



Survey & Assessment of Nightjar *Caprimulgus europaeus* status in the New Forest

Higher Level Stewardship Agreement
The Verderers of the New Forest
AG00300016

October 2018



This project has been funded under the Rural Development Programme for England

Copyright

This report has been prepared for and funded by The Verderers of the New Forest Higher Level Stewardship Agreement AG00300016. The HLS partners shall have the sole right to publish the report and results of the survey, with an appropriate acknowledgement of the work or material contributed by the Contractor.

This report should be cited as: Sarah Jackson, 2018. Survey & Assessment of Nightjar *Caprimulgus europaeus* status in the New Forest Report. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016.

Acknowledgements

Arcadian Ecology & Consulting Ltd were contracted by Leanne Sargeant, Forestry Commission to deliver this work. The author would like to thank Ruth Kernohan, Arcadian Ecology, for her assistance with volunteer co-ordination and transect allocation, Catherine McGuire, Arcadian Ecology, for designing the GIS layer for data entry and Becky Banbury-Morgan, Trainee Ecologist, Hampshire & Isle of Wight Wildlife Trust, for her assistance with data entry and mapping.

Publication Details

This document should be cited as: Jackson, S. (2018) *Survey & Assessment of Nightjar *Caprimulgus europaeus* status in the New Forest. Higher Level Stewardship Agreement, The Verderers of the New Forest AG00300016.* Arcadian Ecology & Consulting Ltd. Curdridge.

Arcadian Ecology & Consulting Ltd is a wholly owned subsidiary of Hampshire and Isle of Wight Wildlife Trust. Maps reproduced under Ordnance Survey licence no. 100015632 with the permission of Her Majesty's Stationery Office, Crown Copyright 2018. Unauthorised reproduction infringes Copyright and may lead to prosecution or civil proceedings.

Published by:
Arcadian Ecology & Consulting Ltd.
Beechcroft House
Vicarage Lane
Curdridge
Hampshire
SO32 2DP

A company Ltd by guarantee & registered in England No. 10033962.

All assessments and recommendations provided are based on the information available to Arcadian Ecology & Consulting Ltd (Arcadian Ecology), and Arcadian Ecology endeavours to ensure all advice is accurate and appropriate at the time of publication. However, it is the sole responsibility of the recipient to ensure that any actions they take are both legally and contractually compliant, and Arcadian Ecology does not accept responsibility or liability for any losses incurred or arising from the advice we provide.

No part of this document may be reproduced without permission. Information contained in this report is intended for The Verderers of the New Forest, Forestry Commission and New Forest National Park Authority. Records of protected and notable species may be forwarded to relevant recording organisations with site names removed. All other information in this report should not be passed on to any third party without the express permission of The Verderers of the New Forest, Forestry Commission, New Forest National Park Authority and Arcadian Ecology. For information on how to obtain further copies of this document and accompanying data please contact Arcadian Ecology: arcadian@hiwwt.org.uk

Document Control

Version	Author name	Date	Signed off by	Date
Draft	Sarah Jackson	21.09.2018	Catherine McGuire John Durnell	24.09.2018 28.09.2018
Draft (v2)	Sarah Jackson	29.10.2018	John Durnell	29.10.2018
Final	Sarah Jackson	30.10.2018	Catherine McGuire	30.10.2018

Executive Summary

Arcadian Ecology & Consulting Ltd were contracted by Leanne Sargeant, Forestry Commission, on behalf of the New Forest Higher Level Stewardship scheme partners to undertake the survey and assessment of Nightjar *Caprimulgus europaeus* status in the New Forest, as a requirement of the agreement to monitor the Special Protection Area (SPA) bird species.

The project aimed to provide an update to the surveys undertaken in 2013, but also a comparison to the national nightjar survey completed in 2004, with supplementary survey of the New Forest conducted in 2005.

Surveys were conducted from the end of May to mid-July 2018 by a team of Arcadian Ecology and Hampshire and Isle of Wight Wildlife Trust staff and volunteers, Forestry Commission staff and Natural England staff. Surveys were completed on 148 transects, following the same routes as completed during the 2013 surveys, plus 47 additional areas were surveyed.

Surveys identified 435 territorial males (303 within the open forest/HLS area), a decline on the results of 2013, which recorded 544 territorial males (441 within the open forest/HLS area).

Results suggest a decline in territorial males in the New Forest when compared to previous local and national surveys. The range of males has expanded slightly but territories within this, based on 1km squares, are more sparsely distributed. Further investigation is required into possible causes for the change in distribution, such as alterations to management practices and localised changes to habitat types in these areas.

The causes of the decline could be as a result of a range of factors including cold and unsettled weather during April affecting migration, changes in habitat management and grazing or increased disturbance, therefore additional comparison with results for other sites during 2018 should be undertaken to clarify whether the results reflect the national picture or are more likely to be caused by localised factors. Further survey work within the Forest should also be carried out over an extended period to establish if there is an overall declining trend in the nightjar population.

Table of Contents

1.	INTRODUCTION	5
1.1.	Background.....	5
1.2.	New Forest SPA.....	5
1.3.	Remit and Scope of the Report.....	5
2.	ECOLOGY AND LEGISLATION	6
2.1.	Ecology.....	6
2.2.	Status.....	6
2.2.1.	<i>National</i>	6
2.2.2.	<i>New Forest</i>	6
2.3.	Legislation.....	6
3.	METHODOLOGY	8
3.1.	Field Survey.....	8
3.1.1.	<i>Survey Period</i>	8
3.1.2.	<i>Surveyors</i>	8
3.1.3.	<i>Survey Area</i>	8
3.2.	Data Analysis.....	9
3.3.	Constraints to survey.....	9
4.	RESULTS	10
4.1.	2018 Survey.....	10
4.2.	Comparison with previous data.....	10
4.2.1.	<i>Population size</i>	10
4.2.2.	<i>Distribution</i>	11
4.2.3.	<i>Comparison to sites outside the New Forest</i>	11
5.	ASSESSMENT OF CURRENT STATUS	12
6.	CONCLUSION	13
7.	REFERENCES	14

MAPS

Map 1:	Survey Area
Map 2:	Transect Routes
Map 3:	Nightjar Territories
Map 4:	Nightjar Territory Centres
Map 5:	Nightjar Territory Centres: 2013 vs 2018
Map 6:	1km square Occupancy

APPENDICES

Appendix 1:	Example recording form
Appendix 2:	Location data for nightjar territories 2018
Appendix 3:	Detailed territory mapping
Appendix 4:	Detailed territory centres mapping
Appendix 5:	Completed survey forms and maps

1. INTRODUCTION

This project will deliver a survey and assessment of Nightjar *Caprimulgus europaeus* status in the New Forest, as a requirement of the agreement to monitor the Special Protection Area (SPA) bird species. It will provide an update to the surveys undertaken in 2013, but also a comparison to the national nightjar survey completed in 2004, with supplementary survey of the New Forest conducted in 2005.

The contract was awarded by Forestry Commission England on behalf of the partners within the New Forest Higher Level Stewardship scheme.

1.1. Background

As part of the Verderers of the New Forest Higher Level Stewardship (HLS) agreement, there is a requirement to monitor the SPA bird species, for which the area is designated.

The first surveys funded through the HLS were undertaken in 2013, which recorded the breeding population of nightjar as 544; 441 within the HLS scheme area, 49 territories within forestry Inclosures, and a further 54 territories on land outside of this area but within the New Forest national park boundary.

An update to these surveys is required to assess the current status of the total New Forest population.

1.2. New Forest SPA

The New Forest SPA covers an area of over 28,000 hectares and comprises a mosaic of habitats including wet and dry heaths, valley mires, grasslands, woodlands, rivers and streams, and ponds, which are able to support a range of species. This diverse habitat has led to multiple designations across the New Forest. In addition to being an SPA, it is also a Special Area of Conservation (SAC), Ramsar and Site of Special Scientific Interest (SSSI).

The SPA is designated due to its importance for breeding and over-wintering birds, qualifying under Article 4.1 of the European Birds Directive (2009/147/EC), supporting populations of European importance for five species listed on Annex I of the Directive:

Breeding populations of:

- Dartford warbler *Sylvia undata*
- Honey Buzzard *Pernis apivorus*
- Nightjar *Caprimulgus europaeus*
- Woodlark *Lullula arborea*

Over-wintering population of:

- Hen harrier *Circus cyaneus*

During the breeding season, the New Forest SPA should support 300 pairs of nightjar, representing at least 8.8% of the breeding population in Great Britain (JNCC 2004 SPA Designation).

1.3. Remit and Scope of the Report

This report provides an assessment of the current status of nightjar in the New Forest, and compares the current status and distribution to previous surveys.

2. ECOLOGY AND LEGISLATION

2.1. Ecology

Nightjars are a summer migrant, arriving from late April to mid-May to breed and leaving during August, to return to their over-wintering grounds in sub-Saharan Africa. Clutches usually comprise two eggs, with one or both birds fledging. Young are independent from a month after hatching.

They are associated with heathlands, moorlands, woodland edges and clearings, in young and recently felled conifer plantations, and in coppiced woodland. Suitable habitat needs 10-20% bare ground patches of greater than two metres squared for nesting. Areas which support rich densities of invertebrate prey, namely woodland – heathland interfaces and the adjoining habitat, are important for foraging.

Nightjars are most active at dusk and dawn, when they are hawking their insect (moths and beetles) prey, with larger Lepidoptera forming an important part of their diet. Males can also be heard making their distinctive “churring” call at this time, often whilst perched on top of tree, and wing clapping when in flight whilst displaying to females. Churring can last several minutes and varies in pitch and volume. Soft “coo-ick” contact calls can also be heard, which both males and females make whilst in flight.

Males have distinctive white markings on their wings and tail, distinguishing them from the females in their silent flight. During the daytime they nest on the ground, their cryptic grey-brown patterned plumage providing excellent camouflage.

2.2. Status

2.2.1. National

Nightjars are most numerous in southern England, found on the heathlands of the New Forest, Dorset and Surrey, reflecting the availability of good breeding habitat.

Nightjars declined across the UK throughout most of the 20th century, but since the 1981 national survey numbers of breeding nightjar have steadily increased, with the most recent national survey conducted in 2004 estimating the national population to be 4606 territorial males.

2.2.2. New Forest

The New Forest was included within the national survey in 2004, however surveys were incomplete so additional surveys, commissioned by English Nature (now Natural England), were undertaken in 2005 to provide supplementary information. The 2004 surveys recorded 552 territorial males, with a further 161 records contributed in 2005, resulting in 713 territories identified for the New Forest. Of these, 51 were outside of the SPA (Gates & Bull 2013).

National declines have been attributed to loss, fragmentation and degradation of heathland sites, combined with the increased use of pesticides leading to a decline in invertebrate prey, changes in forestry practice and disturbance through recreation activities, particularly by walkers and dogs during the incubation period (Langston *et al.* 2008).

2.3. Legislation

In England nightjar, their nests and their eggs are protected under the Wildlife and Countryside Act 1981, as amended by the Countryside and Rights of Way Act 2000. Under this legislation, it is an offence to:

- intentionally kill, injure or take any wild bird;
- intentionally take, damage or destroy the nest of any wild bird whilst it is in use or being built;
- intentionally take or destroy the egg of any wild bird;
- have in one's possession or control any wild bird, dead or alive, or any part of a wild bird, which has been taken in contravention of the Act or the Protection of Birds Act 1954;
- have in one's possession or control any egg or part of an egg which has been taken in contravention of the Act or the Protection of Birds Act 1954;

- use traps or similar items to kill, injure or take wild birds.

(Taken from the RSPB website:

<http://www.rspb.org.uk/forprofessionals/policy/wildbirdslaw/birdsandlaw/wca/index.aspx>)

UK birds are also split into categories (red, amber and green) based on their conservation importance. Nightjar are amber listed, the details for this criteria are as follows:

- Species with unfavourable conservation status in Europe (SPEC = Species of European Conservation Concern) Historical population decline during 1800–1995, but recovering; population size has more than doubled over last 25 years
- Moderate (25-49%) decline in UK breeding population over last 25 years, or the longer-term period
- Moderate (25-49%) contraction of UK breeding range over last 25 years, or the longer-term period
- Moderate (25-49%) decline in UK non-breeding population over last 25 years, or the longer-term period
- Rare breeder; 1–300 breeding pairs in UK
- Rare non-breeders; less than 900 individuals
- Localised; at least 50% of UK breeding or non-breeding population in 10 or fewer sites, but not applied to rare breeders or non-breeders
- Internationally important; at least 20% of European breeding or non-breeding population in UK (NW European and East Atlantic Flyway populations used for non-breeding wildfowl and waders respectively)

(Taken from the RSPB website:

http://www.rspb.org.uk/discoverandenjoynature/discoverandlearn/birdguide/status_explained.aspx)

3. METHODOLOGY

3.1. Field Survey

Surveys followed an adaptation of the BTO standard methodology, which was used for the 2013 survey undertaken by RPS (Gates & Bull 2013). This comprised the use of transects rather than 1km squares, to survey the 80 hectare survey areas.

The surveys comprised two visits to each transect. Visits were conducted between 9pm and 11pm, or 2am and 4.30am, in calm, dry weather; as nightjars churr most predictably and consistently just after sunset and just before dawn. Surveys were not conducted if the wind speed exceeded force 4 (moderate breeze raises dust and loose paper, small branches move).

During the survey, surveyors recorded all calling (churring) males on to maps, in addition to noting other behaviours including the 'coo-ick' call, wing clapping and flying. Only males churr, but the 'coo-ick' call given by both sexes can be used as evidence of an occupied territory.

Surveyors were advised to walk the site at a steady pace along the pre-determined route, stopping and listening for birds every few minutes. On hearing a nightjar, surveyors marked its position as accurately as possible on the map provided, using codes A1, A2, A3 etc for each individual found on visit one, and B1, B2, B3 etc for each found on visit two. The positions of simultaneously churring males were marked by a dashed line (A1-----A2). Any observed flights were recorded by an arrowed line (- A3 ->). The position of distant individuals, particularly outside the survey area, were noted as accurately as possible with a time. No tapes were used.

In addition to recording activity on the map, surveyors completed a standard survey form, detailing the survey dates, times, weather conditions and the number of males they encountered. This also included a row for the estimated number of males on site following the two visits, based on the surveyor's encounters whilst in the field. An example of the recording form is provided in Appendix 1.

3.1.1. Survey Period

Surveys were conducted between the last week of May (26th May 2018) and the end of the second week of July (16th July 2018), with at least one visit in June and visits at least 3 weeks apart. The first visit was completed between 26th May and 17th June (ideally within the first two weeks of June), and the second visit between 18th June and 16th July (ideally within the second two weeks of June).

3.1.2. Surveyors

The survey team comprised Arcadian/Hampshire and Isle of Wight Wildlife Trust staff, Forestry Commission staff and volunteers, Natural England staff and both existing Trust volunteers and new recruits. A breakdown of transect coverage is provided in Table 1.

Table 1. Survey team

Surveyor Type	Number of Transects / Survey Areas
Arcadian Ecology / Hampshire & Isle of Wight Wildlife Trust	38
Forestry Commission	43
Volunteer – Natural England	17
Volunteer – experienced bird surveyor with Trust	56
Volunteer – new recruit	46

3.1.3. Survey Area

Surveys were conducted within the New Forest National Park boundary (Map 1), covering the whole of the New Forest common land which includes land under management of the National Trust, Hampshire County Council and Wellow Parish Council. This followed the same structure used in the 2013 survey (RPS 2013). To allow comparison of results between this survey and the 2013 survey, the same transect routes were also followed; 152 transects were identified, with additional areas being covered to fill in gaps in the current data and provide a more comprehensive survey. The transect routes were designed to pass within 200 metres of all suitable habitat types (Map 2).

3.2. Data Analysis

Maps were submitted in either paper or electronic (scan or photo) format for entry into MapInfo GIS software.

The locations of all observed activity were entered as points into GIS software. Visits 1 and 2 were colour coded differently, with only churring males mapped on the table. A second GIS table was created to show interactions between males to identify concurrently churring males and therefore two individuals for use during territory mapping, and other observed or heard activity such as flying, wing clapping and 'coo-ick' calls.

Individual territories were identified using the analysis employed by Conway *et al.* (2007) and RPS (Gates & Bull 2013). A buffer of 350 metres was created around the points of "churring" males, except where known topographical or structural features were present and likely to form a 'barrier', and clusters of registrations (churring males) indicative of territories mapped using polygons. These polygons were then converted into central points, representing the centre of territory. Grid references were extracted from these points.

Territories were mapped conservatively; therefore the number identified is likely to be the lowest possible number of territories.

The transect data was overlaid with a 1km square grid, to allow comparison of the data with both previous surveys on a local and national scale.

3.3. Constraints to survey

Practical issues identified during the surveys comprised road/traffic noise affecting being able to hear clearly, disturbance from other forest users (human and animal) and sound orientation when lots of trees were present.

The weather is likely to have had an impact of nightjar presence this year, affecting the period when they are migrating to the UK. There was a very cold snap at the beginning of Spring, with April being unsettled and unseasonably cool following the snow and cold easterly winds experienced in March. The weather started to pick up during May, becoming sunny and warm following a cool and unsettled start to the month, this trend continued throughout the remaining survey period until mid-July.

As multiple surveyors were utilised there is the risk of inconsistency between surveyors, however all were provided with a standardised methodology and were experienced bird surveyors, reducing the likelihood of errors.

There were some issues with commitment of volunteers, with some sites not being completed even though surveyors had agreed to do them. Although numerous attempts to contact the volunteers to confirm they had been done, of the 152 transects to be completed, we are missing data for four transects, and thirteen transects only had one visit completed; all remaining transects had two visits. This will have resulted in some males potentially being missed and a slight underestimate of the number of territories. The mean number of territorial male nightjars present per transect is 2.6 and the mode number is 2 territorial males per transect, with a range of no nightjars being present to one site with nine males on a single transect. Based on this, it is estimated that 8 to 11 territories could have been missed.

4. RESULTS

4.1. 2018 Survey

Surveys were completed on 148 transects, in addition, we have received data for an additional 47 areas / transects.

The breeding population of nightjar in the New Forest in 2018 is 435, based on territorial males. This is equivalent to 9.3% of the UK population, based on the 2004 national survey identifying 4606 territorial males. Of these, 303 were within the open forest/HLS area.

Table 2 provides a breakdown of the number of territories by landownership area.

Table 2. Breakdown of number of territories by area

	Number of nightjar territories
Forestry Commission	382
Wellow Parish Council	1
National Trust	35
Hampshire County Council	4
Hampshire & Isle of Wight Wildlife Trust Reserve (Roydon Woods)	3
Private ownership	9
Outside NFNPA boundary	1

Territories are shown on Map 3 with territory centres on Map 4, and co-ordinates for territory centres are provided in Appendix 2. More detailed maps of territories and territory centres are provided in appendices 3 and 4, respectively.

Transposing the territory centres onto a 1km square grid, 214 squares have territory occupancy (of 661 1km squares at least partially within NFNPA boundary), plus one outside NFNPA boundary. This is equivalent to 32% of squares occupied. Based on the 2018 figures, there are approximately 2 individuals per occupied square kilometre.

4.2. Comparison with previous data

4.2.1. Population size

A comparison of the number of territorial males from previous studies, both national and within the New Forest, suggest that there has been a decline in numbers with approximately 20% fewer territories identified than in 2013 (reduction from 544 to 435; and within the open forest/HLS area from 441 to 303).

A comparison of the territory centres for 2013 and 2018 shows there is an overall reduction in density of territories, as illustrated on Map 5. There were particularly dense clusters of records in 2013 compared to 2018 around the north west of the survey area (Millersford Bottom and Stoney Quarry Bottom; Latchmore Bottom and Long Bottom), central west Forest (Harvest Slade Bottom), south west Forest (Wilverley Plain) and south east Forest (Stockhill Inclosure and Hawkley Inclosure).

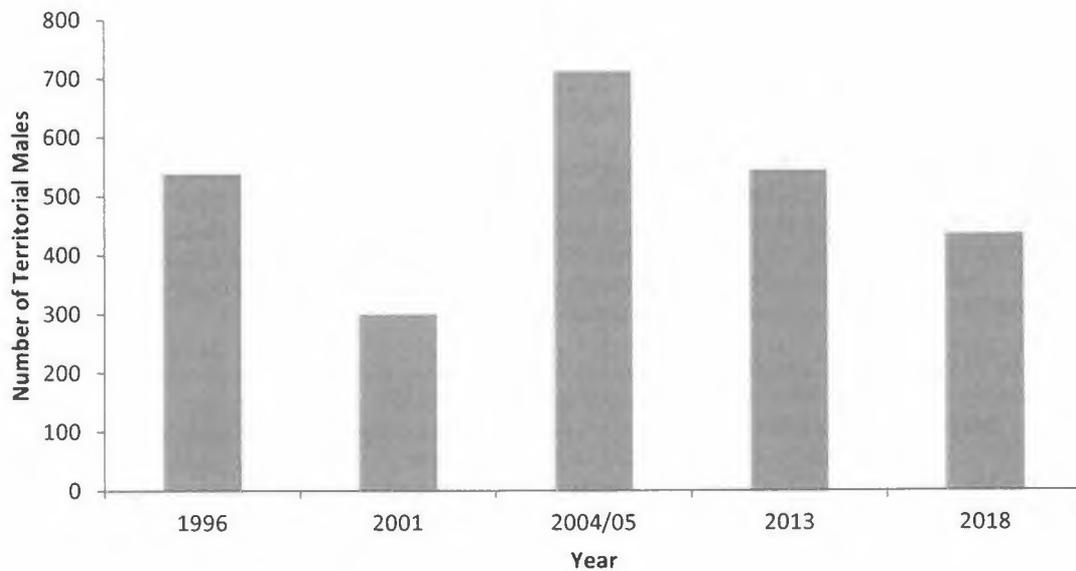


Figure 1. Number of territorial males recorded in the New Forest over time

4.2.2. Distribution

Analysis of distribution by 1km squares indicates that nightjar occupancy has remained constant from 2013 to 2018, with 209 squares and 214 square having territory occupancy respectively.

However, there has been a change in distribution. In 2013 distribution was more compact with territories focused on adjoining squares. However in 2018 the distribution of territories is more sparse, but this has also resulted in a slight range expansion into previously unoccupied 1km squares. This can be seen to the north of the forest in the Godshill area and in the centre of the forest around Lyndhurst, as shown on Map 5.

The density of territorial males per square kilometre has also reduced over this time from 2.6 in 2013 to 2 in 2018.

4.2.3. Comparison to sites outside the New Forest

Data for trends in nightjar populations on the Dorset Heaths and Thames Basin Heaths was investigated.

Analysis of data for nightjar on the Dorset Heaths suggests an average decline in numbers per year of 0.43% from 1991 to 2013, however there has been no significant increase or decrease in numbers (Fearnley & Liley 2014).

Results for Thames Basin Heaths indicate the numbers, although fluctuating from 306 at its lowest to 355 as its highest, have remained relatively stable during monitoring from 2010 to 2016 (2Js Ecology 2016).

5. ASSESSMENT OF CURRENT STATUS

The 2018 surveys suggest that the New Forest nightjar population has suffered a significant decline since the previous national and targeted surveys of the Forest.

In addition, comparison with data from neighbouring nightjar sites of the Dorset and Thames Basin heaths indicates these populations are relatively stable compared with the New Forest population. Although it must be noted that this data is collected on an annual basis and does not contain recent data, covering the periods 1991 to 2013 and 2010 to 2016 respectively. The collation of annual data enables more accurate assessment in population trends, as it allows for anomalies in the data to be identified and explained, such as extreme weather events.

This year may not have provided an accurate representation of nightjar numbers for comparison to the baseline data as the poor weather in April may have affected nightjar migration and consequently reduced the number of breeding nightjar this year. The assessment that the population has declined also makes the assumption that the 2004 and 2014 surveys carried out within the New Forest produced an accurate assessment of the New Forest nightjar population. There is currently no other data available for other sites for 2018 to assess if there has been a similar trend elsewhere.

6. CONCLUSION

The survey suggests that nightjar numbers are declining in the Forest when compared to the 2004/05 and 2013 survey data, but that there has been a slight expansion in range. However, the number of territorial males (as a representation of breeding pairs) still exceeds the SPA target of 300 breeding pairs (8.8% of the breeding population in Great Britain (JNCC 2004)).

The reduction in territories appears to be across the whole of the New Forest, when compared to the territory centres identified during the 2013 survey. As thirteen transects had only one visit, and four transects were not completed, this has the potential to have slightly underestimated the number of territories present (8 to 11 territories based on the mean and mode number of territorial males per transect). However, taking this in to consideration the numbers would still be significantly less than the 2013 survey.

The purpose of this study was to assess the current trend in the New Forest nightjar population compared to previous local and national surveys, and not the possible cause and effect of the population trend. However, some of the potential causes have been identified below, both localised and national/international, as to why the population may have declined from the previous surveys in order to identify areas for further investigation and highlight the requirement for additional surveys. The list of possible causes is not considered exhaustive, there may be other factors influencing the number of nightjars that have not been identified or considered.

The decline may be due to the unusual weather events during the spring of 2018 resulting in a lower number of birds returning to the Forest. It is therefore recommended that further surveys are carried out at regular intervals to establish if this is a declining trend or the consequence of one-off factors such as weather events. Further survey work and additional assessment of localised factors such as changes to habitat type, grazing density and recreational use of areas will also help to establish whether there is a correlation between the decline and other factors. These additional surveys may also help to identify whether there are local mitigation measures that might help to reverse the decline.

The changes in 1km square occupancy also require further investigation to identify potential causes. An expansion in distribution would suggest that those areas previously occupied have become "saturated", having reached carrying capacity and are no longer able to support any more individuals. However, as the numbers have declined since the previous survey, other factors may be influencing this change. Possible areas to consider are:

- localised changes to habitat type e.g. recently felled conifer plantations and heathland restoration which may have created new areas of suitable habitat for nightjars to extend into whilst others through a process of succession have started to become less favourable;
- localised changes to management practices such as grazing intensity to identify if there is a link between the previous and current square occupancy and management practices, and whether these have had a positive, negative or no impact;
- recreational pressure and disturbance, to identify if there has been a change in potential levels of disturbance.

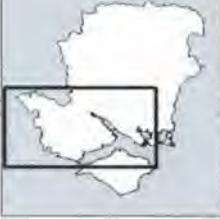
When available a comparative desk assessment of 2018 nightjar survey data from sites outside of the New Forest should also be carried out, to establish if weather is the likely cause of the decrease in territorial males, or if the decline is confined to the New Forest with the cause more likely to be attributable to local factors.

7. REFERENCES

- **2Js Ecology (2016).** 2016 Thames Basin Heaths Special Protection Area Annex 1 bird survey results
<https://surreyheath.moderngov.co.uk/documents/s8821/2016%20Thames%20Basin%20Heaths%20Special%20Protection%20Area%20Annex%201%20bird%20survey%20results.pdf>
[accessed 21st September 2018]
- **Conway, G., Wotton, S., Henderson, I., Langston, R., Drewitt, A. & Currie, F. (2007).** Status and distribution of European Nightjars *Caprimulgus europaeus* in the UK in 2004. *Bird Study*, 54:1, 98-11
- **Fearnley, H. & Liley, D. (2014).** Trends in Nightjar, Woodlark and Dartford Warbler on the Dorset Heaths, 1991 – 2013. *Footprint Ecology*
- **Forestry Commission** Nightjar <https://www.forestry.gov.uk/forestry/nightjar> [accessed 7th August 2018]
- **Gates, N. & Bull, A. (2013).** New Forest Nightjar Report. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016. RPS, St Ives.
- **JNCC (2004).** New Forest SPA <http://jncc.defra.gov.uk/page-2035-theme=default> [accessed 18th September 2018]
- **Langston, J., Lowen, J. and Liley, D. (2008).** Changing patterns of visitor numbers within the New Forest National Park, with particular reference to the New Forest SPA. Unpublished report, Footprint Ecology, Wareham
- **RSPB** Nightjar <https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/nightjar/>
[accessed 7th August 2018]
- **RSPB Wildlife and Countryside Act** <http://www.rspb.org.uk/forprofessionals/policy/wildbirdslaw/birdsandlaw/wca/index.aspx>
[accessed 7th August 2018]

MAPS

Location within county



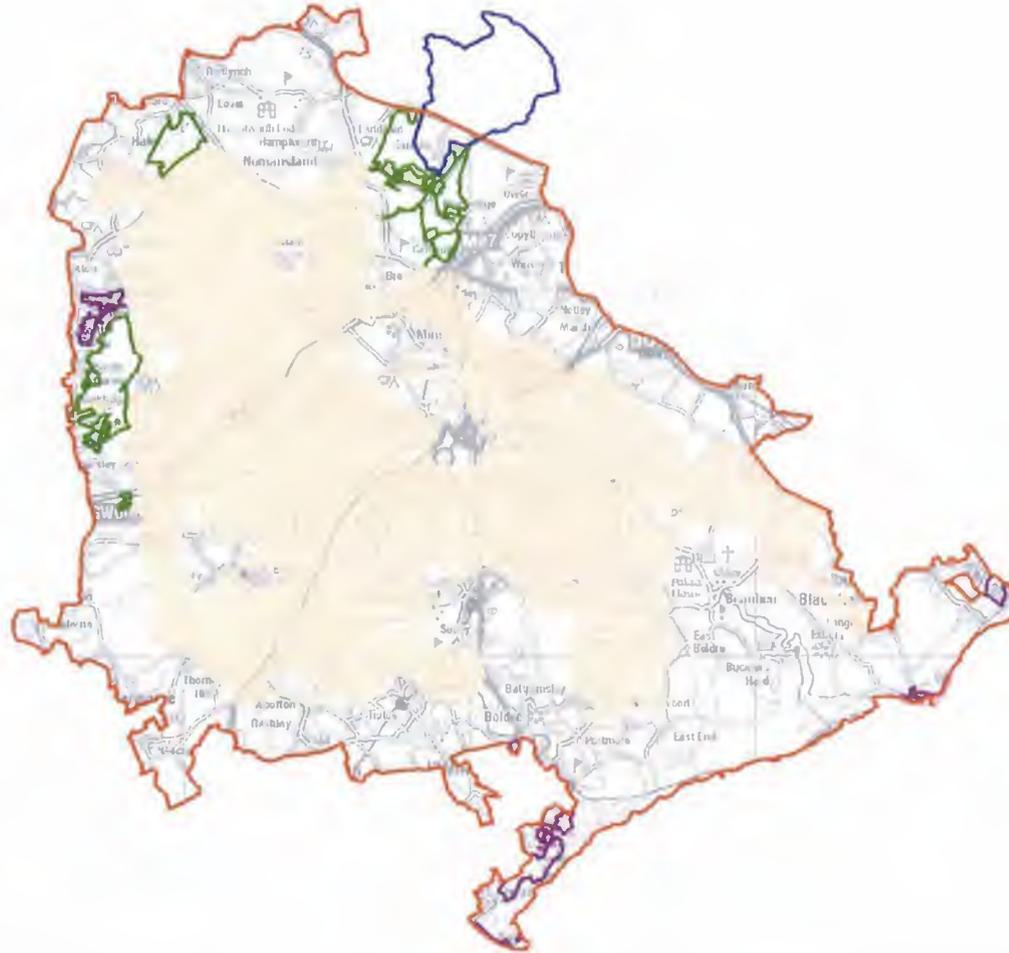
Map 1. Survey Area

New Forest Nightjar Survey

Scale 1:250000



-  New Forest National Park Boundary
-  FC Crown Land
-  Hampshire County Council
-  National Trust
-  Wellow Parish Council



Location within county



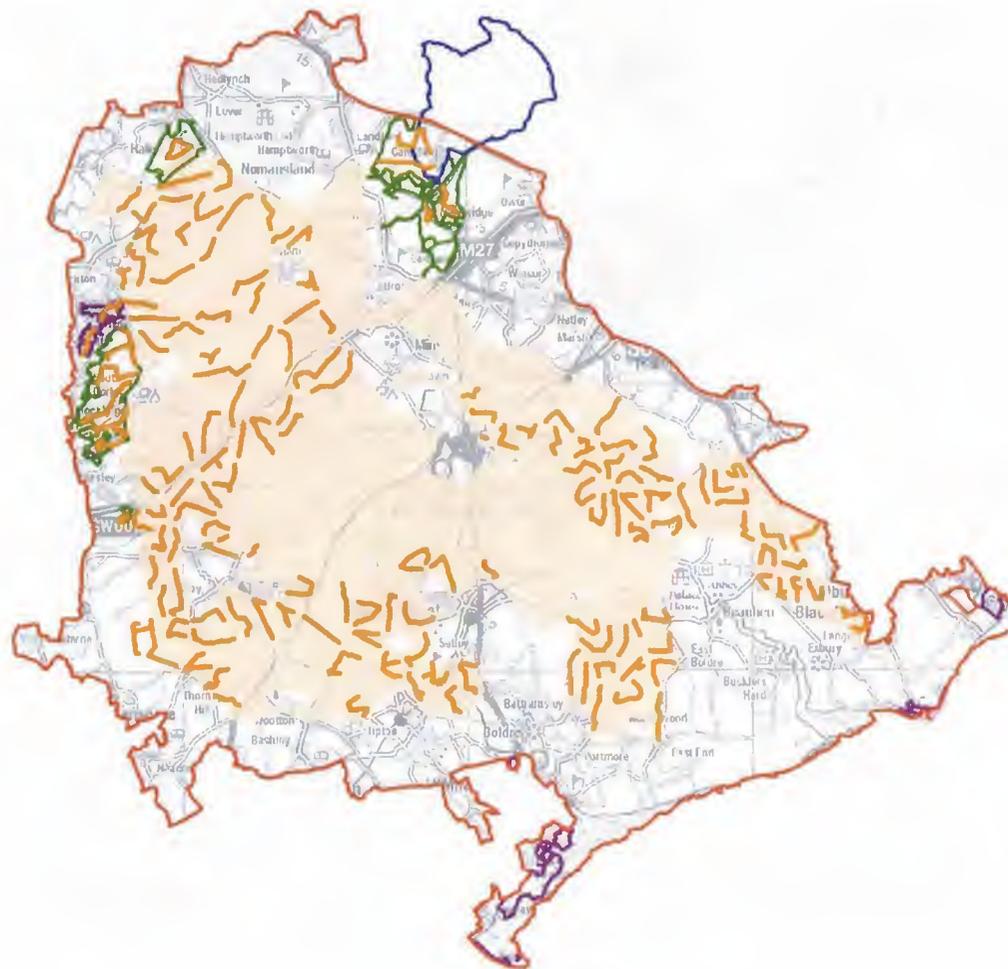
Map 2. Transect Routes

New Forest Nightjar Survey

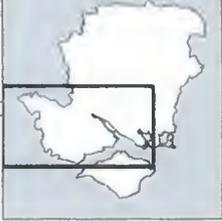
Scale 1:250000



-  New Forest National Park Boundary
-  FC Crown Land
-  Hampshire County Council
-  National Trust
-  Wellow Parish Council
-  Transect Routes



Location within county



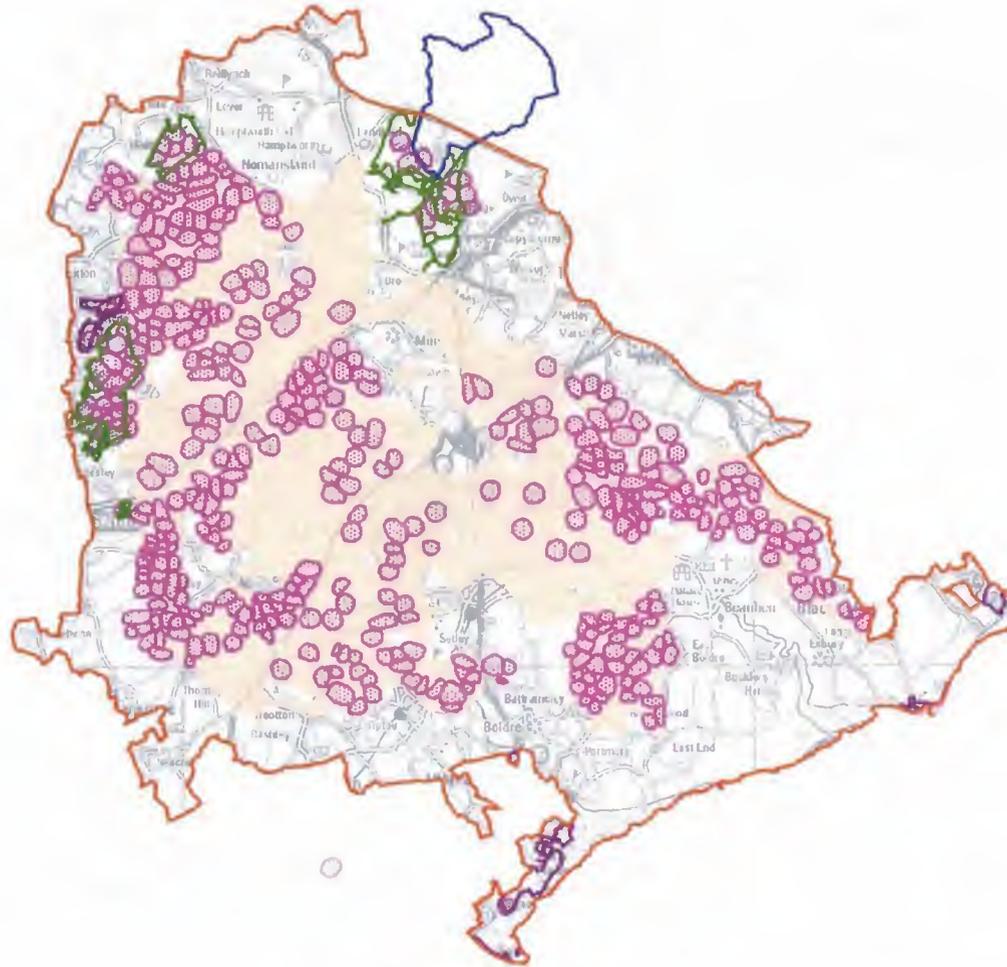
Map 3. Nightjar Territories

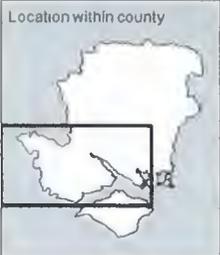
New Forest Nightjar Survey

Scale 1:250000



-  New Forest National Park Boundary
-  FC Crown Land
-  Hampshire County Council
-  National Trust
-  Wellow Parish Council
-  Nightjar Territories





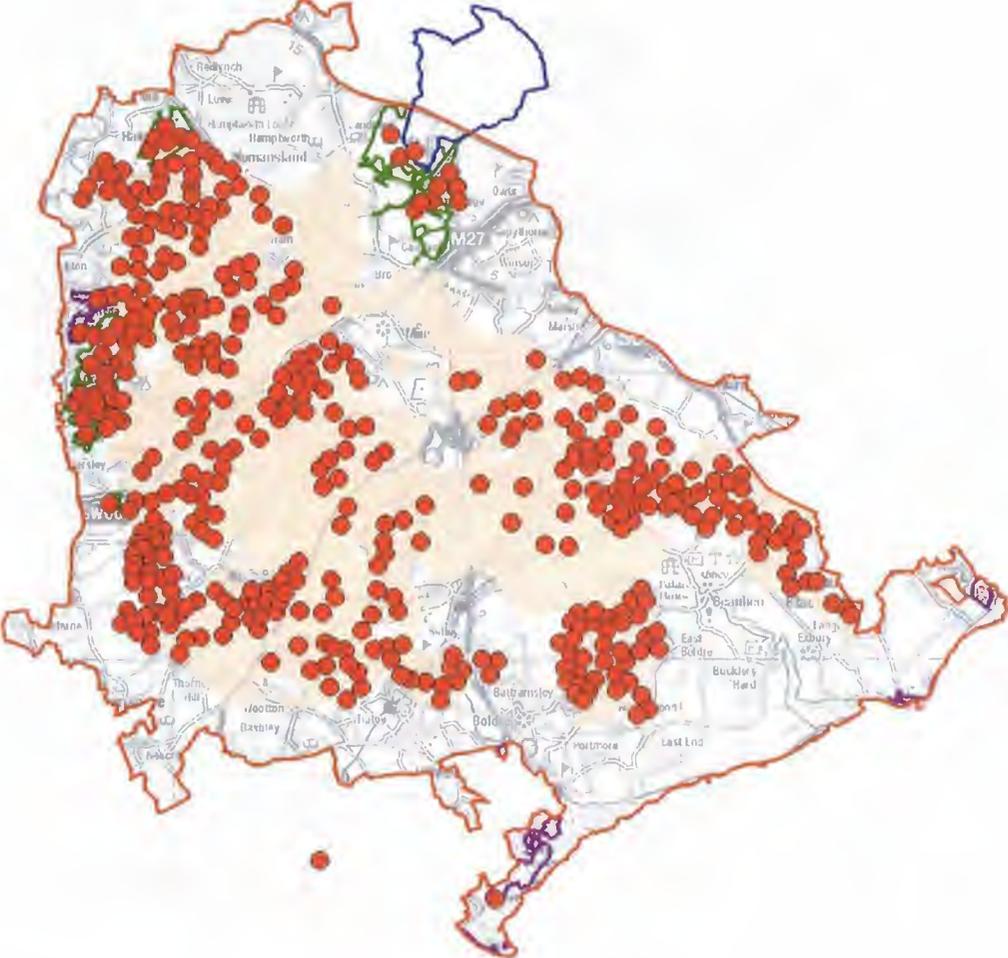
Map 4. Nightjar Territory Centres

New Forest Nightjar Survey

Scale 1:250000



-  New Forest National Park Boundary
-  FC Crown Land
-  Hampshire County Council
-  National Trust
-  Wellow Parish Council
-  Nightjar Territory Centres



Map reproduced by Hampshire and Isle of Wight Wildlife Trust Crown Copyright 2018 OS 1000 15632 Unauthorised reproduction infringes Copyright and may lead to prosecution or civil proceedings
 British Crown and MannaFind Ltd All rights reserved BAP Priority habitat, notable species and SINC data supplied by the Hampshire Biodiversity Information Centre on behalf of the HBIC Partnership Aerial photography courtesy of GetMapping plc
 Produced on 25 September 2018 by Sarah Jackson For enquires relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk tel: 01489 774455

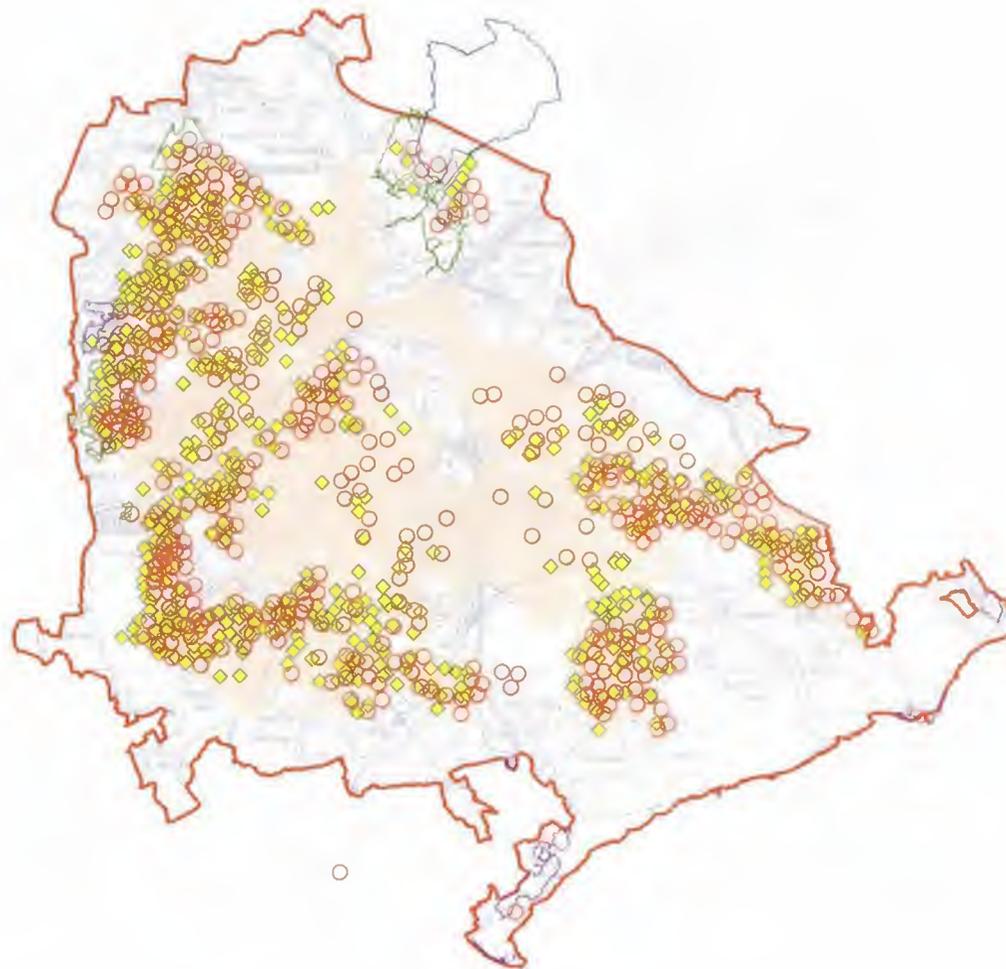
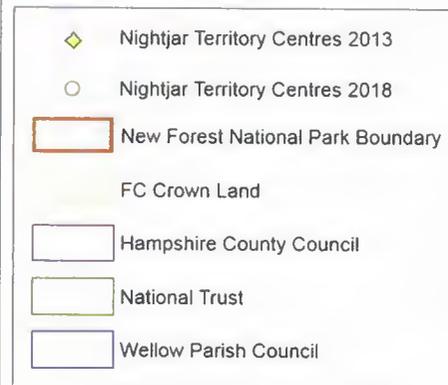
Location within county



Map 5. Nightjar Territory Centres: 2013 vs 2018

New Forest Nightjar Survey

Scale 1:250000



Location within county



Map 6. 1km Square Occupancy

New Forest Nightjar Survey

Scale 1:250000



-  2018 Occupied 1km Squares
-  2013 Occupied 1km Squares
-  New Forest National Park Boundary

