilst allowing that small, difficult to graze corners and on-going reverting, species-poor grasslands, where management is adequate, do not compromise the overall unit-level judgement.

This means that some parcels have been judged as being in Unfavourable condition due to excessive litter build-up caused by under-grazing; however, with more moderate weather and/or farmers being more responsive to grass growth, there is scope for these parcels/units to quickly come into Favourable condition.

The unit level results are best viewed using the Unit Summary Sheets in combination with the SP SSSI Site Condition Plan, in appendices 6 and 7. Also, see Appendix 5 - Condition status of features at unit level; and CMSi.

Out of the 73 units assessed, 46 (63%) were judged to be in Favourable condition, in respect of the chalk grassland features.

1.6 Condition threats

Condition Threats have already been mentioned above, under the NVC types and attributes, and conservation management.

In the Site Condition Plan, the threats have been categorised and attached to 1996 NVC parcel numbers or unit numbers, to help in identifying and discussing the main themes, and for ArcGIS map production. Figures 4 -6 demonstrate the locations and types of Condition Threat on the West, Centre and East.

One or more Condition Threats of one sort or another were applied to a total of 136 grassland parcels (out of 282 parcels assessed). Those from under-grazing were applied to 83 (29.4% of total parcels) grassland parcels - whether due to failed mandatory (sward composition) or non-mandatory attributes (sward structure). Those from scrub encroachment were applied to 34 (12.1%) grassland parcels and seven whole units – due to failing the mandatory attribute for scrub cover, either at parcel or unit level; however, overall scrub cover has been greatly reduced and these threats, after review, may be discounted. Those from negative indicators – weeds (ragwort, creeping thistle) were applied to nine (3.2%) grassland parcels. Those from negative indicators - tor-grass were applied to eight (2.8%) grassland parcels.

In other words, under-grazing was found to be the main threat affecting the chalk grassland on Salisbury Plain, currently. The two wet years and lots of grass growth were a significant contributor to 'failing' swards, where accumulated litter had not been removed; whilst past grazing records show some longer-term neglected areas.

C Juniper

2.1 SAC feature assessed:
Annex 1 habitat, 5130, *Juniperus communis* formations on heaths or calcareous grasslands.

SSSI feature assessed:
W21d *Crataegus monogyna - Hedera helix* scrub with juniper.

Units present: 129, 130, 131,132, 134, 135, 136, 138, 155, 171

2.2 Method/information sources

- Defence Estates. *Juniper Management Plan 1996*, September 1996.
- Defence Estates. *Beacon Hill Woodland Management Plan,* July 2004
- Defence Estates. *The Bulford Ranges Scots Pine Management Plan*, July 2004
- Defence Estates. *Juniper Management Plan Review & Update 2005,* June 2005
- Defence Estates. *Bulford and Beacon Hill Rabbit Exclosure Reports 2005 and 2009,* September 2005 and March 2009
- Defence Infrastructure Organisation. *Super Unit Management Plans 2010-2015,* April 2011

2.3 Results

a) Attribute: population size.
There were 11,100 juniper bushes in 2002 (mainly on Beacon Hill and Bulford Ranges). The distribution and frequency of bushes compared to 1996 did not appear to show any significant differences, although true comparisons were difficult due to different recording techniques. No systematic count has been done since 2002.

In 2015, in unit 155, approximately 50 mature bushes of juniper were found dying or dead – during the Integrated Site Assessment. *Phytophthora austrocedri* was subsequently diagnosed by Forest Research as being present in the soil, in two places on Beacon Hill, potentially connected with the die-off. *P. austrocedri* is a fungus-like pathogen which poses a threat to juniper trees in Britain; first reported in 2011, with infected trees since found at sites across Scotland and the north of England, and more recently widely distributed across England. It is a notifiable pathogen; therefore DIO have received a Plant Health Notice and are putting in place precautions for avoiding or minimising further spread on the Plain. In terms of SSSI condition status, this has been recorded as a Condition Threat against all ten units where juniper occurs.

The attribute target is no marked reduction in population level; therefore, overall, this is currently still met.

b) Attribute: population structure.
Plantlife's definitions for age structure are: seedling (up to 25cm tall), young, mature, over-mature and senile. In 2005, young bushes were recorded in only one compartment; the population was mostly mature individuals (20-48 years old); and over-mature, senile and collapsing bushes were rare throughout the survey area. Since then, regeneration has been occurring in most of the juniper exclosures identified in the management plan (numbered 1 to 18, with nos. 2 and 3 discontinued), although not in the two recently installed ones (16a and b). At least 50 seedlings and young trees are now well established. In addition, some regeneration has occurred at the back of B Range, where grazing is light.

The attribute target is: old growth bushes (> 100 years old) no more than occasional, building to mature bushes at least frequent, pioneer phase bushes (< 5 cm girth) at least occasional. Overall, the attribute is not met, as the current age structure is imbalanced, with a large proportion of the population proceeding to mature and over-mature, however, another small cohort is apparently underway.

c) Attribute: sex ratio.
In 2002, 39% of the population were female, being slightly shorter-lived than male plants. The attribute target is: neither sex should exceed ratio of 2:1; therefore, this is presumably still met.

d) Attribute: vegetation structure.
The most suitable vegetation structure for successful juniper regeneration is an intimate mix of grassland and scattered, open juniper scrub (Ash, 2005).

The densest areas of juniper are in units: 155, 136 and 138. In the southern half of unit 136, the large block of juniper (2-3000 bushes) is approaching closed scrub (also at the expense of chalk grassland).

The attribute target is: no more than 75% closed juniper scrub; therefore, overall, taking the population as a whole, this target is met.

e) Attribute: negative indicators: shading.
The Juniper Management Plan Review & Update, 2005, showed that 32% of the total juniper population occurred within dense scrub and 5% in woodland (predominantly conifer plantation). The FCT attribute target is: overtopping species no more than occasional within juniper stands.

The above document included a scrub management plan for Bulford and Beacon Hill 2005-2010. Also during a similar period, the Bulford Ranges Scots Pine Management Plan and Beacon Hill Woodland Management Plan were completed. Subsequently, DIO's Super Unit Management Plans 2010-15, specifically those for Beacon Hill Super Unit (SUMP no. 27) and Bulford Ranges (SUMP no. 28), have provided an on-going programme of scrub management and self-sown pine removal, for the benefit of juniper. Of the 27 scrub management polygons listed, 13 have been completed over the last five years (2010-15). At the same time, a larger part of Beacon Hill and Bulford Ranges, has been managed by Landmarc Support Services, under their maintenance programme - which in the last five years has covered a large proportion of the juniper areas (*c*.75%). The recent disease alert prevented the scheduled maintenance for last winter (2015/16) going ahead.

Overall, over-topping species have been significantly reduced across much of the juniper population, although are still locally abundant or frequent e.g. on Beacon Hill, opposite A-Range – where the attribute is not met.

2.4 Conservation management

Grazing is needed to create open conditions (bare soil or sparse vegetation) for regeneration to occur, followed by reduced grazing pressure to allow seedling establishment. On Beacon Hill, with steep slopes and thin soils, the predominant grazing animal is the rabbit, which maintains the chalk grassland and prevents scrub re-growth but at the same time inhibits juniper establishment. On the Bulford Ranges, cattle grazing is now established.

Since 1996, 16 exclosures were installed for juniper and marsh fritillary butterflies, covering 10.8 ha. These are now generally successful in excluding rabbits and, along with favourable

conditions for seed survival and germination in certain years, have resulted in a new cohort of seedlings and young trees.

Super Unit Management Plans 28 (Bulford Ranges) and 27 (Beacon Hill) cater for the juniper population, including 'improvement maps' which identify areas for clearing scrub and treating stumps, whilst retaining juniper bushes.

2.5 Condition status

Unfavourable Recovering

Juniper is both a SSSI and SAC species. Like most populations in southern Britain, the one on the eastern side of Salisbury Plain suffers from inadequate regeneration, resulting in limited cohorts and inadequate younger stock. Recently, DIO's rabbit exclosures are showing increasing signs of success, with a scattering of seedlings and young trees now present in many of them; however, the attribute target for 'population structure' is not yet met, therefore the population is considered to be in Unfavourable Recovering condition.

2.6 Condition Threats

Condition Threat: the whole juniper population on Beacon Hill and Bulford Ranges must be considered under threat from *P. austrocedri,* at least until we better understand the spread, control and outcomes from this plant disease.

Condition Threat: the current age structure of juniper is imbalanced, with a large proportion of the population proceeding to mature and over-mature; although a small cohort of seedlings and young trees is relatively recently underway.

Condition Threat: in the southern half of unit 136, the large block of juniper (2-3000 bushes) is approaching closed scrub (also at the expense of CG2 chalk grassland).

D Habitat mosaic

SSSI feature:
Habitat mosaic - scrub and woodland habitats, temporary and permanent pools, and the Nine Mile River winterbourne.

Scrub is reported on under the chalk grassland features. **Temporary and permanent pools** are reported on under fairy shrimp and also will be under the Nine Mile River (with associated temporary pools). The **Nine Mile River winterbourne** has not yet been assessed. The three parcels of ancient semi-natural woodland were assessed as part of this project, as below.

3.1 SSSI feature assessed:
Ancient semi-natural woodland - W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland.

Units present: 1, 2 and 19

Dirtley Wood, 4.53 ha, unit 2, ST891 484
Ranscombe Bottom, 4.50 ha, unit 1, ST886 491
Wadman's Coppice, 2.87ha, units 16, 19, ST948 495

3.2 Method
Woodland Rapid ISA survey forms for ISAT were completed, in December 2015, for the three small ancient woodlands on the Plain.

3.3 Results
a) Attribute: extent
This was the first time these woodlands were assessed, having only recently been considered to be part of the notified features.

Only the southern half of Wadman's Coppice, was found to be ancient woodland – and the south-western corner of this half having been re-planted with conifer and broad-leaves, at some point in the past, presumably prior to SSSI notification. As the Ancient Woodland Inventory shows this south-western corner as semi-natural, a Condition Threat has been applied, suggesting a restoration project.

b) Attribute: structure & natural processes
Ranscombe Bottom and Dirtley Wood are hazel coppice-with-standards, with a high density of healthy hazel stools, and a variable density of standards – only occasional in Ranscombe, more in Dirtley, including some mature/old oaks and ash, with polypody. Wadman's has hazel too, although the wood is more open in places – where it is dominated by mature trees with little under-storey. All three woods have a reasonably varied age-structure, including standing and fallen dead wood.

c) Attribute: composition
The three woods are comprised primarily of native species – ash, field maple, pedunculate oak, with some large common-leaved limes in Wadman's. Sycamore dominates a 2-300m section of Dirtley Wood and was also present in Wadman's. The ground flora was limited in

December but species found in the three woods included dog's mercury, primrose, bugle, herb Robert, viola spp, wood avens, male fern and tufted hair-grass.

d) Attribute: quality indicators
Two mature multi-stemmed field maples and an old ash tree with lichens, were noted in Ranscombe. This attribute needs further survey at a better time of year.

e) Attribute: regeneration potential
In Ranscombe, approximately 0.5 ha of hazel coppicing had been done on the southern slope, about 4-5 years ago, with good hazel re-establishment and plenty of ash regeneration - some of these should be promoted as future standards. In Dirtley, there was a small area of coppicing at the very western end and further in a deer seat with a surrounding clearing, with some ash regeneration, otherwise there was little apparent management. In Wadman's, patches of hazel had been cut, probably about 6-8 years ago, and parts of the wood edges have young ash saplings; there are grassy rides through the wood, although narrow and shaded.

3.4 Conservation management
Forestry, DIO SUMPs.

3.5 Condition status
Favourable

The three small ancient woodlands, have recently been added to the notified features. They have not had an NVC survey yet and the ISA was carried out rather late in the year; however, they appeared to meet the targets for structure and composition.

3.6 Condition Threats
The south-western triangle of Wadman's Coppice (0.48 ha) is mapped on the Ancient Woodland Inventory as semi-natural but at some stage, possibly before notification, has been re-planted with conifer and broad-leaves, and would have scope as a restoration project.

E Rare plants

4.1 SSSI feature assessed:
Tuberous thistle *Cirsium tuberosum* - a vascular plant species of lightly managed grasslands (Suite 4).

Units with historic and recent records: 1, 2, 4, 7, 8, 9, 10, 16, 17, 18, 19, 20, 21, 23, 35, 60, 63, 66, 125, 170.

4.2 Method

- Prendergast A. *Salisbury Plain SSSI – tuberous thistle* Cirsium tuberosum *monitoring 2015.* December 2015, Natural England. To be updated.

With reference to:

- Walker K.J., RF Pywell and C. Carvell. 2001. Cirsium tuberosum (L.) All. *on Salisbury Plain Training Area: distribution and introgression with related thistles.* Centre for Ecology & Hydrology.

4.3 Results

a) Attribute: presence/absence
In summer 2015 (and additional searches in 2016), the thistle was seen to be present in units 1, 2, 7, 8, 9, 17, 20, 21, 60, 66, 125 and 170. It has also been recorded in units 4, 10, 16, 18, 19, 23, 35 and 63. The location in unit 16 was searched but the plant not re-found; whilst the other scattered records were not searched for. See Figures 8, 9 and 10 for a compilation of records on the three areas of the Plain.

b) Attribute: extent or count of groups, including presence/frequency of hybrid *C. tuberosum* x *C. acaule*
In 2001, CEH visited 52 locations. They recorded 2212 plants, including 2096 discrete patches of *C. tuberosum* and 116 *C. x medium*. The four largest colonies were at Wardens Down (unit 7), High Down (unit 7), Penning Down (unit 66) and Ladywell Plantation (units 9, 21) which held 50% of the population.

In 2015, Natural England visited 32 of the previous locations, also incorporating recent records from Sharon Pilkington (BSBI recorder). They recorded 3702 *C. tuberosum* plants. Although many of the recorded figures of *Cirsium tuberosum* plants are based on interpretations and estimations it appears that across the sites there had been a c.76% increase in *Cirsium tuberosum* plants since 2001. This may be an artefact of better survey conditions or an increased survey effort but it is probable that such a large increase is due at least in part to a genuine increase in the numbers of plants present. Small recorded losses at individual sites are unlikely to represent genuine losses, rather artefacts of the realities of recording. Genuine historical losses in the area of Ladywell Plantation due to afforestation appear to be compensated for by increases outside the plantation.

Records of C. x medium indicated a reduction in its numbers across the SSSI. Past confusion over the identification of the pure species, hybrids and backcrosses appear to have prompted fears of a hybridisation threat to *Cirsium tuberosum*, however this project found that plants conforming to the type for *Cirsium tuberosum* are by far the most abundant taxon on Salisbury Plain and hybrids are rather less abundant. Upon reviewing the records, samples and herbarium specimens little evidence was found to support the view that backcrossing occurs between *Cirsium tuberosum* and *Cirsium ×medium*. However a small

number of plants observed do appear to be backcrosses between medium and acaule, a backcross not yet known. Further work is underway to more firmly establish the taxonomy.

c) Attributes: niche availability, negative indicators (scrub)
At most of its Salisbury Plain locations the species occupies old tall CG3 *Bromus erectus* grassland, particularly the undescribed form related to CG2b which supports a suite of species typical of slightly leached (acidified) calcareous swards i.e. betony *Betonica officinalis*, devil's-bit scabious *Succisa pratensis* and saw-wort *Serratula tinctoria,* as well as zig-zag clover *Trifolium medium* (a neutral grassland species), The close presence of these 'chalk heath' and neutral soil species suggests a history of undisturbance with little mixing of the leached surface with the lower chalk. The sward is sometimes rank, sometimes species poor and often has young scattered scrub. Most of the sites occupy the shoulders of valleys, with colonies spreading onto the steeper slope below and occasionaly onto the plateaux above.

d) Attribute: vegetation structure
The widespread use of temporary pennings and mob-grazing with long grazing rotation cycles on Salisbury Plain has created vast amounts of habitat potentially suitable for *Cirsium tuberosum.* Although *Cirsium tuberosum* appears to have rather exacting soil requirements and seems to be very slow to reproduce from seed, this habitat is likely to become increasingly suitable under the current management, particularly in areas with lower levels of military activity.

e) New attribute: disturbance
Unlike many other noteworthy species on Salisbury Plain, *Cirsium tuberosum* does not benefit from the disturbance cause by military activity. Some sites, including some of the best sites appear to be negatively impacted by heavily used tank tracks and even minor disturbance and compaction cause by small numbers of passes has been observed to weaken plants and open up niches for *Cirsium ×medium* and *Cirsium acaule*. It is possible that the mixing of the soil and chalk creates conditions less suitable to *Cirsium tuberosum* which appears to prefer leached, slightly acidified locations. It is therefore suggested that the most important *Cirsium tuberosum* sites (High Down, Penning Down, and Imber Down to Ladywell) and potentially other more minor sites too, are protected from access by vehicles in a similar way to that in which the archaeological interest of the site is protected. These three core areas for *Cirsium tuberosum* at Salisbury plain could be maintained as 'tuberous thistle landscapes' with longer grazing cycles, less disturbance, increased sward height and more scrub.

4.4 Conservation management
DIO's FMPs and SUMPs

4.5 Condition status
Favourable.

Tuberous thistle is Nationally Rare and the only 'individually notified' plant on the Plain. The population was assessed by visiting ¾ of the units or roughly 2/3 of the locations, for which there are records, including the four largest colonies at Wardens Down, High Down, Penning Down and Ladywell Plantation. Both the overall distribution and number of plants at certain locations appear to have expanded, along with relatively small decreases in a few locations.

Whilst for a long time there was a concern that tuberous thistle (*Cirsium tuberosum*) readily hybridises with dwarf thistle (*Cirsium acaule*), this survey and investigation, including viewing the extant population in Glamorgan, and museum specimens at the Linnean Society and

Natural History Museum, suggest that the varied forms found on the Plain are in fact mostly *C. tuberosum*, while any hybrids and backcrosses are much less abundant.

4.6 Condition Threats

(i) Site 15*, 'East of Ladywell Plantation', within Unit 21. Ladywell Plantation was seen to have fragmented the populations still present around the edges and on-going shading by the plantation has eliminated several important populations. There are small glades where tuberous thistle may survive, relying on storage organs, however these are not nearly large or open enough for the plant to thrive and flower. Recommend restoration of Ladywell Plantation to open scrub or wood pasture, as indicated on early maps, or at least creation of extensive glades around former locations for the plant.

(ii) Site 2, 'Penning Down', within Unit 66.
The important *Cirsium tuberosum* population should be protected from military vehicle access.

(iii) Site 24 'High Down' and Site 25 'Warden's Down', within Unit 7.
The important *Cirsium tuberosum* population should be protected from military vehicle access.

(iv) Imber Down to Ladywell, within Unit 21.
The important *Cirsium tuberosum* population should be protected from military vehicle access.

*Site numbers are those from Walker et al., 2001.

5.1 SSSI feature assessed:
Vascular plant assemblage

Units present: See Appendix 2 - Location of features by SSSI unit.

5.2 Method/information sources

- Pilkington S. *Common Standards Monitoring Rare Vascular Plant Survey 2008.* 2009, Natural England

- Wiltshire & Swindon Biological Records Centre records

Since a specially commissioned study in 2008 (Pilkington, 2009), the Plain has been regularly visited and recorded by Sharon Pilkington (BSBI County Recorder) and volunteers from Wiltshire Botanical Society and the three Salisbury Plain conservation groups. Coverage is not systematic but is felt to be sufficient for the time-being – especially given the wider chalk grassland survey this time. The following is a summary of rare plant assemblage records since 2011, obtained from Sharon Pilkington and the W&SBRC. Other records were made during the wider chalk grassland survey by Natural England staff.

5.3 Results

a) Chalk grassland species.

Attributes: assemblage score (based on presence/absence), population size/distribution and indirect habitat attributes.

(i) Purple milk-vetch - *Astragalus danicus.*

Thirty-three records, six recorders, from the East, between 2011 to 2014. This species has a localised distribution on the East of the Plain, recorded in at least 11 units, as listed in the Favourable Condition Tables (FCT). Out of these units, the CG3 and CG2 grassland was classed as being in Favourable condition in eight units, Unfavourable condition in one unit (unit 134) and was not assessed in two units. In unit 134, purple milk-vetch survives well on the regularly mown ranges, therefore no Condition Threat will be applied.

(ii) Dwarf sedge - *Carex humilis.*

Seventeen records/locations, five recorders, from across the SSSI between 2011 and 2014. This species was described by Pilkington (2009) as *widespread in the Haxton Down and Weatherhill areas, also frequent in southern part of Central Impact Area.* The FCT lists 28 units where this species has been recorded. At a whole site level, it appears that suitable habitat conditions are present, and appropriate management in place, over a sufficient area, to be confident that the species is being maintained in Favourable condition.

(iii) Slender bedstraw - *Galium pumilum.*

A population of 150+ was recorded, two recorders, on Slay Down, The Centre, in 2011. The FCT lists two units within the Central Impact Area, which have not yet been assessed, either for chalk grassland or this rare vascular plant.

(iv) Early gentian - *Gentianella anglica.*

Five records, three recorders, including one record for 144 plants, for the Central Impact Area, in shell craters, between 2011 to 2014. Previous to this, the plant had not been recorded on the Plain for twenty-plus years. The FCT lists six units, four on the Centre and two on the East, with previous, older records (which are not considered significant populations and will not be assessed). The population in unit 170 will be assessed, when the time comes, and any other units where this species is newly recorded.

(v) Burnt orchid - *Neotinea ustulata.*

Nineteen records, six recorders, mostly from the East, between 2011 to 2014. The recent fieldwork for this project found a new population in unit 79, with >25 plants. The FCT lists nine units where this species has been recorded on the West, Centre and East; however, it frequently occurs in suitable habitats as scattered individual plants, so many of the previous records on Salisbury Plain do not necessarily represent long-standing or sustainable populations; therefore, it is difficult to assess the condition of this species. For those units listed in the FCT, the ISA of the chalk grassland found: four units = Favourable, four units = Unfavourable (units 73, 85, 109, 134). The Unfavourable units will have Condition Threats applied in respect of burnt orchid and potential impacts from under-grazing.

(vi) Meadow clary - *Salvia pratensis.*

Not recorded since 2012, when Dominic Ash planted c. 30 plugs grown from seed collected from Salisbury Plain and Porton Down, under licence from Natural England. The plug-planting site was visited as part of the fieldwork for this project but no plants were visible, as it was being grazed. It is uncertain if this plant still survives at its one location on the Plain, in unit 17, although the grazing management is suitable, therefore has been recorded as Favourable for now. A Condition Threat will be applied.

(vii) Field fleawort - *Tephroseris integrifolia ssp. integrifolia*.

Four records, three recorders, on the East, between 2011 to 2014. The FCT lists seven units where this species has been recorded; however, this species is generally very rare, with Silk Hill being the only relatively reliable place to record it – unit 129, which has not yet been assessed. For those units listed in the FCT, the ISA of the chalk grassland found: two units = Favourable, three units = Unfavourable (2, 85, 136) and two units =

not yet assessed. The Unfavourable units will have Condition Threats applied in respect of field fleawort and potential impacts from under-grazing.

(viii) Bastard toadflax - *Thesium humifusum.*
Twenty records, seven recorders, at various locations across the Plain, from 2011 to 2014. This species was described by Pilkington (op cit) as *relatively widespread on Salisbury Plain, occurring in approximately 40 1 km squares.* The FCT lists 28 units with previous records. At a whole site level, it appears that suitable habitat conditions are present, and appropriate management in place, over a sufficient area, to be confident that the species is being maintained in Favourable condition.

b) Suite 5 - disturbed/heavily managed grasslands, crumbly turf, path edges, etc.
Attributes: assemblage score, presence/absence, population size/distribution, niche availability, bare ground, sward height, disturbance, encroachment.

(i) Dwarf mouse-ear - *Cerastium pumilum.*
Three records, two recorders, from the East and West, between 2011 to 2014. The FCT lists five units with previous records. Pilkington (op cit) said: *C. pumilum has been recorded in 10 1km squares in Salisbury Plain SSSI since 1985 and new populations are now being regularly found. It is likely that more populations exist but have not been recorded due to limited numbers of botanists confident about differentiating the species from its congeners, the size of the SSSI and the short survey window for the species.* Given this species is dependent on disturbance at track edges from military vehicles, it is reasonable to assume that the indirect attributes are being met and it is in Favourable condition.

c) Suite 9 - ruderal areas.
Attributes: assemblage score, presence/absence, population size, niche availability, encroachment.

(i) Fine-leaved sandwort - *Minuartia hybrida.*
Thirty-two records, seven recorders, from across the Plain, between 2011 to 2014. The FCT lists 23 units with previous records. In 2009, Pilkington said: *Until quite recently there were only a few records for M. hybrida within the SSSI, mostly in the eastern ranges. However, extensive recording by a small number of voluntary recorders from 2005 onwards has significantly increased its known range on Salisbury Plain, where it is now known to be widespread wherever there is active regular disturbance of dirt tracks. It is especially frequent in the Imber Ranges and the Haxton Down area. The only area where it is mostly absent is in the Central Impact Area where tracks are relatively rare. It is likely that the Salisbury Plain metapopulation is one of the largest in the British Isles and total population size may exceed hundreds of thousands of plants.* Given this species is dependent on disturbance at track edges from military vehicles, it is reasonable to assume that the indirect attributes are being met and it is in Favourable condition.

5.4 Conservation management
DIO FMPs, SUMPs and military training activities.

5.5 Condition status
Favourable

The suite of rare vascular plants have been assessed through accumulated records provided by volunteers. The chalk grassland species were all seen to be in Favourable condition, although threats have been applied where burnt orchid and field fleawort occur in generally under-grazed units. The 'disturbed edges' and 'ruderal' species were seen to be in

Favourable condition. One plant, meadow clary (*Salvia pratensis)*, has not been recorded since 2012, although may still exist – after a plug planting project that year.

The Citation only mentions the species highlighted above – and these are what are considered notified and have been assessed; however, there are at least six other 'qualifying' rare vascular plants present on the Plain, plus 24 non-qualifying but locally distinctive species, as also listed in the FCT.

5.6 Condition Threats

Condition Threat: in unit 17, meadow clary, which occurs only in this unit, has not been recorded since 2012.

Condition Threats: in units 73, 85,109 and 134, burnt orchid occurs and may be under threat from under-grazing.

Condition Threats: in units 2, 85 and 136, field fleawort has been recorded and may be under threat from under-grazing.

F Rare mosses and liverworts

6 .1 SSSI feature assessed:
Non-vascular plant assemblage – Bryophytes

Units present: 115, 129, 134, 136, 138, 146, 147, 148, 149, 150, 155

6.2 Method

- Pilkington S. *Salisbury Plain Site of Special Scientific Interest - Bryophyte site dossier.* 2015 April. Location: SSSI files, Natural England.

With reference to:

- Preston, C. D., Hill, M O., Pilkington, S. and Pywell, R J. *The effect of disturbance on the bryophyte flora of Salisbury Plain, western Europe's largest chalk grassland.* J. Bryol. 31, 255-266.

6.3 Results

a) Attribute: presence/absence = assemblage score
The following NR and NS species have been recorded, in the past and all recently (2015):

*Abietinella abietina var. hystricosa (*previously *Thuidium abietinum ssp. hystricosum)* **NS,** *Aloina rigida* **NS,** *Bryum torquescens* **NS,** *Didymodon acutus* **NS,** *Ephemerum recurvifolium* **NS,** *Grimmia orbicularis* **NS,** *Lophozia personii* **NR, RDB Near Threatened,** *Pleurochaete squarrosa* **NS,** *Pottiopsis caespitosa* **NS,** *Racomitrum canescens* **NS,** *Weissia sterilis* **NS, BAP, Vulnerable**

The important bryophyte areas were described by Pilkington (2015) as:

Sidbury Hill (units 146, 147, 148, 149, 150)
Cross Country Driving Area (units 149, 150)
Bulford Firing Ranges (unit 134)
Beacon Hill (units 136, 138, 155)
Silk Hill (units 115, 129)

Also, Pilkington highlights that certain trees in Imber village (which is outside of the SSSI) support a large population of the locally distinctive *Leptodon smithii.* Other locally distinctive species are present on the SSSI: *Entodon concinnus, Scapania aspera, Weissia controversa var. crispata.*

Healthy and sustainable populations of all qualifying species were confirmed, including two nationally scarce mosses that were newly discovered in the course of fieldwork.

The assemblage score at time of notification was 350. Since notification, some species have been down-graded from NS, whereas other new, important species have been found. The current assemblage score is 600.

b) Attribute: niche availability
The current backdrop of military training and estate management appears to be creating and maintaining extensive areas of disturbed calcareous grassland that in turn supports healthy populations of key bryophytes. Only a few recommendations for habitat management

/intervention have been considered necessary where assemblage species are considered to be at imminent risk of loss or damage, which have been highlighted as Condition Threats.

On the Plain, several different microhabitats fall within the scope of 'special habitat 7 - disturbed open lowland calcareous grassland':
• Disturbed active earth (chalk and flint) and stone (limestone chippings) track edges and banks
• Disused earth (chalk and flint) tracks
• Disturbed open grassland (CG2, CG3 and CG7) associated with active and disused firing ranges
• Short-grazed open CG2 and CG3 grassland associated with areas of historical trenching and other ground disturbance.

Given that this Site Dossier represents the results of the first detailed baseline of the populations of bryophyte species in the SSSI, it is not possible to say whether the extent of habitat is similar to previous years; however, the presence of large and healthy populations of some species over large areas would suggest that the target of 'sufficient area of suitable habitat to maintain the population' is being met.

Pilkington estimated that at least 15% of the ground within the key areas is sparsely vegetated or bare and therefore meets the site-specific target of 10-25%.

c) Attribute: vegetation structure
Typically within the areas supporting the majority of the target bryophytes, the disturbed grassland is typically only a few centimetres high so the target of *'turf height less than 2 cm over at least 50% of the area supporting the interest feature'*, is probably being satisfied.

d) Attribute: niche diversity
The attribute *'anthills, soil slippage on steep slopes, terracing, S- and N-facing banks, etc. should be maintained where present'* is difficult to measure within such a large area and over terrain that is inevitably dynamic due to the effects of normal military training activities. It is clear that the condition of the habitat, and in turn, the populations or sub-populations of some of the more mobile species is strongly linked to regular light disturbance of chalk grassland habitat. In particular, *P. caespitosa* appears to be very dependent on the presence of broken, clayey ground within a short and fragmented sward that is maintained by vehicles regularly driving over it. Likewise, other small ephemerals e.g. *A. rigida* and *L. perssonii* appear to rely on the provision of eroding track banks and edges that are inherently vulnerable to catastrophic loss i.e. if a vehicle collides with a bank.

However, the pioneering nature of such species means that they will naturally move around, and the SSSI is large enough to fulfil such needs through day to day military training activities. Some species require habitats that are open but relatively undisturbed by military training. For example, some of the fenced-off earth tracks on the side of Sidbury Hill are home to some of the SSSI's rarest bryophytes (*B. torquescens*, *P. squarrosa* and *W. sterilis*). Similarly, disused firing ranges near Bulford that have been left to nature now support the only populations of *R. canescens* (a disturbance-sensitive species), as well as an abundance of *A. abietina*. At present, it seems that this target is being met through general day-to-day activities and maintenance of the SSSI.

6.4 Conservation management
DIO FMPs, SUMPs and military training activities.

6.5 Condition status

Favourable

This assessment has set a reasonable baseline, for assessing and comparing against in the future. The assemblage of Nationally Rare and Scarce mosses and liverworts has expanded, from a score of 350 at notification to 600 now; with the key areas being identified as Sidbury Hill, Cross Country Driving Area, Bulford Firing Ranges, Beacon Hill and Silk Hill – all on the East. Within these areas, the main bryophyte patches have been mapped, allowing DIO to improve provision in their management plans. The specific habitat requirements have been described in the report and adjustments made in the FCT. In addition to the 'disturbed open calcareous grassland' table, which provides attributes and targets for most of the species, a new 'anthropogenic – man-made structures' table has been added, which caters for *Grimmia orbicularis.*

Overall, the rare mosses and liverworts were seen to have healthy and sustainable populations, as long as military vehicle disturbance followed by rest, and rabbit grazing, continues.

6.6 Condition Threats

Unit 134: In B Range, at SU2016945210, the population of *R. canescens (*an NS moss*)* is beginning to be threatened by scrub and tree encroachment into the open habitat.

Unit 134: On E Range, at SU2111946118, a sub-population of *A. abietina* is threatened by invasion of *R. fruticosus.*

Unit 146: At SU21895027 on Sidbury Hill, closure of a stone track has meant that vehicles have been traversing the grassy slope and damaging the population of *A. abietina* - a NS moss.

G Birds

7.1 SPA and SSSI features assessed:
Aggregation of breeding bird species: Stone-curlew -*Burhinus oedicnemus*.

Units present: all

7.2 Method/information source

- RSPB Wessex Stone-curlew Project annual reports and 'Wessex raw data xls'.

7.3 Results

a) Attribute: population size.

Table 1 Number of breeding stone-curlew pairs present on both the SSSI and wider training area, by year.

	Salisbury Plain SSSI/SPA	SPTA
1993 (designation)	20	
1995	13	17
1996	14	15
1997	17	21
1998	16	20
1999	15	20
2006	20	35
2007	21	35
2008	23	35
2009	19	36
2010	19	32
2011	23	35
2012	22	33
2013	22	32
2014	23	36
2015	25	39

The natural fluctuations approach uses the lowest annual figure from the period used to determine the baseline (usually immediately preceding or following the designation) as a threshold for favourable condition. If a current population falls below this level then that bird feature is considered in unfavourable condition. The five- year mean immediately following designation on the Plain = 15 breeding pairs; the lowest number of breeding pairs from same 5-year period = 13. Therefore, as the above table shows, since this baseline, there has been a consistently higher number of breeding pairs present on the Plain.

b) Attribute: breeding productivity (non-mandatory)

Productivity is another way of measuring success, used by DIO, RSPB, aiming for an average 0.61 fledglings per pair to ensure a stable population. Productivity is currently used as a discretionary target only. These are the productivity figures around the baseline period

and over the last ten years: 1995 – 0.77, 1996 – 0.36, 1997 – 0.53, 1998 – 0.44, 1999 – 0.73; 2006 - 0.57, 2007 – 0.74, 2008 – 0.44, 2009 – 0.59, 2010 – 0.7, 2011– 0.63 (average 2007-11: 0.62); 2012 – 0.36, 2013 – 0.36, 2014 – 0.57, 2015 – 0.76. These figures are fluctuating, tracking the wider Wessex trend, although slightly below. DIO point out in their recently revised management plan that birds subsequently spotted at sites further afield are taken account of in the Wessex figures but not the SPTA figures, which partly explains the difference between the two sets of figures.

Further commentary from Nick Tomalin, the RSPB project officer: *in 2015, for Salisbury Plain Training Area, there were 39 breeding pairs making 48 nesting attempts and fledging 30 chicks with a productivity of 0.77 chicks per breeding pair. So it was a very good year on the Plain, with the number of pairs stable and the highest productivity since 2003. In 2015, for Salisbury Plain SSSI, there were 25 breeding pairs making 30 nesting attempts and fledging 19 chicks with a productivity of 0.76 chicks per breeding pair. So the SSSI/SPA performed well too. The Plain is doing pretty well at present. There have been issues with productivity on semi-natural habitat in recent years, but there are always cycles where a couple of years fall below 0.61 and then a few years are above 0.61.*

c) Attributes: habitat extent (mandatory), food availability, vegetation characteristics for nesting/feeding and roosting (discretionary).
The basic target for MoD is to maintain 35 breeding sites; with a further commitment to expand and stabilise (6 to 8 pairs) the population on the West; and expand and stabilise the population on the Centre (4 pairs). The current management plan provides further detail on ploughing consents, spring cropping, providing short grassland, sign-posting vulnerable plots, Environmental Stewardship and the general rationalisation of plot provision and maintenance across SPTA, with detailed recommendations made for each of the three main areas, West, Centre and East.

7.4 Conservation management
Plot maintenance by DIO and tenant farmers. Public access management through MoD by-laws and DIO Access plans. Wiltshire Council's Community Infrastructure Levy pays for monitoring which helps inform management.

See 'Ash D., L. Wade, J. Swain and T. Crouter. *A progress report and management plan for stone-curlew, Salisbury Plain Training Area.* Defence Infrastructure Organisation, December 2014.

7.5 Condition status
Favourable.

The stone-curlew is both a SSSI and SPA species. It has been continuously and systematically monitored over a long period by the RSPB and DIO, with the number of breeding pairs slowly increasing from 14 pairs at notification in 1993, to 25 in 2015, on the SSSI, and from 20 to 39 on the wider training area. Habitat provision, in the form of 35+ managed plots, is provided by DIO and Landmarc Support Services.

7.6 Condition Threats
None applied.

8.1 SPA and SSSI feature assessed:
Aggregation of breeding bird species: Quail - *Coturnix coturnix.*

Units present: widely distributed across the Plain

8.2 Method/information sources

- Stanbury A. et al. *Breeding bird survey of Salisbury Plain Training Area.* 2000. Defence Estates, RSPB.
- Stanbury A. et al. *Breeding Bird Survey of the Army Training Estate of Salisbury Plain 2005,* December 2005, Defence Estates, RSPB
- Natural England. *Salisbury Plain SSSI Breeding Bird Survey 2015*, December 2015, Thomson Ecology, Natural England.
- Wiltshire Ornithological Society records

8.3 Results

a) Attribute: bird population size

The FCT gives the following figures:

19 individuals, 20% British breeding population count from 1986, SPA data sheet 2006 - use this as baseline to measure condition against.

36 singing quails, Stanbury et al (2000)

86 records, as 'additional bird records', Stanbury et al (2005).

The recent bird survey by Thomson Ecology (2015) found: *at least 20 records in the 91 grid-squares. Density calculations give an estimated population of 74 quail on the SSSI in 2015 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* [37 maximum count] *was a particularly good year for the species on Salisbury Plain.*

Some casual records from Paul Castle, Wiltshire Ornithological Society:

2011 – 3 confirmed 2 probable 11 possible pairs
2012 – 17 probable 13 possible pairs
2013 – 4 probable pairs
2014 – 5 probable 3 possible pairs
2015 – 17 probable (not final total)

Since the 'baseline' in 1986, quail numbers have fluctuated, generally above the baseline, with a good year in 2005. This year, 2015, the Thomson Ecology density calculation estimated a comparable population to 2005. Quail continue to have over 1% of their national population on Salisbury Plain SSSI.

b) Attribute: habitat extent

Quail breed in cereal and hay fields, particularly winter cereals and meadow-like wild grasslands with a vegetation structure that allows good movement with protection from avian predators and with a source of insect food.

8.4 Conservation management

Grazing, ploughing consents

8.5 Condition status
Favourable

Quail is a migratory species, both a SSSI and SPA one. Although the numbers fluctuate each year, the breeding birds surveys in 2000, 2005 and 2015 suggest a sustained improvement over the SSSI baseline.

8.6 Condition Threats
None applied

9.1 SPA and SSSI feature assessed:
Aggregation of breeding bird species: Hobby - *Falco subbuteo.*

Units present: Across the Plain, hobbies tend to nest either in small woods (e.g. Everleigh Ashes, outside of SSSI) or in more isolated copses, Scots Pine and Douglas Fir being favoured trees, always in nests of other species, usually carrion crow and raven.

9.2 Method/information source
- Wiltshire Ornithological Society monitoring

9.3 Results
a) Attribute: population size

The FCT provides the following figures: 6 breeding pairs, 1.2% British breeding population count from 1990, SPA data sheet 2006.

Some casual records from Wiltshire Ornithological Society:

2008	4 pairs confirmed breeding, 4 pairs probable, 4 pairs possible
2009	4 confirmed, 3 probable, 4 possible
2010	6 confirmed, 2 probable, 1 possible
2011	4 confirmed, 3 probable
2012	1 confirmed, 6 probable
2013	3 confirmed, 3 probable, 2 possible
2014	1 confirmed, 4 probable, 4 possible
2015	2 probable pairs (not final total)

Paul Castle (WOS) update: *We have confirmed fewer pairs on SPTA the past two years, not sure whether this was just the weather or other factors involved, including some sites that were always used in the past? SPTA was traditionally one of the sites where egg collectors robbed Hobby nests, and we know that egg collectors are still active on SPTA, but trying to prove this would be difficult…. generally they are doing very well in Wilts but 2014 seemed to be a drop across the county.*

b) Attribute: habitat extent

See Appendix 8 - Woodland and plantations on Salisbury Plain

9.4 Conservation management
Maintain some suitable plantations and woodlands for hobbies.

9.5 Condition status
Favourable

The hobby is both a SSSI and SPA species. It is difficult to monitor, given the sparse and isolated locations in which it nests. Wiltshire Ornithological Society provide their records each year, which are for relatively consistent, low numbers on the Plain.

9.6 Condition Threats
None applied

10.1 SPA and SSSI feature assessed:
Aggregation of non-breeding bird species: Hen harrier - *Circus cyaneus*

Units present:
Main focus of wintering population on the Centre, at Ell Barrow, Rushall Down, Charlton Down, Compton Down, at heads of dry chalk valleys or along ridges separating them. Also present on the West (Knapp Down, New Zealand Farm Camp) and East (Lower and West Everleigh Downs).

10.2 Information source
- Wiltshire Ornithological Society monitoring (WOS).

10.3 Results
a) Attribute: population size
The FCT gives the following figures: 5 individuals, 0.7% British wintering population, count from 1993, SPA data sheet 2006.

Maximum roost counts from WOS:

Maximum count of 12 in 2003/04, WOS
Maximum count of 16 in 2004/05, WOS
Maximum count of 17 in 2005/06, WOS
Maximum count of 10 in 2006/07, WOS
Maximum count of 12 in 2007/08, WOS
Maximum count of 15 in 2008/09, WOS
Maximum count of 13 in 2009/10, WOS
Maximum count of 13 in 2010/11, WOS
Maximum count of 12 in 2011/12, WOS
Maximum count of 20 in 2012/13, WOS
Maximum count of 19 in 2013/14, WOS
Maximum count of 12 in 2014/15, WOS

Last three years:

2012 – 2013

i. Centre – 15 (5 grey 10 browns)
ii. East – 2 (1 grey 1 brown)
iii. West – 3 (2 greys 1 brown)

2013 – 2014

iv. Centre – 9 (3 grey 6 browns)
v. East – 7 (1 grey 6 browns)

vi. West – 3 (2 greys 1 brown)

2014 – 2015

vii. Centre – 9 (2 grey 7 brown)

viii. East – 2 (2 brown)

ix. West – 1 (1 brown)

WOS comment:

The 2014-15 winter was the poorest for at least a decade, not sure whether due to a crash in vole numbers or fewer birds arriving from breeding grounds?

b) Attributes: habitat extent, disturbance

WOS comment:

In September 2015 a satellite tagged first year male Hen Harrier spent a few weeks on SPTA West and the tracking data showed how important the SPA grasslands are for foraging.

On SPTA West and SPTA East there is too much grazing and not enough long grass roost areas are being left. On SPTA Centre there is also more grazing nowadays but there is usually at least one of the key roost sites that has not been grazed or burnt in the past year. In October, WOS showed DIO all of the key roost areas that needed protecting from grazing, also areas of grassland at Chirton Gorse that are being lost to scrub and should be cleared.

The military training does not really impact the birds too much, the wild fires do burn out roost sites, but are more effective at eliminating scrub growth than grazing and therefore maintain suitable habitat.

Overall, a balance has to be maintained between grazing the chalk grassland for its botanical diversity and rest to provide a longer, grassier habitat for hen harriers, with specific SUMPs including an objective for the latter, which are implemented by DIO.

10.4 Conservation management

Grazing pennings, scrub management

10.5 Condition status

Favourable

The hen harrier is both a SSSI and SPA feature - as an over-wintering bird. Winter roosts have been monitored since 1977 by MOD conservation groups and WOS. Numbers over the last ten years appear relatively stable.

10.6 Condition Threats

None applied

11.1 SSSI feature assessed:
Assemblage of breeding bird species on lowland dry grassland.

Units present: all SSSI units

11.2 Method/information sources

- Stanbury A. et al. *Breeding bird survey of Salisbury Plain Training Area.* 2000. Defence Estates, RSPB.

- Stanbury A. et al. *Breeding Bird Survey of the Army Training Estate of Salisbury Plain 2005,* December 2005, Defence Estates, RSPB

- Natural England. *Salisbury Plain SSSI Breeding Bird Survey 2015*, December 2015, Thomson Ecology, Natural England.

This recent study was designed to replicate as far as possible the studies in 2000 and 2005 – whilst on reduced resource. Therefore, the number of 1km grid squares covered was reduced from 157 in 2005, down to 100 in 2015, confined to the SSSI area. The design allowed for statistically robust comparison, as long as raw counts were high enough.

- Taylor, Jenni (2015) *Determinants of variation in productivity, adult survival and recruitment in a declining migrant bird: the Whinchat (*Saxicola rubetra*).* PhD thesis, Lancaster University.

11.3 Results

a) Attribute: assemblage score

The breeding birds assemblage species comprise those listed in Fuller (1982), Table 32: *Ground and scrub nesting birds on chalk downland*, which are also qualifying/scoring according to the '*Guidelines for selection of biological SSSIs'* (1989) – and recorded on the Plain at some point in time.

Table 2 Breeding birds assemblage species present on Salisbury Plain SSSI – and their score based on '*Guidelines for selection of biological SSSIs'* (1989).

Baseline – based on SSSI Criteria Sheet at time of notification	**2000**	**2005**	**2015**
Blackcap *Sylvia atricapilla* 1	Blackcap *Sylvia atricapilla* 1	Blackcap *Sylvia atricapilla* 1	Blackcap *Sylvia atricapilla* 1
Not listed	Bullfinch *Pyrrhula pyrrhula* 1	Bullfinch *Pyrrhula pyrrhula* 1	Bullfinch *Pyrrhula pyrrhula* 1
Not listed	Chiffchaff *Phylloscopus collybita* 1	Chiffchaff *Phylloscopus collybita* 1	Chiffchaff *Phylloscopus collybita* 1
Corn Bunting *Miliaria calandra* 1	Corn Bunting *Miliaria calandra* 1	Corn Bunting *Miliaria calandra* 1	Corn Bunting *Miliaria calandra* 1
Cuckoo *Cuculus canorus* 1.5	Cuckoo *Cuculus canorus* 1.5	Cuckoo *Cuculus canorus* 1.5	Cuckoo *Cuculus canorus* 1.5
Not listed	Garden Warbler *Sylvia borin* 1	Garden Warbler *Sylvia borin* 1	Garden Warbler *Sylvia borin* 1

Not listed	Goldcrest *Regulus regulus* 1	Goldcrest *Regulus regulus* 1	Goldcrest *Regulus regulus* 1
Not listed	Goldfinch *Carduelis carduelis* 1	Goldfinch *Carduelis carduelis* 1	Goldfinch *Carduelis carduelis* 1
Grasshopper Warbler *Locustella naevia* 2	Grasshopper Warbler *Locustella naevia* 2	Grasshopper Warbler *Locustella naevia* 2	Grasshopper Warbler *Locustella naevia* 2
Not listed	Greenfinch *Carduelis chloris* 1	Greenfinch *Carduelis chloris* 1	Greenfinch *Carduelis chloris* 1
Grey Partridge *Perdix perdix* 1	Grey Partridge *Perdix perdix* 1	Grey Partridge *Perdix perdix* 1	Grey Partridge *Perdix perdix* 1
Not listed	Lapwing *Vanellus vanellus* 1	Lapwing *Vanellus vanellus* 1	Lapwing *Vanellus vanellus* 1
Lesser Whitethroat *Sylvia curruca 2*	Lesser Whitethroat *Sylvia curruca 2*	Lesser Whitethroat *Sylvia curruca 2*	Lesser Whitethroat *Sylvia curruca 2*
Linnet *Carduelis cannabina* 1	Linnet *Carduelis cannabina* 1	Linnet *Carduelis cannabina* 1	Linnet *Carduelis cannabina* 1
Long-eared Owl *Asio otus* 3	NR	Long-eared Owl *Asio otus* 3	Long-eared Owl *Asio otus* 3
Not listed	Long-tailed Tit *Aegithalos caudatus* 1	Long-tailed Tit *Aegithalos caudatus* 1	Long-tailed Tit *Aegithalos caudatus* 1
Nightingale *Luscinia megarhynchos* 3	Nightingale *Luscinia megarhynchos* 3	Nightingale *Luscinia megarhynchos* 3	Nightingale *Luscinia megarhynchos* 3
Red-legged partridge *Alectoris rufa* 1	Red-legged partridge *Alectoris rufa* 1	Red-legged partridge *Alectoris rufa* 1	Red-legged partridge *Alectoris rufa* 1
Reed Bunting *Emberiza schoeniclus* 1	Reed Bunting *Emberiza schoeniclus* 1	Reed Bunting *Emberiza schoeniclus* 1	Reed Bunting *Emberiza schoeniclus* 1
Quail *Coturnix coturnix* 5	Quail *Coturnix coturnix* 5	Quail *Coturnix coturnix* 5	Quail *Coturnix coturnix* 5
Not listed	Short-eared Owl *Asio flammeus* 3	Short-eared Owl *Asio flammeus* 3	Short-eared Owl *Asio flammeus* 3
Stonechat *Saxicola torquata 2*	Stonechat *Saxicola torquata 2*	Stonechat *Saxicola torquata 2*	Stonechat *Saxicola torquata 2*
Stone-curlew *Burhinus oedicnemus* 4	Stone-curlew *Burhinus oedicnemus* 4	Stone-curlew *Burhinus oedicnemus* 4	Stone-curlew *Burhinus oedicnemus* 4
Tree Pipit *Anthus trivialis* 1.5	Tree Pipit *Anthus trivialis* 1.5	Tree Pipit *Anthus trivialis* 1.5	Tree Pipit *Anthus trivialis* 1.5
Turtle Dove *Streptopelia turtur* 2	Turtle Dove *Streptopelia turtur* 2	Turtle Dove *Streptopelia turtur* 2	NR

Whinchat *Saxicola rubeta 2*	Whinchat *Saxicola rubeta 2*	Whinchat *Saxicola rubeta 2*	Whinchat *Saxicola rubeta 2*
Not listed	Whitethroat *Sylvia communis* 1	Whitethroat *Sylvia communis* 1	Whitethroat *Sylvia communis* 1
Overall assemblage score: **34**	Overall assemblage score: **43**	Overall assemblage score: **46**	Overall assemblage score: **44**

NR = Not Recorded

In addition to the above species which are considered part of the notified breeding birds assemblage, the following species are listed in Fuller (op cit), now considered to be of conservation interest and are present on the Plain: dunnock, skylark, song thrush and yellowhammer. Note that wheatear occurs as a spring and autumn migrant on the Plain.

Neither long-eared owl or short-eared owl were recorded during the Thomson Ecology breeding birds assemblage survey (using BBS); therefore an update was requested from Paul Castle at Wiltshire Ornithological Society, who provided the following anecdotal evidence:

Long-eared Owl breeds annually, Bulford danger area and Everleigh being favoured areas but they probably nest on all three ranges annually but grossly under recorded and likely to be in the range 5 to 10 pairs. Hawthorn scrub particularly favoured for nesting and roosting, using old magpie nests. There has been a roost used at Deptford Down, again winter roosts under recorded.

Short-eared Owl big annual variation in numbers due to peaks and troughs perhaps related to vole cycle. Last peak 2012 2013 resulted in at least six pairs attempting to nest in 2013 (display and food carrying recorded), numbers currently very low in 2015. I think that pairs probably attempt to nest annually in Areas 15 & 16. Winter numbers can be 20 to 40 birds in a peak year with roosts in long grass, same requirements as Hen Harriers.

Based on the assemblage score, the breeding birds assemblage is assessed as being in Favourable condition, however this disguises the fact that some species have significantly increased and others declined. The recent Thomson Ecology report discusses the population trends of each species, with key results as follows:

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.

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.

According to analysis of raw (maximum) counts, since 2000, across the entire Salisbury Plain SSSI there have 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).

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.

Turtle dove was not recorded during this survey, with seven records in the 2005 survey and one in 2000 – these numbers being too small to be included in the above statistical analyses.

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).

Certainly, DIO and HLS resources coincided from about 2010 to tackle increasingly widespread scrub on the chalk grassland. Whilst farmers are obliged to maintain previously cleared areas there may be scope elsewhere for preserving remaining scrub and some management relaxation in places.

Whinchat, according to the raw (maximum) count figures from the recent Thomson Ecology study, shows a significant overall decline since 2000. Density trends correlate with the raw count trends, showing a significant decline across the Plain (SSSI) between 2000 and 2015 (see Table 7). However at 313 pairs on the SSSI (196.9km2), the 2015 whinchat population estimate compares favourably with the 429 pairs estimated for the entire ATE (296.54km2) in 2005. Another recent study (Taylor, 2015) provides further evidence for whinchat declines - a 30% decline in breeding pairs between 2010 and 2014. Taylor suggests 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; but also predicts a future population decline due to reduced breeding success, adult survival and first year survival and lack of recruitment of immigrant birds into the population. These trends are in line with national trends (Harris et al. 2015), including a decline within preferred habitats (Henderson et al. 2014).

The 2000 BBS report predicted that the reintroduction of grazing on the Plain 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). Taylor (2015) found nest predation and first year survival as the main factors affecting the population; and, whilst grazing was important during the breeding season i.e. sward removal making the nests more vulnerable to predation, it was not a factor otherwise, with large amounts of breeding habitat (valleys, tussocks, perches etc.) and food being available. Taylor recommends avoiding grazing in the breeding season, in key areas, and ensuring plenty of moderately tall vegetation, with perches, in valleys.

In conclusion, whinchat appear to be declining on the Plain, in line with a national trend. Both habitat structure which is affected by grass growth and grazing levels, and predation, are likely to be important influences; and Taylor's advice seems sensible, to protect habitat structure in the valleys during the nesting period.

b) Attribute: habitat extent

See Part A – chalk grassland.

11.4 Conservation management

Grazing, scrub control

11.5 Condition status

Favourable

The notified breeding birds assemblage comprises 27 species that are ground or scrub nesting on chalk grassland. All of these species, bar turtle dove last year, have been recorded during the three standardised Breeding Birds Surveys in 2000, 2005 and 2015, which meets the target for Favourable condition status. Eight species of conservation interest have increased (raw count data) e.g. corn bunting and tree pipit; whilst six species of conservation interest have declined e.g. linnet, reed bunting, whinchat and whitethroat. Turtle dove was not recorded, although the past low numbers makes for lack of statistical significance. The possible influences on population numbers are discussed above, including national trends, grazing and scrub clearance. Whilst grazing is an on-going management tool on the Plain, scrub control is more subject to agri-environment and DIO funds, with several large HLS agreements and associated Capital Works Programmes coinciding from 2010 to 2015, which has resulted in good gains for the chalk grassland but possibly reduced numbers of some of the bird species. At the time of notification in 1993, scrub encroachment was not a problem but increasingly became so in the 2000s; whereas now, the situation appears more under control, with arguably plenty of remaining areas of both dense and scattered scrub.

11.6 Condition Threats

None applied.

H Invertebrates

12.1 SAC and SSSI features assessed: Annex 2 species, 1065, marsh fritillary butterfly - *Euphydryas aurinia*

Units present: core areas on the West and Centre, with a smaller core area on the East, and a more variable population across the wider SSSI.

12.2 Method/ information sources

The following relevant studies have been done over time:

- Bulman CR. *Improving the management of Salisbury Plain Natura 2000 sites – marsh fritillary baseline monitoring – August 2001* Butterfly Conservation Report, Salisbury Plain LIFE Project. 2001.

- Hobson R., NAD Bourn, MS Warren and TM Brereton. *The marsh fritillary in England: a review of the status and habitat condition.* Butterfly Conservation, English Nature. 2001.

- Hobson R. and T. Wigglesworth. *The marsh fritillary in Wiltshire: site dossier.* Butterfly Conservation Report, English Nature. 2001.

- Bulman CR. *Historical and current records of marsh fritillary (Euphydryas aurinia) on Salisbury Plain and Pewsey Down (pre 1970 to 2001*) Butterfly Conservation Report, Defence Estates. May 2002.

- Bulman CR and NAD Bourn. *Monitoring the impact of management changes on the marsh fritillary on Salisbury Plain.* Butterfly Conservation Report, Defence Estates, Salisbury Plain LIFE Project. 2005.

- Pywell RF et al. *Ecological monitoring of the Defence Training Estate Salisbury Plain: 2007 – 2011*. NERC CEH. 2012 See Chapter 9 – Management to conserve the marsh fritillary butterfly.

- Botham MS, D Ash, N Aspey, NAD Bourn, CR Bulman, DB Roy, J Swain, A Zanesse and Pywell RF (2010). *The effects of habitat fragmentation on niche requirements of the marsh fritillary, Euphydryas aurinia (Rottemburg, 1775) on calcareous grasslands in southern UK.* J. Insect Conserv.

During 2008 – 11, CEH did research/monitoring on marsh fritillary and *Succisa* within permanent plots. They set up 757 permanent plots across the Plain, for chalk grassland research and monitoring, including 83 plots for marsh fritillary, targeting areas of *Succisa* at different densities, across the West, Centre and East. They sampled the abundance and quality of *Succisa* (to produce a '*Succisa* composite' value), number of larval webs and adult butterflies.

12.3 Results

a) Attributes: Presence/absence, population size

FCT: if any population estimate is to be made, the species should be known to be readily countable, quantifiably and replicably, and there should be a realistic likelihood that the number of individuals counted bears a true relationship to the health of the population.

In Hobson and Wigglesworth (op cit) and Bulman (2002), they estimate the marsh fritillary population size as:

Extra large population (>10,000 larval webs) – the Centre
Very large population (>1,000 larval webs) – the West
Large population (>100 larval webs) – the East

And they provide a list of about 150 sites on the Plain, with map grid references and a mix of adult and larval web abundances.

In the CEH study, in 2008, 238 adult marsh fritillaries were recorded, 45 of these within 65 plots, the rest walking between plots. Many of the plots in the CIA were not surveyed due to restricted access and weather. This found a significant positive correlation between number of adults and number of larval webs present the next year in 2009. During 2008 to 11, the number of plots was increased up to 83, and figures produced for number of plots with webs in (max. 57), % occupancy (max. 69), total number of webs in plots (max. 883), mean webs per plot (max. 11, standard error 1.8), mean webs per occupied plot (max. 18, standard error 2.5) and total number of webs recorded (max. 1207). Overall, the marsh fritillary population was smallest in 2008, then increased to 2010 and declined in 2011. In fact, % occupancy was highest in 2011, reflecting how the population may have spread out to new, previously unoccupied patches in lower numbers, which is typical of meta-population dynamics. This pattern mirrored the national trend across the UK for the same time period.

b) Attribute: habitat quality.

The differences between the three main areas of the Plain were also examined. The Central Impact Area is dominated by tall *Bromus erectus* grassland, with some grazing, with wild fires and impact craters helping to create *Succisa* patches. The West is similar, with more scrub. The East tends to have more regular grazing and hay cutting on some areas. CEH found that the mean number of webs per plot was generally highest on the West and Centre, and least on the East, with a marked peak in 2010 on the West and Centre, but relatively consistent low numbers on the East.

A particularly interesting observation from the study was the varying density and seeming cyclicity of *Succisa,* changing from rare to abundant and vice versa in the plots, especially within burnt areas, during the study period. Climatic conditions were also thought to have affected overall cover and quality.

Density and quality of food plant accounted for the greatest variability in number of larval webs, as found in other studies, whilst sward height was also extremely important as exemplified by the number of plots containing high abundance of *Succisa* but no larval webs in the East. The unknown or less clear factors requiring further study were: how *Succisa* cycles and in turn interacts with the butterfly's cycle, the effect of climate, levels of parasitism and the conservation management.

The grazing system, which uses temporary pennings, is obviously key for promoting both *Succisa* abundance and quality. Grazing intensity must be sufficient to cater for this early successional species, taking the sward down and creating small pockets of bare ground, then, when stock are removed, allowing re-growth and a sufficient sward height for *Succisa* quality over the subsequent 1 -2 years. In other words, both over-grazing and under-grazing are potential issues for the butterfly e.g. the CEH study mentions Blackball Firs, which may be a link between the West and East, but has relatively intense sheep and cattle grazing, producing a floristically diverse but structurally closed and uniform sward. On the Plain, the basic grazing system is likely to lead to dynamism of the grasslands, with a mix of both

suitable and unsuitable areas in the vicinity of the butterfly at any one time. The CEH study suggests that whilst cattle grazing and military action were keeping enough area at suitable sward height, too little grazing and cessation of military action could also pose a threat.

12.4 Conservation management

DIO Farm Management Plans and Super Unit Management Plans

12.5 Condition status

Favourable

Marsh fritillary butterfly is both a SSSI and SAC species, with a large and highly significant population on the Plain. The CEH study (2012) was a scientific investigation into how the species and its food plant, devil's-bit scabious, are doing on the Plain. It sets a baseline, against which future monitoring must be taken forward, soon, as agreed with a Natural England national specialist and DIO staff. It was not a widescale survey of the Plain, which would be subject to generally dramatic butterfly population fluctuations year-on-year. It started looking into the relationships between larva and adult numbers in the different sward types, across the Plain.

The chalk grassland management for this species has to be both light-touch for promoting tall, lush devil's-bit scabious and protecting the larval webs, and more intensive for maintaining botanical diversity, including devil's-bit scabious regeneration. The grazing and military vehicle disturbance, which are the key influences, have already been discussed above, under chalk grassland.

12.6 Condition Threats

Comment has been added to chalk grassland condition threats (as above), for core marsh fritillary areas.

13.1 SSSI feature assessed:
Adonis blue -*Polyommatus bellargus*

Units present: distributed across the Plain, on good quality grassland.

13.2 Method/information sources

- Grinsted S. *Salisbury Plain SSSI – Chalk Grassland Rapid ISA – project brief and instructions.* May 2015, Natural England. Location: SSSI files, Natural England.

- Fuller M. (2011-14) *Wiltshire Butterfly Reports 2011-14*. Butterfly Conservation, Wiltshire Branch, 2011-14 – which provide ad hoc sightings summaries only.

As part of the above project, a '*F111 and F112 SAT 'proxy' habitat survey form'* was completed for each SSSI unit visited (x 73 units). This required 20 stops or roundrats, apportioned according to broad habitat amount in each unit, recording against each attribute and target derived from the FCT – for vegetation heterogeneity, floweriness, over-wintering provision and Preferred Features.

13.3 Results

a) Attributes: presence/absence, population extent/distribution

2014:

Counts: First generation: *good numbers on Sidbury Hill* (x 34). DTE SP (Centre and East), Larkhill and Tidworth garrison areas, *'very local, scattered sightings but poor in summer'.* Second generation: '*second generation made a good recovery'.*
Recorder effort: on DTE SP, first generation, 20 x 1 km squares (38% of total area), second generation, 18 x 1km squares (33% of total area), with 1 new tetrad.
General trend: '*welcome increases at many sites'*.

2013:
Counts: On DTE SP (Centre and East), Larkhill and Tidworth garrison areas, '*none in spring, a few in summer'.*
Recorder effort: on DTE SP, first generation, 15 x 1km squares, second generation, 10 x 1km squares, with three new tetrads.
General trend: *A below average first generation at most sites, second generation made a good recovery.*

2012:
Counts: On DTE SP (Centre) *few in spring, scarce in summer.* Records of 1-20 adults from various sites across the Plain.
Recorder effort: on DTE SP, first generation, 21 x 1km squares; second generation, 6 x 1km squares; overall twenty-three records, eleven recorders; with zero new tetrads.
General trend: *mainly very large decreases, big problem was getting the grazing right in an excessively strong grass growth year – sites were seriously under-grazed.*

2011:
Counts: Records of 1-44 adults from various sites spread across the Plain.
Recorder effort: on DTE SP, first generation, 21 x 1km squares; second generation, 22 x 1km squares; overall 47 records, 16 recorders; with four new tetrads.
General trend: *A good first generation, second generation much less abundant than 2010 but still some reasonable counts.*

b) Attributes: habitat extent, habitat quality
Adonis blue butterfly is associated with short turf 1-4 cm tall, except in sheltered quarries where slightly taller vegetation may be used, with abundant foodplants - horseshoe vetch (*Hippocrepis comosa*). The autumn generation selects shorter turf than the spring generation which can lay eggs on vegetation up to 8 cm tall. Most colonies occur on warm, south-facing slopes. On the Plain, CG2 *Festuca ovina-Avenula pratensis* grassland and some of the better quality CG3 grasslands, with horseshoe vetch, are distributed across the Plain, especially on thinner soils, on archaeology, in old shell craters and patches previously disturbed by military vehicles. Such habitats are relatively stable, although lack of management or under-grazing over time will lead to increased upright brome, and ultimately other coarser grasses, bramble and scrub cover.

The following units were assessed as having insufficient Preferred Surfaces 1 (bare ground) and 2 (short sward): 2, 5, 17, 18, 30, 73, 80, 85, 147 and 171, out of the 73 units surveyed.

13.4 Conservation management
Grazing, periodic disturbance by military vehicles and shelling.

13.5 Condition status
Favourable

The adonis blue butterfly has never been systematically surveyed across the Plain but has been subject to on-going recording by the three conservation groups, as annually reported by Wiltshire Butterfly Conservation. Nowadays it is doing much better as a species,

generally, and it is not difficult to see it on the Plain. There is no reason to suggest it is not in 'Favourable condition' based on ad hoc records, although under-grazing and reduced disturbance leading to insufficient bare ground and short swards in ten SSSI units have been recorded as Condition Threats.

13.6 Condition Threats

Very little bare ground and short sward, ref. invertebrates – for all of the above ten units.

14.1 SSSI feature assessed:
Brown hairstreak-*Thecla betulae*

Units present:

Core sites on the East:

Bulford Ranges (units 132, 133, 134, 135), Beacon Hill (units 136, 138, 155), Shipton Bellinger, Tidworth (off the SSSI), Sidbury Hill (units 147, 148, 149, 150), Perham Down and Ludgershall (off the SSSI).

Small to medium colonies on the Centre:
Enford Down, Lavington Folly, Wexland Hanging, Well Bottom and Shrewton Folly; which includes units 72, 75, 77, 78, 80, 84, 93.

Small and remote population on the West:
Ranscombe Bottom, Dirtley Wood (units 1, 2) and further south at Upton Scudamore Field Barn and Fernicombe (off the SSSI).

Plus many outlying, ephemeral sites on the East and southern part of the Centre.

14.2 Method/information sources

- Martin F. et al. *Brown hairstreak (Thecla betulae) – egg survey on DTE SP East, 2007*, Defence Estates, 2007.

- Lockwood M. *Brown hairstreak on Salisbury Plain* January 2016, Larkhill & Westdown Conservation Group.

- Fuller M. (2011-14) *Wiltshire Butterfly Reports 2011-14*. Butterfly Conservation, Wiltshire Branch, 2011-14.

14.3 Results

a) Attributes: presence/absence, population extent/distribution

Extracts from Lockwood (2016):

On Salisbury Plain Training Area (SPTA) and surrounding land the brown hairstreak exists as a classic meta-population with key strongholds in traditional sites around Tidworth and Bulford; smaller outlying colonies extend further west towards Tilshead as females disperse in search of suitable habitats. A separate and isolated population exits in a sheltered valley system near Warminster.

Previous studies on the Plain have concentrated on the East, finding the butterfly as far north as Everleigh Ashes and west to the Avon Valley - but it was not known to have crossed the river. It is unclear whether the Centre was not searched at the time because of

restrictions on resources or because the butterfly was not considered to be present there. The present survey by Mike Lockwood began in winter 2012 and is ongoing in an effort to access the current range of what is referred to as the 'southern population' of brown hairstreak in Wiltshire.

The current status may be described as a "dynamic population", in a constant state of flux typical of a meta-population as levels of 'sink' colonies (which are maintained by immigration into lower quality habitat) fluctuate. It is fortunate that the 'source' colonies remain generally stable due to the relatively secure habitat provided by the landscape scale management on SPTA. The population expands in favourable seasons as the females disperse and it is likely that the butterfly (or eggs) could be encountered almost anywhere on the Plain, from time to time, as females spill out from peripheral colonies. Failure to establish new viable colonies seems mainly due to a shortage of the foodplant.

The population is not continuous and females seem quite capable of wandering several kilometres, crossing inhospitable terrain thus leaving several gaps in the recorded distribution. The butterfly may sometimes be 'missing' from what appears to be suitable habitat, such as around Netheravon and parts of the Centre. This suggests factors other than quality of foodplant and environment may limit the ability to survive in a particular area; maybe the gaps are natural buffer zones preventing autocorrelation (adjacent colonies becoming extinct simultaneously due to the same cause) and the spread of predators and pathogens; or perhaps eggs are simply too difficult to locate?

Outlying colonies are transitory and may appear or disappear as habitat becomes more or less suitable and fragmented. Losses are mainly due to extensive cutting of hedgerows, removal of thickets, excessive trimming of suckers along woodland edges and field margins. However, they may quickly recover if the bushes are allowed to regenerate and healthy colonies exist nearby to recolonise, which is referred to as the 'rescue effect'.

Several extensive checks were carried out on the northern and western fringes of the range during 2015-2016 but failed to reveal any eggs where low counts had been recorded previously. This implies that the butterfly did not enjoy a particularly good egg-laying season in summer 2015, with limited dispersal leading to a withdrawal in some of the marginal localities.

Despite losses elsewhere in the UK, the brown hairstreak has maintained a healthy and widespread population on SPTA, due in part to the rich diversity of habitats available across the landscape and management that has preserved suitable patches of the principal foodplant blackthorn. A good number of stable communities exist with smaller ephemeral outliers established as the butterflies disperse in good years. Colonies may recover quickly in core sites but are more fragile in low density populations and susceptible to local extinction when key habitats are degraded or lost completely.

It is no coincidence that the butterfly is more common in the east of SPTA where there are extensive patches of blackthorn. Colonies in the west are much smaller, more loosely structured and scattered over a wider area. They are often centred on the corner of a wood, overgrown hedge, neglected field margin or short scrubby hillside, especially if ash trees are nearby. Attention should be paid to the conservation of these delicate habitats, particularly where the butterfly was not previously thought to occur and the environment may not have been managed accordingly.

Wiltshire Butterfly Conservation records:

<u>2014.</u>

Counts, recorder effort: on DTE SP, 51 x 1km squares, with 42 new tetrads. Egg search by five members of Bulford Conservation Group, which found 11 eggs near Lower Everleigh; then another member carried out further searches in late winter/spring, adding 21 new tetrads and a new 10km square (SU04 centred on Shrewton), finding 635 eggs in various situations as before; then then the same member did more searches in autumn/early winter, finding a total of 602 eggs, adding another 14 tetrads and two new 10km squares off the Plain.

On DTE SP (West), three search parties found 15 eggs at the known colony base; then 2 eggs at the Land Warfare Centre, Warminster, in a new tetrad. The DTE SP (West) colony appears to be small, probably restricted to 2 tetrads.

2013.
Counts, recorder effort: on DTE SP, 30 x 1km squares, with 12 new tetrads. Egg search by nine members of Bulford Conservation Group in March, which found 125 eggs in Sidbury Hill area; then another member carried out further searches in spring, finding 274 eggs in various situations from hedgerows, tree belts, wood edges, isolated blackthorn bushes, blackthorn clumps and thickets, adding eight new tetrads: then the same member did more searches in autumn/early winter, finding a total of 253 eggs, adding another 3 tetrads.

On DTE SP (West), a small population was discovered in 1998, confirmed again in 2011, no records/probably not visited in 2013.

2012.
Counts, recorder effort: on DTE SP, 7 x 1km squares, with one new tetrad. Egg search by ten members of BCG in February, which found 38 eggs on Wiltshire/Hampshire border. Otherwise, eleven records, from three recorders, for adults/eggs.

On DTE SP (West), no records received.

2011.
Counts, recorder effort: on DTE SP, 5 x 1km squares, with one new tetrad. Egg search by 13 members of BCG in February, which found 94 eggs. The botany sub-group in late August found four adults near Milston Firs. Otherwise, 16 records, from 4 recorders, for adults/eggs.

On DTE SP (West), at least three males were observed, then later in the year four eggs found, confirming the presence of this small colony.

b) Attributes: habitat extent, habitat quality

Extracts from Lockwood (2016):

Brown hairstreak may be found in a variety of different habitats wherever blackthorn occurs on SPTA. Broadly, it can be considered as most likely to be encountered along woodland edges in the East and on thickets on the Centre.

Greater coverage of blackthorn exists on the East, particularly re-growth on Bulford Ranges and around broad-leaved woodlands between Tidworth and Ludgershall (off the SSSI). Blackthorn is much less common on the Centre, especially in the central parts which are dominated by open, rolling grassland. An extensive area of scrub on West Down does not contain any blackthorn, being predominantly hawthorn and gorse. Limited amounts of blackthorn do occur on woodland edges along the escarpment to the north of SPTA (off the SSSI), where suitable sites may be unoccupied due to a lack of connectivity to the main population centres.

Ash trees seem important (but not essential) in the establishment of resident colonies. Prominent trees are used as assembly points where adults congregate and mate; these are often referred to as a 'master tree'. Some colonies can be found where no ash trees are present and the butterfly is presumably using oak as a congregation tree (e.g. at Perham Down). However, in some parts of the Centre there is neither ash nor oak present where eggs have been found in good concentrations, and it is possible that tall pine trees are being used instead.

The butterfly prefers a sheltered location and tends to favour woodland edges and hedgerows with a south or east facing aspect for egg-laying. The female generally chooses young blackthorn typically 4/5 years old, particularly with vigorous stems, laying her eggs at the base of a spine or junction between 1 and 2 year old growth.

Despite its elusiveness the butterfly is highly mobile and eggs may be found scattered over a wide area but discrete colonies occur only in a few places. These are identified by egg concentrations and clusters; position and height of the eggs laid; type of habitat and presence of assembly trees etc.

Where colonies are present, females tend to lay eggs lower down c0.5m-1.0m; often on suckers some distance away from the main thicket or patch, possibly to escape predation by foraging birds during the winter. Eggs laid by passing females are usually higher up on prominent branches c1.0m-1.5m. Unfortunately, these stems on the edge of a patch are usually the first to be cut when an area is 'tidied up'. Colony sizes vary with 2/300 adults in the main centres but probably less than 50 in outlying communities, and therefore generally below observation density.

14.4 Conservation management

DIO Super Unit Management Plans 2010-2015

There is a healthy population on Sidbury Hill using re-growth following scrub removal and on suckers under blanket bramble in areas of cleared woodland.

DIO have been liaising with the conservation groups to identify any suitable blackthorn to be retained prior to removal of hawthorn or other scrub.

Some older thickets need trimming to encourage new growth, as the butterfly tends to avoid older woody stems especially when they are encrusted with lichen.

14.5 Condition status

Favourable

The brown hairstreak butterfly continues to be recorded and monitored by Mike Lockwood in the Larkhill & Westdown Conservation Group and Mervyn Grist and others in the Bulford Conservation Group. The number of tetrads where it has been recorded has undergone significant expansion in the last five years or so, both on and off the SSSI, on the East, the southern part of the Centre and a small part of the West, where both core colonies and more peripheral egg-laying occur on blackthorn. The expansion is thought to reflect increased surveillance more than an increased population – but is nonetheless extremely positive.

14.6 Condition Threats

None applied.

15.1 SSSI feature assessed:
Duke of Burgundy-*Hamearis lucina*

Units present: recorded in 46 units across the Plain, see Appendix 2 – Location of features by SSSI unit.

15.2 Method/information sources

- Townsend M. *Report on Duke of Burgundy butterfly survey on Salisbury Plain SSSI in 2015.* Natural England, March 2016.

- Fuller M. (2011-14) *Wiltshire Butterfly Reports 2011-14*. Butterfly Conservation, Wiltshire Branch, 2011-14.

With reference to:

- Bealey, C. *A butterfly survey of ATE Salisbury Plain West and Central with particular emphasis on the Duke of Burgundy* (Hamearis lucina). Unpublished report for Defence Estates. 2006.

- Martin, F. *The habitat preferences of the ovipositing Duke of Burgundy butterfly* (Hamearis lucina) *on Salisbury Plain Training Area*. Unpublished BSc thesis, Kingston University, London. 2008.

15.3 Results

a) Attributes: presence/absence, population extent/distribution

The aims of Townsend's study were to record Duke of Burgundy butterfly colonies, assess habitat quality and consider the condition status of the population, through sampling a representative number and spread of sites on Salisbury Plain. Historical records, reports and maps were used to visit previously recorded colony locations and select new survey sites with potential for the butterfly, across Salisbury Plain, whilst focussing particularly on The West. Twenty x 1 km squares were visited to do adult butterfly timed counts from early May to mid-June. These, plus another 40 x 1km squares (60 in total), had a larval feeding damage survey, from July to October. In addition, the vegetation type and structure were recorded at each site.

Table 3 Number of sites or incidences of Duke of Burgundy adults and larval feeding damage, for the West, Centre and East.

SPTA Area	Sites surveyed for adults	Sites adults seen	No. adults	Sites surveyed for LD	Sites LD seen	No. of LD
West	18	4	15	41	15	117
Centre	6	3	21	13	7	104
East	5	2	14	5	3	81

SPTA Area	Sites surveyed for ads. and LD	Sites surveyed for ads. only	Sites where ads. only seen	Sites surveyed for LD only	Sites where LD only seen	Sites where ads. and LD seen	Sites where ads. or LD seen

West	18	0	1	23	10	3	16
Centre	5	1	0	10	4	3	7
East	5	1	0	2	1	2	3

A total of 61 sites (1 km squares) were surveyed and convincing evidence of Duke of Burgundy (either adults or feeding signs or both) was found in 26 (43%) of these.

Twenty-eight sites were surveyed for adult DoB, with 65 timed counts carried out within these. From 9 sites (32%) (four in the West, 3 in the Centre and 2 in the East), on 13 counts, a total of 50 adults were recorded, comprising 38 males and 12 females.

A total of 59 sites (1 km squares) were surveyed for larval feeding damage (LD), with 130 LD counts made within these, recording 2,112 Cowslip plants/clumps. Larval feeding damage attributable to DoB was found in 25 sites (42%), on 39 counts, on 302 cowslip clumps.

Townsend reports: *The weather was variable, however, the flight period was sufficiently long for the surveys to be carried out when adults were active and they were seen on 5 of the 6 days when surveys took place. It was still possible to find adults in cool, cloudy weather although they were less active, even on a day after overnight rain once the vegetation had dried out, although it was noticeable that this was later in the day than normal. They were present in similar habitat to those seen in warmer, sunny weather so there is no evidence that they were behaving in a way which may have affected the results. Therefore, poor weather is unlikely to have significantly affected the results.* Other constraints are discussed in the report.

Given the challenges associated with surveying for DoB on Salisbury Plain, it is likely that only a proportion of the extant colonies have been detected by this work. Colonies of this butterfly are often small, with only a handful of adults active on any one day at any point during the flight period and they can be restricted to very small areas even within a larger area of suitable habitat.

Other records from local recorders:

<u>2014.</u>
Counts, recorder effort:

DTE SP, 18 x 1km squares, with one new tetrad. On DTE SP (West), 15 males in usual place and 18 along old tyre track. On Battlesbury Hill, 26. On DTE SP (Centre and East), good season, local but regular numbers, seen in new areas and eggs found.

General trend: *sightings and comments indicate that this nationally declining and vulnerable species did well again at many of its favoured sites in south Wiltshire. With continued monitoring and appropriate management, this bodes well for its future, although its extreme scarcity in the north is worrying.*

2013.
Counts, recorder effort: DTE SP, 18 x 1km squares. On DTE SP (West), 13 at three sites and 10 near Imber village. On DTE SP (Centre and East), small numbers at several sites, a good season.

General trend: *a good season considering the inclement weather and the best recorded since 2006.*

b) Attributes: habitat extent, habitat quality

Although cowslip is, overall, an abundant plant on SPTA, its abundance is very patchy and areas with numerous cowslip plants coinciding with the right microclimate for DoB are relatively scarce when the whole area is taken into consideration. A number of suitable-looking areas were encountered but with cowslip either very scarce or even absent. Perhaps not surprisingly, the adult surveys on their own suggest that in the West and Centre, DoB is highly localised but in the East it is more numerous (when taken together with regular monitoring by local enthusiasts). However, when the LD results are added, even with the caveats regarding correct identification, the picture appears considerably more encouraging and indicates a wider, albeit still rather localised distribution.

More detailed results from the three main areas of the Plain are discussed in the report.

Duke of Burgundy is widespread on SPTA. In the west, it appears rather localised and colonies appear to be relatively small. Much tall, dense and/or exposed grassland exists in intervening areas, as well as grazed areas. Known sites should be highlighted in management plans and protected against unfavourable management. Summer grazing should be avoided if possible and scrub cover maintained. In some instances, allowing previously cleared scrub to regrow could be beneficial in the long term.

In the Centre, DoB is probably restricted to the western side and the southeast, where significant colonies are present. In the East sites surveyed, DoB is more reliant on woodland edges and complex mosaics of scrub and grassland. It is known to occur on a number of other sites in the East (mainly in the southern half), but these were not surveyed.

The extent to which DoB can shift breeding sites on SPTA when habitat becomes overgrown or is too heavily grazed is little known. The fact that much of the intervening habitat lacks the necessary vegetation structure needed for the butterfly, and the right kind of Cowslip plants in sufficient quantity, together with its apparent faithfulness to certain sites would indicate the importance of these core sites. Therefore, avoidance of detrimental management at these sites would certainly be prudent, and this is emphasised by the general and continued decline of the species elsewhere.

15.4 Conservation management

Grazing, scrub management.

15.5 Condition status

Favourable

The Duke of Burgundy butterfly is a rare and elusive species, which is particularly difficult to survey on a large area like the Plain. Despite past and this recent survey, it is difficult to

describe a baseline population size or distribution, other than to say that it has been recorded in 46 SSSI units, spread thinly and in places patchily across the West, Centre and East. This recent survey demonstrates the butterfly's continuing presence and highlights focal areas, and makes no case to suggest the butterfly is not in 'Favourable condition'. Townsend recommends that scrub management is carefully planned in the focal areas, given the apparent unsuitability of some other parts of the Plain and the butterfly's fidelity to sites.

15.6 Condition Threats

These have been applied to Units 1, 2 and 21, where scrub removal had affected Duke of Burgundy habitat; and Unit 11 (Battlesbury Hill), where excess grazing, as seen in August, had potentially damaged DoB habitat.

16.1 SSSI feature assessed:
Fairy shrimp-*Chirocephalus diaphanus*.

Units present: widespread across the SSSI, apart from the Central Impact Area.

16.2 Method/information sources

- Mann T., Ash D., Wade L., Swain J. and Perkins I. *Fairy Shrimp* Chirocephalus diaphanus *Survey, DTE Salisbury Plain.* February 2008, Defence Estates.

- Perkins I. *Fairy shrimp* Chirocephalus diaphanus – *a study into optimal habitat requirements and the potential vectors that affect its distribution on Salisbury Plain in Wiltshire.* June 2012. BSc (Hons) dissertation, Sparsholt College.

- Personal communication from Iain Perkins (DIO) to Sarah Grinsted, dated 24/11/2015.

16.3 Results

a) Attributes: presence/absence, population extent

In a study by Defence Estates in 2008, the total number of unique sites found was 191, with 37 from historical data and 151 new sites. The total number of records mapped was 537. This figure was a snapshot, rather than a baseline, due to the on-going variability in number of temporary pools.

Fairy shrimp are widely distributed on Salisbury Plain and can be found on the West, Centre and East, both close to and away from major routes. Many management units contain the species, however it would be unrealistic to make any estimates of population size due to fluctuating weather patterns and consequent number of temporary pools.

Military vehicle disturbance of tracks and grassland is important for this species, which can fluctuate in type and intensity, and has reduced in the recent decade due to 'urban-style warfare'. Also, track improvements are a potential threat, if carried out without avoidance, mitigation or compensation measures.

Subsequent to the 2008 study, Iain Perkins completed a dissertation on fairy shrimps in 2012, based on The West, where he surveyed most of the 1km grid squares, which added approximately 300 records to the SPTA species database. Perkins continues to have a 'constant effort' valley, which he surveys once a month; as well as continuing to record temporary pools on a wider scale.

Perkins recommended that, for monitoring population distribution, *it is most realistic to make estimates of temporary ponds than actual fairy shrimp due to their ecology, specifically their hedge-betting strategy which means eggs will not hatch on the first wetting and remain dormant when ponds are dry - in the UK, five years has been recorded in Cambridgeshire and longer in other countries. As long as the pond remains wet for approximately six weeks (earlier in warmer temperatures), fairy shrimp will reach maturity - usually when they can be seen by eye.*

Perkins suggested that *the ponds that support fairy shrimp (possibly 90%+) should be considered meta-populations. As most ponds are fairly new they support smaller populations when compared to the ponds of the New Forest, so it important to keep them linked where possible. As long as the temporary ponds are puddled (occasionally) when wet and compacted when dry by their makers - military vehicles - and ground water levels in winter remain constant, then this habitat will remain. Lack of compaction when dry allows the vegetation to break through the soil thus increasing drainage, particularly when not bolstered by the underlying aquifer. Long-term this results in the loss of a temporary pond.* On this basis, Perkins noted a reduction of ponds overall on the West e.g. behind Imber Court, the large pond at the junction of Southdown/Ladywell which only a couple of years ago held water most of the year and now drains quite quickly due to grassing/scrubbing over.

To sum up, Perkins commented '*apart from the warmer weather of late which affects the life of the pond, fairy shrimps appear in good health on the West and more records are to be added on the Centre and East though there are less ponds'.*

b) Attribute: habitat extent – as affected by bare, rutted ground caused by military vehicle disturbance and the weather. This has been reported on above, under the chalk grassland section. Whilst we have various ways of estimating bare ground on the Plain, none of these are quantified or scientifically robust, and it currently comes down to impressions on the ground or through viewing sequential aerial photography. No data on weather has been obtained.

16.4 Conservation management

Military vehicle disturbance, as already reported on above, under the chalk grassland section.

16.5 Condition status

Favourable.

The fairy shrimp on the Plain continues to be recorded and monitored by Iain Perkins and others in the conservation groups. The population appears to be stable, with the persistent eggs present in dust along natural chalk and soil tracks throughout the training area; and the visible adult stage present in temporary pools, dependant on rainfall and military vehicle disturbance.

16.6 Condition Threats

None applied – but some risks are presented in the FCT.

17.1 SSSI features assessed:
Habitat-associated invertebrate assemblage: F111 sand & chalk Specific Assemblage Type (SAT)

Habitat-associated invertebrate assemblage: F112 open short sward SAT

Units present: assumed to be most units, apart from the hay-cut ones north of the Haxton to Everleigh Road.

17.2 Method

- Grinsted S. *Salisbury Plain SSSI – Chalk Grassland Rapid ISA – project brief and instructions.* May 2015, Natural England. Location: SSSI files, Natural England.

- Boyce D. and A. Wright. *Invertebrate survey for Salisbury Plain SSSI Condition Assessment 2008*, Natural England, 2009.

As part of the above project, a '*F111 and F112 SAT 'proxy' habitat survey form'* was completed for each SSSI unit visited (x 73 units). This required 20 stops or roundrats, apportioned according to broad habitats in each unit, recording against each attribute and target derived from the FCT – for vegetation heterogeneity, floweriness, over-wintering provision and Preferred Features - and a summary and condition status provided on the Unit Summary Sheet.

17.3 Results

Overall, 57 units were judged to be in Favourable condition for the two invertebrate assemblages and 10 in Unfavourable Recovering condition – which often but not always accorded with the chalk grassland condition.

Whilst general comments can be made against each attribute, the ISAT (at the time) did not cater for invertebrate assemblages, therefore no numerical analysis from the survey forms has been done.

a) Attribute: Species diversity present/assemblage score – not assessed, as no direct survey - 'proxy' habitat survey only.

b) Attribute: Vegetation heterogeneity, diverse surface topography of vegetation types (target: at least 3 different Functional Ecological Surfaces present in at least 60% of stops).

For the ten units judged to be in Unfavourable condition, they all suffered from lack of or little bare ground and/or short swards; whilst also having too much coarse/tussocky grassland and being generally homogenous.

The other units tended to have at least small areas of bare ground and short sward e.g. along chalk tracks and edges, vehicle ruts and scrapes around training features and through grassland, and impact craters, as caused by military vehicles; and poaching, as caused by grazing.

c) Attribute: Vegetation heterogeneity, scrub (target: young scrub present in 2-25% of stops)

As already described above for the chalk grassland, the focus has been on reducing scrub cover, whilst retaining and managing areas of dense, static scrub for invertebrates and birds – along with remaining areas of scattered scrub.

Of the units assessed (x73), there was an average of 2.4% cover of dense scrub per unit in 2008/9 (n = 73, mean = 2.4%, s.d. = 5.9%), as calculated from the SUMP; and an average of 4.0% cover of dense scrub per unit at ISA in 2014-15 (n = 73, mean = 4.0%, s.d. = 6.0%), as estimated through fieldwork and aerial photography.

In addition to those areas specifically retained and managed for invertebrates and birds, there were other areas of scattered scrub present, some classed as low priority within the SUMP, being widely scattered, and largely omitted from DIO management for the time-being; some due to be cleared or re-growing under the agreements and management plans. Of the units assessed (x73), there was an average of 8% cover of scattered scrub per unit at ISA in 2014/15 (n = 73, mean = 8%, s.d. = 11%), as estimated through fieldwork and aerial photography.

Some of the proxy habitat survey forms mention inadequate scattered scrub, however, overall, there appears to be an appropriate balance between the needs of chalk grassland and invertebrates. Scrub clearance and management tends to be large-scale on the Plain, which has potential for local or wider impacts on sensitive species - but is largely unknown. For example, recently improved knowledge of Duke of Burgundy butterfly and brown hairstreak distribution is being considered as part of updates to DIO's management plans.

d) Attribute: Floweriness – nectar and pollen sources (target: sward and scrub able to flower at >50% of stops)

A large proportion of the chalk grassland is allowed to flower in summer, although some was being intensively grazed at the time of survey through the grazing pennings system. Lack of flowering was never identified as a limitation on the survey forms. The proportion of summer grazing pennings to winter is approximately 50:50.

e) Attribute: Cover and over-wintering sites – litter layer (target: >1cm depth at >20% of stops

Litter was not in short supply – and for the chalk grassland, as above, was often too high.

f) Attribute: Cover and over-wintering sites – seed heads and hollow stems (present until late spring at >30% of stops.

There was usually some of this resource present at stops, although this wasn't always possible to assess in mid-summer.

17.4 Conservation management

DIO Farm Management Plans, Super Unit Management Plans 2010-2015, vehicle disturbance from military training.

17.5 Condition status

Favourable – units x 57
Unfavourable recovering – units x 10

The 'bare ground' and 'short sward' invertebrate assemblages were not directly assessed i.e. by trapping and counting, on this occasion, but indirectly assessed by looking at the habitat resource, particularly the sward and scrub structure – again using the attributes and targets from the FCT. The scale at which we did this was the SSSI unit, which was often a relatively large area, with 20 stops apportioned according to the broad habitats present. On the whole, longer grasses/forbs, young scrub, nectar and pollen sources, and seed heads and hollow stems, were all present in adequate amounts; coarser tussocky grasses and litter layer were over-supplied; and bare ground and tight-grazed/short sward were often sufficient but seen to be insufficient in ten units.

17.6 Condition Threats

Very little bare ground and short sward reference invertebrates - for ten units, classed as Unfavourable.

I Unit level assessments

Unit level assessments were carried out for the chalk grassland and invertebrate assemblage habitats, on 73 units, as already described above. The Unit Summary Sheets and associated NVC maps are provided in Appendix 6. The other features have largely been assessed at the 'whole site level', as discussed in the introduction, and the results recorded against each unit where the feature is known to be present.

A list of units, features and condition status is provided in Appendix 5.

J Overall results, discussion and conclusions

The overall result of the ISA was that, out of the 73 SSSI units assessed, 43 (59%) were judged to be in Favourable condition, for all features present, whilst 29 were classed as Unfavourable Recovering and 1 Part Destroyed. This was a significant improvement in condition status on the Plain, largely due to considerable scrub removal, also some improvement in chalk grassland composition, whilst other units (although scrub-cleared) didn't change condition status largely due to under-grazing. See Figure 7 below for some summary figures, including the 5,170 ha that contributes to the Government's target for SSSIs.

Figure 7 Condition status change at whole SSSI level.

		Hectares	Units
Total SSSI area:		= 19,715	x 99 (inc. A303 road verge)
In 2008:	F	= 2,827	x 26
	UR	= 16,888	x 73
Area surveyed in 2014 and 2015		= 12,087	x 73
Of this:	F	= 6,609	x 43 (32 units (5,587 ha) moved from UR to F)
	UR	= 5,290	x 29
	PD	= 187	x 1 (4 units (417 ha) moved from F to UR or PD)
Not yet surveyed		= 7,629	x 26
Of this, in 2008:	F	= 1,388	x 11
	U	= 6,241	x 15 (inc. unit 170 @ 3,125 ha)
Therefore, current totals:			
F = 6,609 + 1,388		= 7,997	x 54 (43 (2014/15) + 11 (2008))
UR = 5,290 + 6,241		= 11,531	x 44
PD		= 187	x 1
Backwards move from F to U =		417	x 4 (units 5, 30, 52, 112)
Overall gain in F (7,997 (2015) – 2,827 (2008))		= 5,170	x 28

The assessment of 73 of the total 99 SSSI units covering the Plain, was carried out over two years, using Natural England staff (WCT and NEFU) for the chalk grassland element and contractors and local recorders for the species surveys. The rest of the units will be assessed in due course.

The FCT, which provided the backbone of the assessment, has been further developed and an updated version provided to partners. It provides a list of notified features, past surveys and information sources, and attributes and targets, for managing and monitoring. Whilst a 'final' version, it has scope for further development e.g. to better cater for conflicting species needs.

The chalk grassland element was based on Natural England's 'Rapid ISA' method, which was applied to randomly selected chalk grassland parcels, for each NVC type present, within any given unit. Some attributes e.g. bare ground (localised) and scrub were best considered at the whole unit level. Most attributes were considered at the parcel level. The findings were summarised in a 'unit summary sheet'. Some fieldwork instructions were developed, which might be used in the future.

Chalk grassland parcel level is possibly the best way to look at the results. The raw data can be readily analysed using spreadsheet reports from ISAT; and there is some comparability between this assessment and previous ones. For example, whilst survey methods have differed, the use of attributes and targets e.g. positive indicators has not changed. Between the English Nature condition assessment in 2002 and this recent one, there appears to have been an overall improvement in chalk grassland quality e.g. 43% of grassland parcels met all mandatory targets in 2002, and 62% in 2014/15; and 61% of grassland parcels met the positive indicator target in 2002, and 72% in 2014/15. This is despite the apparent under-grazing on some parts of the Plain particularly over the last two summers, along with high rainfall, and the Condition Threats that have been applied.

In 2014/15, of the 282 chalk grassland parcels assessed, 176 (62%) passed all mandatory attributes and targets i.e. they were in Favourable condition. Of these, some failed one or more non-mandatory targets. This leaves 106 (38%) parcels that failed one or more mandatory attributes and targets i.e. they were in Unfavourable condition - mainly inadequate positive indicator species (79 parcels, 28% of total parcels), also unwanted grasses, weeds in a few places and localised scrub. The invasive tor-grass was not found to be a widespread problem, although is known to be extensive in the (un-assessed) Central Impact Area.

The main non-mandatory attribute and target not met (whether the parcel was in Favourable or Unfavourable condition) was 'litter', which was seen to be was excessive in 68 parcels (24% of total grassland parcels assessed).

Condition Threats, which are perceived risk to the features, were applied to 136 (48%) grassland parcels – a figure higher than that for the basic 'failed' parcels – primarily for under-grazing (83 parcels, 29.4% of total parcels) and localised scrub, although overall scrub has been significantly reduced and some CTs on review will be readily discounted. The 2014 and 15 seasons were relatively wet with unusual amounts of grass growth, which the farmers had not responded to; plus there is a longer history of under-grazing on some parts of the Plain.

The assessment was focussed primarily on chalk grassland botanical diversity, whilst also taking account of marsh fritillary, tuberous thistle and other species requiring particularly light grazing. It is to be hoped that the grazing management, better tuned into grass growth and

conservation needs, along with the natural reversion processes on large areas, can continue the chalk grassland on a positive trajectory.

For the wider assessment, we learnt something of the current condition of all the notified features - apart from the Nine Mile River and great crested newts, which remain to be surveyed in unit 172 (a new unit).

The species features appeared to be doing at least satisfactorily and have all been classed as Favourable, apart from juniper in the ten units where it is present and the two invertebrate assemblages (bare ground and short sward) on some units. Whilst the chalk grassland was assessed as being in Favourable condition on 46 units, overall, taking account of all features present, 43 units were assessed as being in Favourable condition. A short summary is provided at the end of each species chapter.

There were some challenges and constraints to the project. The size and remoteness of the Plain required long days and off-road driving skills; whilst the on-going military training sometimes meant last-minute changes to plans. The level of survey effort or data capture varied in intensity between features, aiming for a representative and robust result, but in some cases being more reliant on local advisers' experience and knowledge of the Plain. Some of the chalk grassland, whilst labelled as CG3d and CG/MG mosaics, was species-poor, not meeting the FCT targets; and, in such cases, we used the past NVC cards to check that these were indeed 'reverting' grasslands, ploughed at some point and still limited in positive indicator species.

The dynamics or flux of habitats were a challenge, when assessing against a baseline. Bare ground and scrub, for example, will inevitably flux across the site, which should be accepted as long as there is a balance to processes such as disturbance/recovery, grazing/neglect and scrub control/re-growth, as affected by both conservation management and military training intensity. This helps to cater for species like Duke of Burgundy, without overly neglecting the chalk grassland – 'landscape scale ecology'. Therefore, whilst these two attributes – bare ground and scrub - were recorded on the grassland parcels, in line with the 'Rapid ISA' survey forms, they were assessed at unit or wider level.

Some of the lower quality chalk grasslands might relatively easily/quickly change between MG1 and CG3, where it's a matter of defining grass species like false oat-grass and upright brome, being affected by grazing levels. During this assessment, we highlighted those parcels going in the wrong direction, or 'below the bar' (compared to the 1996 NVC map), with Condition Threats, but did not necessarily highlight those on the up, or above the bar. On smaller SSSIs, this issue can be addressed in the FCT, by modifying targets for specific parcels or units; but such is difficult on a site with 99 units, 2,627 chalk grassland parcels and varying grassland quality. It is perhaps a tendency of the ISA method to place more emphasis on the negatives, as these are what need action – although follow-up letters to farmers can also emphasise the positives.

Other habitats and species, though, are the result of longer-term stability, and usually narrower in distribution; therefore, arguably, require extra care to ensure adequate or intense survey effort and ultimately conservation management focus e.g. the CG2 and CG3a chalk grasslands, containing rare plants like burnt orchid and purple milk-vetch, the rare bryophyte areas and the nationally rare tuberous thistle areas.

The key recommendations from this assessment are:

The SP Site Condition Plan and Condition Threats will be addressed by Natural England and DIO, through local liaison and the Major Landowners Group.

For scrub, the impetus now must be to maintain the previously cleared areas and continue with a balanced scrub programme on the rest of the SSSI, that caters for the varying demands of chalk grassland, breeding birds assemblage and Duke of Burgundy butterfly.

For the grazing, this assessment suggests that some farmers are better or more able than others at a) covering their licence areas and b) grazing at an appropriate frequency and intensity. Farmer co-operation with and understanding of conservation grazing is essential, and increased adviser time must be put into this. Whilst the FMPs are clear on the basic prescriptions, they tend to emphasise avoiding over-grazing rather than under-grazing, and could better explain and illustrate desired sward structures for promoting both botanical and invertebrate diversity. This might be addressed through some new Salisbury Plain-specific illustrated or photographic guides and/or more user-friendly Favourable Condition Tables. In addition, consideration should be given to increasing the number of grazing pennings for selected farmers. There must be regular monitoring of grazing pennings - the grazing coverage, frequency and intensity - with feedback to the farmers. On Beacon Hill, livestock grazing is needed, rather than reliance on rabbits.

The tor-grass study must be followed up, to obtain a more accurate measure of tor-grass coverage on the Centre, making use of both existing aerial photography and latest imaging technology. There is currently no tor-grass control - other than grazing and compaction by vehicles along tracks - which needs further investigation, although may be difficult to achieve.

Further monitoring and investigating marsh fritillary and its foodplant, devil's-bit scabious, on the Plain, will be important for understanding both the butterfly and chalk grassland quality.

Glossary

CEH	Centre for Ecology & Hydrology
CG2	CG2 - *Festuca ovina-Avenula pratensis* grassland
CG3	CG3 - *Bromus erectus* grassland
CG4	CG4 - *Brachypodium pinnatum* grassland
CG5	CG5 - *Bromus erectus – Brachypodium pinnatum* grassland
CG6	CG6 - *Avenula pubescens* grassland
CG7	CG7 - *Festuca ovina – Hieracium pilosella – Thymus praecox/pulegioides* grassland
CMSi	Conservation Management System
CSM	Common Standards Monitoring
DIO	Defence Infrastructure Organisation
FCT	Favourable Condition Tables
FMP	Farm Management Plan (DIO)
HLS	Higher Level Stewardship
ISA	Integrated Site Assessment
ISAT	Integrated Site Assessment Toolkit
MoD	Ministry of Defence
NEFU	Natural England Field Unit
NVC	National Vegetation Classification
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SUMP	Super Unit Management Plan (DIO)
WCT	Wiltshire Conservation Team

Appendices

Appendix 1 Salisbury Plain SSSI Citation

Appendix 2 Location of features by SSSI unit

Appendix 3 Calculated dense and scattered scrub cover by unit (from SUMP 2008/9) and estimated dense and scattered scrub cover by unit (from SP ISA 2014-15).

Unit number	Unit % dense scrub cover - SUMP improvement polygons - in 2008/9*	Unit % dense scrub cover in 2014-15 - rough estimate from ISA	Unit % scattered scrub cover - SUMP improvement polygons - medium and high priority only - in 2008/9	Unit % scattered scrub cover in 2014-15 - rough estimate from ISA	Are scrub levels now within target range?
1	1.88	7	9.5	12	Yes
2	6.47	8	32.5	30	No
4	3.21	5	18.32	25	Yes
5	0	0	61.63	1	Yes
7	2.21	2	23.32	10	Yes
9	1.19	1	26.9	40	No
10	2.25	2	43.3	35	No
11	0	0	21.99	5	Yes
12	0	0	0	5	Yes
16	0	0	27.4	2	Yes
17	2.85	5	43.43	10	Yes
18	0	0	23.8	20	Yes
19	0	1	25.52	3	Yes
20	0	0	34.06	6	Yes
21	0	0	2.27	10	Yes
22	0	0	8.4	5	Yes
23	0	1	29.6	8	Yes
29	0.48	0	31.77	4	Yes
30	0	0	0	1	Yes
31	4.31	2	73.27	8	Yes
32	0	0	0	0	Yes
33	0	0	41.72	15	Yes
34	0	0	22.57	4	Yes
35	0	0	0	0	Yes
41	0.87	1	36.19	7	Yes
42	0.54	0	39.1	0	Yes
44	19.24	20	1.49	2	Yes
45	0.29	0	1.13	0	Yes
50	0	0	64.75	5	Yes
51	0	0	4.57	2	Yes
52	0	0	2.82	4	Yes
53	0	0	0	0	Yes
54	6.65	7	0.99	1	Yes
55	0	0	17.4	1-2%	Yes
65	0	0	13.3	0	Yes
68	0	2	4.5	1	Yes
72	8.42	8	10.3	2	Yes
73	0	0	5.1	1	Yes
75	0	1	7.1	5	Yes

78	0	1	8.44	1	Yes
79	8.2	5	13.6	3	Yes
80	0	1	8.7	20	Yes
81	0	4	9.7	2	Yes
85	1.7	5	2.9	8	Yes
106	5.4	5	7	1	Yes
108	0	0	0	0	Yes
109	7.32	10	8.5	2	Yes
111	0	0	0	0	Yes
112	0	0	0	0	Yes
113	0	0	1.6	0	Yes
114	0	1	8.2	0	Yes
115	0	0	34.7	2	Yes
116	1.8	1	7	2	Yes
117	4.5	0	4.1	1	Yes
122	2.9	0	2.14	2	Yes
124	1.4	1	0	1	Yes
125	0.6	1	0.7	2	Yes
126	1.6	2	1.1	2	Yes
127	2.9	7	0.54	0	Yes
128	6.2	6	7	10	Yes
130	43.8	15	17.7	10	Yes
132	0	0	27.8	5	Yes
134	1.2	1	15	15	Mostly yes; HK16 = no
136	1.7	30	8.4	4	No
138	2.8	25	27.5	15	No
145	0	0	0	0	Yes
146	3.6	4	5.3	10	Yes
147	10.3	4	2.8	5	Yes
148	1.7	20	0.26	12	Yes
149	0	1-2%	55	10	Yes
150	0	0	86.73	15	Yes
155	0	20	7.3	60	No
171	n/a	10	n/a	40	No

*Not all dense scrub was mapped as part of SUMP improvement polygons in 2008/9, rather patches were included if there was an aspiration to remove or manage them in some way.

Appendix 4 Tuberous thistle records from Prendergast (2015), sorted by SSSI unit.

Site numbers are from Walker et al., 2001.

Unit 1
Site 26: Fourteen Hundred Down (aka Four Hundred Down). One large *C. tuberosum* plant.

Site 27: Thirteen Hundred Down. Not relocated.

Site 28: Branscombe Bottom. Two *C.* ×*medium* and one *C. tuberosum*. *C. acaule* present

Site 22: Knapp Down. One *C. tuberosum.*

Site 53: Thirteen hundred Down. Not relocated. *Cirsium acaule* present.

Unit 2
Site 29: Warminster Ranges. One *C.* ×*medium* and four *C. tuberosum*. *C. acaule* present. The single *C.* ×*medium* is almost certainly the same plant described in the CEH report.

Unit 7
Site 24: High Down. Thousands of *C. tuberosum.* Three *C.* ×*medium.* Population continuous with that of site 25

Site 25: Warden's Down. Eight *C. tuberosum.* Population continuous with that of site 24

Unit 7/8
Site 19: Thorncombe Down. A small area on recently grazed down containing six *C. tuberosum* and two *C.* ×*medium*. *C. acaule* present.

Unit 8
Site 20: Middle Ridge Plantation. One *C. tuberosum* and eight *C.* ×*medium*. *C. acaule* present. Aspect different to that given in CEH report so possibly a new site.

Site 21: North of Knapp Down. Eleven *C. tuberosum* and four *C.* ×*medium*.

Site 36: New Farm Down. Not visited.

Site 51: Summer Down (opposite). Not visited.

Site 52: Imber Clump. Not visited.

Unit 9
Site 17: South of Ladywell Plantation. Not relocated.

Site 43: South Down-Bowl's Barrow. Not relocated.

Site 44: Ladywell plantations - tumuli. Not visited.

Site 45: Ladywell plantations. Not visited.

Site 46: Ladywell plantations. Not visited.

Site 47: Ladywell plantations. Not visited.

Site 48: Ladywell plantations. Not relocated.

Site 49: Ladywell plantations. Not relocated. Same grid reference as Site 14 and presumably once part of that extensive colony but now lost to the plantation.

Site 50: South Down Sleight. Not visited.

Unit 16
Site 5: Coulston Down Valley Bottom. Not re-found. Occasional *C. acaule.*

Site 6: Coulston Down. Not re-found. Occasional *C. acaule.*

Unit 17
Site 8: Tenantry Down. Two patches of *C. tuberosum*.

Site 35:. Tenantry Down. Not visited.

Site 9: South Down Barn. Not re-found.

Site 10: Wadman's Coppice. Not visited.

Unit 19
Site 7: Brouncker's Well. Not visited.

Unit 20
Site 11: South of Imber Valley. Not visited. Recent records from SP.

Site 37: Imber Down. Not visited.

Site 38: Imber Down West. Not visited (incorrect grid reference).

Site 39: South Down West. Nine *C. tuberosum*. Continuous with the population at site 41, parallel to the main track along a minor track.

Site 40: South Down west. Not relocated.

Site 41: South Down west. One *C.* ×*medium* and nine *C. tuberosum*. Continuous with the population at site 16, parallel to the main track along a minor track.

Site 42: Bowl's Barrow. Not relocated.

Unit 21
Site 12: South Down East. Not visited.

Site 13: Imber Valley South Side. Approximately 75 *C. tuberosum* plants on the easternmost part of this slope. The westernmost part of the slope supports approximately 10 *C. tuberosum* plants in a population continuous with northern part of Site 14.

Site 14: North of Ladywell Plantation. This is probably the best site seen during this survey with hundreds of plants of *C. tuberosum* and an unusual form of *C. tuberosum*. Individuals are difficult to recognise due to the high density of the plants. 1000 *C. tuberosum* were

conservatively estimated. One plant of *C.* ×*medium* was recorded on the short sward beside a regularly used track. This is obviously an important population with little *C. acaule* nearby.

The unusual form of *C. tuberosum* is tall to 1.5m; the leaves are noticeably softly spiny and deeply lobed. There are no, or very few septate hairs on the underside of the leaf. The capitulum shape is round with a truncate base and the marginal flowers are distinctly recurved. This population may represent conservation of ancestral *Cirsium tuberosum* genetics on Salisbury Plain and is probably worth further investigation using DNA technology.

Site 15: East of Ladywell Plantation. Not re-found. Possibly lost to shading by the forestry plantation.

Site 16: South Down West. Two *C.* ×*medium* and five *C. tuberosum* plants.

Site 18: South of Ladywell Plantation. Five plants of *C. tuberosum* found here and 20 further small *C. tuberosum* at a presumably new location 100m to the west on a gentle S-SE facing slope (likely expansion of the known colony).

Unit 66
Site 33: Redhorn Hill. Not visited.

Site 2: Penning Down (SPTA Centre). A large population of several hundred *C. tuberosum* plants (92 inspected), with 5 recorded *C.* ×*medium* on the periphery of the backcross population. *C. acaule* present in the surrounding grassland with one possible *C.* ×*medium* × *acaule* backcross.

Unit 71
Site 30: Marden Down. Not visited.

Site 31: Chirton Down. Not visited.

Site 32: Chirton Down east. Not visited.

Site 34: Brounker's Down. Not visited (incorrect grid reference).

Unit 125
Site 1: Haxton Down (SPTA East). One pure *C. tuberosum* within a 3x3m cage. Hybrid plants previously recorded nearby were not relocated although a seedling on the side of the track at the foot of the slope appeared to be *C.* ×*medium.*

Outside of SSSI
Site 3: Upper Coulston Valley. Two *C.* ×*medium* in tightly grazed CG3-MG1 with abundant *C. acaule*.

Site 4: Lower Coulston Valley. C. 30 *C.* ×*medium,* one *C. tuberosum* and frequent *C. acaule* in tightly grazed CG3.

Site 54: Upton Cow Down. Not visited.

Site 23: Farm Down Plantation. One *C. tuberosum*

Appendix 5 Condition status of features at unit level

Appendix 6 Unit Summary Sheets and NVC maps

Appendix 7 Salisbury Plain SSSI Site Condition Plan

Appendix 8 Woodlands and plantations on Salisbury Plain

References

Provided under the chapters.

Acknowledgements

The Wiltshire Conservation Team (WCT) and Natural England Field Unit (NEFU) completed the chalk grassland element of the ISA, project managed by Sarah Grinsted, Jo Chesworth and Elaine Mayner.

The field surveyors were: Sarah Grinsted, Dave Collingbourne, Ben Cooke, Katie Lloyd, Dianne Matthews, Fergus Mitchell, Jenny Parsons, Stephanie Payne and Elin Rees – from WCT; and Liz Biron, Jo Chesworth, Sean Cooch, Simon Curson, Hannah Etherington (on secondment), Gillian Fisher, Hannah Gibbons, Jo Hackman, Sonja Kaupe, Stephen Parker, Jude Smith, Graham Steven and Alex Prendergast – from NEFU; also Chris Westcott, Tom Lane and Charles Routh – from the wider Somerset, Avon and Wiltshire Team.

Fran Tattersall, as a volunteer, gave a significant amount of time in 2014. Abi Burns completed an MSc project titled '*A critical review of integrated land management within Natura 2000 sites; Salisbury Plain, a case study*'.

Elaine Mayner, with help from Karen Bullen, Jane Clarke and Julie Kidd, entered 285 ISAT forms onto the system.

The chalk grassland element was based at Parsonage Down NNR - Roger Marris and Simon Hope kindly allowed use of the farmyard and office, and provided two 4x4 vehicles.

Roger Griffin, Bio2020 programme lead and team leader, has provided on-going support, with both a partner and national perspective.

Jon Curson (invertebrates), Richard Jefferson (grassland), John Martin (plants), Susie Smith (access to evidence) and Jonathan Pearce (Bio 2020 programme – West) were among the national specialists who advised.

Tom Lane and Kip D'Aucourt (volunteer) provided expert help with ArcGIS and GPS.

Alex Prendergast (NEFU) completed the tuberous thistle survey and investigation.

Our partner, Defence Infrastructure Organisation, provided help in many ways – particularly Olly Howells, Julie Swain and Lisa Wade. Range Operations, for SPTA, despite their other priorities, usually managed to fit us in.

Consultants and volunteer groups provided much vital data and commentary: Sharon Pilkington (bryophytes, rare plants), Martin Townsend (Duke of Burgundy butterfly), John Redhead (Centre for Ecology & Hydrology) (tor-grass), Thomson Ecology (breeding birds assemblage, quail), Wiltshire Botanical Society (rare plants), Wiltshire & Swindon Biological Records Centre (rare plants), Wiltshire Butterfly Conservation (butterflies), the Imber, Larkhill & Westdown, and Bulford Conservation Groups (butterflies, fairy shrimp), Wiltshire Ornithological Society (hen harrier, hobby) and Royal Society for Protection of Birds (stone-curlew).

Summary

The Integrated Site Assessment (ISA) of Salisbury Plain Site of Special Scientific Interest (SSSI) was carried out during 2014 and 2015. The main challenge was to assess an area the size of the Isle of Wight, with 25 notified features, on finite resources whilst ensuring representative and robust results.

Salisbury Plain is important for, essentially, chalk grassland and other habitats including the Nine Mile River, and a range of rare plants, mosses, invertebrates and birds. The legally notified features are listed in the Favourable Condition Tables (FCT), along with attributes and targets for monitoring and managing each.

The chalk grassland element of the assessment was completed by Natural England staff. For each SSSI unit, average size 165 ha, it took two to four surveyors to look over the paperwork, then drive around the unit to get the lie of the land, take photos, and record scrub and bare ground at unit level. Then, basing things on the mid-90s National Vegetation Classification (NVC) survey, they homed in on previously randomly selected grassland parcels for each NVC type present and did a 'Rapid ISA' – in other words a structured walk across the grassland parcel, without necessarily doing quadrats or stops, but recording against all the attributes and targets, including DAFORs for the positive indicator species. They also did an invertebrate assemblage habitat survey, apportioning 20 stops according to the broad habitats present in the unit. At the end of surveying each unit, they completed a Unit Summary Sheet which pulled together the results by chalk grassland feature, including condition status and Condition Threats.

Some of the grasslands were historically species-poor, not meeting the FCT targets - often classed as CG/MG mosaics and transitions, sometimes CG3d, on the NVC map. These parcels were recorded 'down the line' against the ISAT survey forms but also compared against the old NVC cards and if there was no decline and the management was satisfactory, were not allowed to compromise the overall condition status of the unit. A decision tree was followed in this respect.

For this element of the assessment, 73 SSSI units were visited, completing 282 Rapid ISA survey forms, which are now stored on Natural England's database – the Integrated Site Assessment Toolkit.

For the 'other' features, we let contracts and contacted recording groups, for data and commentary. Some features were surveyed across a wide area and/or relatively intensively, whilst others were assessed more locally, perhaps using ad hoc records. For example, the 'breeding birds assemblage' was assessed using the Breeding Birds Survey national method across 100 x 1km squares, with statistical analysis to compare these results against the 2000 and 2005 surveys. At the other end of the scale of survey effort, Adonis blue was assessed using local conservation group records. The full report summarises the evidence obtained for each feature, the conservation management, condition status and any Condition Threats.

Overall, 73 SSSI units were assessed, out of the 99 comprising the whole SSSI – or 12,035 hectares (ha) out of 19,690 ha. Of these units, 43 were classed as being in Favourable condition, 29 Unfavourable and 1 Part- destroyed. In terms of change, 32 units had improved from Unfavourable Recovering to Favourable condition, whilst four had gone backwards. Overall, this was a gain of 5,170 ha in Favourable condition. The predominant reason for change was reduced scrub cover. Under Higher Level Stewardship agreements, 5,429 ha of

scrub was cleared between 2010 to 2015 inclusive (six winters), and under Defence Infrastructure Organisation (DIO), another 1,380 ha over the same period. At the same time, Landmarc Support Services did 'maintenance' works as directed and funded by DIO, and tenant farmers followed their scrub management plans, mostly covering the easier, toppable scrub, with some individual tenants covering steeper slopes and taking on denser areas with no funding.

This left 30 units judged to be in Unfavourable condition, of which 26 were already classed as such and four had gone backwards. Both Favourable and Unfavourable units have had Condition Threats (CT) applied - 59 units with 208 CTs. These are mostly for under-grazing (x 94), also excess scrub, too little bare ground, weeds in a few places, tor-grass in a few places and 'other' risks. Recommendations have been made for improving the grazing.

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** .

Report number RP02386
ISBN 978-1-78354-431-8