# Southern Damselfly Repeat Survey Programme Report

Eastleigh Borough

**Dr Ben Rushbrook**

**September 2018**

## Acknowledgements

Arcadian Ecology & Consulting Ltd was appointed to deliver this work by Eastleigh Borough Council. The author would like to thank Graham Tuck (Eastleigh Borough Council) for providing support, background information and guidance throughout this project. The author would also like to thank Dominic Plumpton (Giles Wheeler-Bennett) and Nigel Shannon (Highwood) for assistance with access arrangements.

The author would like to thank Kevin Young and Marco Bartolini for conducting surveys as part of the Itchen Valley Country Park monitoring study.

Finally, the author would like to thank all the respective landowners and angling clubs for allowing access to undertake this work.

## Publication Details

This document should be cited as: Rushbrook, B. (2018). *Southern damselfly repeat survey programme report: Eastleigh Borough*. Arcadian Ecology & Consulting Ltd, Curdridge.

Arcadian Ecology & Consulting Ltd is a wholly owned subsidiary of Hampshire & Isle of Wight Wildlife Trust.



Front Cover: Pair of copulating southern damselfly at Allington Manor Farm.

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

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

## Document Control

| Version | Author name | Date | Signed off by | Date |
|---|---|---|---|---|
| *Draft* | *Ben Rushbrook* | *06/09/2018* | *Carmen Green* | *07/09/2018* |
| *Final* | *Ben Rushbrook* | *07/09/2018* | *Carmen Green* | *07/09/2018* |

# Executive Summary

Arcadian Ecology & Consulting Ltd (hereafter 'Arcadian Ecology') was appointed by Eastleigh Borough Council in 2017 to conduct a survey and habitat assessment for southern damselfly *Coenagrion mercuriale* at known and potential sites associated with the River Itchen Site of Special Scientific Interest (SSSI) / Special Area of Conservation (SAC). The results of this study were reported in Arcadian Ecology's report titled '*Southern damselfly survey and habitat assessment study: Eastleigh Borough'* (Rushbrook, 2018a).

Arcadian Ecology were subsequently appointed by Eastleigh Borough Council to repeat adult count surveys in 2018 at those sites where southern damselfly had been recorded during the aforementioned study (Rushbrook, 2018a).

The results of adult count surveys conducted in 2017 and 2018 were considered in combination with the data collected as part of an on-going, long-term monitoring study at Itchen Valley Country Park. This allowed for a robust assessment of the relative strength of the southern damselfly populations within, and immediately north of, the Eastleigh Borough boundary, and by association an assessment of their value and / or importance for the Itchen Valley southern damselfly metapopulation.

Interrogation of the data collected during the two adult count survey programmes identified Highbridge Farm and Allington Manor Farm as key sites within the study area, with transects from these sites consistently present in the top ten ranked transects for abundance and density in 2017 and 2018. Furthermore, the inclusion of transects from land behind GW Martin, Ashtrim Nursery, Breach Farm and Itchen Valley Country Park within these rankings provided further evidence of the relative importance of these sites for southern damselfly populations within and adjacent to the Eastleigh Borough boundary, as well as the wider Lower Itchen Valley metapopulation.

Though it is acknowledged that caution must be exercised when drawing conclusions from the data collected throughout the Itchen Valley Country Park monitoring study, it is considered that the data is valuable in identifying substantial differences in data returned between years, and for the assessment of the overall strength of the southern damselfly population at Itchen Valley Country Park.

Long-term annual count data collected from Itchen Valley Country Park between 1999 and 2018 inclusive shows that, following a period of notable fluctuation (i.e. 1999 to 2004 inclusive), there was a sharp decline in the number of southern damselfly recorded between 2005 and 2013, with little recovery in the total counts over the following four survey seasons. However, there was a notable increase in the total numbers of southern damselfly recorded in 2018 in comparison with recent years, although numbers remain substantially lower (less than half) than the total counts recorded in the early 2000's.

Based on the results of the two years of adult count surveys and the data from the Itchen Valley Country Park monitoring study, it is considered that only Highbridge Farm, Allington Manor Farm, and (when considering the site in its entirety) Itchen Valley Country Park support strong populations of southern damselfly located in, and immediately adjacent to, the Eastleigh Borough boundary. These sites are therefore considered the three most important or key sites within this study area, with Highbridge Farm also considered strategically very important in connecting sites across the wider Itchen Valley metapopulation.

Furthermore, Ashtrim Nursery, land behind GW Martin, Breach Farm, land owned by Bishopstoke Fishing Club and (to a lesser degree) West Horton are also considered to be potentially important sites. This is due in part to the intrinsic value of the predominately medium strength populations they support, but also a consequence of their strategic location, potentially facilitating southern damselfly dispersal between the three key sites, thereby increasing the resilience and robustness of the Lower Itchen Valley metapopulation.

However, the vast majority of male southern damselfly recorded during each of the two adult count survey programmes were encountered at only a small number of sites, with Highbridge Farm and Allington Manor Farm accounting for 83% and 64% of all males recorded during the 2017 and 2018 surveys respectively. Therefore, given the localised distributions of the majority of males, the

unsuitability of the majority of other sites / transects visited in the original study (Rushbrook, 2018a), and the inherently limited dispersal capabilities of the species, the distance between sites supporting strong and / or medium strength populations is considered to be highly concerning. Furthermore, despite the more positive survey results returned in 2018, there remains evidence that there has been a decline in population strength at both Itchen Valley Country Park and West Horton Farm in the past 10 – 20 years. These findings indicate that southern damselfly have become localised and are therefore at increased risk of, or potentially already suffering a decline in, the strength of the metapopulation in and around Eastleigh Borough. It is therefore considered that urgent conservation action is required for this species across the study area.

It is therefore strongly recommended that consideration is given to the range of habitat enhancement and creation options identified within, and immediately adjacent to the Eastleigh Borough boundary, set out in the recently published '*Strategic conservation plan for southern damselfly Coenagrion mercuriale: habitat enhancement and creation opportunities in and adjacent to Eastleigh Borough*' (Rushbrook, 2018b). This document allows for an informed and considered approach to be adopted to southern damselfly conservation in and around the borough. This may be achieved proactively through the planning system (either through Eastleigh Borough Council's commitment to secure net biodiversity gain or as direct mitigation / compensation for the effects of development on this species), and / or more reactively as and when opportunities arise.

However, as set out in the strategic conservation plan (Rushbrook, 2018b), it is emphasised that collaboration between local authorities, statutory bodies and non-statutory conservation bodies is essential to successfully deliver this strategic conservation plan for southern damselfly. These organisations must work closely with land managers / stakeholders to facilitate the delivery of long-term conservation measures for southern damselfly and, where opportunities arise, secure land for the purpose of the delivery of the identified habitat enhancement and creation proposals. This approach will address a number of constraints identified with the delivery of the proposed habitat enhancement and creations works at some sites, and will be fundamental in maximising the extent and value of the habitat specific conservation measures delivered for southern damselfly within and beyond the Eastleigh Borough boundary.

# Table of Contents

**1. INTRODUCTION ..... 5**
1.1 Background ..... 5
1.2 Study Area ..... 5
1.3 Southern Damselfly ..... 5
*1.3.1 Ecology ..... 5*
*1.3.2 Status and Legislation ..... 5*
1.4 Remit and Scope of the Report ..... 7
**2. METHODOLOGY ..... 8**
2.1 Site and Transect Selection ..... 8
2.2 Field Survey ..... 8
*2.2.1 Adult count surveys ..... 9*
*2.2.2 Itchen Valley Country Park monitoring study surveys ..... 9*
2.3 Survey Limitations ..... 10
*2.3.1 Adult count surveys ..... 10*
*2.3.2 Itchen Valley Country Park monitoring study surveys ..... 10*
2.4 Data Analysis ..... 11
**3. RESULTS ..... 12**
3.1 Adult Count Surveys ..... 12
3.2 Itchen Valley Country Park Monitoring Study ..... 12
**4. COMPARATIVE ANALYSIS ..... 16**
4.1 Adult Count Surveys ..... 16
4.2 Itchen Valley Country Park Monitoring Study ..... 18
**5. BISHOPSTOKE FISHING CLUB LAND ..... 23**
5.1 Site Description ..... 23
5.2 Adult Count Surveys ..... 23
*5.2.1 Southern damselfly ..... 23*
*5.2.2 Other Odonata ..... 23*
**6. HIGHBRIDGE FARM ..... 26**
6.1 Site Description ..... 26
6.2 Adult Count Surveys ..... 26
*6.2.1 Southern damselfly ..... 26*
*6.2.2 Other Odonata ..... 28*
**7. BREACH FARM ..... 29**
7.1 Site Description ..... 29
7.2 Adult Count Surveys ..... 29
*7.2.1 Southern damselfly ..... 29*
*7.2.2 Other Odonata ..... 29*
**8. LAND BEHIND GW MARTIN ..... 31**
8.1 Site Description ..... 31
8.2 Adult Count Surveys ..... 31
*8.2.1 Southern damselfly ..... 31*
*8.2.2 Other Odonata ..... 31*
**9. ASHTRIM NURSERY ..... 34**

9.1 Site Description ..... 34
9.2 Adult Count Surveys ..... 34
*9.2.1 Southern damselfly ..... 34*
*9.2.2 Other Odonata ..... 34*
**10. DUNFORD'S LAND ..... 36**
10.1 Site Description ..... 36
10.2 Adult Count Surveys ..... 36
*10.2.1 Southern damselfly ..... 36*
*10.2.2 Other Odonata ..... 36*
**11. WEST HORTON FARM ..... 39**
11.1 Site Description ..... 39
11.2 Adult Count Surveys ..... 39
*11.2.1 Southern damselfly ..... 39*
*11.2.2 Other Odonata ..... 41*
**12. ALLINGTON MANOR FARM ..... 42**
12.1 Site Description ..... 42
12.2 Adult Count Surveys ..... 42
*12.2.1 Southern damselfly ..... 42*
*12.2.2 Other Odonata ..... 44*
**13. ITCHEN VALLEY COUNTRY PARK ..... 45**
13.1 Site Description ..... 45
13.2 Adult Count Surveys ..... 45
*13.2.1 Southern damselfly ..... 45*
*13.2.2 Other Odonata ..... 45*
13.3 Itchen Valley Country Park Monitoring Study ..... 47
**14. SUMMARY AND DISCUSSION ..... 50**
14.1 Adult Count Surveys ..... 50
14.2 Itchen Valley Country Park Monitoring Study ..... 50
14.3 Discussion ..... 51
**15. REFERENCES ..... 54**

## MAPS

Map 1. Location of all survey sites.
Map 2. Transects supporting southern damselfly in 2018.

## APPENDICES

Appendix 1: Comparison of relative abundance (males) and density (males per 100m) for all transects included within both 2017 and 2018 adult count survey programmes.
Appendix 2: Results and weather conditions during all adult count surveys conducted in 2017.

# 1. INTRODUCTION

## 1.1 Background

Arcadian Ecology & Consulting Ltd (hereafter 'Arcadian Ecology') was appointed by Eastleigh Borough Council in 2017 to conduct a survey and habitat assessment for southern damselfly *Coenagrion mercuriale* at known and potential sites associated with the River Itchen Site of Special Scientific Interest (SSSI) / Special Area of Conservation (SAC). The results of this study were reported in Arcadian Ecology's report titled '*Southern damselfly survey and habitat assessment study: Eastleigh Borough'* (Rushbrook, 2018a).

Arcadian Ecology were subsequently appointed by Eastleigh Borough Council to repeat adult count surveys in 2018 at those sites where southern damselfly had been recorded during the aforementioned study (Rushbrook, 2018a).

## 1.2 Study Area

The study area (Map 1) agreed with Eastleigh Borough Council focused specifically on those sites where adult (male) southern damselfly were recorded during the survey and habitat assessment study conducted in 2017 (Rushbrook, 2018a).

## 1.3 Southern Damselfly

### *1.3.1 Ecology*

A detailed description of the ecology of southern damselfly is provided in Rushbrook (2018a), and a detailed account of the habitat requirements of southern damselfly on lowland heath and chalk river systems in Rouquette (2005). The specific optimal characteristics of these habitat features vary slightly between adults and larvae (Rouquette, 2005), though for ease of reference the key habitat features for a site to support strong numbers of southern damselfly include (illustrated in Figures 1 and 2):

- Shallow, well oxygenated, base-rich water;
- A constant (perennial) slow to moderate flow of water;
- Channel substrate consisting primarily of silt and detritus;
- Presence of a broad fringe of herbaceous emergent dicotyledon plants along margins;
- Presence of some areas of open water; and
- Largely (but not necessarily completely) unshaded by bankside shrubs and trees.

### *1.3.2 Status and Legislation*

A detailed account of the status and legal protection afforded to southern damselfly is provided by Rushbrook (2018a). However, for ease of reference, a summary of this information is provided below.

The southern damselfly is one of Europe's and Britain's rarest and most threatened damselflies (Thompson *et al*., 2003a). As a consequence of its global and national decline (Thompson *et al*., 2003a; Boudot, 2006), southern damselfly are protected under European and national legislation.

The UK populations of southern damselfly are considered to comprise a significant proportion of the European total. This species has a fragmented distribution in the UK, restricted to the south and west, with major strongholds occurring in the New Forest, the Preseli Hills in Pembrokeshire, and on the Itchen and Test valleys in Hampshire (Thompson *et al*., 2003a; Rouquette, 2005). Smaller colonies exist in Devon, Dorset and the Gower Peninsula, and single populations are present in both Anglesey and Oxfordshire (Thompson *et al*., 2003a).

The River Itchen is of national and international significance for this species (Thompson *et al*., 2003a; Rouquette, 2005). The importance of this population is reflected by its inclusion in the River Itchen SSSI citation, and its identification as one of the primary reasons for the designation of the River Itchen SAC. However, recent studies have identified an increase in the fragmentation, and an associated decline in the extent and resilience, of the Itchen Valley metapopulation (Rouquette, 2005; Rushbrook, 2018a; 2018b).

**Figure 1:** Suitable southern damselfly habitat on a small floodplain ditch at Ashtrim Nursery.

**Figure 2:** Suitable southern damselfly habitat at the margin of the main River Itchen at Highbridge.

Furthermore, the historic water meadow network at Itchen Valley Country Park supports a population of southern damselfly considered to be of national importance (Thompson, 2003a), and with Allington Manor Farm and (to a lesser degree) West Horton Farm, was considered to be an important population 'complex' in the lower Itchen Valley (Rouquette, 2005). However, recent studies have indicated a potential decline in the strength of this population 'complex', and it is considered that urgent conservation action for this species is required at this site (Rouquette, 2005; Rushbrook, 2018b).

## 1.4 Remit and Scope of the Report

This report presents the findings of a repeat adult (male) count survey programme for southern damselfly, focusing on those sites where adult (male) southern damselfly were recorded during a survey and habitat assessment study conducted on behalf of Eastleigh Borough Council in 2017 (Rushbrook, 2018a). It also presents an updated assessment of the results of an on-going monitoring study at Itchen Valley Country Park, including data collected between May and August 2018.

It is intended that the findings of this report will supplement the findings of the aforementioned study (Rushbrook, 2018a). The combined results will be used to provide a robust assessment of the relative strength of the southern damselfly populations within, and immediately north of, the Eastleigh Borough boundary, and by association an assessment of their value and / or importance for the Itchen Valley southern damselfly metapopulation.

# 2. METHODOLOGY

## 2.1 Site and Transect Selection

All sites found to support southern damselfly during the survey and assessment study (Rushbrook, 2018a) were included within the repeat survey programme, with the exception of Withy Meadows and Morris' Land. These sites were excluded from the study since it was concluded that the males recorded at these sites (a single and two males respectively) were most likely transient individuals, and that both sites were considered to currently be unsuitable for southern damselfly (Rushbrook, 2018a). Furthermore, two transects at Highbridge Farm, specifically transects 2c and 32, were excluded from the repeat study as it was also considered that males recorded on these transects in 2017 were most likely transient individuals, since these transects were considered to currently be unsuitable and largely unsuitable for southern damselfly respectively.

Repeat surveys were limited to the remaining transects at each site found to support southern damselfly during the surveys conducted in 2017 (Rushbrook, 2018a), with two exceptions. An additional transect was added to land owned by the Bishopstoke Fishing Club and Itchen Valley Country Park, both representing sections of the main channel of the River Itchen. It had been agreed with Eastleigh Borough Council that main river channels would predominately be excluded from the original study (Rushbrook, 2018a), as proposals to be included within the strategic planning for southern damselfly conservation would be focused on carrier streams and other floodplain channels (Rushbrook, 2018b). However, sections of the main channel of the River Itchen around Highbridge had been included given their strategic importance for this species (Rushbrook, 2018a), and the inclusion of these two additional sections was considered important for the reasons outlined below.

No southern damselfly were recorded on the floodplain ditches surveyed on land owned by the Bishopstoke Fishing Club in 2017, and the habitat present was considered unsuitable or largely unsuitable for this species. However, reports were received that southern damselfly had been recorded on the main river channel during early June 2018 and, given its location immediately upstream of the important reach of main river channel that flows through Highbridge Farm, its inclusion within this study was considered to be highly relevant.

Conversely, Itchen Valley Country Park is itself considered to support a nationally important population of southern damselfly (Rushbrook, 2018b). However, given concerns that the population at this site was in decline, and its proximity to one of four main road transport routes at or adjacent to the borough boundary (i.e. the A27), it was considered that the inclusion of a suitable section of main river channel located at the southern boundary of Itchen Valley Country Park may provide important current and baseline data.

The specific locations of all 13 sites included within the original study (Rushbrook, 2018a) are shown on Map 1, with the extent of 200m buffer zones for the four main road transport routes that cross the River Itchen SAC provided. It should be noted that the most northerly buffer zone represents the route of re-aligned Highbridge Road, based on information provided to the author in December 2017.

Finally, desktop analysis of data collected during an on-going, long-term monitoring programme of a number of ditches at Itchen Valley Country Park were included within the survey and assessment study (Rushbrook, 2018a). Arcadian Ecology was commissioned to co-ordinate the delivery of this monitoring programme in 2018, with the detailed findings of this work to be provided in a separate report (Rushbrook, in prep). However, since the findings of this desktop study was used in the assessment of the population strength of southern damselfly at Itchen Valley Country Park in the original survey and assessment study (Rushbrook, 2018a), it is appropriate to both include a summary of the findings of the monitoring study here, and consider the findings of this work when assessing the current strength of the southern damselfly population at this site.

## 2.2 Field Survey

All repeat adult count surveys were completed by Dr Ben Rushbrook (MCIEEM; licence holder) under Natural England Licence 2018-35529-SCI-SCI. Appropriate biosecurity measures were implemented prior to, during, and after each survey visit to minimise the risk of transferring or transmitting non-native invasive species.

Itchen Valley Country Park monitoring study surveys were conducted by Dr Ben Rushbrook (under Natural England Licence 2018-35529-SCI-SCI), Kevin Young (under Natural England Licence 2018-34579-SCI-SCI) and Marco Bartolini (under Natural England Licence 2017-30801-SCI-SCI).

### *2.2.1 Adult count surveys*

The presence and number of adult Odonata encountered is strongly influenced by weather conditions at the time of recording, and the timing of the main flight period can vary substantially from year to year. Adult southern damselfly have been recorded in Hampshire from late April to early October (Jenkins, pers. comm.), with the main flight period considered to extend from early June to late July (Taverner *et al*., 2004). Furthermore, across UK sites it is considered that peak counts are likely to be obtained during a four week period between 20th June and 18th July (Thompson *et al*., 2003b).

It was intended that all adult transect counts were conducted between 10:30am and 4pm British Summer Time (BST), with shade temperatures at least 17°C, at least 50% sunshine, and with wind speed not exceeding force 4 on the Beaufort scale.

Surveys consisted of slowly walking the entire length (where feasible) of all relevant transects. All species of Odonata within an area approximately 2m in front and encompassing the width of the watercourse were recorded (with the exception of main river channels where the area extended to the middle of the channel), and the number of males, copulating pairs and ovipositing females recorded (both those on the wing or resting on vegetation). It is considered that individual male numbers provide a better indication of relative population size than female numbers (Thompson *et al*., 2003b), since males spend almost every day of their mature adult lives at breeding sites, whereas females are only present during the time it takes to mate and lay a clutch of eggs.

Where identification was difficult, individuals were identified using close focusing binoculars or caught using a kite net if necessary. Particular care was taken to distinguish between southern damselfly, azure damselfly *Coenagrion puella* and common blue *Enallagma cyathigerum* damselfly, as these are similar in colouration and size. Exact numbers of male southern damselfly were recorded, with the abundance of other species represented by the following codes; A (single individual), B (2-5), C (6-20), D (21-100) and E (>100).

Other variables recorded for each transect were:

- start time;
- finish time;
- shade temperature;
- wind direction, predominate wind speed and maximum wind speed (Beaufort Scale); and
- % of sunshine.

### *2.2.2 Itchen Valley Country Park monitoring study surveys*

In contrast to the adult count surveys, where a single survey of each transect was conducted in one or both of 2017 and 2018, Itchen Valley Country Park monitoring study surveys were conducted on a weekly basis, commencing from the second Saturday in May. It was intended that surveys continued for either a fifteen week period or until the first nil count in August was recorded, whichever is later. However, given that numbers had reduced considerably from mid-July, and the very low total number of individuals recorded during the week fifteen survey, it was considered practical to terminate the programme at this point.

In contrast to the adult count surveys conducted in this study (see Section 2.2.1), all adult southern damselfly (i.e. not only males) encountered during Itchen Valley Country Park monitoring study surveys were recorded. Furthermore, in accordance with the methodology historically adopted for this study, ditch 1 was surveyed from a single bank due to access (i.e. transect 1a), whereas each bank was surveyed separately on ditches 3 and 4 (i.e. transects 3d & 3e and 4f & 4g), with the mean value of the two transect counts (rounded-up to the nearest whole number where necessary) considered to represent the number of individuals recorded on each of these ditches. This was then combined with the number of individuals recorded on ditch 1 / transect 1a to calculate the weekly total.

In accordance with the pre-established methodology for this study, it was intended that all surveys were conducted between 11am and 3pm British Summer Time (BST), with shade temperatures at least 16°C, at least 60% sunshine, and with wind speed not exceeding force 4 on the Beaufort scale.

## 2.3 Survey Limitations

### *2.3.1 Adult count surveys*

All transects were conducted within the main flight period for southern damselfly, at the recommended time of day, and met the recommended weather criteria with the exception of transect 4 at Itchen Valley Country Park (i.e. the new transect), when percentage sunshine did not exceed 50%.

Access to channel margins and / or a continuous view of the watercourse was restricted across a number of transects, either as a consequence of tall, dense bankside and bank top monocotyledon vegetation, or as a result of enclosed scrub and / or trees (for more details see Section 4.3.1 of Rushbrook, 2018a). The degree to which access and view was obscured was notably different between transects, and it is considered possible that these habitat characteristics would have resulted in a reduced encounter rate with southern damselfly. However, as set out in Rushbrook (2018a), these sections of channel are inherently unsuitable for southern damselfly, and therefore the restricted access is unlikely to have had a meaningful impact on the number of males recorded. Furthermore, levels of accessibility on all transects did not notably differ from that experienced during surveys conducted in 2017, and therefore did not prevent comparative analysis between years.

### *2.3.2 Itchen Valley Country Park monitoring study surveys*

All monitoring surveys were conducted at the recommended time of day, and met the recommended weather criteria, with the exception of the first survey visit when the temperature at the start of the survey was 15.7°C.

In week six of fifteen it became apparent that there was a small degree of divergence in the exact route that different surveyors had been walking when surveying transects 3e and 4g. The nature and resolution of this situation is explained in detail in the specific report for this study (Rushbrook, in prep), but is summarised below in the context of its implications for this study.

Further investigation identified that this had been the situation for a number of years, and potentially for the majority of the on-going monitoring study. However, as illustrated in Table 1 below, the overall transect length involved is relatively small. Furthermore, it is understood that historically the majority of surveys have been conducted following route A. Therefore, this route was adopted from week 8 onwards and, since they had been followed by the surveyor conducting surveys in weeks 6 and 7, it was only surveys conducted in weeks 1 – 5 that did not follow this route in 2018.

**Table 1:** Comparison of the two Itchen Valley Country Park monitoring study survey routes outlining their minor differences.

| Transect Number | Transect Length (m) | | Difference in Character of Transect |
|---|---|---|---|
| | Route A | Route B | |
| 1a | 230 | 230 | None – follows same route. |
| 3d | 170 | 170 | None – follows same route. |
| 3e | 165 | 180 | An additional 15m is walked along the length of the same watercourse. |
| 4f | 200 | 200 | None – follows same route. |
| 4g | 205 | 185 | First 100m follows the same route along a historic water meadow ditch, which historically has dried-up during a number of years; route A then continues to follow the route of this ditch, whereas route B follows the upper reach of the watercourse that forms transect 3d and 3e. |

It is therefore acknowledged that comparative analysis of southern damselfly numbers between years must be undertaken with caution, particularly given the additional constraints associated with the variability in the number of surveys conducted both between years, and between individual ditches within a limited number of specific years (i.e. 2012 and 2014), as set out in the original survey and habitat assessment report (Rushbrook, 2018a).

However, given the relatively small difference in the length of flowing channel surveyed between routes when considering the total survey length, and supported by the data analysis methods set out in Section 2.4, it is considered that the data is valuable in identifying substantial differences in data returned between years, and for the assessment of the overall strength of the southern damselfly population at Itchen Valley Country Park.

## 2.4 Data Analysis

All data analysis was performed using Microsoft® Excel 2010.

To allow for comparison of the relative value of those individual transects included in both the 2017 and 2018 adult count survey programmes, each transect was ranked both by abundance and by density for each year, with the transect returning the highest abundance / density within each year ranked as 1, the second highest as 2, and so forth.

The calculation of both means and median values was included in the assessment of the results of the Itchen Valley Country Park monitoring study to ensure that, when interpreting the average values collected, there was a consideration of the potential influence of the variability in the number of surveys conducted both between years, and between individual ditches within a limited number of specific years (i.e. 2012 and 2014).

# 3. RESULTS

The following section summarises the results of the repeat adult count surveys and the Itchen Valley Country Park monitoring study. Furthermore, based on the results of the survey programme conducted in 2018, it both provides an overview of the distribution and strength of southern damselfly numbers at each of the nine survey sites included within this repeat study (Map 1).

A more detailed analysis of the findings of surveys conducted at each of the nine sites is provided within the specific site accounts presented in Sections 5 – 13.

## 3.1 Adult Count Surveys

Repeat adult count surveys were conducted on 29 transects across nine survey sites (Table 2), with southern damselfly recorded on all transects surveyed (Maps 1 and 2). It is emphasised that the extents shown on Map 2 represent the full length of each transect and, in a number of instances, does not reflect the length that actually supported this species. This is clearly demonstrated when comparing the length of and densities (number of males recorded per 100m) returned for a number of transects (Table 2).

In total, 1,658 male southern damselfly were recorded across the 29 transects included within the repeat adult count survey programme (Table 2; Map 2). The greatest abundance of southern damselfly were recorded at Highbridge Farm, Allington Manor Farm and Breach Farm with 599, 467 and 229 males recorded at each site respectively. These three sites therefore account for over 78% of all male southern damselfly recorded across the repeat surveys. However, moderate numbers of individuals were also recorded at a number of sites, with 122, 80 and 67 individuals recorded at Itchen Valley Country Park, land behind GW Martin and West Horton Farm respectively, although the majority of individuals (>70%) at the latter were associated with a single transect (Table 2).

The density of southern damselfly recorded across the survey sites was largely consistent with the corresponding abundances recorded. The greatest densities of individuals were recorded on transects at Allington Manor Farm, Highbridge Farm and Breach Farm (Table 2), with moderate densities recorded on other transects at the former two sites. Moderate densities were also recorded on transects at West Horton Farm, Itchen Valley Country Park, land behind GW Martin and Ashtrim Nursery. However, density was not only highly variable between sites, but also demonstrated considerable differences within sites (Table 2), a reflection in the level and extent of suitable habitat present on each individual transect (see Table 3 and Appendix 3 of Rushbrook, 2018a).

Only a limited number of copulating pairs were recorded during the adult count surveys, and a single ovipositing female was observed at Allington Manor Farm and land behind GW Martin (Table 2). A list of other species of Odonata recorded during adult count surveys has been included within the site specific accounts provided in Sections 5 – 13.

## 3.2 Itchen Valley Country Park Monitoring Study

As explained in more detail in Section 2.3.2, given the recognition that there has been discrepancies in the exact transect routes surveyed, caution must be exercised when drawing conclusions from the data collected throughout the long-term monitoring study at Itchen Valley Country Park. However, as set out above, given the relatively small difference in survey routes, and supported by the data analysis methods set out in Section 2.4, it is considered that the data is valuable in identifying substantial differences in data returned between years, and for the assessment of the overall strength of the southern damselfly population at Itchen Valley Country Park.

A total of 721 southern damselfly were recorded across transects 1, 3 and 4 during the fifteen week survey programme (Table 3). Southern damselfly were recorded on all fifteen survey visits, with peak counts of 143 and 146 individuals recorded in weeks 4 and 5 respectively, though it is acknowledged that this was recorded following route B (see Section 2.3.2), when a greater length of suitable habitat on transects 3e and 4g was surveyed. However, relatively large numbers of individuals were also recorded in weeks 8 and 9 (Table 3), when the surveyor was following route A, indicating that that transect 4 was not the most influential transect determining the abundance of southern damselfly in the monitoring area.

**Table 2:** Results and weather conditions during all adult count surveys conducted in 2018 (red text indicates weather conditions were not met).

| Site Name & Transect No. | Transect Length (m) | Abundance (males) | Density (males per 100m) | Copulating Pairs | Ovipositing Females | Date | Start Time | Temp (°C) | Ave Wind Speed | Max Wind Speed | % Sunshine |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bishopstoke FC - T6 | 487 | 44 | 9.03 | 1 | 0 | 13/06/2018 | 14:22 | 20.7 | 2 | 4 | 100 |
| Highbridge Farm - T1 | 421 | 16 | 3.80 | 0 | 0 | 11/06/2018 | 10:33 | 19.7 | 2 | 3 | 100 |
| Highbridge Farm - T2a | 103 | 13 | 12.62 | 0 | 0 | 11/06/2018 | 11:32 | 22.8 | 2 | 3 | 80 |
| Highbridge Farm - T2b | 149 | 41 | 27.52 | 0 | 0 | 11/06/2018 | 11:52 | 22.8 | 2 | 4 | 90 |
| Highbridge Farm - T3 | 229 | 91 | 39.74 | 0 | 0 | 11/06/2018 | 12:39 | 23.3 | 3 | 3 | 80 |
| Highbridge Farm - T4 | 1382 | 239 | 17.29 | 3 | 0 | 11/06/2018 | 13:20 | 23.4 | 3 | 4 | 80 |
| Highbridge Farm - T5 | 1075 | 195 | 18.14 | 4 | 0 | 13/06/2018 | 10:43 | 19.9 | 3 | 4 | 50 |
| Highbridge Farm - T9 | 372 | 4 | 1.08 | 0 | 0 | 11/06/2018 | 15:26 | 23.4 | 2 | 3 | 100 |
| Breach Farm - T1c | 661 | 229 | 34.64 | 3 | 0 | 13/06/2018 | 12:26 | 20.3 | 3 | 4 | 95 |
| GW Martin - T1 | 431 | 73 | 16.94 | 2 | 1 | 18/06/2018 | 11:53 | 19.7 | 2 | 4 | 100 |
| GW Martin - T2 | 339 | 7 | 2.06 | 0 | 0 | 18/06/2018 | 12:51 | 21.7 | 3 | 4 | 100 |
| Ashtrim - T1 | 200 | 37 | 18.50 | 0 | 0 | 21/06/2018 | 12:10 | 17.7 | 3 | 4 | 100 |
| Dunford - T1 | 553 | 1 | 0.18 | 0 | 0 | 21/06/2018 | 13:07 | 18.8 | 2 | 4 | 95 |
| Dunford - T2 | 599 | 12 | 2.00 | 0 | 0 | 21/06/2018 | 13:50 | 18.9 | 4 | 4 | 85 |

| Site Name & Transect No. | Transect Length (m) | Abundance (males) | Density (males per 100m) | Copulating Pairs | Ovipositing Females | Date | Start Time | Temp (°C) | Ave Wind Speed | Max Wind Speed | % Sunshine |
|---|---|---|---|---|---|---|---|---|---|---|---|
| West Horton Farm - T1 | 233 | 5 | 2.15 | 0 | 0 | 23/06/2018 | 12:38 | 22.2 | 2 | 2 | 90 |
| West Horton Farm - T4 | 465 | 4 | 0.86 | 0 | 0 | 23/06/2018 | 13:39 | 22.2 | 2 | 3 | 90 |
| West Horton Farm - T5 | 169 | 4 | 2.37 | 0 | 0 | 25/06/2018 | 11:28 | 24 | 1 | 2 | 100 |
| West Horton Farm - T6 | 188 | 4 | 2.13 | 0 | 0 | 25/06/2018 | 12:13 | 24.2 | 1 | 2 | 100 |
| West Horton Farm - T7 | 114 | 2 | 1.75 | 0 | 0 | 25/06/2018 | 12:58 | 25.3 | 2 | 2 | 100 |
| West Horton Farm - T8 | 186 | 48 | 25.81 | 2 | 0 | 25/06/2018 | 13:22 | 24.8 | 2 | 2 | 100 |
| Allington Manor Farm - T1 | 640 | 48 | 7.50 | 0 | 0 | 22/06/2018 | 10:48 | 17.3 | 3 | 3 | 70 |
| Allington Manor Farm - T3 | 561 | 115 | 20.50 | 2 | 1 | 22/06/2018 | 11:55 | 17.1 | 2 | 3 | 90 |
| Allington Manor Farm - T13 | 132 | 111 | 84.09 | 3 | 0 | 22/06/2018 | 13:19 | 19.4 | 2 | 3 | 95 |
| Allington Manor Farm - T17 | 447 | 157 | 35.12 | 0 | 0 | 22/06/2018 | 13:56 | 20.7 | 2 | 3 | 85 |
| Allington Manor Farm - T18 | 144 | 36 | 25.00 | 0 | 0 | 22/06/2018 | 15:00 | 20.7 | 2 | 2 | 80 |
| IVCP - T1 | 136 | 28 | 20.59 | 1 | 0 | 15/06/2018 | 10:36 | 19.1 | 2 | 3 | 65 |
| IVCP - T2 | 262 | 48 | 18.32 | 2 | 0 | 15/06/2018 | 11:02 | 18.8 | 3 | 4 | 50 |
| IVCP - T3 | 157 | 15 | 9.55 | 0 | 0 | 15/06/2018 | 13:05 | 19.9 | 3 | 4 | 90 |
| IVCP - T4 | 143 | 31 | 21.68 | 0 | 0 | 15/06/2018 | 12:11 | 19.8 | 2 | 3 | 35 |

**Table 3:** Results of Itchen Valley Country Park monitoring surveys (red text indicates weather conditions were not met).

| Week | Date | Number of Southern Damselfly | | | |
|---|---|---|---|---|---|
| | | Ditch 1 | Ditch 2 | Ditch 3 | Combined |
| 1 | 17/05/2018 | 0 | 1 | 0 | 1 |
| 2 | 22/05/2018 | 2 | 4 | 2 | 8 |
| 3 | 28/05/2018 | 6 | 27 | 22 | 55 |
| 4 | 03/06/2018 | 18 | 75 | 50 | 143 |
| 5 | 11/06/2018 | 17 | 96 | 33 | 146 |
| 6 | 16/06/2018 | 5 | 7 | 1 | 13 |
| 7 | 23/06/2018 | 30 | 16 | 5 | 51 |
| 8 | 30/06/2018 | 44 | 36 | 4 | 84 |
| 9 | 08/07/2018 | 25 | 70 | 14 | 109 |
| 10 | 16/07/2018 | 15 | 29 | 3 | 47 |
| 11 | 22/07/2018 | 6 | 3 | 1 | 10 |
| 12 | 31/07/2018 | 5 | 16 | 2 | 23 |
| 13 | 06/08/2018 | 8 | 15 | 2 | 25 |
| 14 | 14/08/2018 | 2 | 1 | 1 | 4 |
| 15 | 21/08/2018 | 0 | 2 | 0 | 2 |

Indeed, despite its shorter length, ditch 3 supported the highest number of southern damselfly, with total of 183, 398 and 140 individuals recorded on ditches 1, 3 and 4 respectively (Table 4). Furthermore, ditch 3 supported the highest number of individuals on 11 of the 15 surveys visits (Table 3), and had notably higher peak, mean and median counts than the other ditches (Table 4).

**Table 4:** Basic analysis of data collected during Itchen Valley Country Park monitoring surveys.

| Parameter | Ditch 1 | Ditch 2 | Ditch 3 |
|---|---|---|---|
| Total No. Individuals | 183 | 398 | 140 |
| Peak Count | 44 | 96 | 50 |
| Mean | 12.2 | 26.5 | 9.3 |
| Median | 6 | 16 | 2 |
| No. visits recorded | 13 | 15 | 13 |

# 4. COMPARATIVE ANALYSIS

## 4.1 Adult Count Surveys

Southern damselfly abundance and density was highly variable, both between and within individual sites, during both the 2017 and 2018 adult count surveys programmes (Table 5). For example, when considering transects included in both years of the study, abundances recorded at Highbridge in 2017 varied between 25 and 194 individuals, and densities at Allington Manor Farm varied between 7.50 and 84.09 males per 100m in 2018.

**Table 5:** Comparison of southern damselfly abundance (males) and density (per 100m) recorded during adult count surveys in 2017 and 2018 (red text indicates weather conditions were not met).

| Site Name & Transect No. | 2017 | | 2018 | | Variation | |
|---|---|---|---|---|---|---|
| | Abundance | Density | Abundance | Density | Abundance | Density |
| Bishopstoke FC - T6 | DNS | | 44 | 9.03 | n/a | n/a |
| Highbridge Farm - T1 | 34 | 8.08 | 16 | 3.80 | -18 | -4.28 |
| Highbridge Farm - T2a | 25 | 24.27 | 13 | 12.62 | -12 | -11.65 |
| Highbridge Farm - T2b | 72 | 48.32 | 41 | 27.52 | -31 | -20.81 |
| Highbridge Farm - T3 | 135 | 59.08 | 91 | 39.74 | -44 | -19.34 |
| Highbridge Farm - T4 | 194 | 14.04 | 239 | 17.29 | 45 | 3.26 |
| Highbridge Farm - T5 | 76 | 7.07 | 195 | 18.14 | 119 | 11.07 |
| Highbridge Farm - T9 | 37 | 9.95 | 4 | 1.08 | -33 | -8.87 |
| Breach Farm - T1c | 23 | 3.48 | 229 | 34.64 | 206 | 31.16 |
| GW Martin - T1 | 54 | 12.53 | 73 | 16.94 | 19 | 4.41 |
| GW Martin - T2 | 8 | 2.36 | 7 | 2.06 | -1 | -0.29 |
| Ashtrim - T1 | 53 | 26.47 | 37 | 18.50 | -16 | -7.97 |
| Dunford - T1 | 3 | 0.54 | 1 | 0.18 | -2 | -0.36 |
| Dunford - T2 | 7 | 1.17 | 12 | 2.00 | 5 | 0.83 |
| West Horton Farm - T1 | 1 | 0.43 | 5 | 2.15 | 4 | 1.72 |
| West Horton Farm - T4 | 8 | 1.72 | 4 | 0.86 | -4 | -0.86 |
| West Horton Farm - T5 | 0 | 0.00 | 4 | 2.37 | 4 | 2.37 |
| West Horton Farm - T6 | 0 | 0.00 | 4 | 2.13 | 4 | 2.13 |
| West Horton Farm - T7 | 1 | 0.88 | 2 | 1.75 | 1 | 0.88 |
| West Horton Farm - T8 | 0 | 0.00 | 48 | 25.81 | 48 | 25.81 |
| Allington Manor Farm - T1 | 116 | 18.13 | 48 | 7.50 | -68 | -10.63 |
| Allington Manor Farm - T3 | 82 | 14.62 | 115 | 20.50 | 33 | 5.88 |
| Allington Manor Farm - T13 | 71 | 53.97 | 111 | 84.09 | 40 | 30.12 |
| Allington Manor Farm - T17 | 149 | 33.34 | 157 | 35.12 | 8 | 1.78 |
| Allington Manor Farm - T18 | 23 | 15.97 | 36 | 25.00 | 13 | 9.03 |
| IVCP - T1 | 27 | 19.85 | 28 | 20.59 | 1 | 0.74 |
| IVCP - T2 | 19 | 7.25 | 48 | 18.32 | 29 | 11.07 |
| IVCP - T3 | 2 | 1.27 | 15 | 9.55 | 13 | 8.28 |
| IVCP - T4 | DNS | | 31 | 21.68 | n/a | n/a |

There was also considerable variation within a number of individual transects when comparing the two separate adult count surveys, with an almost ten-fold increase in the number of males recorded on transect 1c at Breach Farm between years, and 0 and 48 males recorded on transect 8 at West Horton Farm in 2017 and 2018 respectively (Table 5). In addition to the considerable increase in both abundance and density at Breach Farm and transect 8 of West Horton Farm, there existed a notable degree of variation within a number of those transects that returned relatively high southern damselfly abundance and / or density in both 2017 and 2018. This was apparent at both Highbridge Farm and Allington Manor Farm, where a notable increase in abundance and / or density was recorded in some transects, whereas a contrasting decrease in abundance and / or density was recorded on others (Table 5).

Despite the variability in southern damselfly abundance and density recorded within individual transect between years, there was only a limited degree of variation in the relative importance of the individual transects. Of the ten transects that recorded the highest abundances in 2017, eight were also included in the highest 11 transects (as three transects were ranked joint 9$^{th}$) in the 2018 survey programme (Table 6; Appendix 1). Furthermore, three of the five transects with the lowest abundances in 2017, were also positioned within the five lowest ranking transects in 2018 (Appendix 1). Transects 1c and 8 at Breach Farm and West Horton Farm respectively were once again the notable exceptions, with the latter ranked joint last in 2017 but joint 9$^{th}$ in 2018, and the former 15$^{th}$ and 2$^{nd}$ in 2017 and 2018 respectively (Appendix 1).

**Table 6:** Comparison of relative abundance for the top ten ranked transects in 2017.

| Site | Rank | |
|---|---|---|
| | **2017** | **2018** |
| Highbridge Farm - T4 | 1 | 1 |
| Allington Manor Farm - T17 | 2 | 4 |
| Highbridge Farm - T3 | 3 | 7 |
| Allington Manor Farm - T1 | 4 | 9 |
| Allington Manor Farm - T3 | 5 | 5 |
| Highbridge Farm - T5 | 6 | 3 |
| Highbridge Farm - T2b | 7 | 12 |
| Allington Manor Farm - T13 | 8 | 6 |
| GW Martin - T1 | 9 | 8 |
| Ashtrim - T1 | 10 | 13 |

A similar pattern is observed when comparing southern damselfly densities between years, with eight of the ten transects that recorded the highest densities in 2017, also ranked in the top ten in 2018 (Table 7). Furthermore, transect 1c at Breach Farm / transect 8 at West Horton Farm were once again the notable exceptions (Appendix 1), ranked 4$^{th}$ and 6$^{th}$ respectively in 2018, from 17$^{th}$ and joint last in 2017. Finally, transects at West Horton Farm (with the above exception) and Dunford's Land consistently retuned no or low densities of southern damselfly (Appendix 1).

The comparison of the relative abundance and density of southern damselfly within the individual transect between years, provides support for the assessments of the relative importance of the study sites reached in the original survey and habitat assessment study (Rushbrook, 2018a). Transects at Highbridge Farm and Allington Manor Farm were consistently present in both the top ten ranked transects for abundance and density in 2017 and 2018 (Tables 6 and 7; Appendix 1). This provides further evidence of the strength and considerable importance of these populations within the context of southern damselfly sites within and immediately adjacent to the Eastleigh Borough boundary, and for the lower Itchen Valley metapopulation as a whole (see Rushbrook, 2018a; 2018b).

The inclusion of transects at Itchen Valley Country Park, land behind GW Martin, and Ashtrim Nursery within Tables 6 and 7 also emphasise the importance of these sites, with the latter two considered to support medium strength populations and, in combination with the data collected from the on-going monitoring study, the former considered to support a strong population of this species. Furthermore,

given the abundance and density recorded on transect 1c at Breach Farm in 2018, this site must also be considered to support a medium strength population of southern damselfly. Finally, although not included within the analysis of relative abundance and densities, since it was not surveyed in 2017, the number of males recorded on the main river channel at land owned by Bishopstoke Fishing Club indicates that this to supports a weak to medium strength population of southern damselfly (Table 2).

**Table 7:** Comparison of relative densities for the top ten ranked transects in 2017.

| Site | Rank | |
|---|---|---|
| | **2017** | **2018** |
| Highbridge Farm - T3 | 1 | 2 |
| Allington Manor Farm - T13 | 2 | 1 |
| Highbridge Farm - T2b | 3 | 5 |
| Allington Manor Farm - T17 | 4 | 3 |
| Ashtrim - T1 | 5 | 10 |
| Highbridge Farm - T2a | 6 | 15 |
| IVCP - T1 | 7 | 8 |
| Allington Manor Farm - T1 | 8 | 17 |
| Allington Manor Farm - T18 | 9 | 7 |
| Allington Manor Farm - T3 | 10 | 9 |

The notable increase in the number of males recorded on transect 8 at West Horton Farm, which also forms the section of channel directly upstream of the transect 17 at Allington Manor, is considered important for this species. However, the relatively low abundances and densities recorded across the other transects emphasises the overall weak state of the population at this site (Appendix 1).

## 4.2 Itchen Valley Country Park Monitoring Study

There was a notable increase in the total numbers of southern damselfly recorded in 2018 when compared with the results of surveys conducted in recent years, although numbers remain substantially lower (less than half) than total counts recorded in the early 2000's (Figure 3; Table 8).

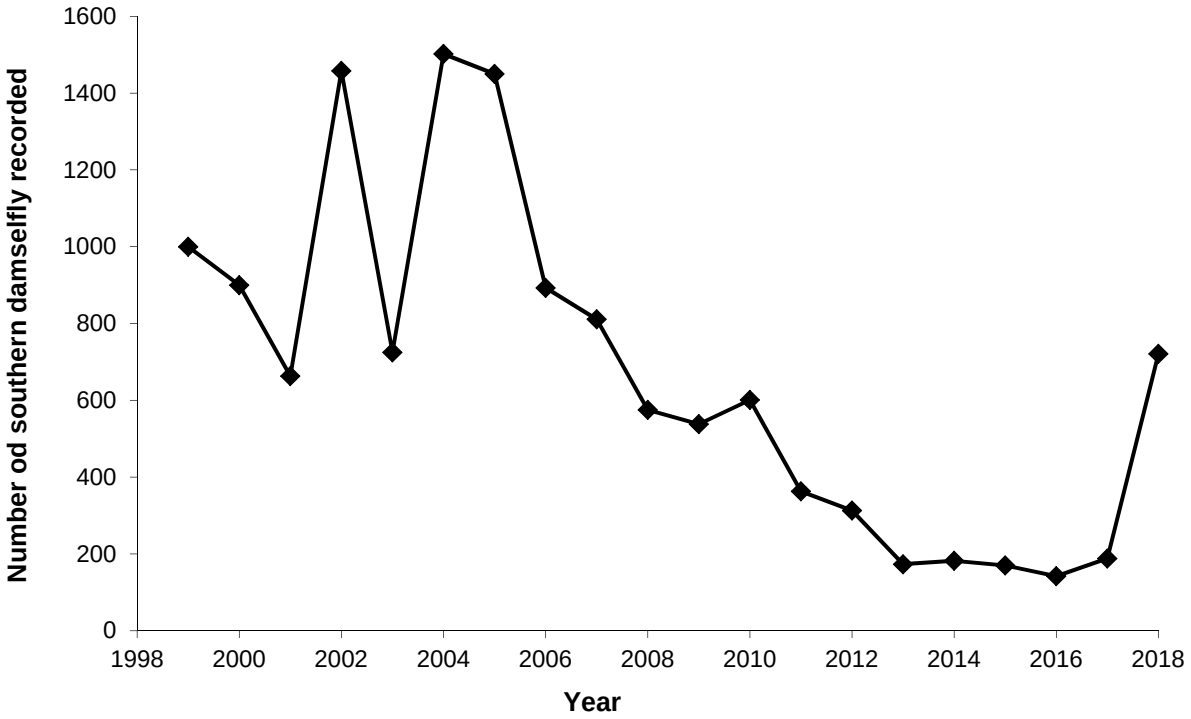



**Figure 3:** Total number of individuals recorded across all ditches combined between 1999 and 2018.

**Table 8:** Summary and basic analysis of data collected during Itchen Valley Country Park monitoring study surveys conducted between 2006 and 2018.

| Ditch | Parameter | Year & Dates | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** |
| | | 14/05 - 10/09 | 20/05 - 04/09 | 11/05 - 26/05 | 09/05 - 23/08 | 09/05 - 30/08 | 15/05 - 03/09 | 13/05 - 08/09 | 18/05 - 26/08 | 06/06 - 08/09 | 21/05 - 28/08 | 16/05 - 23/08 | 21/05 - 22/08 | 17/05 – 21/08 |
| **1** | **Total** | 377 | 319 | 155 | 103 | 138 | 119 | 94 | 34 | 47 | 21 | 18 | 52 | 183 |
| | **Peak Count** | 86 | 112 | 53 | 43 | 39 | 21 | 33 | 13 | 11 | 8 | 8 | 24 | 44 |
| | **Mean** | 26.9 | 24.5 | 15.5 | 7.4 | 9.9 | 7.0 | 7.2 | 2.6 | 4.3 | 1.5 | 2.6 | 10.4 | 12.2 |
| | **Median** | 24.5 | 18 | 8 | 1.5 | 4 | 5 | 1 | 0 | 4 | 0 | 2 | 8 | 6 |
| | **Survey Visits** | 15 | 14 | 11 | 15 | 15 | 18 | 14 | 14 | 12 | 15 | 8 | 6 | 15 |
| | **No. Visits Recorded** | 10 | 10 | 7 | 10 | 9 | 15 | 9 | 5 | 7 | 6 | 4 | 5 | 13 |
| **3** | **Total** | 386 | 426 | 288 | 290 | 221 | 133 | 162 | 73 | 101 | 87 | 46 | 92 | 398 |
| | **Peak Count** | 89 | 101 | 108 | 91 | 64 | 34 | 50 | 25 | 26 | 29 | 22 | 27 | 96 |
| | **Mean** | 27.6 | 32.8 | 28.8 | 20.7 | 15.8 | 7.8 | 12.5 | 5.6 | 9.2 | 6.2 | 6.6 | 18.4 | 26.5 |
| | **Median** | 13 | 29 | 20 | 6.5 | 8.5 | 4 | 6 | 3 | 3 | 2 | 3 | 22 | 16 |
| | **Survey Visits** | 15 | 14 | 11 | 15 | 15 | 18 | 14 | 14 | 12 | 15 | 8 | 6 | 15 |
| | **No. Visits Recorded** | 12 | 12 | 7 | 12 | 11 | 15 | 10 | 8 | 7 | 10 | 5 | 5 | 15 |
| **4** | **Total** | 130 | 86 | 132 | 145 | 242 | 111 | 57 | 54 | 34 | 62 | 13 | 36 | 140 |
| | **Peak Count** | 31 | 23 | 55 | 46 | 64 | 17 | 31 | 32 | 14 | 18 | 9 | 15 | 50 |
| | **Mean** | 9.3 | 6.6 | 13.2 | 11.2 | 17.3 | 6.5 | 7.1 | 4.2 | 3.8 | 4.4 | 1.9 | 7.2 | 9.3 |
| | **Median** | 3 | 5 | 10 | 3 | 14.5 | 5 | 1.5 | 0 | 2 | 1.5 | 0 | 6 | 2 |
| | **Survey Visits** | 15 | 14 | 11 | 14 | 15 | 18 | 9 | 14 | 10 | 15 | 8 | 6 | 15 |
| | **No. Visits Recorded** | 10 | 9 | 6 | 8 | 12 | 14 | 6 | 4 | 6 | 8 | 3 | 5 | 13 |
| **Combined** | **Total** | 893 | 811 | 575 | 538 | 601 | 363 | 313 | 161 | 182 | 170 | 76 | 180 | 721 |
| | **Peak Count** | 185 | 178 | 174 | 180 | 138 | 62 | 114 | 69 | 42 | 48 | 32 | 57 | 146 |
| | **Mean** | 63.8 | 62.4 | 57.5 | 38.4 | 42.9 | 21.4 | 24.1 | 12.4 | 15.2 | 12.1 | 10.9 | 36.0 | 48.1 |
| | **Median** | 48.5 | 57 | 41.5 | 7 | 28.5 | 16 | 12 | 3 | 7 | 6 | 5 | 32 | 25 |
| | **Survey Visits** | 15 | 14 | 11 | 15 | 15 | 18 | 14 | 14 | 13 | 15 | 8 | 6 | 15 |
| | **No. Visits Recorded** | 13 | 12 | 7 | 13 | 13 | 15 | 11 | 8 | 8 | 14 | 5 | 5 | 15 |

As outlined in Section 2.3.2 above, given the recognition that there has been discrepancies in the exact transect routes surveyed throughout majority of the study, caution must be exercised when drawing conclusions from the data collected throughout the Itchen Valley Country Park monitoring study. However, given the relatively small difference in the survey routes, and supported by the data analysis methods set out in Section 2.4, it is considered appropriate to interrogate the data in order to identify potential large scale differences in the results returned between years.

Table 8 provides a summary of the raw data collected during the 2006 to 2018 (inclusive) survey programmes. Interrogation of this data identifies not only a sharp increase in the total number of individuals recorded in 2018 compared with recent years, but that this trend was also evident within the individual ditches surveyed (Figure 4). However, it is emphasised that survey effort was neither fully consistent between years, nor was it consistent between the individual ditches within a number of specific years (Table 8), and would therefore explain a degree of the observed variation in the number of individuals recorded between years and ditches. These inconsistencies were a result of a combination of factors including resources (i.e. 2016 and 2017), weather, and associated ground conditions. However, although considerably fewer surveys were conducted in 2016 and 2017 compared with the current year, a similar number of surveys were conducted during 2011–2014, with still around half or fewer individuals recorded during these years compared with 2018.

Irrespective of the natural and artificially driven variability in the data detailed above, it is considered highly likely that the trend in the numbers of individuals recorded at the site, and within individual ditches, provides an accurate indication of the size and / or strength of the population at the site in recent years. Although it does not fully correct for the variability outlined above (since surveys lost may correspond to different phases of the species' flight period), the corresponding patterns in peak counts, mean and median number of individuals recorded (Figures 6 - 8) support the overall assessment of the strength of the population, or at least the sub-population within this area.

Specifically, the data would suggest that the (sub-)population suffered a considerable decline over a 12 year period from 2004, but presented a strong recovery this year, returning total, peak, mean and median counts comparable with the best years in the past decade (Figures 4 - 7). However, this is still substantially lower (less than half) than the total counts returned in the early 2000's (Figure 3).

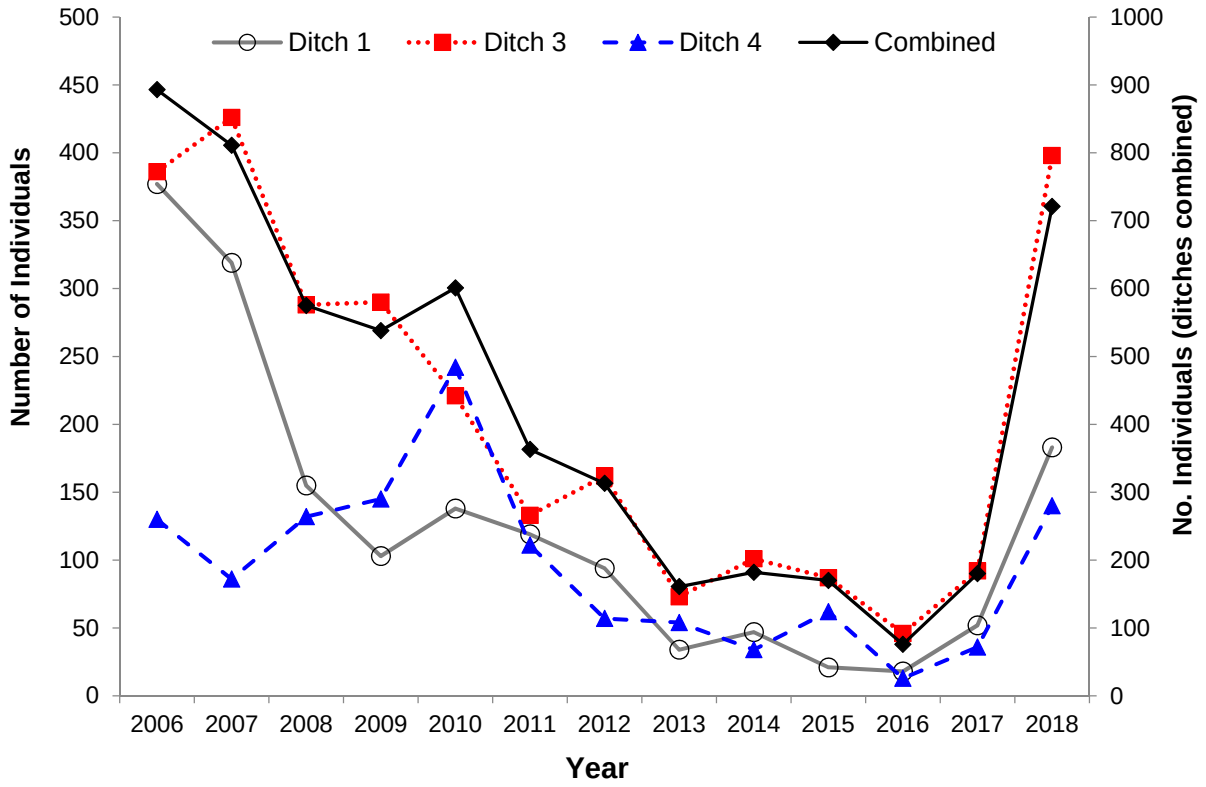



**Figure 4:** Total number of individuals recorded on ditch 1, ditch 3, ditch 4, and across all ditches combined.

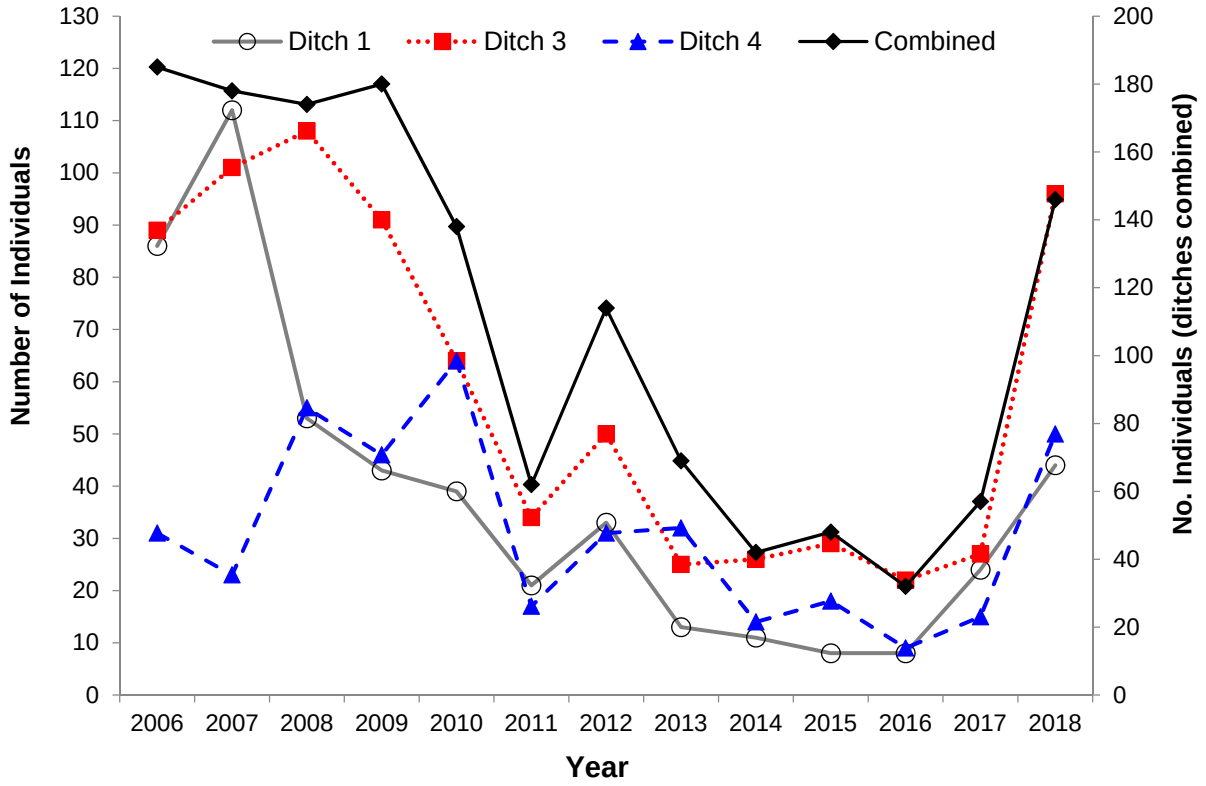



**Figure 5:** Peak counts of the number of individuals recorded on ditch 1, ditch 3, ditch 4, and across all ditches combined.

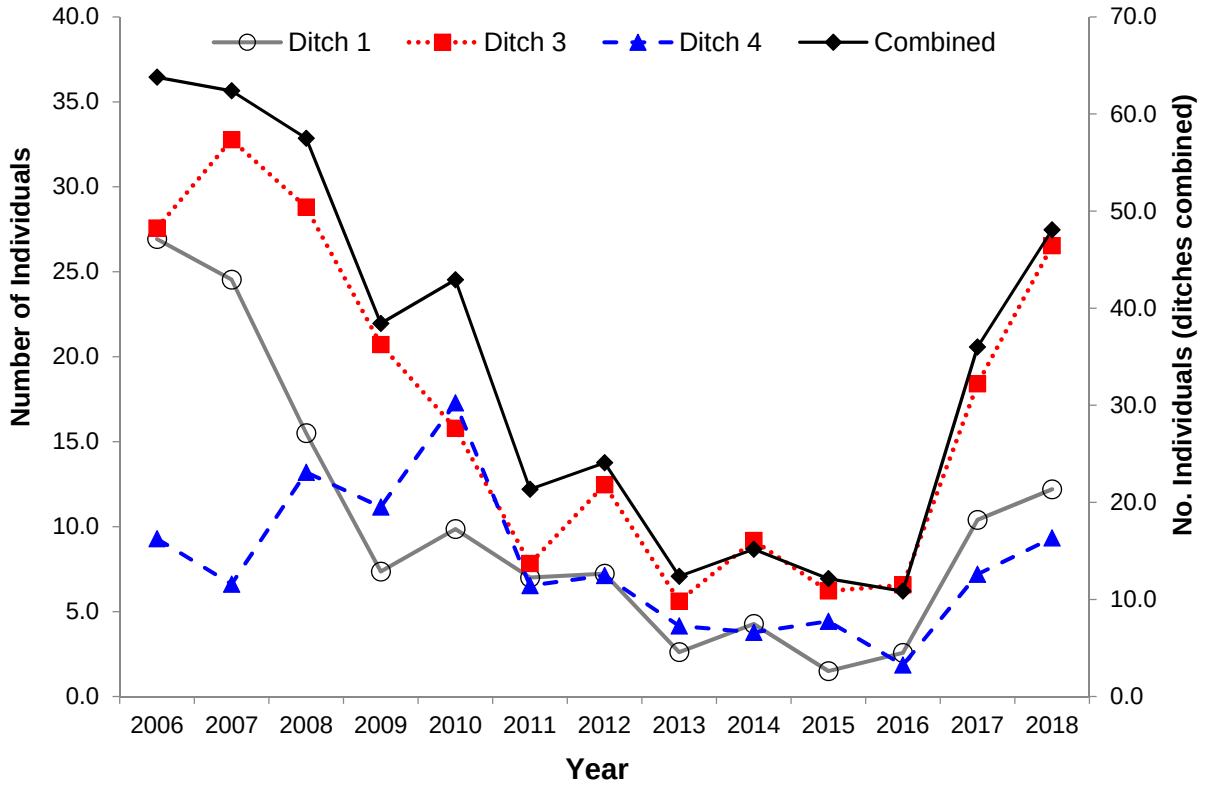



**Figure 6:** Mean number of individuals recorded per survey visit on ditch 1, ditch 3, ditch 4, and across all ditches combined.

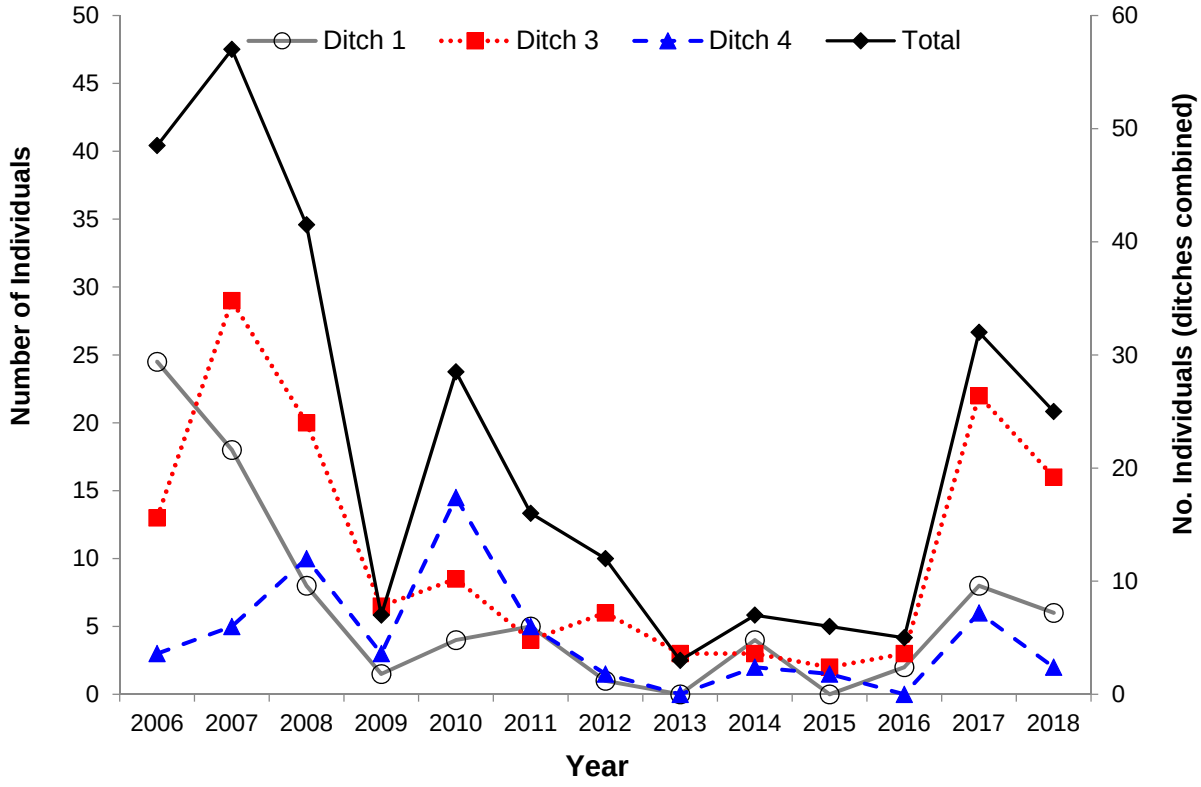



**Figure 7:** Median numbers of individuals recorded on ditch 1, ditch 3, ditch 4, and across all ditches combined.

# 5. BISHOPSTOKE FISHING CLUB LAND

## 5.1 Site Description

A detailed description of the land owned by Bishopstoke Fishing Club (Map 1) is provided in Section 5 of the original survey and habitat assessment study report (Rushbrook, 2018a), with all transects included within this study shown on Figure 8 below.

An additional transect, comprising an approximately 500m stretch of the main channel of the river Itchen, which supported sections of sub-optimal habitat for southern damselfly, was included within the 2018 adult count survey programme. This followed reports that southern damselfly had been recorded on this stretch of the main river channel during early June 2018.

## 5.2 Adult Count Surveys

Although included in the 2017 survey programme, transect 5 was not included in the 2018 adult count survey programme, since no southern damselfly were recorded on the floodplain ditches surveyed in 2017, and the habitat present was considered to be unsuitable or largely unsuitable for this species. However, as set out in Section 5.1 above, reports were received that southern damselfly had been recorded on the main river channel during early June 2018 and, given it location immediately upstream of the important reach of the main channel that flows through Highbridge Farm, its inclusion within this study was considered to be highly relevant. As a result, an additional transect, transect 6, was added to the 2018 adult count survey programme.

### *5.2.1 Southern damselfly*

The results of adult count surveys conducted at Bishopstoke Fishing Club land in 2017 and 2018 are summarised in Table 9.

**Table 9:** Southern damselfly abundance (males) and density at Bishopstoke Fishing Club land.

| Transect No. | Transect Length (m) | 2017 | | 2018 | | Weather Criteria |
|---|---|---|---|---|---|---|
| | | Abundance | Density (per 100m) | Abundance | Density (per 100m) | |
| 5 | 97 | 0 | 0 | *DNS* | | Met |
| 6 | 487 | *DNS* | | 44 | 9.03 | Met |

*DNS* = Did Not Survey

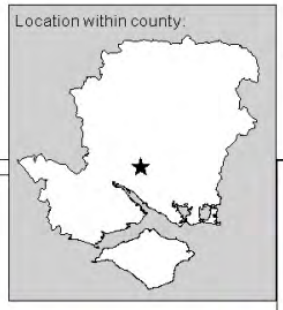
No southern damselfly were recorded on the land owned by the Bishopstoke Fishing Club during the adult count survey in 2017 (Table 9), nor were any individuals encountered anywhere across the floodplain meadow ditches during the concurrent habitat assessments (Rushbrook, 2018a).

In contrast, 44 male southern damselfly were recorded during the adult count survey conducted on transect 6 in 2018 (Table 9), with the majority of individuals recorded in the middle and upper reaches of the transect, where more extensive growths of marginal dicotyledon growth had developed. Furthermore, a single copulating pair were recorded on transect 6, but no ovipositing females were recorded during adult count surveys (Table 2).

Based on the results of the habitat assessments and adult count surveys conducted in 2017, and the repeat adult count surveys conducted in 2018, the land owned by Bishopstoke Fishing Club is considered to support a weak to medium strength southern damselfly population.

### *5.2.2 Other Odonata*

No male Odonata were recorded during the adult count survey conducted in 2017 (Rushbrook, 2018a). In contrast, males from five species of Odonata were recorded on transect 6 in 2018, with banded demoiselle *Calopteryx splendens*, azure damselfly and southern damselfly the most abundant species (Table 10).




# Figure 8: Bishopstoke Fishing Club Land

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Site boundary

Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

Drain

Drain

Drain

Drain

Track

16m

1

2

3

4

5

6

0

200

metres

N

**Table 10:** Odonata abundance (males) recorded at Bishopstoke Fishing Club land in 2018.

| Common Name | Scientific Name | Transect Number |
|---|---|---|
| | | **6** |
| Southern damselfly | *Coenagrion mercuriale* | D |
| Banded demoiselle | *Calopteryx splendens* | E |
| Azure damselfly | *Coenagrion puella* | D |
| Red-eyed damselfly | *Erythromma najas* | A |
| Common blue damselfly | *Enallagma cyathigerum* | A |

# 6. HIGHBRIDGE FARM

## 6.1 Site Description

Highbridge Farm consisted of two distinct survey areas, with the majority of the site located adjacent to the northern boundary of Eastleigh Borough (Map 1). A detailed description of Highbridge Farm is provided in Section 6 of the original survey and habitat assessment study report (Rushbrook, 2018a), with all transects included within this study shown on Figure 9 below.

## 6.2 Adult Count Surveys

Adult count surveys were conducted on seven transects at Highbridge Farm in both 2017 and 2018. Furthermore, two transects at Highbridge Farm, specifically transects 2c and 32, were excluded from the repeat study as it was considered that individuals recorded on these transects in 2017 were most likely transient individuals, since these transects were considered to be unsuitable and largely unsuitable for southern damselfly respectively (Rushbrook, 2018a). Therefore, it was considered that repeating surveys at the remaining seven transects provided a more representative assessment of the population status at this site.

### *6.2.1 Southern damselfly*

The results of adult count surveys conducted at Highbridge Farm in 2017 and 2018 are summarised in Table 11.

**Table 11:** Southern damselfly abundance (males) and density at Highbridge Farm.

| Transect No. | Transect Length (m) | 2017 | | 2018 | | Weather Criteria |
|---|---|---|---|---|---|---|
| | | Abundance | Density (per 100m) | Abundance | Density (per 100m) | |
| 1 | 421 | 34 | 8.08 | 16 | 3.80 | Met |
| 2a | 103 | 25 | 24.27 | 13 | 12.62 | Met |
| 2b | 149 | 72 | 48.32 | 41 | 27.52 | Met |
| 2c | 397 | 2 | 0.50 | *DNS* | | Met |
| 3 | 229 | 135 | 59.08 | 91 | 39.74 | Met |
| 4 | 1382 | 194 | 14.04 | 239 | 17.29 | Met |
| 5 | 1075 | 76 | 7.07 | 195 | 18.14 | Met |
| 9 | 372 | 37 | 9.95 | 4 | 1.08 | Met |
| 32 | 759 | 4 | 0.53 | *DNS* | | Met |

In total, 573 and 599 male southern damselfly were recorded across the seven transects surveyed in both 2017 and 2018 (Table 11). Furthermore, four and three of the seven transects were included in the top ten transects ranked by abundance in 2017 and 2018 respectively (Table 6; Appendix 1), and three and two of the seven transects were included in the top ten transect ranked by density in 2017 and 2018 respectively (Table 7; Appendix 1).

Southern damselfly were the most abundant species on two discrete habitat types; the main carrier stream that flows from the north through the central region of the site to its southern boundary (i.e. transects 1, 2a, 2b and 3), and the main river channel (i.e. transects 4 and 5). Though a number of the former predominately supported a greater density (Table 11), the large numbers recorded on the main river channel make this habitat very valuable also.

Location within county

# Figure 9: Highbridge Farm

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Site boundary

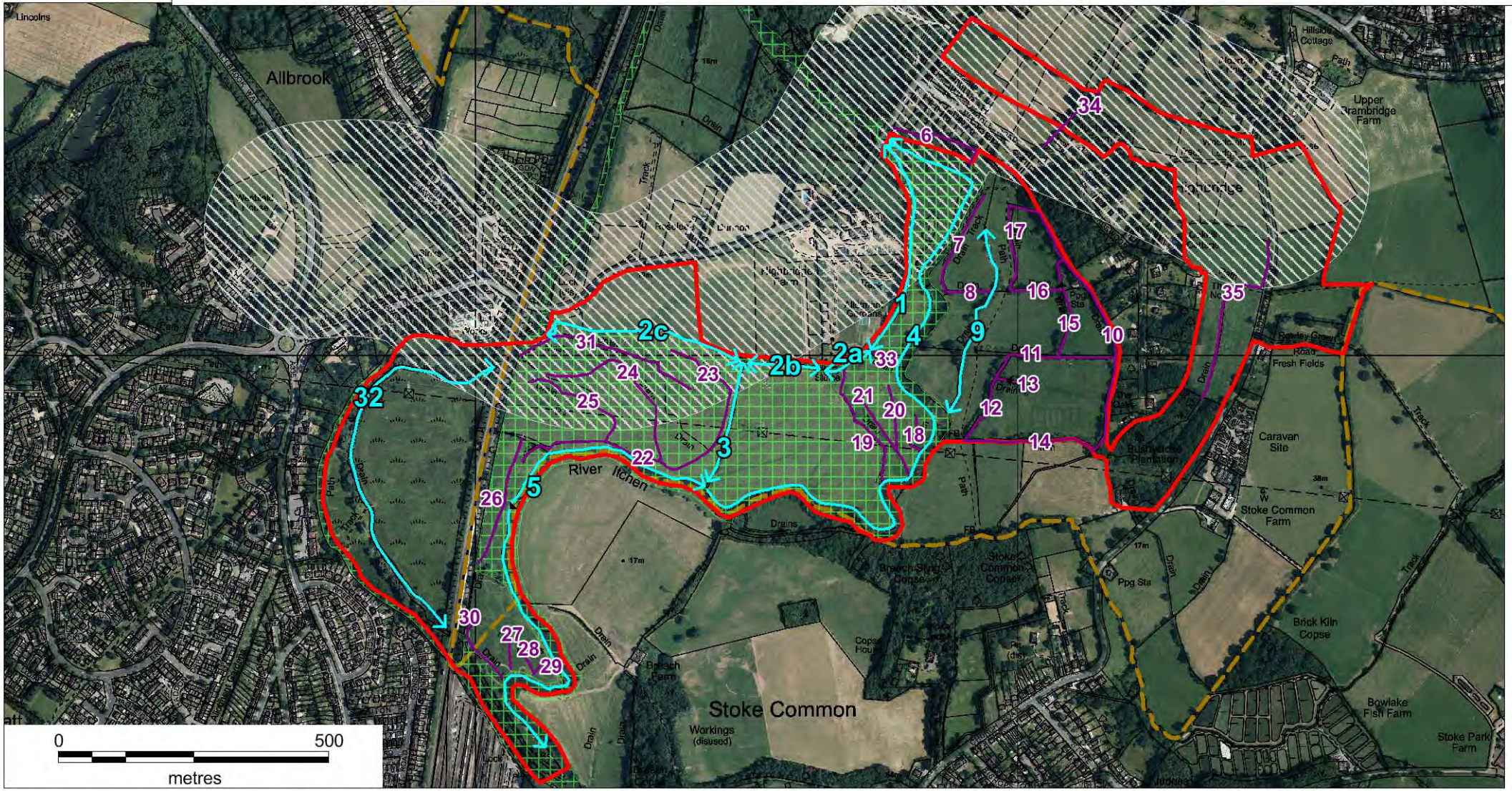
Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary





Produced on 7 September 2018 by Deborah Whitfield For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

A reduction in abundance (and by association density) was recorded on the main carrier stream across all transects (i.e. transects 1, 2a, 2b and 3) during adult count surveys conducted in 2018 (Tables 5 and 11). In contrast, an increase in abundance (and by association density) was recorded on the main river channel transects. Furthermore, copulating pairs were recorded on transects 1, 2a, 2b, 3 and 4 during adult count surveys conducted in 2017 (Appendix 2), but only on transects 4 and 5 in 2018 (Table 2). No ovipositing females were recorded during adult count surveys in either year (Table 2; Appendix 2).

Finally, there was a notable reduction in the number of male southern damselfly recorded on transect 9 in 2018, when compared with the adult count survey conducted in 2017.

Based on the results of the habitat assessments and adult count surveys conducted in 2017, and the repeat adult count surveys conducted in 2018, Highbridge Farm is considered to support a strong population of southern damselfly.

### *6.2.2 Other Odonata*

In total, nine species of Odonata were recorded during the 2018 adult count surveys (Table 12), an increase on the seven species recorded in 2017 (Rushbrook, 2018a). Excluding southern damselfly, banded demoiselle were the most abundant species recorded at the site in both years, primarily associated with the larger channels (i.e. transects 4 and 5). Azure damselfly were both abundant and widespread in both 2017 and 2018, though a reduction in the distribution of large red damselfly *Pyrrhosoma nymphula* and common blue damselfly was observed in 2018 (Table 12; see Table 8 of Rushbrook, 2018a).

**Table 12:** Odonata abundance (males) recorded at Highbridge Farm in 2018.

| Common Name | Scientific Name | Transect Number | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **1** | **2a** | **2b** | **3** | **4** | **5** | **9** |
| Southern damselfly | *Coenagrion mercuriale* | C | C | D | D | E | E | B |
| Banded demoiselle | *Calopteryx splendens* | D | C | C | D | E | E | C |
| Azure damselfly | *Coenagrion puella* | D | B | - | D | D | D | D |
| **Red-eyed damselfly** | ***Erythromma najas*** | **A** | **-** | **-** | **-** | **-** | **-** | **-** |
| Large red damselfly | *Pyrrhosoma nymphula* | - | - | - | A | B | C | C |
| Common blue damselfly | *Enallagma cyathigerum* | - | - | - | - | A | - | C |
| Blue-tailed damselfly | *Ischnura elegans* | C | - | - | - | B | C | - |
| Emperor dragonfly | *Anax imperator* | - | - | - | - | A | - | - |
| **Broad-bodied chaser** | ***Libellula depressa*** | **-** | **-** | **-** | **-** | **A** | **-** | **-** |

Species in **bold** were not recorded at the site in 2017

# 7. BREACH FARM

## 7.1 Site Description

A detailed description of Breach Farm (Map 1) is provided in Section 7 of the original survey and habitat assessment study report (Rushbrook, 2018a), with all transects included within this study shown on Figure 10 below.

## 7.2 Adult Count Surveys

Adult count surveys were conducted on a single transect at Breach Farm in 2017 and 2018.

### *7.2.1 Southern damselfly*

The results of adult count surveys conducted at Breach Farm in 2017 and 2018 are summarised in Table 13.

**Table 13:** Southern damselfly abundance (males) and density at Breach Farm.

| Transect No. | Transect Length (m) | 2017 | | 2018 | | Weather Criteria |
|---|---|---|---|---|---|---|
| | | Abundance | Density (per 100m) | Abundance | Density (per 100m) | |
| 1c | 661 | 23 | 4.17 | 229 | 34.64 | Met |

There was a near ten-fold increase in the number of male southern damselfly recorded between the 2017 and 2018 adult count surveys at Breach Farm. Furthermore, three copulating pairs were recorded in 2018 (Table 2), whereas no pairs were recorded in 2017 (Appendix 2). No ovipositing females were recorded during adult count surveys in either year (Table 2; Appendix 2).

Based on the results of the habitat assessments and adult count surveys conducted in 2017, and the repeat adult count surveys conducted in 2018, Breach Farm is considered to support a medium strength southern damselfly population.

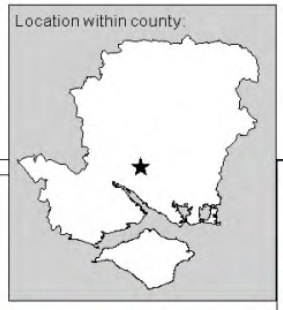
### *7.2.2 Other Odonata*

In total, four and five species of Odonata were recorded during the adult count surveys in 2017 and 2018 respectively (Table 14). Southern damselfly and banded demoiselle was the most abundant species in both years, with both species recording a substantial increase in the number of individuals encountered in 2018. Large red damselfly, present in a moderate number, was recorded at the site for first time in 2018, with both azure damselfly and blue-tailed damselfly returning a similar number of individuals in each year.

**Table 14:** Odonata abundance (males) recorded at Breach Farm in 2018.

| Common Name | Scientific Name | Transect Number |
|---|---|---|
| | | 1c |
| Southern damselfly | *Coenagrion mercuriale* | E |
| Banded demoiselle | *Calopteryx splendens* | E |
| Azure damselfly | *Coenagrion puella* | C |
| **Large red damselfly** | ***Pyrrhosoma nymphula*** | **C** |
| Blue-tailed damselfly | *Ischnura elegans* | A |

Species in **bold** were not recorded at the site in 2017




# Figure 10: Breach Farm

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Site boundary

Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

River Itchen
Drain
2
1a
1b
Drains
17m
Drain
3
Drain
Drains
Drain
Drain
Breach Farm
Stoke Common
1c
4
Drain
Drain
Workings (disused)
Lock
Breach Copse
Path
Path
Drain
FB
Drain
BREACH LANE
0
200
metres

# 8. LAND BEHIND GW MARTIN

## 8.1 Site Description

A detailed description of land behind GW Martin (Map 1) is provided in Section 10 of the original survey and habitat assessment study report (Rushbrook, 2018a), with all transects included within this study shown on Figure 11 below.

## 8.2 Adult Count Surveys

Adult count surveys were conducted on two transects at land behind GW Martin in 2017 and 2018.

### *8.2.1 Southern damselfly*

The results of adult count surveys conducted at land behind GW Martin in 2017 and 2018 are summarised in Table 15.

**Table 15:** Southern damselfly abundance (males) and density at land behind GW Martin.

| Transect No. | Transect Length (m) | 2017 | | 2018 | | Weather Criteria |
|---|---|---|---|---|---|---|
| | | Abundance | Density (per 100m) | Abundance | Density (per 100m) | |
| 1 | 431 | 54 | 12.53 | 73 | 16.94 | Met |
| 2 | 339 | 8 | 2.36 | 7 | 2.06 | Met |

Similar results were recorded during adult count surveys at land behind GW Martin in 2017 and 2018, with 62 and 80 individuals recorded in each year respectively. Furthermore, transect 1 supported a substantially higher number and density of southern damselfly in both years (Table 15), with males focused on the northern half of the transect, upstream of where the channel ran parallel to houses. Moreover, individuals were only recorded on transect 2 along the highly limited number of short, open sections in both years.

However, there was a small but noticeable increase in the number of males recorded on transect 1 during the 2018 adult count survey (Table 15). Furthermore, no copulating pairs or ovipositing females were recorded during the adult count surveys conducted at this site in 2017 (Appendix 2), but two copulating pairs and a single ovipositing female was recorded on transect 1 in 2018 (Table 2).

Based on the results of the habitat assessments and adult count surveys conducted in 2017, and the repeat adult count surveys conducted in 2018, land behind GW Martin is considered to support a medium strength population of southern damselfly.

### *8.2.2 Other Odonata*

In total, five and eight species of Odonata were recorded during the adult count surveys in 2017 and 2018 respectively, with those species only present during 2018 surveys recorded in low numbers (Table 16). Banded demoiselle was the most abundant species on each individual transect, though was recorded in lower numbers on transect 1 in 2018.

All other species were predominately recorded in only low numbers, with only single individuals recorded across both transects for four of the eight species present (Table 16).

Location within county:

# Figure 11: Land behind GW Martin

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Site boundary

Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

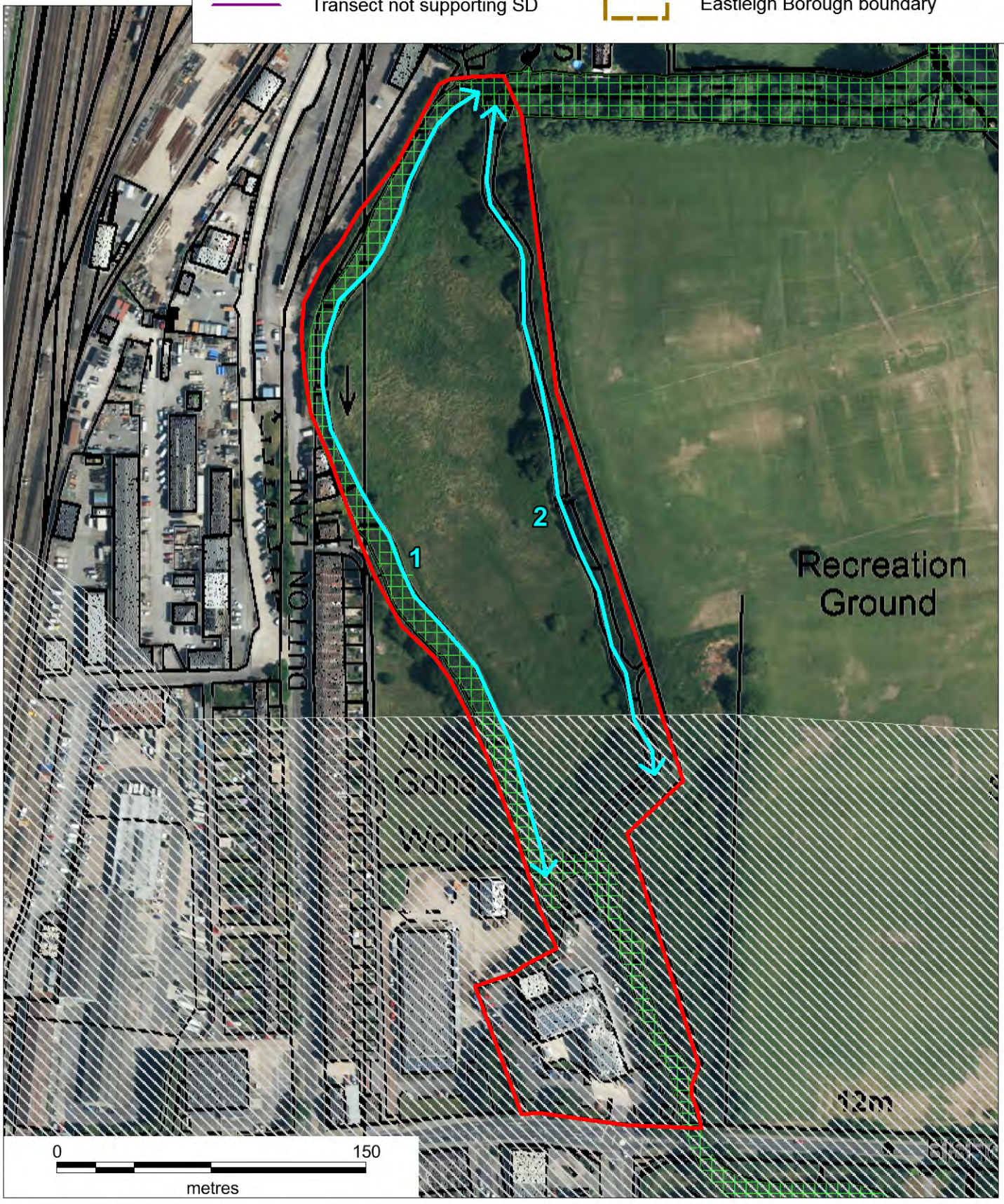


**Table 16:** Odonata abundance (males) recorded at land behind GW Martin in 2018.

| Common Name | Scientific Name | Transect Number | |
|---|---|---|---|
| | | **1** | **2** |
| Southern damselfly | *Coenagrion mercuriale* | D | C |
| Banded demoiselle | *Calopteryx splendens* | D | D |
| Beautiful demoiselle | *Calopteryx virgo* | C | B |
| **Azure damselfly** | ***Coenagrion puella*** | **-** | **A** |
| Large red damselfly | *Pyrrhosoma nymphula* | A | - |
| **Blue-tailed damselfly** | ***Ischnura elegans*** | **B** | **-** |
| **Emperor dragonfly** | ***Anax imperator*** | **A** | **-** |
| Golden-ringed dragonfly | *Cordulegaster boltonii* | A | - |

# 9. ASHTRIM NURSERY

## 9.1 Site Description

A detailed description of Ashtrim Nursery (Map 1) is provided in Section 11 of the original survey and habitat assessment study report (Rushbrook, 2018a), with all transects included within this study shown on Figure 12 below.

## 9.2 Adult Count Surveys

Adult count surveys were conducted on a single transect at Ashtrim Nursery in 2017 and 2018.

### *9.2.1 Southern damselfly*

The results of adult count surveys conducted at Ashtrim Nursery in 2017 and 2018 are summarised in Table 17.

**Table 17:** Southern damselfly abundance (males) and density at Ashtrim Nursery.

| Transect No. | Transect Length (m) | 2017 | | 2018 | | Weather Criteria |
|---|---|---|---|---|---|---|
| | | Abundance | Density (per 100m) | Abundance | Density (per 100m) | |
| 1 | 200 | 53 | 26.47 | 37 | 18.50 | Met |

There was reduction in the number of male southern damselfly recorded on transect 1 at Ashtrim Nursery in 2018 (Table 17). Though still representing one of the higher densities of all transects included in this study, this did result in the site dropping from fifth to tenth in terms of the density of males this site supported (Table 7; Appendix 1). Male southern damselfly were largely focused on the section upstream (north) of the junction of transect 1 with transect 2 (Figure 12) during both surveys, with few individuals recorded downstream (south) of where these two transects re-connect. No copulating pairs or ovipositing females were recorded during the adult count survey conducted in either 2017 or 2018 (Table 2; Appendix 2).

Based on the results of the habitat assessments and adult count surveys conducted in 2017, and the repeat adult count surveys conducted in 2018, Ashtrim Nursery is considered to support a medium strength southern damselfly population.

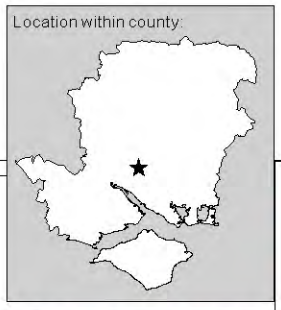
### *9.2.2 Other Odonata*

In total, four and five species of Odonata were recorded during the adult count surveys in 2017 and 2018 (Table 18). Banded demoiselle was the most abundant species at the site in both years, with a similar number of azure damselfly and large red damselfly recorded in 2017 and 2018.

**Table 18:** Odonata abundance (males) recorded at Ashtrim Nursery in 2018.

| Common Name | Scientific Name | Transect Number |
|---|---|---|
| | | **1** |
| Southern damselfly | *Coenagrion mercuriale* | D |
| Banded demoiselle | *Calopteryx splendens* | E |
| Azure damselfly | *Coenagrion puella* | C |
| Large red damselfly | *Pyrrhosoma nymphula* | B |
| **Blue-tailed damselfly** | ***Ischnura elegans*** | **A** |

Species in **bold** were not recorded at the site in 2017




# Figure 12: Ashtrim Nursery

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Site boundary

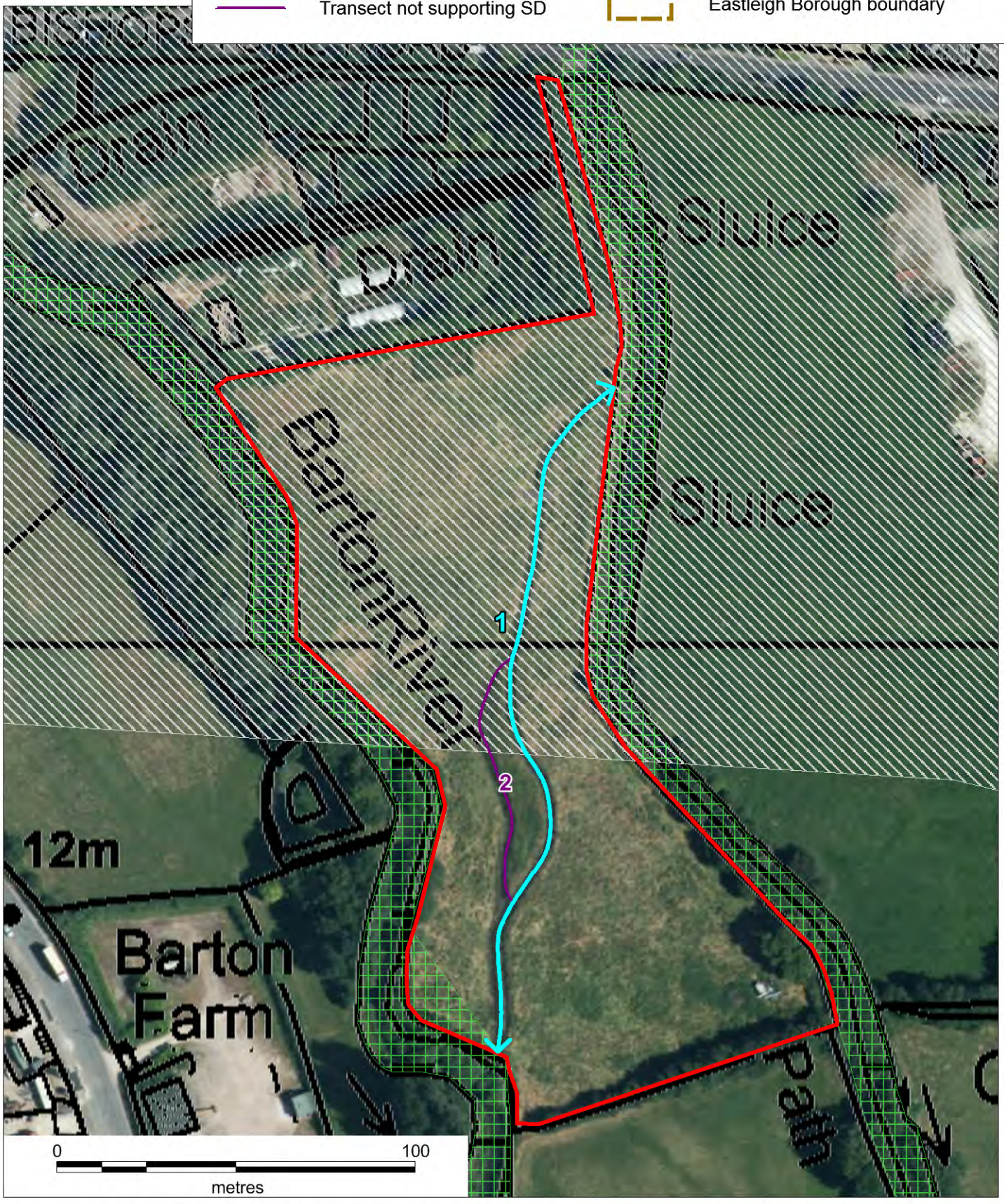
Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary



# 10. DUNFORD'S LAND

## 10.1 Site Description

A detailed description of Dunford's Land (Map 1) is provided in Section 14 of the original survey and habitat assessment study report (Rushbrook, 2018a), with all transects included within this study shown on Figure 13 below.

## 10.2 Adult Count Surveys

Adult count surveys were conducted on two transects at Dunford's Land in both 2017 and 2018. A third transect was excluded from the 2018 adult count survey programme since its habitat suitability was assessed to be sub-optimal to unsuitable during the original survey and habitat assessment study (Rushbrook, 2018a), and given that no southern damselfly were recorded during the adult count survey conducted in 2017 (Table 19).

### *10.2.1 Southern damselfly*

The results of adult count surveys conducted at Dunford's Land in 2017 and 2018 are summarised in Table 19.

**Table 19:** Southern damselfly abundance (males) and density at Dunford's Land.

| Transect No. | Transect Length (m) | 2017 | | 2018 | | Weather Criteria |
|---|---|---|---|---|---|---|
| | | Abundance | Density (per 100m) | Abundance | Density (per 100m) | |
| 1 | 553 | 3 | 0.54 | 1 | 0.18 | Met |
| 2 | 599 | 7 | 1.17 | 12 | 2.00 | Met |
| 3 | 490 | 0 | 0.00 | *DNS* | | Met |

A single to small number of male southern damselfly were recorded across transects 1 and 2 during the adult count surveys conducted in 2017 and 2018 (Table 19). Furthermore, no copulating pairs or ovipositing females were recorded during 2017 or 2018 (Table 2; Appendix 2).

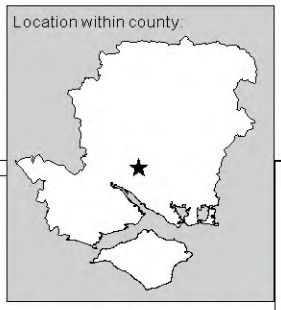
Male southern damselfly were recorded at two locations on transect 1 in 2017; where the channel runs parallel to a new development to the north (i.e. adjacent to Southern Water Pumping House), and where the transect re-enters the site after flowing through a small number of properties (Figure 13). Furthermore, all individuals recorded on transect 2 were focused on the lower reaches, where the channel flows in an east to west direction.

Based on the results of the habitat assessments and adult count surveys conducted in 2017, and the repeat adult count surveys conducted in 2018, Dunford's Land is considered to support a weak population of southern damselfly.

### *10.2.2 Other Odonata*

In total, four species of Odonata were recorded during the adult count surveys (Table 20). Banded demoiselle was the most abundant species recorded at the site during adult count surveys conducted in both 2017 and 2018, and was the most abundant species on both transects during the 2018 surveys.

Azure damselfly and blue-tailed damselfly were recorded in 2017, but were not encountered in 2018. However, given that only a single individual of each species had been recorded across all transects in 2017, this was not unexpected. In contrast, a small number of beautiful demoiselle *Calopteryx virgo* were recorded on both transects 1 and 2 in 2018 (Table 20), but this species was not encountered during the adult count surveys conducted in 2017.




# Figure 13: Dunford's Land

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Arcadian

The wildlife TRUSTS Hampshire & Isle of Wight Wildlife Trust

Site boundary

Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary



N

**Table 20.** Odonata abundance (males) recorded at Dunford's Land in 2018.

| Common Name | Scientific Name | Transect Number | |
|---|---|---|---|
| | | **1** | **2** |
| Southern damselfly | *Coenagrion mercuriale* | A | C |
| Banded demoiselle | *Calopteryx splendens* | C | D |
| **Beautiful demoiselle** | ***Calopteryx virgo*** | **B** | **B** |
| ~~Azure damselfly~~ | ~~*Coenagrion puella*~~ | **-** | **-** |
| ~~Blue-tailed damselfly~~ | ~~*Ischnura elegans*~~ | **-** | **-** |
| Golden-ringed dragonfly | *Cordulegaster boltonii* | A | - |

Species in **bold** were not recorded at the site in 2017

Species ~~struck through~~ were recorded at the site in 2017 but not in 2018

# 11. WEST HORTON FARM

## 11.1 Site Description

A detailed description of West Horton Farm (Map 1) is provided in Section 15 of the original survey and habitat assessment study report (Rushbrook, 2018a), with all transects included within this study shown on Figure 14 below.

## 11.2 Adult Count Surveys

Adult count surveys were conducted on six transects at West Horton Farm in 2017 and 2018. Weather criteria was met for all six surveys conducted in 2018, but for only three (half) of the surveys conducted in 2017 (Appendix 2).

### *11.2.1 Southern damselfly*

The results of adult count surveys conducted at West Horton Farm in 2017 and 2018 are summarised in Table 21.

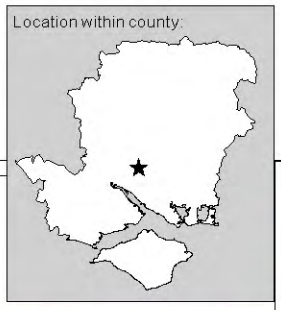
**Table 21:** Southern damselfly abundance (males) and density at West Horton Farm.

| Transect No. | Transect Length (m) | 2017 | | 2018 | | Weather Criteria |
|---|---|---|---|---|---|---|
| | | Abundance | Density (per 100m) | Abundance | Density (per 100m) | |
| 1 | 233 | 1 | 0.43 | 5 | 2.15 | Met |
| 4 | 465 | 8 | 1.72 | 4 | 0.86 | Met |
| 5 | 169 | 0 | 0.00 | 4 | 2.37 | Failed 2017 |
| 6 | 188 | 0 | 0.00 | 4 | 2.13 | Met |
| 7 | 114 | 1 | 0.88 | 2 | 1.75 | Failed 2017 |
| 8 | 186 | 0 | 0.00 | 48 | 25.81 | Failed 2017 |

Male southern damselfly were recorded in very low numbers / densities on three of the six transects subject to adult count surveys in 2017, with only a single male recorded on two of these three transects, and no males recorded on the remaining three transects (Table 21). Although weather criteria was not met during three of the six adult count surveys conducted in 2017, the low numbers of individuals recorded during favourable conditions in 2018, and the findings of the habitat assessments conducted in 2017, would indicate that is was unlikely to have substantially influenced the findings on transects 1, 4, 5, 6 and 7.

However, the findings of surveys on transect 8 varied substantially between years, with 0 and 48 male southern damselfly recorded during the 2017 and 2018 adult count surveys respectively. Furthermore, in contrast to the findings of the 2017 habitat assessment, where only short localised patches of emergent marginal herbaceous vegetation was present, sections of extensive marginal berms with emergent marginal herbaceous frontage were encountered in 2018, with the majority of southern damselfly recorded associated with these areas. It remains unclear why different habitat characteristics were encountered during the two survey years, as no modification in / additional management was evident at the site.

Although the increase in abundance and associated density recorded on transect 8 in 2018 is positive, it important to acknowledge that its direct hydrological links with transect 17 at Allington Manor Farm may augment the numbers of individual that this channel would likely support if it were more isolated..




# Figure 14: West Horton Farm

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Arcadian

The wildlife TRUSTS Hampshire & Isle of Wight Wildlife Trust

Site boundary

Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

8m

Drain

Drain

Drain

Drain

Drain

Viaduct

Track

FB

Track

Track

9m

1

2

3

4

5

6

7

8

9

10

0

200

metres

N


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 6 September 2018 by Deborah Whitfield
For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

The only copulating pairs recorded at the site across the two years were two pairs located on transect 8 during the 2018 adult count survey (Table 2). Furthermore, no ovipositing females were recorded during 2017 or 2018 surveys (Table 2; Appendix 2).

Based on the results of the habitat assessments and adult count surveys conducted in 2017, and the repeat adult count surveys conducted in 2018, West Horton Farm is considered to support a weak to medium strength southern damselfly population.

### *11.2.2 Other Odonata*

Seven species of Odonata were recorded during the adult count surveys at West Horton Farm in 2017 and 2018, although this comprised a total of nine species across the two years (Table 22). Banded demoiselle was the most abundant species in both years, but there was also a substantial increase in the number of azure damselfly recorded in 2018 and, given this species was not recorded at the site in 2017, a moderately high number of beautiful demoiselle also. The abundance of azure damselfly, in particular on transect 6 in both 2017 and 2018, reflected the extended length of standing water present within the ditch system. This is in direct contrast to the perennially slow-moderate flowing conditions required to support southern damselfly.

**Table 22:** Odonata abundance (males) recorded at West Horton Farm in 2018.

| **Common Name** | **Scientific Name** | **Transect Number** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1** | **4** | **5** | **6** | **7** | **8** |
| Southern damselfly | *Coenagrion mercuriale* | B | B | B | B | B | D |
| Banded demoiselle | *Calopteryx splendens* | D | E | E | D | B | E |
| **Beautiful demoiselle** | ***Calopteryx virgo*** | **C** | **D** | **B** | **-** | **A** | **B** |
| Azure damselfly | *Coenagrion puella* | B | A | E | E | C | A |
| Large red damselfly | *Pyrrhosoma nymphula* | B | A | B | B | B | A |
| ~~Common blue damselfly~~ | ~~*Enallagma cyathigerum*~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |
| Blue-tailed damselfly | *Ischnura elegans* | A | B | B | C | A | B |
| Golden-ringed dragonfly | *Cordulegaster boltonii* | A | B | A | - | - | - |
| ~~Black-tailed skimmer~~ | ~~*Orthetrum cancellatum*~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ | ~~-~~ |

Species in **bold** were not recorded at the site in 2017

Species ~~struck through~~ were recorded at the site in 2017 but not in 2018

# 12. ALLINGTON MANOR FARM

## 12.1 Site Description

A detailed description of Allington Manor Farm (Map 1) is provided in Section 16 of the original survey and habitat assessment study report (Rushbrook, 2018a), with all transects included within this study shown on Figure 15 below.

## 12.2 Adult Count Surveys

Adult count surveys were conducted on five transects at Allington Manor Farm in 2017 and 2018.

### *12.2.1 Southern damselfly*

The results of adult count surveys conducted at Allington Manor Farm in 2017 and 2018 are summarised in Table 23.

**Table 23:** Southern damselfly abundance (males) and density at Allington Manor Farm.

| Transect No. | Transect Length (m) | 2017 | | 2018 | | Weather Criteria |
|---|---|---|---|---|---|---|
| | | Abundance | Density (per 100m) | Abundance | Density (per 100m) | |
| 1 | 640 | 116 | 18.13 | 48 | 7.50 | Met |
| 3 | 561 | 82 | 14.62 | 115 | 20.50 | Met |
| 13 | 132 | 71 | 53.97 | 111 | 84.09 | Met |
| 17 | 447 | 149 | 33.34 | 157 | 35.12 | Met |
| 18 | 144 | 23 | 15.97 | 36 | 25.00 | Met |

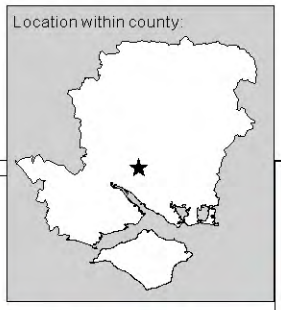
In total, 441 and 467 male southern damselfly were recorded across the five transects surveyed in 2017 and 2018 respectively (Table 23). Furthermore, four of the five transect were included in the top ten transects ranked by abundance in both 2017 and 2018 (Table 6; Appendix 1), and five and four of the top ten transects ranked by density in 2017 and 2018 respectively (Table 7; Appendix 1).

Southern damselfly were present on two main carrier streams (transects 1 & 3 and 17 & 18), and one smaller ditch (transect 13) located within the northern half of the site (Figure 15). Transect 13 supported the greatest density of individuals, returning a particularly high density in 2018 (Table 23). Indeed, this transect supported between one and a half to ten times as many males per 100m than other transects at the site within a given year. However, transects 1, 3 and in particular 17, were also considered to be very important given the length of channel that supported this species, and the notable abundances recorded.

The majority of individuals recorded on both transects 1 and 17 were recorded in the upstream (northern) half of the transects. Furthermore, it was considered that transect 18 provided largely sub-optimal conditions for this species, and that the numbers present on this transect may have been augmented by its connection to transects 1, 17 and 13.

Finally, a copulating pair was recorded on transects 1, 3 and 17 during adult count surveys in 2017 (Appendix 2), and two and three pairs were recorded on transects 3 and 13 during the 2018 surveys (Table 2). Furthermore, although no ovipositing females were recorded on any transects in 2017 (Appendix 2), a single ovipositing female was recorded on transect 3 during the 2018 adult count surveys (Table 2).

Based on the results of the habitat assessments and adult count surveys conducted in 2017, and the repeat adult count surveys conducted in 2018, Allington Manor Farm is considered to support a strong population of southern damselfly.




# Figure 15: Allington Manor Farm

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Arcadian

The wildlife TRUSTS Hampshire & Isle of Wight Wildlife Trust

Site boundary

Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

### *12.2.2 Other Odonata*

A total of seven species were recorded in each of the 2017 and 2018 adult count surveys, but with golden-ringed dragonfly *Cordulegaster boltonii* and beautiful demoiselle recorded in only 2017 and 2018 respectively (Table 24). Southern damselfly and banded demoiselle were the most abundant species recorded during both 2017 and 2018 adult count surveys, though there was a notable increase in large red damselfly, common blue damselfly and blue-tailed damselfly in 2018.

**Table 24:** Odonata abundance (males) recorded at Allington Manor Farm in 2018.

| Common Name | Scientific Name | Transect Number | | | | |
|---|---|---|---|---|---|---|
| | | **1** | **3** | **13** | **17** | **18** |
| Southern damselfly | *Coenagrion mercuriale* | D | E | E | E | D |
| Banded demoiselle | *Calopteryx splendens* | E | E | D | E | D |
| **Beautiful demoiselle** | ***Calopteryx virgo*** | **A** | **B** | **B** | **B** | **-** |
| Azure damselfly | *Coenagrion puella* | C | B | - | A | - |
| Large red damselfly | *Pyrrhosoma nymphula* | C | C | - | A | A |
| Common blue damselfly | *Enallagma cyathigerum* | D | C | - | B | A |
| Blue-tailed damselfly | *Ischnura elegans* | E | B | B | C | - |
| ~~Golden-ringed dragonfly~~ | ~~*Cordulegaster boltonii*~~ | **-** | **-** | **-** | **-** | **-** |

Species in **bold** were not recorded at the site in 2017

Species ~~struck through~~ were recorded at the site in 2017 but not in 2018

# 13. ITCHEN VALLEY COUNTRY PARK

## 13.1 Site Description

A detailed description of the area of Itchen Valley Country Park included within the original survey and habitat assessment study is provided in Section 17 of the associated report (Rushbrook, 2018a), with all transects included within that study shown on Figure 16 below.

An additional transect, comprising an approximately 150m stretch of the main channel of the River Itchen, was included within the 2018 adult count survey programme.

## 13.2 Adult Count Surveys

Adult count surveys were conducted on three transects at Itchen Valley Country Park in both 2017 and 2018, with an additional transect included within the 2018 adult count survey programme.

### *13.2.1 Southern damselfly*

The results of adult count surveys conducted at Itchen Valley Country Park in 2017 and 2018 are summarised in Table 25.

**Table 25:** Southern damselfly abundance (males) and density at Itchen Valley Country Park.

| Transect No. | Transect Length (m) | 2017 | | 2018 | | Weather Criteria |
|---|---|---|---|---|---|---|
| | | Abundance | Density (per 100m) | Abundance | Density (per 100m) | |
| 1 | 136 | 27 | 19.85 | 28 | 20.59 | Met |
| 2 | 262 | 19 | 7.25 | 48 | 18.32 | Met |
| 3 | 157 | 2 | 1.27 | 15 | 9.55 | Met |
| 4 | 143 | *DNS* | | 31 | 21.68 | Failed |

Male southern damselfly were recorded in moderate to very low numbers on the three transects surveyed in 2017, moderate to low numbers on the four transects surveyed in 2018, and with density decreasing as the carrier stream (i.e. transects 1 to 3) progressed downstream (Table 25). Furthermore, a copulating pair was recorded on transect 2 in 2017 (Appendix 2), with one and two pairs recorded on transects 1 and 2 respectively in 2018 (Table 2). No ovipositing females were recorded during any of the adult count surveys (Table 2; Appendix 2).

Abundance, and by association density, was higher on all transects in 2018 than 2017 (though the values returned for transect 1 are very similar between years), and the moderate number of males recorded on the short section of the main river added to the 2018 surveys provided further evidence of the value of this area for southern damselfly.

Based on the results of the habitat assessments and adult count surveys conducted in 2017, and the repeat adult count surveys conducted in 2018, the area of Itchen Valley Country Park included within the adult count surveys is considered to support a medium strength (sub-)population of southern damselfly.

### *13.2.2 Other Odonata*

In total, ten species of Odonata were recorded across the adult count surveys conducted at Itchen Valley Country Park in 2017 and 2018, although only six species were recorded during the latter. The absence of the larger anisopteran species (i.e. dragonfly) from the 2018 adult count surveys may be a consequence of the survey being conducted a month earlier in this year, though it is emphasised that both surveys were conducted within the recommended period for southern damselfly.


# Figure 16: Itchen Valley Country Park

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Site boundary

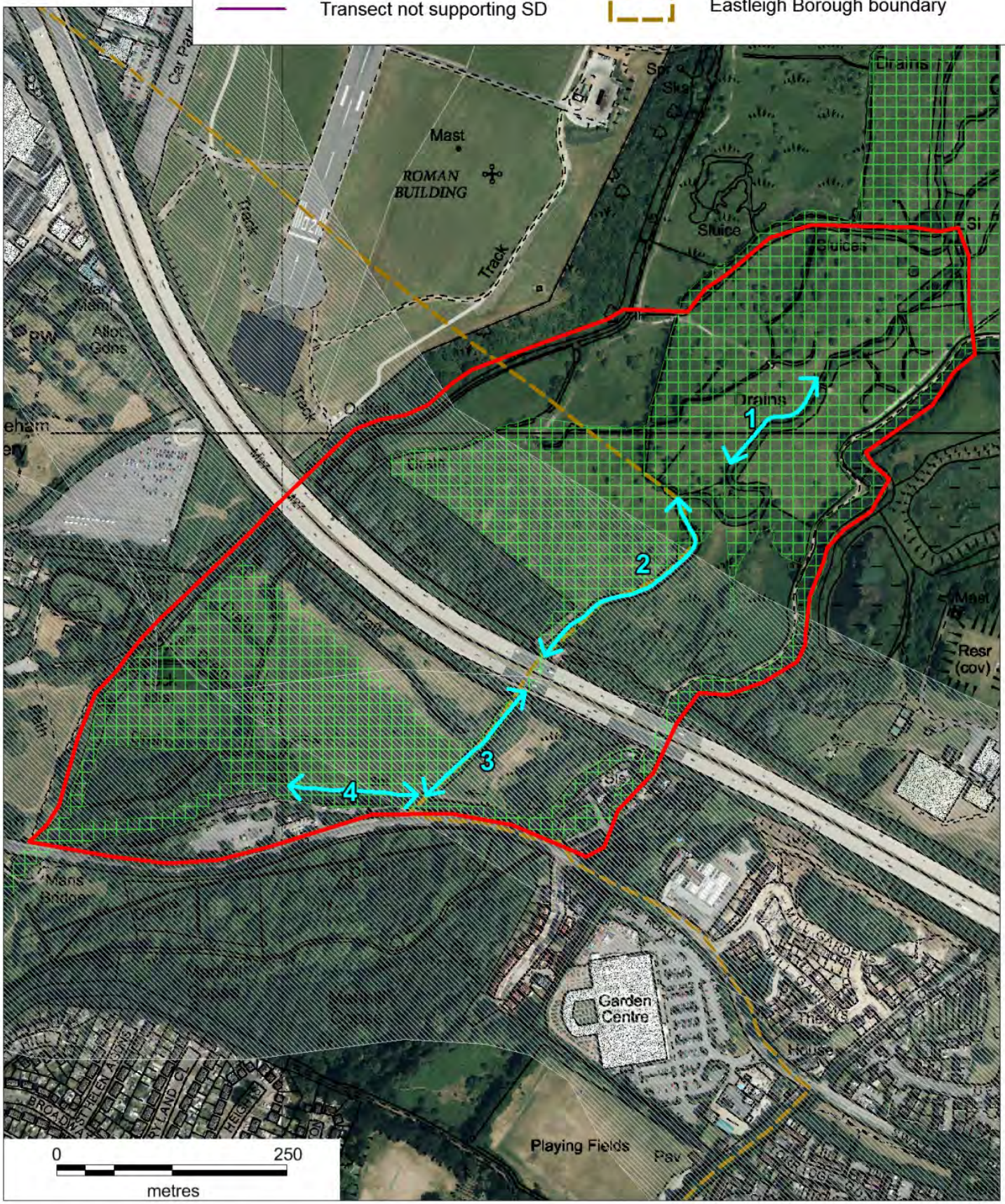
Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary




N

Banded demoiselle was noticeably more abundant than all other species during both 2017 and 2018 adult count surveys. Large red damselfly and azure damselfly were the next most frequently recorded species, with the remainder largely consisting of single or a small number of individuals (Table 26).

**Table 26.** Odonata abundance (males) recorded at Itchen Valley Country Park in 2018.

| Common Name | Scientific Name | Transect Number | | | |
|---|---|---|---|---|---|
| | | 1 | **2** | **3** | **4** |
| Southern damselfly | *Coenagrion mercuriale* | D | D | C | D |
| Banded demoiselle | *Calopteryx splendens* | D | E | D | D |
| Azure damselfly | *Coenagrion puella* | B | - | C | C |
| Large red damselfly | *Pyrrhosoma nymphula* | - | B | C | B |
| Blue-tailed damselfly | *Ischnura elegans* | A | B | B | B |
| Emperor dragonfly | *Anax imperator* | A | - | A | A |
| ~~Golden-ringed dragonfly~~ | ~~*Cordulegaster boltonii*~~ | - | - | - | - |
| ~~Broad-bodied chaser~~ | ~~*Libellula depressa*~~ | - | - | - | - |
| ~~Common darter~~ | ~~*Sympetrum striolatum*~~ | - | - | - | - |
| ~~Ruddy darter~~ | ~~*Sympetrum sanguineum*~~ | - | - | - | - |

Species ~~struck through~~ were recorded at the site in 2017 but not in 2018.

## 13.3 Itchen Valley Country Park Monitoring Study

A total of 721 southern damselfly were recorded across ditches 1, 3 and 4 (Figure 17) during the fifteen week survey programme (Table 3). Southern damselfly were recorded on all fifteen survey visits, with peak counts of 143 and 146 individuals recorded in weeks 4 and 5 respectively, though it is acknowledged that this was recorded following route B (see Section 2.3.2), when a greater length of suitable habitat on transects 3e and 4g was surveyed. However, relatively large numbers of individuals were also recorded in weeks 8 and 9, when the surveyor was following route A, indicating that ditch 4 was not the most influential transect determining the abundance of southern damselfly in the monitoring area.

Indeed, despite its shorter length (Table 4), ditch 3 supported the highest number of southern damselfly, with a total of 183, 398 and 140 individuals recorded on ditches 1, 3 and 4 respectively. Furthermore, ditch 3 supported the highest number of individuals on 11 of the 15 surveys visits (Table 3), and had notably higher peak, mean and median counts than the other ditches (Table 4).

The long-term data set suggests that the population had suffered a considerable decline during a 12 year period between 2004 and 2016, but has presented a strong recovery this year, returning total, peak, mean and median counts comparable with the best years in the past decade (Figures 4-7). However, it is emphasised that these are still substantially lower (less than half) than the total counts returned in the early 2000's (Figure 3).

It is therefore considered that, based on the results of recent monitoring surveys, and acknowledging that some sections of channel are included within the monitoring study for their historic rather than currently suitability, the area of Itchen Valley Country Park included within monitoring study is considered to support a medium to strong (sub-)population of southern damselfly.


# Figure 17: IVCP Monitoring Ditches

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Site boundary

Transect supporting SD

Transect not supporting SD

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

M1

M2

M3

M4

Sluice

Track

FB

0 100

metres

N

Furthermore, when considering the results of the two survey programmes in combination, and given the fact that extensive areas of suitable habitat at the site are excluded from formal investigation, it is considered likely that the Itchen Valley Country Park in its entirety supports a strong population of southern damselfly.

# 14. SUMMARY AND DISCUSSION

## 14.1 Adult Count Surveys

In total, 1,658 male southern damselfly were recorded across the 29 transects included within the repeat adult count survey programme. The greatest abundance of southern damselfly were recorded at Highbridge Farm, Allington Manor Farm and Breach Farm. Furthermore, moderate numbers of males were recorded at Itchen Valley Country Park, land behind GW Martin, Ashtrim Nursery, land owned by Bishopstoke Fishing Club, and West Horton Farm, although the majority of individuals recorded (>70%) at the latter were associated with a single transect (Table 2). The densities of southern damselfly (number of males recorded per 100m) recorded across the survey sites was largely consistent with their corresponding abundances, with those sites supporting high abundances of male southern damselfly predominately returning relatively high densities of individuals. However, density was not only highly variable between sites, but also demonstrated considerable differences within sites (Table 2), a reflection in the level and extent of suitable habitat present on each individual transect.

There was also considerable variation when comparing a number of individual transects between the two separate adult count surveys (Table 5). Indeed, in addition to the considerable increase in both abundance (and by association density) observed at sites including Breach Farm and West Horton Farm in 2018, there existed a notable degree of variation within a number of those transects that returned relatively high southern damselfly abundance and / or density in both 2017 and 2018. This was apparent at both Highbridge Farm and Allington Manor Farm, where a notable increase in abundance and / or density was recorded in some transects, whereas a contrasting decrease in abundance and / or density was recorded on others (Table 5).

Despite the variability in absolute southern damselfly abundance and density recorded within individuals transects between years, there was only a limited degree of variation in the relative importance of the individual transects. Interrogation of the data collected during each adult count survey programme identified Highbridge Farm and Allington Manor Farm as key sites within the study area, with transects from these sites consistently present in the top ten ranked transects for abundance and density in 2017 and 2018 (Tables 6 and 7; Appendix 1). Furthermore, the inclusion of transects from Itchen Valley Country Park, land behind GW Martin, and Ashtrim Nursery within these rankings (Tables 6 and 7) provided further evidence of the relative importance of these sites for southern damselfly populations within and adjacent to the Eastleigh Borough boundary, as well as the wider Lower Itchen Valley metapopulation.

Transect 1c at Breach Farm and transect 8 at West Horton Farm were notable exceptions to this trend, with southern damselfly abundance and densities substantial greater in 2018 than were recorded in 2017, elevating the relative importance of these sites within Eastleigh Borough as well as the wider Lower Itchen Valley metapopulation.

## 14.2 Itchen Valley Country Park Monitoring Study

As explained in more detail in Section 2.3.2, given the recognition that there have been discrepancies in the exact transect routes surveyed, caution must be exercised when drawing conclusions from the data collected throughout the Itchen Valley Country Park monitoring study. However, given the relatively small difference in the survey routes, and supported by the data analysis methods set out in Section 2.4, it is considered that the data is valuable in identifying substantial differences in data returned between years, and for the assessment of the overall strength of the southern damselfly population at Itchen Valley Country Park.

A total of 721 southern damselfly were recorded across ditches 1, 3 and 4 during the fifteen week survey programme, with ditch 3 returning the highest abundances and densities of individuals (Table 3). Long-term annual count data collected from Itchen Valley Country Park between 1999 and 2018 inclusive shows that, following a period of notable fluctuation (i.e. 1999 to 2004 inclusive), there was a marked decline in the total number of adult southern damselfly recorded (Figure 3). Specifically, following a sharp decline in the number of southern damselfly recorded between 2005 and 2013, there was little recovery in the total counts over the following four survey seasons (Figure 3). This trend was also evident when interrogating the total count data for the individual ditches (Figure 4).

Furthermore, the corresponding patterns in peak, mean, and median counts of individuals recorded (Figures 5-7) support this overall assessment of the relative population strength.

However, there was a notable increase in the total numbers of southern damselfly recorded in 2018 in comparison with recent years, although numbers remain substantially lower (less than half) than the total counts recorded in the early 2000's (Figure 3). Once more, this trend was evident both when interrogating the total count data for the individual ditches, and within the corresponding patterns for peak, mean, and median counts (Figures 4–7).

## 14.3 Discussion

The results of the 2018 adult count surveys and Itchen Valley Country Park monitoring study provided additional data to support the assessment of southern damselfly population strength provided in the original survey and habitat assessment study (Rushbrook, 2018a). A revised assessment of the relative strength of all thirteen study sites is therefore provided in Table 27.

**Table 27:** Assessment of the relative strength of southern damselfly populations at each of the thirteen sites included within the original study.

| Site | Assessment of Population Strength | | |
|---|---|---|---|
| | **Original**† | **Current** | **Potential**^ |
| Bishopstoke FC Land | Absent* | Weak to Medium | Medium |
| Highbridge Farm | Strong | Strong | Very Strong |
| Breach Farm | Weak | Medium | Medium |
| Withy Meadows | Absent | *no revision* | Medium |
| Bishopstoke Park | N/a | *no revision* | N/a |
| Land behind GW Martin | Medium | Medium | Medium‡ |
| Ashtrim Nursery | Medium | Medium | Medium‡ |
| Morris' Land | Negligible | *no revision* | N/a‡ |
| Toby Carvery | Absent | *no revision* | N/a |
| Dunford's Land | Weak | Weak | Medium‡ |
| West Horton Farm | Weak | Weak to Medium | Strong |
| Allington Manor Farm | Strong | Strong | Strong |
| Itchen Valley Country Park | Medium | Strongˆ | Strong |

† This is the assessment presented in Table 2 of the original survey and habitat assessment report (Rushbrook, 2018a).

^ This assessment of potential population strength is based on the implementation of one or more of the habitat enhancement opportunities identified in the strategic conservation plan (Rushbrook, 2018b).

* Section of the main River Itchen identified at the site that may provide suitable habitat for southern damselfly but was not assessed in 2017.

‡ This assessment may be increased to strong if one or more of the habitat creation opportunities identified in the strategic conservation plan (Rushbrook, 2018b) were implemented.

ˆ Assessment based on the combined results of adult count surveys and the Itchen Valley Country Park monitoring study.

It is considered that only Highbridge Farm, Allington Manor Farm, and (when considering the site in its entirety) Itchen Valley Country Park support strong populations of southern damselfly located in, and immediately adjacent to, the Eastleigh Borough boundary. These sites are therefore considered the

three most important or key sites within this study area. Furthermore, Highbridge Farm is located at and immediately beyond the northern boundary of the borough, whereas Allington Manor Farm and Itchen Valley Country Park are located towards, at, or immediately beyond the southern boundary of the borough. Therefore, given its location and associated value in connecting southern damselfly populations in the lower and middle reaches of the Itchen Valley, Highbridge Farm is also considered strategically very important in connecting sites across the wider Itchen Valley metapopulation.

In addition to Ashtrim Nursery and land behind GW Martin, the repeat study has also identified Breach Farm, land owned by Bishopstoke Fishing Club and West Horton Farm as sites that support (weak to) medium strength southern damselfly populations (Table 27), whose intrinsic value is amplified by their strategic locations. Specifically since the three 'strong' populations of southern damselfly are located at either the northern (i.e. Highbridge Farm) or southern boundary (i.e. Allington Manor Farm and Itchen Valley Country Park) of the study area, Ashtrim Nursery and land behind GW Martin are considered to be strategically important sites due to both the population size, but also given their central location within the study area. Furthermore, the presence of a (weak to) medium strength population to the north (i.e. land owned by Bishoptoke Fishing Club), and medium strength population to the south (i.e. Breach Farm) of Highbridge Farm, and a (weak to) medium strength population to the north of Allington Manor Farm (i.e. West Horton Farm), may allow individuals to disperse more readily between the central and southern population 'hubs' of the wider Itchen Valley metapopulation. This allows these sites to act more effectively as source populations, and thereby increases the resilience and robustness of the wider Itchen Valley metapopulation.

However, the vast majority of male southern damselfly recorded during each of the two adult count survey programmes were encountered at only a small number of sites, with Highbridge Farm and Allington Manor Farm accounting for 83% and 64% of all males recorded during the 2017 and 2018 surveys respectively. Therefore, given the localised distributions of the majority of males, the unsuitability of the majority of other sites / transects visited in the original study (Rushbrook, 2018a), and the inherently limited dispersal capabilities of the species (Purse, 2002; Rouquette, 2005), the distance between sites supporting strong and / or medium strength populations is considered to be highly concerning.

Furthermore, despite the number of individuals recorded during this years' Itchen Valley Country Park monitoring study, there remains concerning evidence to suggest there has been a decline in the number of individuals supported by this site in the past 15 – 20 years. Moreover, though a moderate number of individuals were recorded on transect 8 during this year's adult count surveys, there remains strong evidence for both a recent loss of suitable habitat, and a marked decline in the strength of the population, at West Horton Farm (Rouquette, 2005; Rushbrook, unpublished data; Rushbrook, personal observations).

In combination, these findings indicate that southern damselfly have become localised and therefore remain at increased risk, or potentially already suffering, a decline in the strength of the metapopulation in and around Eastleigh Borough. It is therefore considered that urgent conservation action is required for this species across the study area.

Since the majority of the data assessed within this study is limited to two years of collection only, and given that habitat condition was the only potential factor (of a number that may be influencing the distribution of the species in Eastleigh Borough) that was assessed, it is not appropriate to speculate what spectrum of factors is causing this localised distribution. However, what is evident that it is not only the size of the sites, but also the presence of beneficial management practices such as grazing and scrub control, that has resulted in Highbridge Farm, Allington Manor Farm, Breach Farm, Ashtrim Nursery and land behind GW Martin supporting the majority of individuals recorded. It is therefore considered that a programme of habitat enhancement and / or creation would facilitate an increase in the strength of the southern damselfly metapopulation present in and around Eastleigh Borough.

It is therefore strongly recommended that consideration is given to the range of habitat enhancement and creation options identified within, and immediately adjacent to the Eastleigh Borough boundary, set out in the recently published '*Strategic conservation plan for southern damselfly Coenagrion mercuriale: habitat enhancement and creation opportunities in and adjacent to Eastleigh Borough*' (Rushbrook, 2018b). This document allows for an informed and considered approach to be adopted to southern damselfly conservation in and around the borough. This may be achieved proactively

through the planning system (either through Eastleigh Borough Council's commitment to secure net biodiversity gain or as direct mitigation / compensation for the effects of development on this species), and / or more reactively as and when opportunities arise.

However, as set out in the strategic conservation plan (Rushbrook, 2018b), it is emphasised that collaboration between local authorities, statutory bodies and non-statutory conservation bodies is essential to successfully deliver this strategic conservation plan for southern damselfly. These organisations must work closely with land managers / stakeholders to facilitate the delivery of long-term conservation measures for southern damselfly and, where opportunities arise, secure land for the purpose of the delivery of the identified habitat enhancement and creation proposals. This approach will address a number of constraints identified with the delivery of the proposed habitat enhancement and creations works at some sites, and will be fundamental in maximising the extent and value of the habitat specific conservation measures delivered for southern damselfly within and beyond the Eastleigh Borough boundary.

# 15. REFERENCES


- **Boudot, J.-P. (2006).** *Coenagrion mercuriale*. The IUCN Red List of Threatened Species 2006: e.T5081A11113215. http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T5081A11113215.en. Downloaded on 29th August 2017.
- **Purse, B.V. (2002).** *The ecology of the southern damselfly (Coenagrion mercuriale - Charpentier) in Britain*. R&D Technical Report W1-021/TR, Environment Agency, Bristol.
- **Rouquette, J.R. (2005).** *Conservation requirements of the southern damselfly in chalkstream and fen habitats*. Science Report SC000017/SR, Environment Agency, Bristol.
- **Rushbrook, B. (2018a).** *Southern damselfly survey and habitat assessment study: Eastleigh Borough*. Arcadian Ecology & Consulting Ltd, Curdridge.
- **Rushbrook, B. (2018b).** *Strategic conservation plan for southern damselfly Coenagrion mercuriale: habitat enhancement and creation opportunities in and adjacent to Eastleigh Borough*. Arcadian Ecology & Consulting Ltd, Curdridge.
- **Rushbrook, B. (*in prep*).** *Itchen Valley Country Park southern damselfly monitoring study: 2018 Report*. Arcadian Ecology & Consulting Ltd, Curdridge.
- **Taverner, J., Cham, S. & Hold, A. (2004).** *The dragonflies of Hampshire*. Pisces Publications, Newbury.
- **Thompson, D.J., Rouquette, J.R. & Purse, B.V. (2003a).** *Ecology of the southern damselfly*. Conserving Natura 2000 Rivers Ecology Series No.8, English Nature, Peterborough.
- **Thompson, D. J., Purse, B. V. & Rouquette, J. R. (2003b).** *Monitoring the southern damselfly*. Conserving Natura 2000 Rivers Monitoring Series No.8, English Nature, Peterborough.

# MAPS


# Map 1. Location of all survey sites

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Ordnance Survey basemap (1:50,000)

Arcadian

The Wildlife Trusts
Hampshire & Isle of Wight Wildlife Trust

Bishopstoke Fishing Club Land

Highbridge Farm

Breach Farm

Withy Meadows

Bishopstoke Park

Land behind GW Martin

Land associated with Toby Carvery

Ashtrim Nursery

Morris' Land

Dunford's Land

West Horton Farm

Itchen Valley Country Park

Allington Manor Farm

Site boundary (included in repeat survey study)

Site boundary (excluded from repeat survey study)

200m road buffer

River Itchen SAC

Eastleigh Borough boundary

N


For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

Location within county:

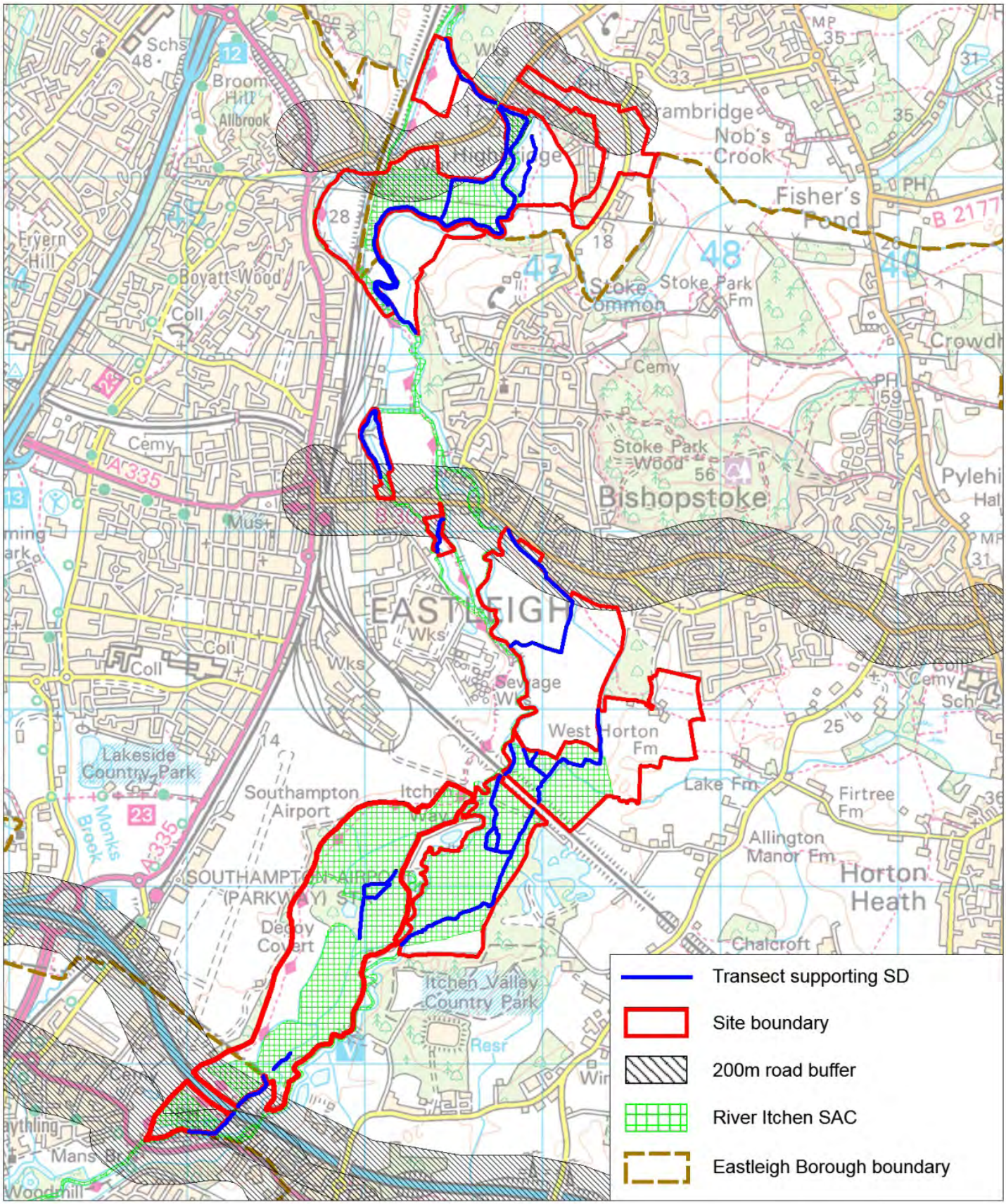
# Map 2. Transects supporting southern damselfly in 2018

Southern Damselfly Repeat Survey Study: Eastleigh Borough

Ordnance Survey basemap (1:50,000)

Arcadian

The Wildlife Trusts – Hampshire & Isle of Wight Wildlife Trust




N


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 6 September 2018 by Ben Rushbrook.
For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwwt.org.uk, tel: 01489 774455.

# APPENDICES

# Appendix 1:

Comparison of relative abundance (males) and density (males per 100m) for all transects included within both 2017 and 2018 adult count survey programmes

**Appendix 1:** Comparison of relative abundance (males) and density (males per 100m) for all transects included within both 2017 and 2018 adult count survey programmes.

| Site Name & Transect No. | 2017 | | 2018 | | Variation | |
|---|---|---|---|---|---|---|
| | Rank Abundance | Rank density | Rank Abundance | Rank density | Rank Abundance | Rank density |
| Highbridge Farm - T1 | 12 | 14 | 16 | 18 | 4 | 4 |
| Highbridge Farm - T2a | 14 | 6 | 18 | 15 | 4 | 9 |
| Highbridge Farm - T2b | 7 | 3 | 12 | 5 | 5 | 2 |
| Highbridge Farm - T3 | 3 | 1 | 7 | 2 | 4 | 1 |
| Highbridge Farm - T4 | 1 | 11 | 1 | 13 | 0 | 2 |
| Highbridge Farm - T5 | 6 | 16 | 3 | 12 | -3 | -4 |
| Highbridge Farm - T9 | 11 | 13 | 22 | 25 | 11 | 12 |
| Breach Farm - T1c | 15 | 17 | 2 | 4 | -13 | -13 |
| GW Martin - T1 | 9 | 12 | 8 | 14 | -1 | 2 |
| GW Martin - T2 | 18 | 18 | 20 | 22 | 2 | 4 |
| Ashtrim - T1 | 10 | 5 | 13 | 10 | 3 | 5 |
| Dunford - T1 | 21 | 23 | 27 | 27 | 6 | 4 |
| Dunford - T2 | 20 | 21 | 19 | 23 | -1 | 2 |
| West Horton Farm - T1 | 23 | 24 | 21 | 20 | -2 | -4 |
| West Horton Farm - T4 | 18 | 19 | 22 | 26 | 4 | 7 |
| West Horton Farm - T5 | 25 | 25 | 22 | 19 | -3 | -6 |
| West Horton Farm - T6 | 25 | 25 | 22 | 21 | -3 | -4 |
| West Horton Farm - T7 | 23 | 22 | 26 | 24 | 3 | 2 |
| West Horton Farm - T8 | 25 | 25 | 9 | 6 | -16 | -19 |
| Allington Manor Farm - T1 | 4 | 8 | 9 | 17 | 5 | 9 |
| Allington Manor Farm - T3 | 5 | 10 | 5 | 9 | 0 | -1 |
| Allington Manor Farm - T13 | 8 | 2 | 6 | 1 | -2 | -1 |
| Allington Manor Farm - T17 | 2 | 4 | 4 | 3 | 2 | -1 |
| Allington Manor Farm - T18 | 15 | 9 | 14 | 7 | -1 | -2 |
| IVCP - T1 | 13 | 7 | 15 | 8 | 2 | 1 |
| IVCP - T2 | 17 | 15 | 9 | 11 | -8 | -4 |
| IVCP - T3 | 22 | 20 | 17 | 16 | -5 | -4 |

**N.B**. Transects included in only the 2017 or 2018 adult count survey programmes have been excluded from this analysis.

# Appendix 2:

Results and weather conditions during all adult count surveys conducted in 2017
(red text indicates weather conditions were not met)

**Appendix 2:** Results and weather conditions during all adult count surveys conducted in 2017 (red text indicates weather conditions were not met).

| Site Name & Transect No. | Transect Length (m) | Abundance (males) | Density (males per 100m) | Copulating Pairs | Ovipositing Females | Date | Start Time | Temp (°C) | Ave Wind Speed | Max Wind Speed | % Sunshine |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bishopstoke FC - T5 | 97 | 0 | 0.00 | 0 | 0 | 20/07/2017 | 15:00 | 21 | 3 | 4 | 100 |
| Highbridge Farm - T1 | 421 | 34 | 8.08 | 2 | 0 | 13/06/2017 | 10:40 | 19.3 | 2 | 3 | 90 |
| Highbridge Farm - T2a | 103 | 25 | 24.27 | 1 | 0 | 13/06/2017 | 12:06 | 21.7 | 2 | 2 | 90 |
| Highbridge Farm - T2b | 149 | 72 | 48.32 | 2 | 0 | 13/06/2017 | 12:43 | 22.9 | 2 | 3 | 65 |
| Highbridge Farm - T2c | 397 | 2 | 0.50 | 0 | 0 | 13/06/2017 | 14:54 | 21.6 | 1 | 2 | 75 |
| Highbridge Farm - T3 | 229 | 135 | 59.08 | 2 | 0 | 13/06/2017 | 13:26 | 22.2 | 1 | 2 | 60 |
| Highbridge Farm - T4 | 1382 | 194 | 14.04 | 4 | 0 | 14/06/2017 | 10:36 | 22.8 | 2 | 4 | 99 |
| Highbridge Farm - T5 | 1075 | 76 | 7.07 | 0 | 0 | 14/06/2017 | 14:00 | 23.2 | 4 | 4 | 100 |
| Highbridge Farm - T9 | 372 | 37 | 9.95 | 0 | 0 | 17/06/2017 | 10:42 | 23.0 | 1 | 2 | 100 |
| Highbridge Farm - T32 | 759 | 4 | 0.53 | 0 | 0 | 18/06/2017 | 13:14 | 28.2 | 1 | 2 | 65 |
| Breach Farm - T1c | 661 | 23 | 3.48 | 0 | 0 | 15/06/2017 | 15:03 | 21.8 | 3 | 4 | 75 |
| GW Martin - T1 | 431 | 54 | 12.53 | 0 | 0 | 19/06/2017 | 11:30 | 28.1 | 1 | 2 | 85 |
| GW Martin - T2 | 339 | 8 | 2.36 | 0 | 0 | 19/06/2017 | 12:47 | 27.0 | 1 | 2 | 80 |
| Ashtrim Nursery - T1 | 200 | 53 | 26.47 | 0 | 0 | 19/06/207 | 13:56 | 29.2 | 2 | 3 | 80 |
| Morris' Land - T6 | 237 | 2 | 0.84 | 0 | 0 | 21/06/2017 | 14:54 | 29.2 | 2 | 3 | 100 |
| Dunford's Land - T1 | 553 | 3 | 0.54 | 0 | 0 | 02/07/2017 | 11:54 | 20.8 | 2 | 3 | 95 |
| Dunford's Land - T2 | 599 | 7 | 1.17 | 0 | 0 | 02/07/2017 | 13:35 | 21.6 | 2 | 3 | 95 |
| Dunford's Land - T3 | 490 | 0 | 0.00 | 0 | 0 | 02/07/2017 | 15:05 | 22.1 | 2 | 3 | 100 |

| Site Name & Transect No. | Transect Length (m) | Abundance (males) | Density (males per 100m) | Copulating Pairs | Ovipositing Females | Date | Start Time | Temp (°C) | Ave Wind Speed | Max Wind Speed | % Sunshine |
|---|---|---|---|---|---|---|---|---|---|---|---|
| West Horton Farm - T1 | 233 | 1 | 0.43 | 0 | 0 | 07/07/2017 | 10:47 | 22.2 | 2 | 3 | 55 |
| West Horton Farm - T4 | 465 | 8 | 1.72 | 0 | 0 | 07/07/2017 | 12:04 | 24.6 | 2 | 3 | 90 |
| West Horton Farm - T5 | 169 | 0 | 0.00 | 0 | 0 | 14/07/2017 | 15:08 | 20.7 | 3 | 5 | 35 |
| West Horton Farm - T6 | 188 | 0 | 0.00 | 0 | 0 | 07/07/2017 | 14:32 | 25.1 | 2 | 3 | 85 |
| West Horton Farm - T7 | 114 | 1 | 0.88 | 0 | 0 | 14/07/2017 | 13:19 | 22.4 | 3 | 4 | 35 |
| West Horton Farm - T8 | 186 | 0 | 0.00 | 0 | 0 | 14/07/2017 | 14:14 | 22.2 | 3 | 4 | 40 |
| Allington Manor - T1 | 640 | 116 | 18.13 | 1 | 0 | 06/07/2017 | 11:19 | 24.6 | 2 | 2 | 75 |
| Allington Manor - T3 | 561 | 82 | 14.62 | 1 | 0 | 05/07/2017 | 10:52 | 20.7 | 2 | 3 | 100 |
| Allington Manor - T13 | 132 | 71 | 53.97 | 0 | 0 | 05/07/2017 | 14:09 | 25.2 | 2 | 3 | 95 |
| Allington Manor - T17 | 447 | 149 | 33.34 | 1 | 0 | 05/07/2017 | 12:46 | 23.6 | 2 | 3 | 100 |
| Allington Manor - T18 | 144 | 23 | 15.97 | 0 | 0 | 05/07/2017 | 15:09 | 25.3 | 3 | 3 | 100 |
| Itchen Valley CP - T1 | 136 | 27 | 19.85 | 0 | 0 | 17/07/2017 | 11:34 | 22.2 | 2 | 3 | 95 |
| Itchen Valley CP - T2 | 262 | 19 | 7.25 | 1 | 0 | 17/07/2017 | 12:16 | 22.7 | 2 | 3 | 95 |
| Itchen Valley CP - T3 | 157 | 2 | 1.27 | 0 | 0 | 17/07/2017 | 13:20 | 24.7 | 2 | 3 | 85 |