A SURVEY OF ODONATA ON THE WEST SUSSEX RIVERS ARUN & ROTHER

Banded demoiselles on the River Arun © D Sadler

2014

by David Sadler
edited by Fran Southgate

heritage lottery fund
LOTTERY FUNDED

ARUN & ROTHER CONNECTIONS
linking landscape and community

CONTENTS

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Summary

In summer 2014, the Arun & Rother Connections (ARC) project funded an in-depth survey of the Odonata along the Arun and Western Rother Rivers in West Sussex. The survey was carried out in order to provide information on the current status of dragonflies in the catchment and in the Upper Arun Site of Special Scientific Interest, and to provide information on whether the ARC project and its partners can and should take action to enhance dragonfly habitat throughout the river catchment.

The limits of the area surveyed were Houghton north to Drungewick on the Arun, and westward to Shopham on the Rother. Although it was not possible to visit the whole of these respective rivers within the confines of the survey, a representative suite of sites was surveyed across a wide landscape area. A range of wetland habitats were surveyed, however the primary focus was on riparian and riverine habitats. In total, over 60 km of river and wetland were inspected, some areas on multiple occasions.

A total of 27 species were recorded, including 11 damselfly and 16 dragonfly species. The majority of these species are likely to have been breeding, although evidence of breeding was only observed for 16 species. This is one more breeding species than was noted in the original SSSI citation. Notable species present were Hairy Dragonfly, Common Clubtail, Scarce Chaser and Brilliant Emerald, the first three of these species showing strong breeding populations. Overall 443 unique dragonfly and damselfly records were submitted, totaling over 6,800 individual records, with over 670 records of copulating pairs, 230 records of pairs or lone females ovipositing (depositing eggs), 992 identified males, 946 identified females, 119 tenerals and 3 exuviae recorded.

The survey enabled unusual behaviours of key species to be recorded such as mating and egg-carrying by the Common club-tail (one of the focal species of the ARC project). Although Club-tails were only recorded on 3 far-separated reaches of the Arun and Rother, it is inconceivable that the species does not breed successfully both in between and beyond these sites. We would recommend further survey in future years in order to learn more about this notable species.

Although some heathland specialists were noted such as Black darter and Golden-ringed dragonfly, we recommend that further specialist survey is carried out across heathlands, greensand streams, chalk streams and notable ponds to gain a better understanding of the distributions and habitat uses of these specialists. There were also notable differences in populations of some species such as Scarce chaser between the Arun & the Western Rother rivers.

There were evident associations with good quality wetland habitat. Good numbers of Emerald damselfly were found at Graffham Common where extensive wetland restoration works have recently been carried out, and good numbers of dragonflies were recorded on many designated sites throughout the catchment. Habitat for dragonflies varies greatly in quality throughout the rest of the catchment, with many opportunities available to enhance both the connectivity and the extent of available habitats.

A single season survey cannot of course, be definitive, and it is difficult to draw meaningful conclusions from the data collected in ones season. This survey is however extremely useful as a baseline data set, upon which future studies can be based.

1. Introduction

In summer 2014, the Arun & Rother Connections (ARC) project funded an in-depth survey of the Odonata along the Arun and Western Rother Rivers in West Sussex. The survey area included parts of the Upper Arun Site of Special Scientific Interest (SSSI). The survey was carried out in order to provide information on the current status of dragonflies in the SSSI, and on whether the ARC project and its partners can take action to enhance dragonfly habitat throughout the river catchment.

Common Club-tail (m) © D Sadler

The Upper Arun SSSI consists of a 13km length of the River Arun, flowing south across weald clay and lower greensand between New Bridge, Billingshurst and Stopham Bridge, Pulborough. It is known to support an outstanding selection of breeding dragonflies including a number of rare species. The unique local geography of the SSSI has resulted in a complex habitat assemblage upon which the dragonflies depend for breeding, feeding and resting sites. The SSSI citation states that fifteen species of dragonfly breed within the river, including the nationally rare Scarce chaser *Libellula fulva*. Also found are the notable species Common Club-tail dragonfly *Gomphus vulgatissimus*, Brilliant emerald *Somatochlora metallica* and the Hairy dragonfly *Brachytron pratense*. In 2011, Natural England updated the dragonfly list following surveys by Simon Curson and Jane Field. At this time, dragonfly populations were deemed to be retaining their numbers and breeding at similar levels to when the original designation was made.

A further purpose of the current survey was to note dragonfly and damselfly species present in the wider catchment, as well as their population densities and their breeding status. Particular attention was paid to the Common Clubtail (*Gomphus vulgatissimus*) and to expanding knowledge of its breeding status and range, as this is one of the few river systems in the UK where this notable species occurs.

2. Methodology

2.1 Surveyor

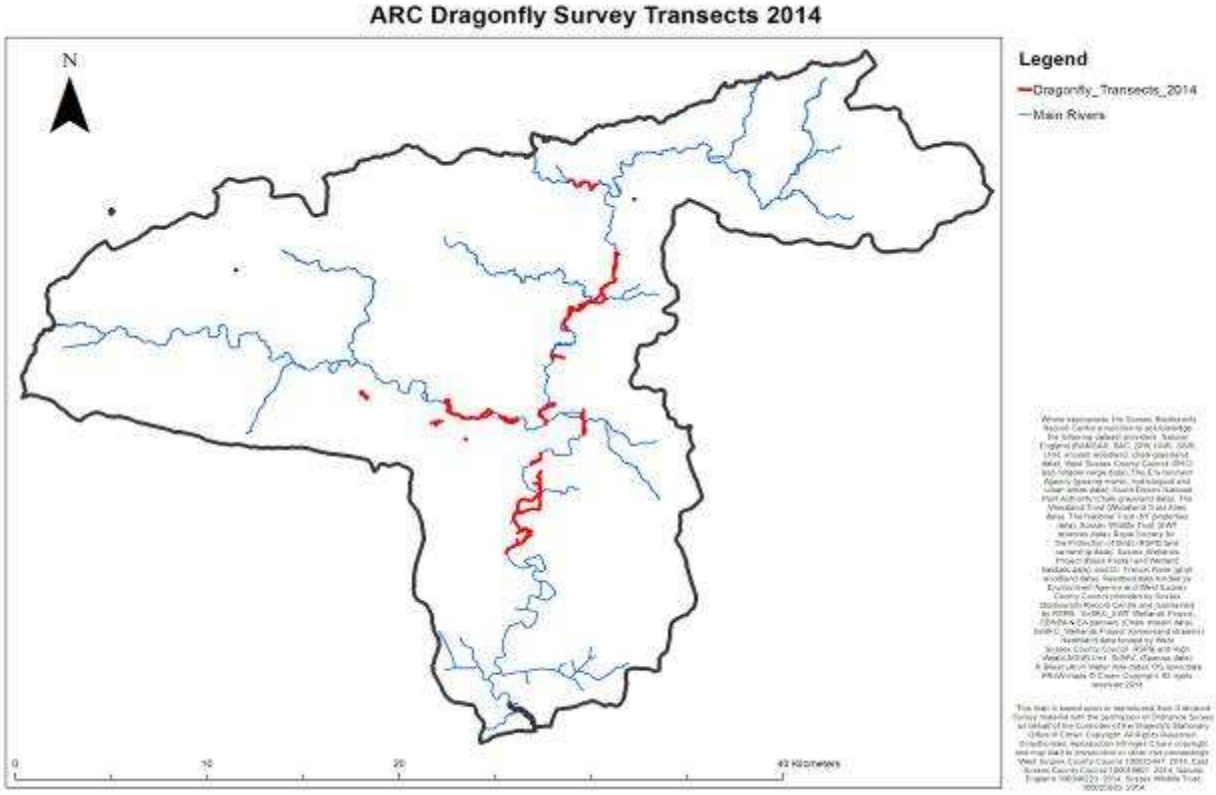
The survey was carried out by David Sadler, who is an experienced ecologist with over 30 years experience in surveying Odonata. Dave is also part of the editorial team which produced "The Dragonflies of Sussex" (Belden et al 2004) and who contributed to "Britain's Dragonflies" (Smallshire and Swash 2004) and the "Atlas of Dragonflies in Britain and Ireland" (ed. 2014).

2.2 Methodology

The survey was carried out between May and August 2014 on 30 different days. Accessible river banks and adjacent ditches, meadows and woodland were walked, noting approximate numbers of each species and interesting behaviours, using close-focusing binoculars to confirm identification. No attempt was made to net any species. Weather conditions on each survey day were recorded (**APPENDIX 4**), although surveys were weather dependent. Additional information was also recorded in the form of incidental sightings, particularly of invasive non-native plant species (**APPENDIX 3**). Results were passed to the Sussex Biodiversity Records Centre in paper format, to be converted into digital (GIS) format.

2.3 Area Surveyed

The limits of the area surveyed were Houghton north to Drungewick on the Arun, and westward to Shopham on the Rother. Although it was not possible to visit the whole of these respective rivers within the confines of the survey due to lack of time and public access, a representative suite of sites was surveyed from across a wide landscape area. A range of wetland habitats were surveyed, however the primary focus was on riparian and riverine habitats. In total, over 60 kilometers of river and wetland were inspected, on multiple occasions. See **APPENDIX 1** for details of areas surveyed.

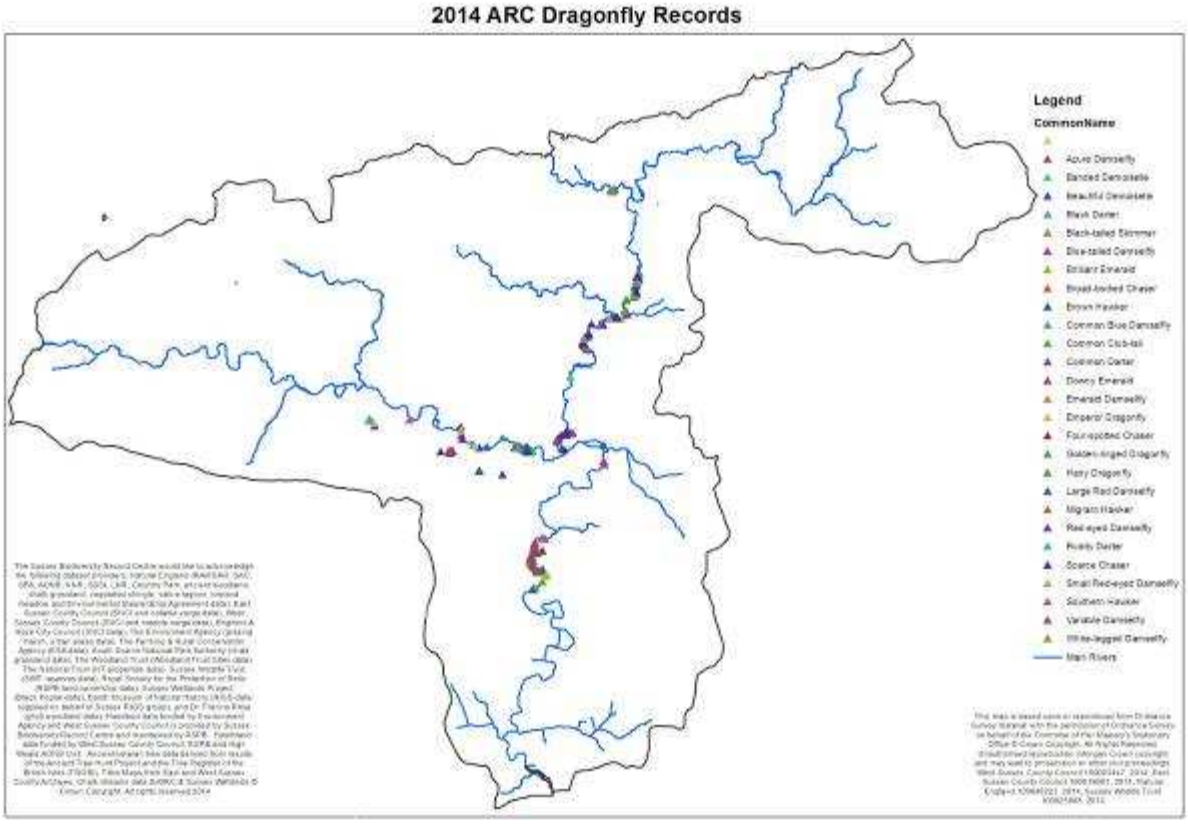


3. Survey Results

3.1 Species recorded

A total of 27 species were recorded, including 11 damselfly and 16 dragonfly species. The majority of these species are likely to have been breeding, although evidence of breeding was only observed for 16 species. This is one more breeding species than was noted in the original SSSI citation. Notable species present were Hairy Dragonfly, Common Clubtail, Scarce Chaser and Brilliant Emerald, the first three of these species showing strong breeding populations. Overall 443 unique dragonfly and damselfly records were submitted, totaling over 6,800 individual records, with over 670 records of copulating pairs, 230 records of pairs or lone females ovipositing (depositing eggs), 992 identified males, 946 identified females, 119 tenerals and 3 exuviae recorded. See **APPENDIX 2** for maps of individual species.

Zygoptera:		**Anisoptera:**	
COMMON NAME	**Latin Name**	**COMMON NAME**	**Latin name**
BANDED DEMOISELLE	*Calopteryx splendens*	MIGRANT HAWKER	*Aeshna mixta*
BEAUTIFUL DEMOISELLE	*Calopteryx virgo*	SOUTHERN HAWKER	*Aeshna cyanea*
EMERALD DAMSELFLY	*Lestes sponsa*	BROWN HAWKER	*Aeshna grandis*
BLUE-TAILED DAMSELFLY	*Ischnura elegans*	EMPEROR DRAGONFLY	*Anax imperator*
COMMON BLUE DAMSELFLY	*Enallagma cyathigerum*	HAIRY DRAGONFLY	*Brachytron pratense*
AZURE DAMSELFLY	*Coenagrion puella*	COMMON CLUBTAIL	*Gomphus vulgatissimus*
VARIABLE DAMSELFLY	*Coenagrion pulchellum*	GOLDEN RINGED DRAGONFLY	*Cordulegaster boltonii*
RED-EYED DAMSELFLY	*Erythromma najas*	DOWNY EMERALD	*Cordulia aenea*
SMALL RED-EYED DAMSELFLY	*Erythromma viridulum*	BRILLIANT EMERALD	*Somatochlora metallica*
LARGE RED DAMSELFLY	*Pyrrhosoma nymphula*	BROAD-BODIED CHASER	*Libellula depressa*
WHITE-LEGGED DAMSELFLY	*Platycnemis pennipes*	SCARCE CHASER	*Libellula fulva*
		FOUR-SPOTTED CHASER	*Libellula quadrimaculata*
		BLACK-TAILED SKIMMER	*Orthetrum cancellatum*
		BLACK DARTER	*Sympetrum danae*
		RUDDY DARTER	*Sympetrum sanguineum*
		COMMON DARTER	*Sympetrum striolatum*



3.2 Individual species accounts of dragonflies noted during survey

BANDED DEMOISELLE

The commonest species of Odonata by far seen during the ARC survey. First seen 4th May. Present on all parts of the Arun/Rother. It was the only species seen on certain sections. Abundant especially on the Upper Arun (N and S of New Bridge) and the Rother, South of Fittleworth. Numbers declined into August but were still frequent to the end of the month. A common breeding species.

Image © B Rainbow

Image © D Sadler

BEAUTIFUL DEMOISELLE

This species was recorded frequently, during the whole period of the survey along many stretches of the both the Arun and the Western Rother. Usually only an odd one or two males were recorded, probably wanderers from nearby breeding sites on shadier, faster-flowing tributaries. Occasionally a slightly larger concentration of the species was observed but the main Rivers do not suggest suitable breeding habitat for this species.

EMERALD DAMSELFLY

The Emerald damselfly is one of the more specialist species which was only recorded on two occasions on the main Rivers (or, more specifically, on adjacent ditches). There is, however, known to be a large breeding population at Graffham Common pond which appears to have benefited significantly from recent works to open up the heathland and to re-wet the area. This species is known to prefer more acidic waters.

Image © D Sadler

Image © D Sadler

BLUE-TAILED DAMSELFLY

This species is probably the most widespread of the British odonata. It was present in most of the area of this survey from mid-May onwards, although seldom in large numbers. The Blue-tailed damselfly is a confirmed breeding species.

COMMON BLUE DAMSELFLY

Absent from most of the survey area. This species does not favour rivers and ditch systems, preferring larger ponds and lakes. A small population was noted on one of the larger ditches to the east of the Arun at Bury and there is a strong breeding population at Graffham Common pond.

Image © D Sadler

AZURE DAMSELFLY

Image © D Sadler

The commonest of the blue damselflies in the survey area, recorded from the first day of the survey in May to the last day of August. The Azure damselfly was found breeding along most stretches of the main Rivers and especially in adjacent ditches.

VARIABLE DAMSELFLY

A generally scarce species in Sussex. It was noted, especially during the earlier period of the survey near Stopham Bridge, in good numbers in ditches adjacent to the main River north of Houghton, and at Burton Mill pond. Historically, Variable damselfly is known to have a stronghold at Amberley Wildbrooks but there was no attempt made during this survey to thoroughly cover that area. A local breeding species.

Image © D Sadler

Image © D Sadler

RED-EYED DAMSELFLY

This species was present along many stretches of the upper Arun, especially around lily pads, with notable concentrations south of New Bridge and on the Wey and Arun canal. A locally common breeding species.

SMALL RED-EYED DAMSELFLY

This fairly recent arrival to the UK was observed only in two places; a lone female on the canal at Lording's Lock, and at a ditch adjacent to the River Arun at Houghton where a number of males were occupying suitable breeding habitat.

Image © D Sadler

Image © D Sadler

LARGE RED DAMSELFLY

A widespread damselfly that was recorded throughout the survey area, especially during the first half of the survey, although rarely seen in large numbers. A common breeding species.

WHITE-LEGGED DAMSELFLY

Only recorded in June and July and at few locations. It was in low numbers on the Arun, both north and south of New Bridge and on the Wey and Arun canal. A scarce breeding species.

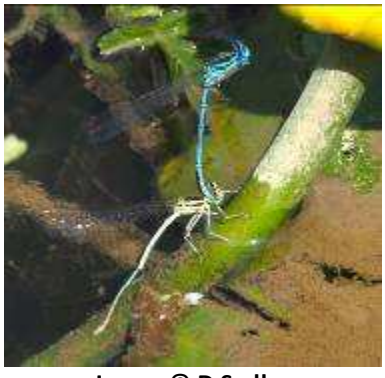


Image © D Sadler

Image © D Sadler

MIGRANT HAWKER

This late summer species was not recorded until August. As the month progressed it became, by far, the commonest species of Anisoptera as is usual, and it was observed in all areas visited, with evidence of breeding at a number of sites.

Image © B Rainbow

SOUTHERN HAWKER

This common species was encountered on very few occasions. However, it is a species which tends to prefer shady, still water, so it is not entirely surprising that the Rivers did not produce many sightings.

Image © D Sadler

BROWN HAWKER

From July onwards, this common species was evident at most of the sites visited, with males patrolling stretches of river, canal or pond-side and it surely breeds all over the survey area. Females were seen ovipositing on the Wey and Arun canal, north of New Bridge, and at Graffham Common.

EMPEROR DRAGONFLY

This is a common and widespread species in the County and was recorded frequently from June onwards. The males were frequently found patrolling stretches of river or ditches throughout the survey area. Emperors do however, prefer still water for breeding and females were observed ovipositing on parts of the old Wey & Arun canal, various ditches and at Graffham pond.

Image © D Sadler

Image © D Sadler

HAIRY DRAGONFLY

This is one of the notable species found in the Arun/Rother survey area. First seen in mid-May, it was frequently encountered, especially the males as they search for females along well-vegetated ditches adjacent to the Rivers and at Burton Mill pond. Last seen in early July and although no breeding behaviour was noted during the survey, the species undoubtedly breeds in reasonable numbers.

GOLDEN-RINGED DRAGONFLY

Only 3 individuals of this scarce Sussex species were recorded. The first was a dead female on the bank of the Rother west of Fittleworth on 5th June. The other 2 were recorded at Stopham Bridge on the Arun on 23rd June. The species prefers to breed in small heathland streams so is unlikely to use the main rivers in our area with any regularity, although the adults wander widely.

Image © D Mitchell

COMMON CLUBTAIL

This species was the focal species for the current survey, and our aim was to discover more about its behaviour, distribution and habitat use across the ARC project area. In the United Kingdom, the Common Club-tail is restricted to only seven river systems. Only two of these are in the South-east, one of which is Arun & Rother. This species is notoriously difficult to observe unless found at emergence time. It also seems to exist in lower densities than at other Rivers such as the Thames and the Severn. Although observation of the Upper Arun SSSI was made difficult due to lack of public access to much of the riverbank in this area, we were still able to record new evidence of the species.

Common club-tail female (above) and male (below) © D Sadler

Emergence dates of the Common Club-tail can vary significantly, depending on weather conditions and water temperature. After the cold spring of 2013, Club-tail emergence began on the Western Rother on 25th May. In contrast, in 2014 after a more normal spring, their emergence began around 14th May, although around this time only 4 tenerals (young emerging dragonflies) were found.

It is possible that the extreme winter flooding of 2013 / 2014 and the widely dispersed river floods may have pushed larvae of the Club-tails (and other dragonflies and damselflies) further downstream. With this in mind, effort was concentrated in the lower reaches of the River Arun near Houghton, where adults had been seen in the past. Emergence there was marginally later than on the Western Rother, probably due to temperature differences in the larger river here. In this area, from 17th May until 6th June, 54 teneral Common Club-tails were found. The final 2 tenerals, found on 6th June, were to the south of Houghton Bridge.

Following emergence Common Club-tails fly off to woodlands to mature, not returning to the river for around two weeks. They are then found in low densities, the males holding territory usually only on warm sunny and calm days. Adult females are even harder to observe, generally only returning to the river to mate and oviposit (lay eggs).

The first sightings of mature adults returning to the River were on the Western Rother on 10th June where 2 males and a female carrying her egg-mass prior to oviposition were observed. Subsequently, up to 5 males were seen at this site, with a further 2 males on the Arun north of New Bridge, 1 south of New Bridge, and 3 including a mating pair, on 22nd June on the Arun near Houghton. The last sighting of Common Club-tails was a single male on 2nd July at New Bridge. This last date is probably early for their final appearance. However, numbers decline quickly and the species is difficult to find after the first week of July. There are occasional late records. In particular, one at Arundel recorded in August 2013.

Rare pictures of Common Club-tails mating, and a female carrying an egg mass © D Sadler

Although we were only able to record Club-tails on 3 far-separated reaches of the Arun and Rother rivers, it is inconceivable that the species does not breed successfully at points in between and also beyond these sites (e.g. as far as Shopham Bridge on the River Rother).

DOWNY EMERALD

Image © S Smith

Emerald dragonflies are secretive, rapid fliers, and normally settle out of the view of observers. For these reasons much of their life history is little understood. This scarce species' preferred habitat is ponds and lakes, usually in or near woodland. Consequently, during the survey, it was located only at Burton Mill Pond and Lord's Piece Pond. It may well be a future occupant of the now opened-up pond at Graffham Common. We would recommend further study to gain more information on the species and its distribution on still waters.

BRILLIANT EMERALD

Another scarce species, which favours lakes in woodland areas, but which is occasionally found on tree-lined canals. However, during the maturation period, males will sometimes take up territory on stretches of river and most years one or two can be found near New Bridge on the Arun. 2014 proved no exception with 2 present from 8th June. It was noteworthy that 1 was still there on 21st July. Even more interesting was a female ovipositing on the Wey & Arun Canal on 23rd August.

Image © D Sadler

Image © D Sadler

BROAD-BODIED CHASER

The Broad-bodied chaser is a common species in the survey area. It prefers the still waters of ponds, lakes and ditches for breeding. During the first half of the survey it was noted on various parts of the Rivers Arun and Western Rother. On 19th May at least 10 adults were present at Lord's Piece Pond (heathland) with mating pairs observed and females ovipositing.

SCARCE CHASER

Sussex is an important county for this nationally scarce species, and the Arun in particular supports large numbers in some years. The first sightings were of 3 tenerals at Burton Mill Pond and 4 at Stopham on 14th May. Subsequently, on the Arun from Scrace Farm to north of New Bridge, visits on various dates revealed exuviae, emergence, adults and mating pairs. Further south on the Arun, Scarce Chasers were noted at Stopham Bridge (4) and the Arun/Rother confluence near Pulborough. The last seen were 2 females on the Wey and Arun Canal on 21st July. The species proved harder to find on the River Rother, but there was an adult male west of Shopham on 10th June and one at Fittleworth on 13th.

Image © D Sadler

Image © D Sadler

FOUR-SPOTTED CHASER

This species shows a preference for still, acid waters but can sometimes be found in drainage ditches, where there were few individuals east of Bury and one near Fittleworth on dates in July. More typically, 4 were at Lord's Piece Pond on 19th May and 2 at Graffham Common Pond on 3rd August.

Image © D Sadler

BLACK-TAILED SKIMMER

Generally favouring ponds and lakes, it is not surprising that only 2 individual Black-tailed skimmers were found along the Arun and the Rother rivers during the survey. Eight individuals were seen on the Wey and Arun Canal in July which suggests a breeding population there.

BLACK DARTER

This species is relatively uncommon as it is generally associated with acid heathlands. An adult male was found at Graffham Common Pond on 3rd August. The improved habitat at that site suggests that the species could be a future colonist there.

Image © D Sadler

Image © D Sadler

RUDDY DARTER

This species is usually common but it was strangely absent during the survey from much of the Rivers Arun and Rother. In fact, it was only recorded north of New Bridge, at Houghton, and near Fittleworth. However, there is a strong population at Graffham Common pond.

COMMON DARTER

First noted on 1st July at Houghton, the species became numerous in late summer at widespread locations, as is usual. Concentrations of this species were found in Houghton ditches, on the Wey and Arun Canal, and at Graffham Common. A common breeding species.

Image © D Sadler

5. Discussion

The Rivers Arun and Rother have been and remain excellent sites for Odonata. The Western Rother and Arun rivers are supplied by a unique system of groundwater fed chalk and greensand springs, which contribute significant flows of constant clean water to the river systems, and which therefore help to reduce the impacts of human induced reductions in water quality. In addition the area is host to a range of rare and unusual pond wetland types. Floodplain and coastal grazing marsh systems are covered by a complex of drainage ditch systems and grazing meadows which, in places provide good wetland habitat for dragonflies (Pulborough Brooks, Coldwaltham, Amberley Wildbrooks and areas around South Stoke and Arundel). There are also significant areas of rare wet heathland habitat throughout the catchment including at Graffham, Stedham, Iping and Lavington commons.

Regular winter flooding creates natural chaos in the wetland systems which can both undermine and support the survival of different dragonfly and damselfly species. Although the river Rother suffers from intense sedimentation and agricultural run off, and much of the Arun's summer flow is supplied by Sewage Treatment Works, a surprising range of Odonata were observed. There were obvious locations where habitat quality was compromised by over poaching of watercourses, and water quality was compromised by diffuse and direct pollution. However despite this, despite pressure on wetland habitats, and despite extreme wet winter weather, a healthy range and number of dragonfly species were observed.

The SSSI citation states that fifteen species of dragonfly breed within the river, including the nationally rare Scarce chaser *Libellula fulva*, for which this is the best stretch of river in West Sussex. Also found are the notable species Common club-tail dragonfly *Gomphus vulgatissimus*, Brilliant emerald *Somatochlora metallica* and the Hairy dragonfly *Brachytron pratense*. This survey recorded the presence of all of the notable and rare species of dragonfly expected, with no additions or anomalies recorded other than lower than expected numbers of some common species such as the Ruddy darter. Sixteen species in total were recorded to be breeding

A single season survey cannot of course, be definitive, and it is difficult to draw any meaningful conclusions from the data collected. The data is however extremely useful as a baseline data set, upon which future studies can be based. Numbers and behaviours of many species can alter from year to year depending on weather and temperatures, and some species may have a larval stage up to 5 or 6 years. Therefore long-term population changes take time to become evident and require further study. Results suggest that numbers of Scarce Chaser, Emerald Damselfly and White-legged Damselfly were all low in 2014. Future survey work may determine whether such declines are temporary or not.

2014's survey was limited in that certain areas could not be visited. Much of the Arun and Rother valleys is not publicly accessible. In order to survey Odonata it is essential to access riverbanks and stream sides but only a small proportion have public footpaths. While some permissions were obtained to visit otherwise private areas, some important sections remained 'out of bounds'. It would be most informative to inspect traditionally productive dragonfly stretches, for instance from Stopham Bridge north to Pallingham Quay, if access permissions were acquired.

Although Amberley Wildbrooks was visited briefly on two occasions, no attempt was made to thoroughly survey this important site. The extensive ditch system has always been prime habitat for such notables as Hairy Dragonfly and Variable Damselfly as well as a host of commoner species. The Wildbrooks could therefore be the focus of further work. A search on the headwaters and tributaries of the Arun and Rother might also reveal interesting information on the distribution of species such as Beautiful Demoiselle and Golden-ringed Dragonfly. Recent habitat improvement work to remove Rhododendron and pines and to restore heathland at Graffham Common is producing encouraging results. The boggy areas and the large pond are already looking good and it is likely that the future for this site will be even better with some of the scarcer heathland species gaining a foothold.

Particular attention during this survey was given to the Common Club-tail, a nationally scarce species occurring on a limited number of river systems. It was located at three quite separate areas of the rivers and future work could be undertaken to establish that the species is surely present between and beyond those sections. It would also be interesting to discover how far south on the Arun Common Club-tails can survive in the tidal reaches. A newly-emerged teneral Club-tail was found south of Houghton Bridge, 17.75 Kilometres from the sea at Littlehampton. Increased salinity undoubtedly prevents the larvae existing much farther down river, but its presence at Arundel indicates that it may be able to tolerate some saline intrusion at some stages of its life cycle. Contrary to some opinion, it seems that Common Club-tails do not always emerge in the mornings. On non-tidal rivers, such as the Rother, where water levels do not rise, morning emergences are certainly likely to be the case, but on tidal rivers, such as the lower Arun, emergence must take place on the falling tide to avoid inundation.

Finally, the results of any survey of dragonflies will be influenced by weather conditions and it is not possible to survey only on calm, warm and sunny days. The middle part of the summer of 2014 was actually very good but during the beginning and the end ideal weather was at a premium. Even on sunny days there was often a strong breeze, affecting sightings. Two visits to the same site on consecutive days, but in slightly worse weather conditions might reveal only 10% of the dragonflies recorded on the day prior with better weather. It is highly likely therefore that the species and behaviours observed represent only a small proportion of that which is actually present. In particular it would be interesting to observe more detail on the distribution of dragonfly and damselfly exuviae in different parts of the catchment.

6. Recommendations

The main recommendation of this survey is that further surveys should be carried out, including a range of different species surveys across a range of different habitat networks, in order to establish long term trends in dragonfly and damselfly populations. The following information would be useful to acquire:-

- Further information on the distribution and behaviours of :-
  Common club-tail dragonflies
  Downy and Brilliant emeralds
  Black darters at Graffham common and other heathland sites
  Scarce Chaser, Emerald Damselfly and White-legged Damselfly whose numbers were all low in 2014.
- Further survey of stillwaters such as ponds, dew ponds and lakes
- Further survey of unusual waters such as chalk streams and greensand heath streams and flushes
- Further survey of the Upper Arun (SSSI) and headwater areas around Horsham and the Surrey border (including Chiddingfold and St Leonards Forests).
- Further survey of Amberley wildbrooks
- Further survey of coastal and tidal areas of the catchment
- Surveys around Surrey border to observe, where possible the colonization of willow emerald

We would also recommend that ARC :-

- Encourages citizen science surveys of rivers, perhaps through Riversearch programmes
- Supports further surveys and reporting of dragonfly exuviae
- Supports more long-term studies of trends in Odonata behaviour and numbers.
- Links with Surrey and Hampshire stakeholders and survey groups to survey, consolidate and create cross-border species migration routes

A map showing the parts of the ARC project area which currently have no dragonfly records at all is attached in APPENDIX 5

7. References

Dragonflies (Corbet & Brooks 2008)
The Dragonflies of Europe (Askew 2004)
Britain's Dragonflies (Smallshire & Swash 2010)
Field Guide to the Dragonflies & Damselflies of Great Britain and Ireland (Brooks 1997)
The Dragonflies of Sussex (Belden et al 2004)
Atlas of Dragonflies in Britain and Ireland (Cham et al 2014)

8. APPENDICES

APPENDIX 1

Areas surveyed

1) Arun; Houghton to Amberley Wildbrooks

A major area of the survey incorporating around 6kms of riverbank, adjacent ditches on the west and east sides of the Arun, and meadows and drainage ditches east of Bury. Cursory visits were made to Amberley Wildbrooks although no attempt was made to fully survey this historically rich site for odonata.

A total of 17 species was recorded with significant populations of notable species such as Variable Damselfly, Hairy Dragonfly and Common Clubtail. 54 tenerals of the latter were encountered at emergence, and, later, returned adults including a mating pair in the bankside reeds.

2) Arun; Greatham Bridge south

This particularly open part of the Arun valley is prone to windy conditions, as was the case on my visits to this promising-looking stretch of river. I noted only one species, the ubiquitous Banded Demoiselle.

3) Arun; Pulborough south to RSPB Reserve

A strong population of Banded Demoiselles were on the main river and, notably, Variable Damselflies in the adjacent ditches, together with the commoner damselfly species. Stretches of the river appeared suitable for Common Clubtails but were not visited during emergence and no adults were seen.

4) Arun/Rother confluence to Stopham Bridge north

About 2 kms of riverbank, adjacent meadows, and woodland north of Stopham Bridge. 12 species were recorded including Hairy Dragonfly, Scarce Chasers, Variable Damselfly and Red-eyed Damselflies favouring, as ever, lily pads.

The Arun north of Stopham towards Pallingham is a traditional 'hot spot' for Common Clubtail and Scarce Chaser so it is unfortunate that it was not possible to obtain permission from the landowner for access to inspect this stretch.

5) Arun; Scrace Farm north to Lording's Lock and New Bridge

15 species were recorded along over 6kms of river together with a restored section of the Wey and Arun Canal. Many stretches of the river looked promising for Common Clubtail but only 1 was seen. Banded Demoiselles were abundant and other notable species included White-legged Damsefly, Hairy Dragonfly and good numbers of Scarce Chaser, with emergence and mating observed.

6) Arun; New Bridge north

The 2kms or so north of New Bridge are readily accessible. This includes the west bank of the River Arun and parts of the Wey and Arun Canal although this is mostly quite shallow and overgrown. This section of the river is fairly narrow but with occasional wider sheltered 'pools'. 17 species of odonata were noted including abundant Banded Demoiselles, White-legged Damselfly, Hairy Dragonfly and Scarce Chaser. Brilliant Emeralds (up to 2) were present and as were Common Clubtails on two dates.

7) Wey and Arun Canal (west of Drungewick)

The River Arun flows under the canal and roughly parallel but is largely inaccessible and mostly shaded in this area. The restored canal provides a good habitat for odonata with populations of White-legged and Red-eyed Damselflies, Scarce Chaser and Black-tailed Skimmer. In late August a female Brilliant Emerald was seen inspecting the canal bank and ovipositing.

8) Rother; Fittleworth eastwards

This part of the river is easily accessible for over a kilometre on both banks. The Rother is quite different from the muddy River Arun. It flows over a sandy bottom and is probably less nutrient-rich, supporting smaller numbers of Odonata. It is, however, an excellent site with 13 species recorded along the main river, and adjacent meadows and ditches.

Common Club-tails emerge here in mid-May, although not in large numbers and 2014 seemed particularly poor. A number of returning adults were seen in June, with a brief sighting of a female carrying her egg-mass and resting on a leaf prior to oviposition. There is a strong population of Banded Demoiselles and Scarce Chaser present but in smaller numbers than on the Arun.

9) Rother; Shopham Bridge west and east

Only 8 species were noted (including Scarce Chaser) along around 5kms of river.

No Common Clubtails were seen although there is much suitable habitat and the area around Shopham Bridge is known as a traditional site for the species.

7.2 Other areas:

10) Arun; Pallingham Quay

It is unfortunate that the riverbanks here are privately-owned and access was not available as, in the past, it has been a good area for emerging and adult Common Clubtails. My one visit, in less-than-optimum conditions, revealed only Banded Demoiselles.

11) Lord's Piece Pond

This shallow pond on heathland, an ideal habitat for dragonflies, is unfortunately much-disturbed by dog-walkers, but holds good numbers of breeding Broad-bodied and Four-spotted Chasers, and a visiting Downy Emerald was present on 14th May.

12) Burton Mill Pond

This large lake, with surrounding woodland and sheltered glades, is an important dragonfly habitat although access to the water's edge is difficult apart from along the dam end. Notable residents include Variable Damselfly, Hairy Dragonfly, Downy Emerald and Scarce Chaser. Common Club-tails occasionally visit (1 present on 25th May).

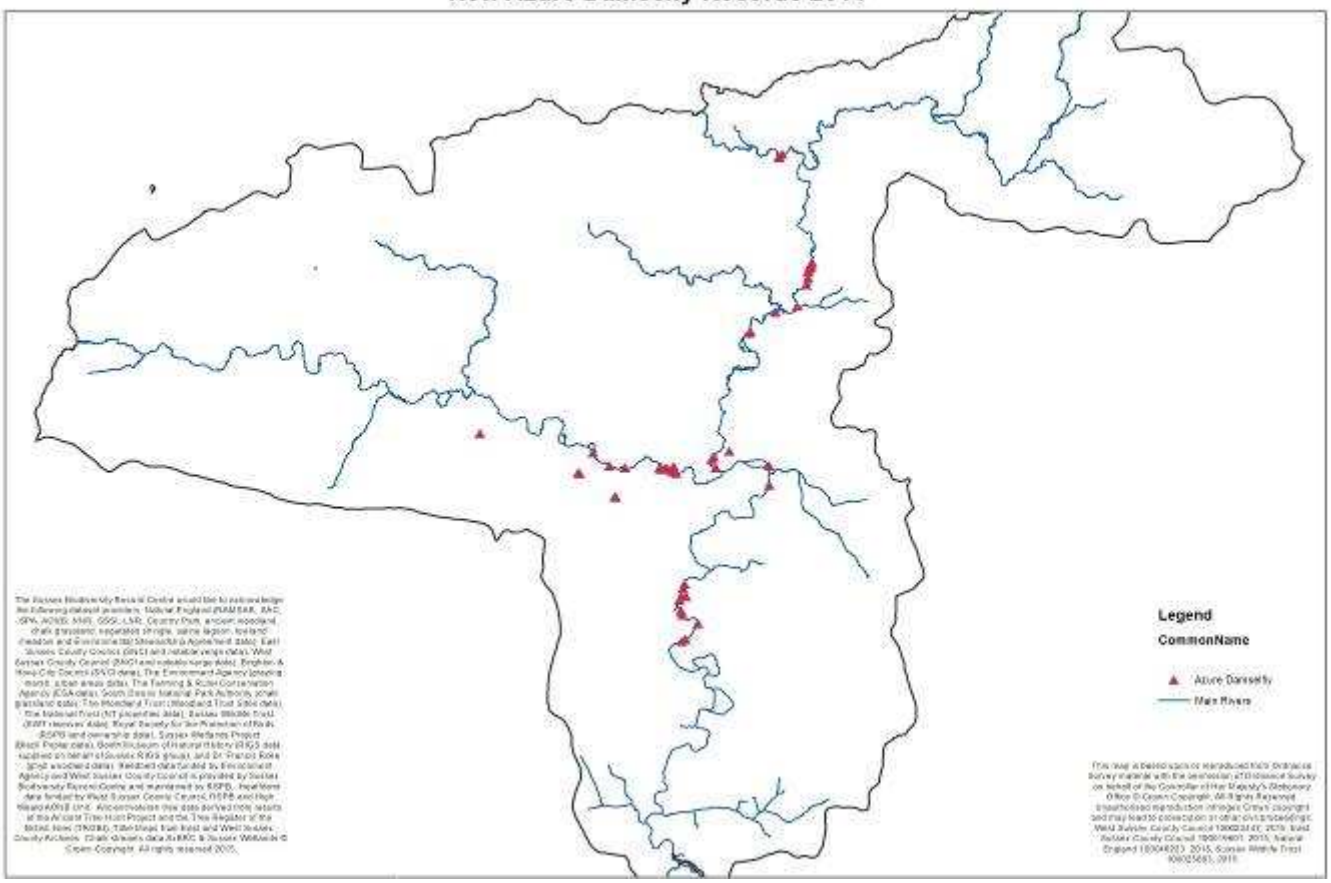
13) Graffham Common

Much habitat improvement has been carried out over recent years so that what was thick pine wood with a largely inaccessible over-shaded pond is now becoming open heathland with boggy pools and seepages again. The large pond is now an excellent dragonfly habitat with large populations of Common Blue and Emerald Damselflies and Ruddy Darter. A Black Darter, a heathland specialist and a scarce species is Sussex, was present on 3rd August and could possibly be a future resident. A total of 12 species was recorded.

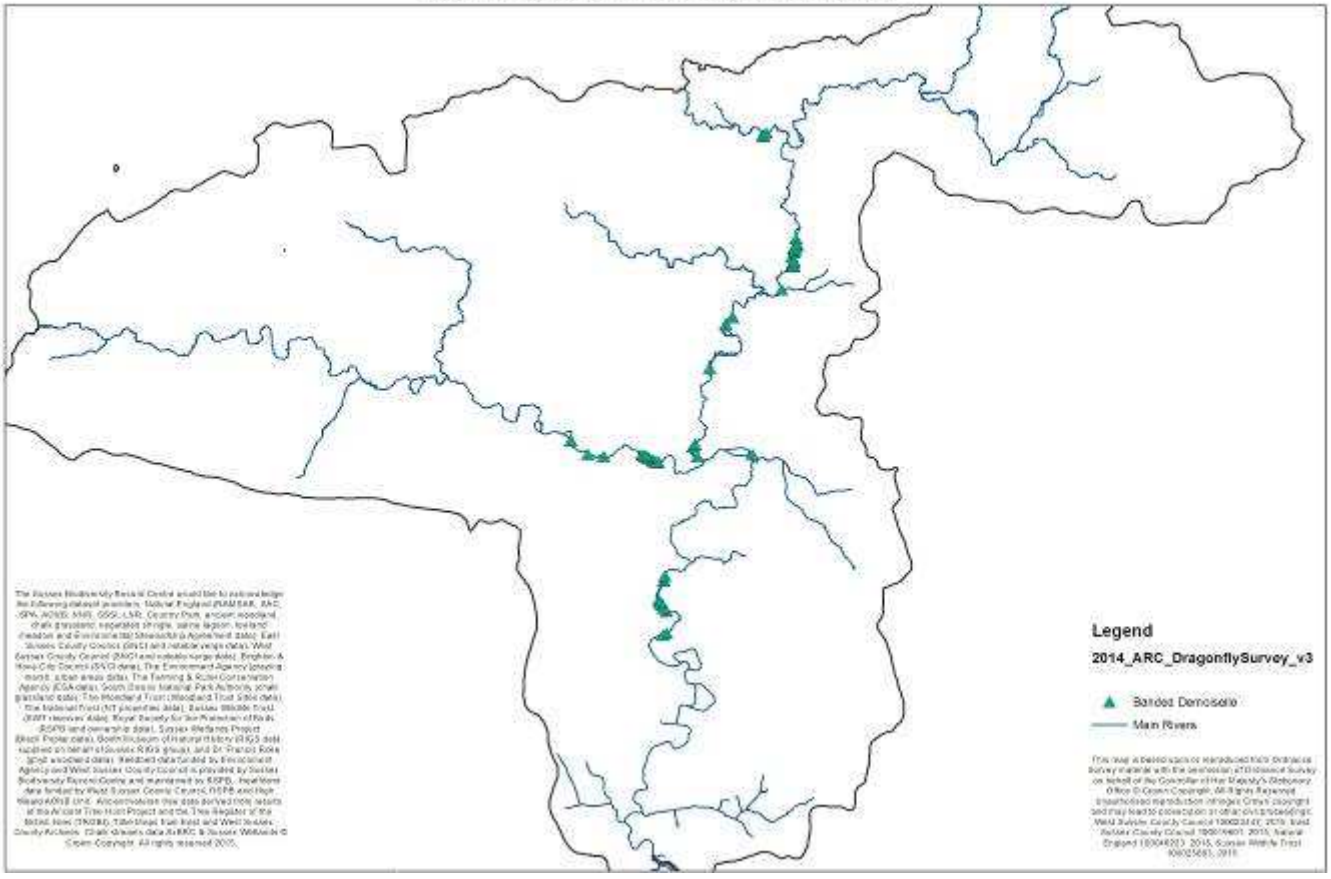
APPENDIX 2

Maps of Individual Species

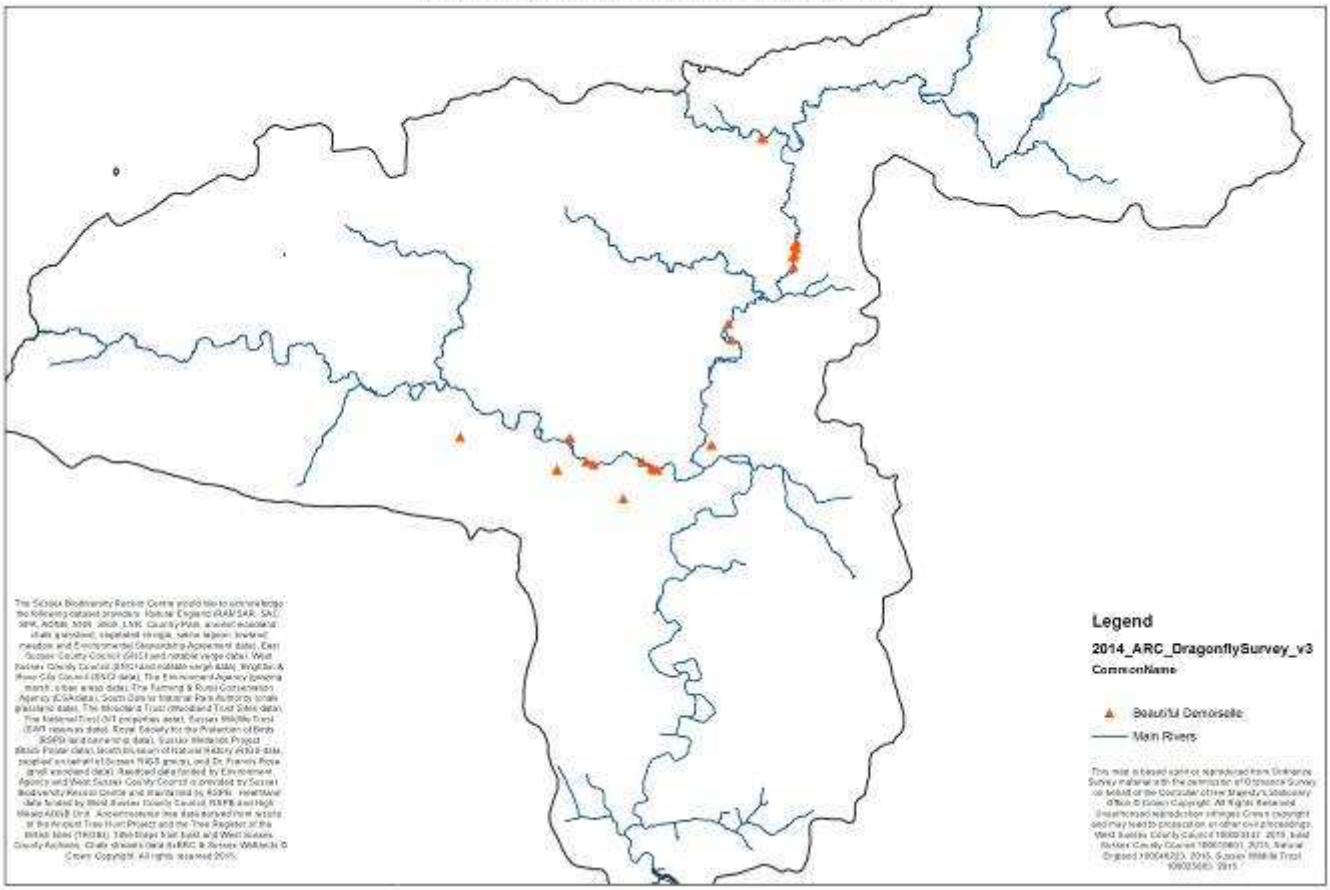
New Azure Damselfy Records 2014



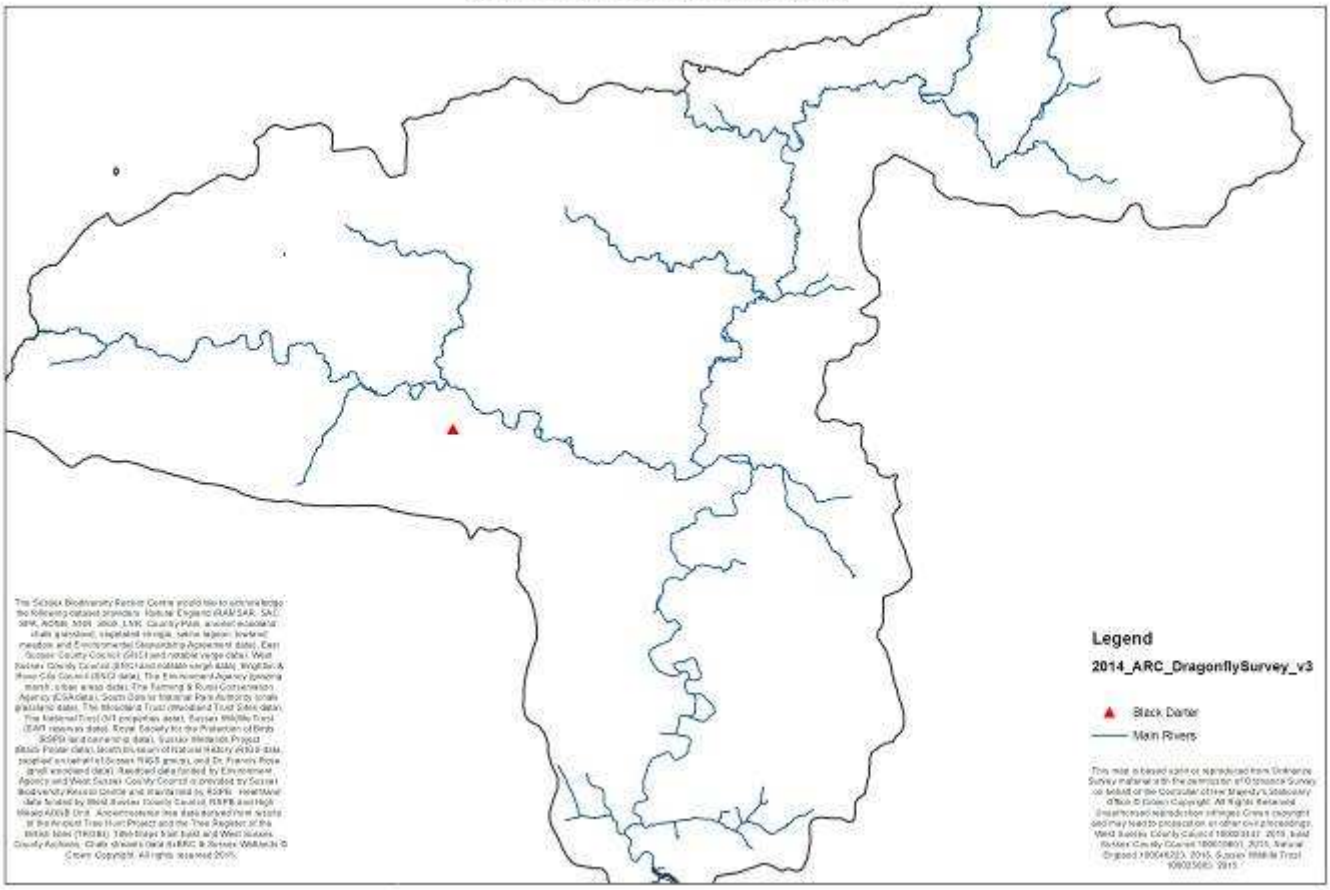
New Banded Demoiselle Records 2014



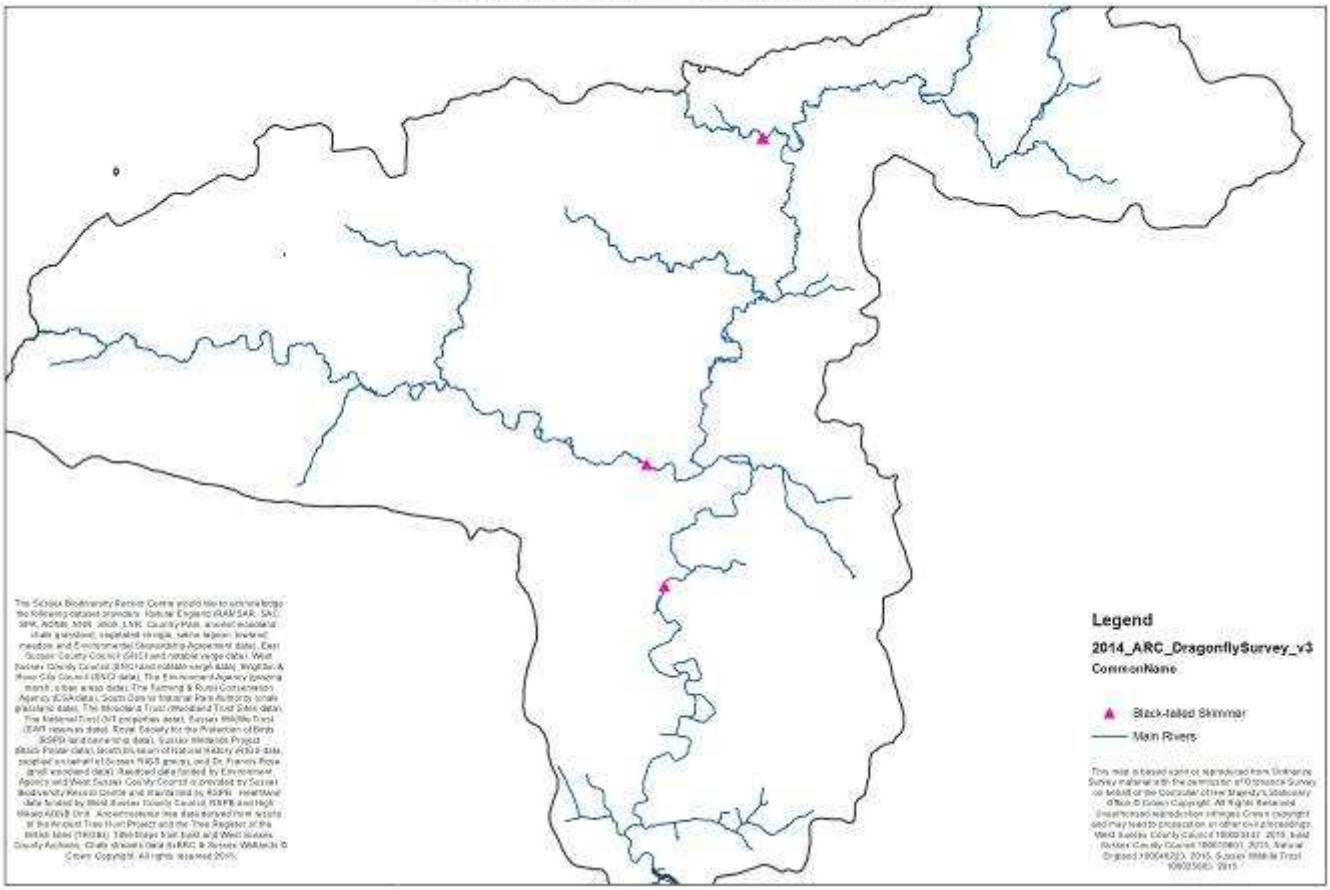
New Beautiful Demoiselle Records 2014



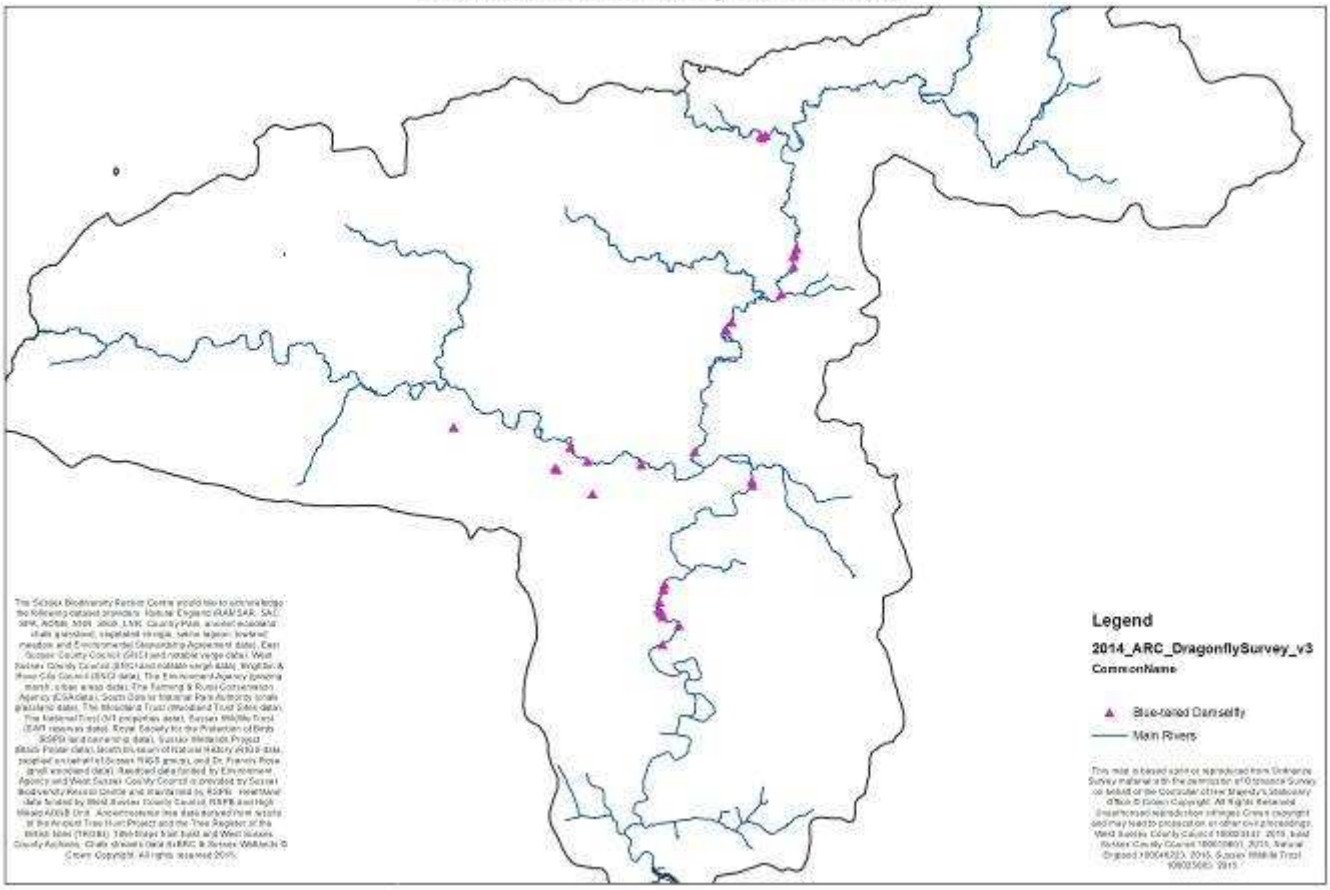
New Black Darter Records 2014



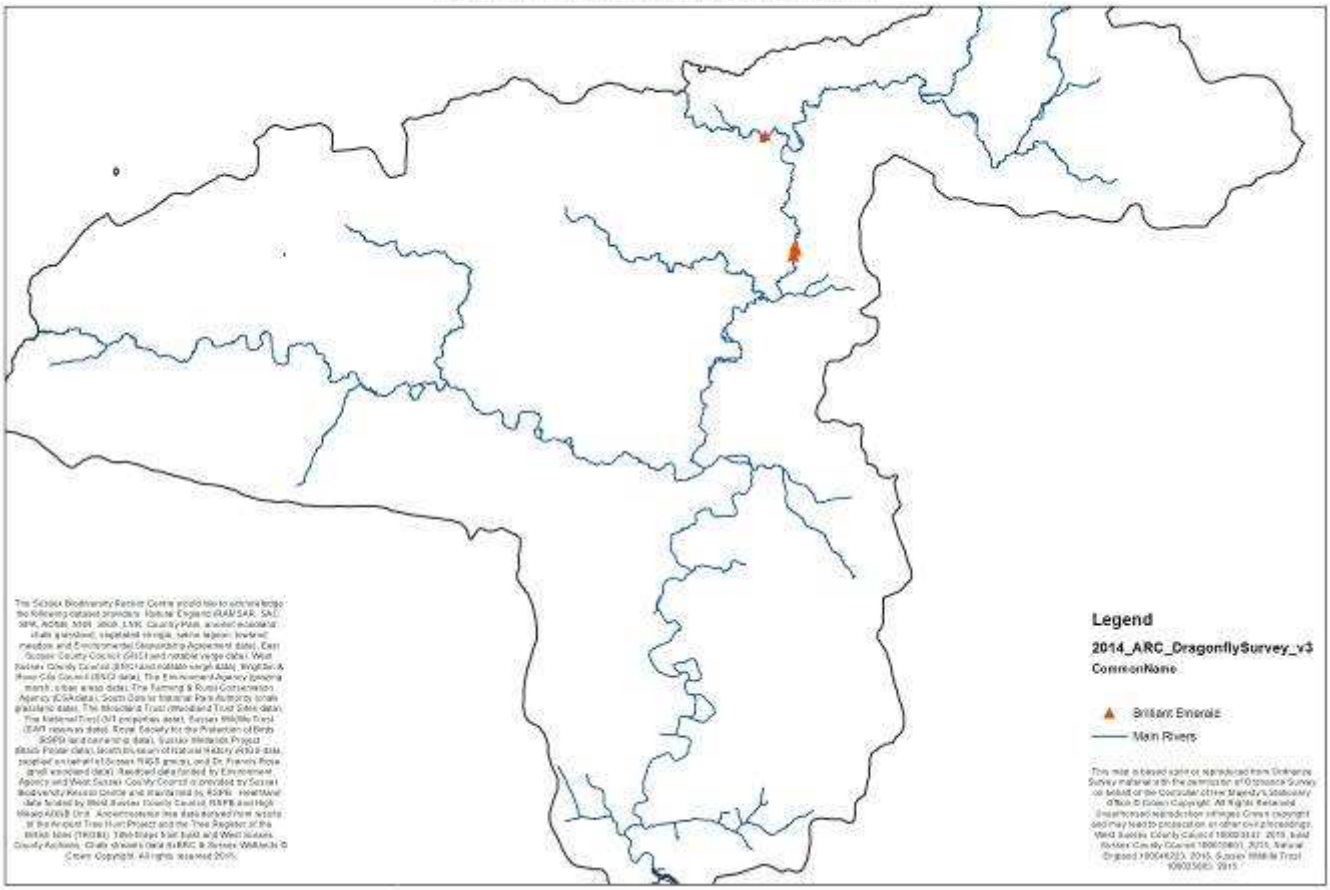
New Black-tailed Skimmer Records 2014



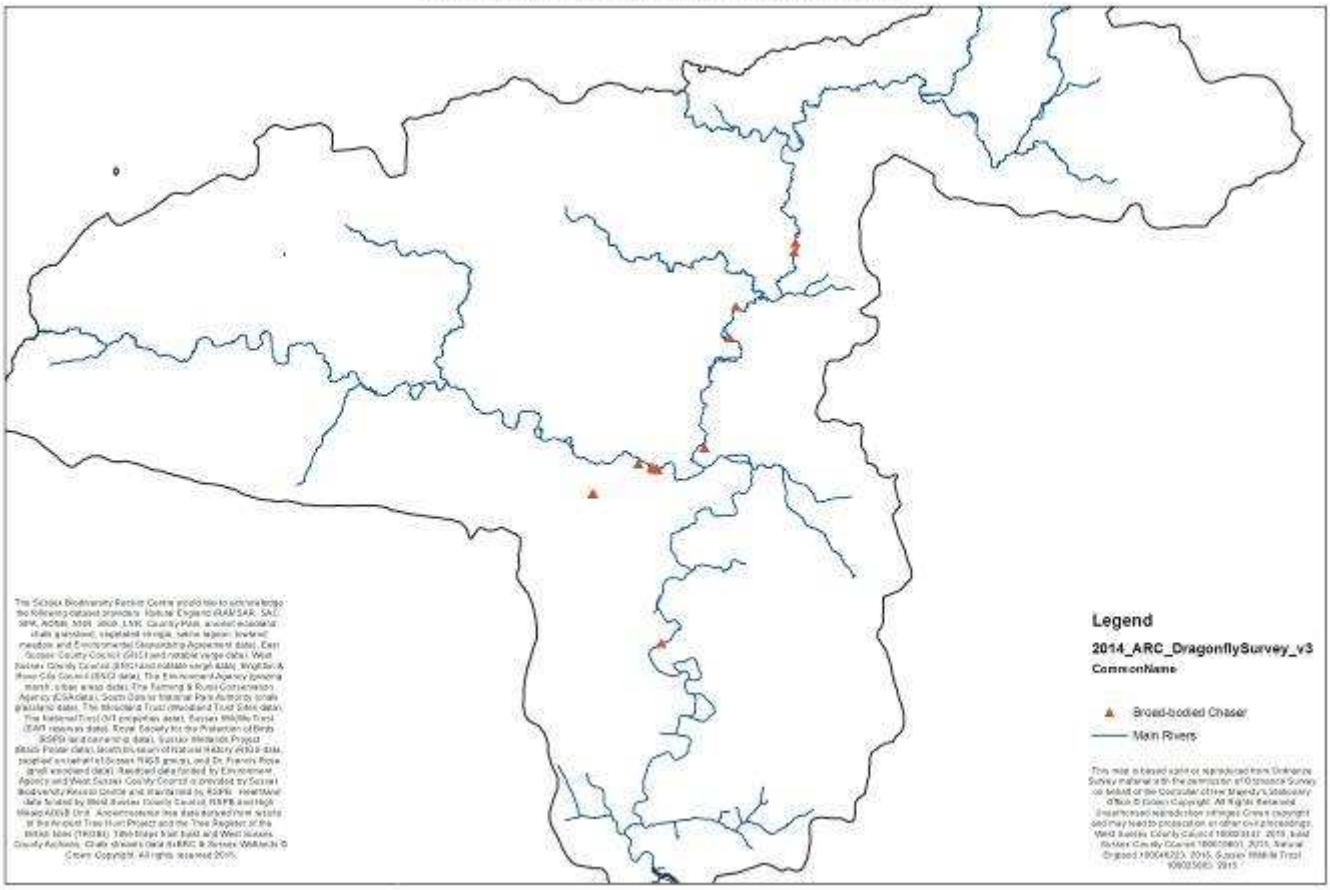
New Blue-tailed Damselfly Records 2014



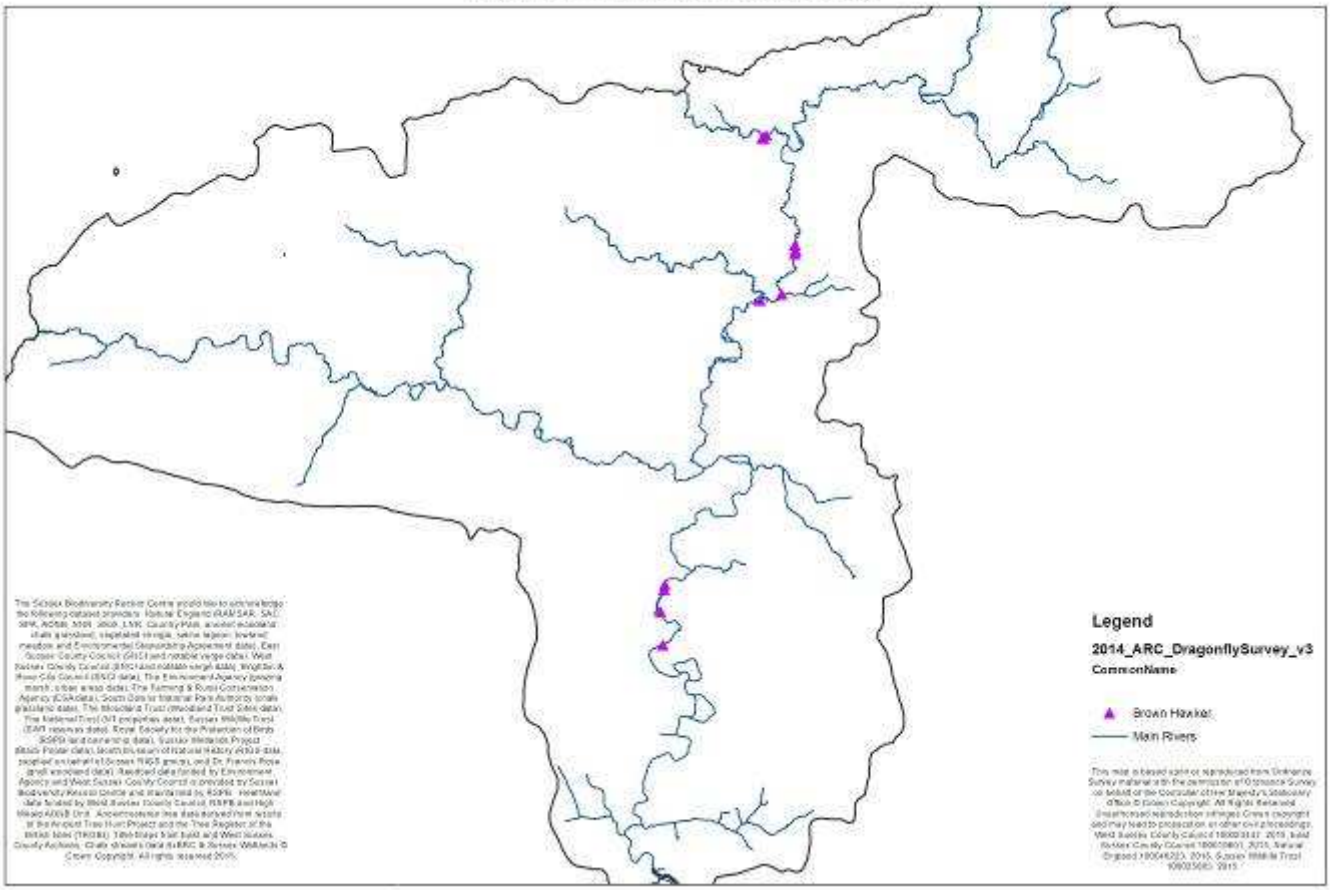
New Brilliant Emerald Records 2014



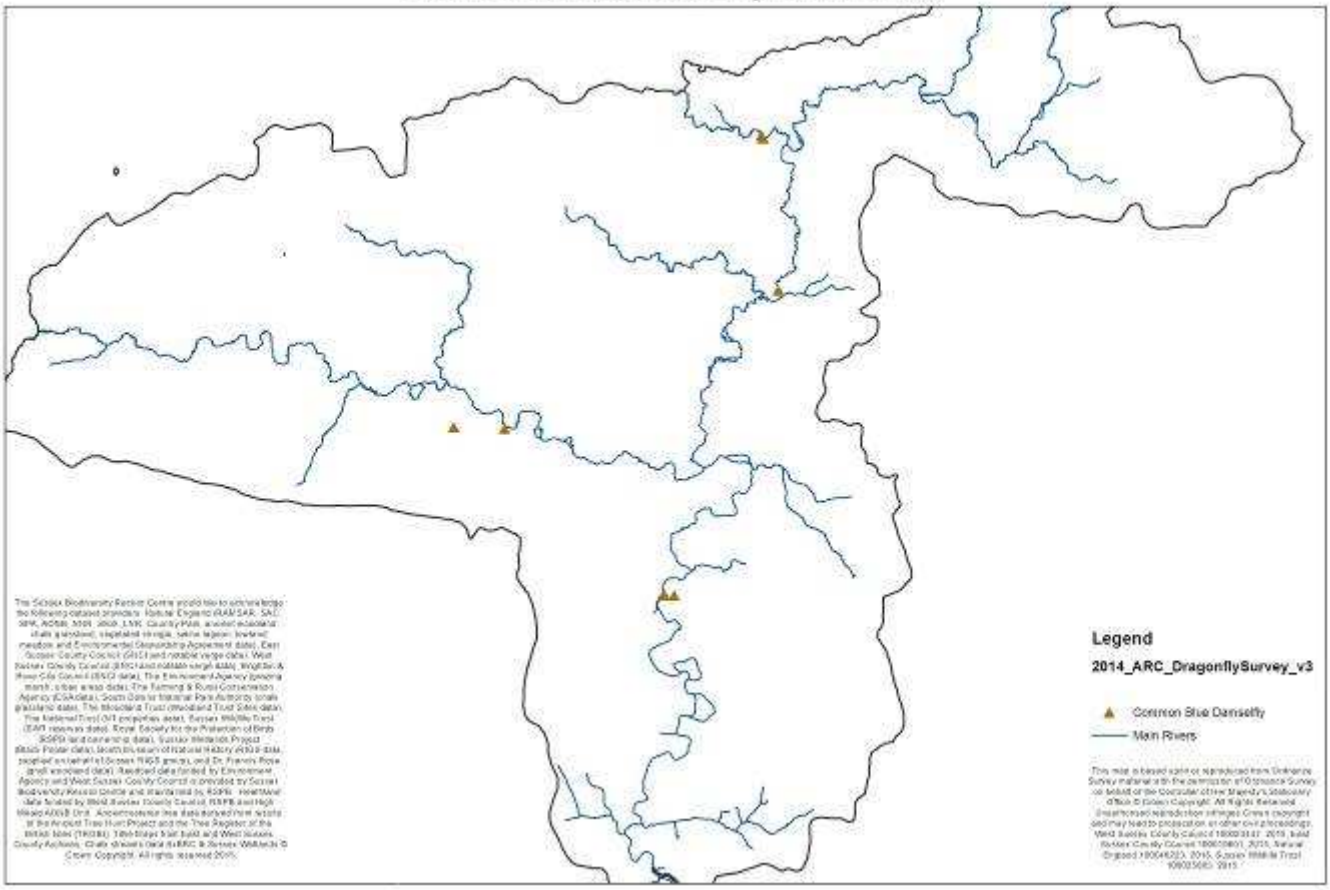
New Broad-bodied Chaser Records 2014



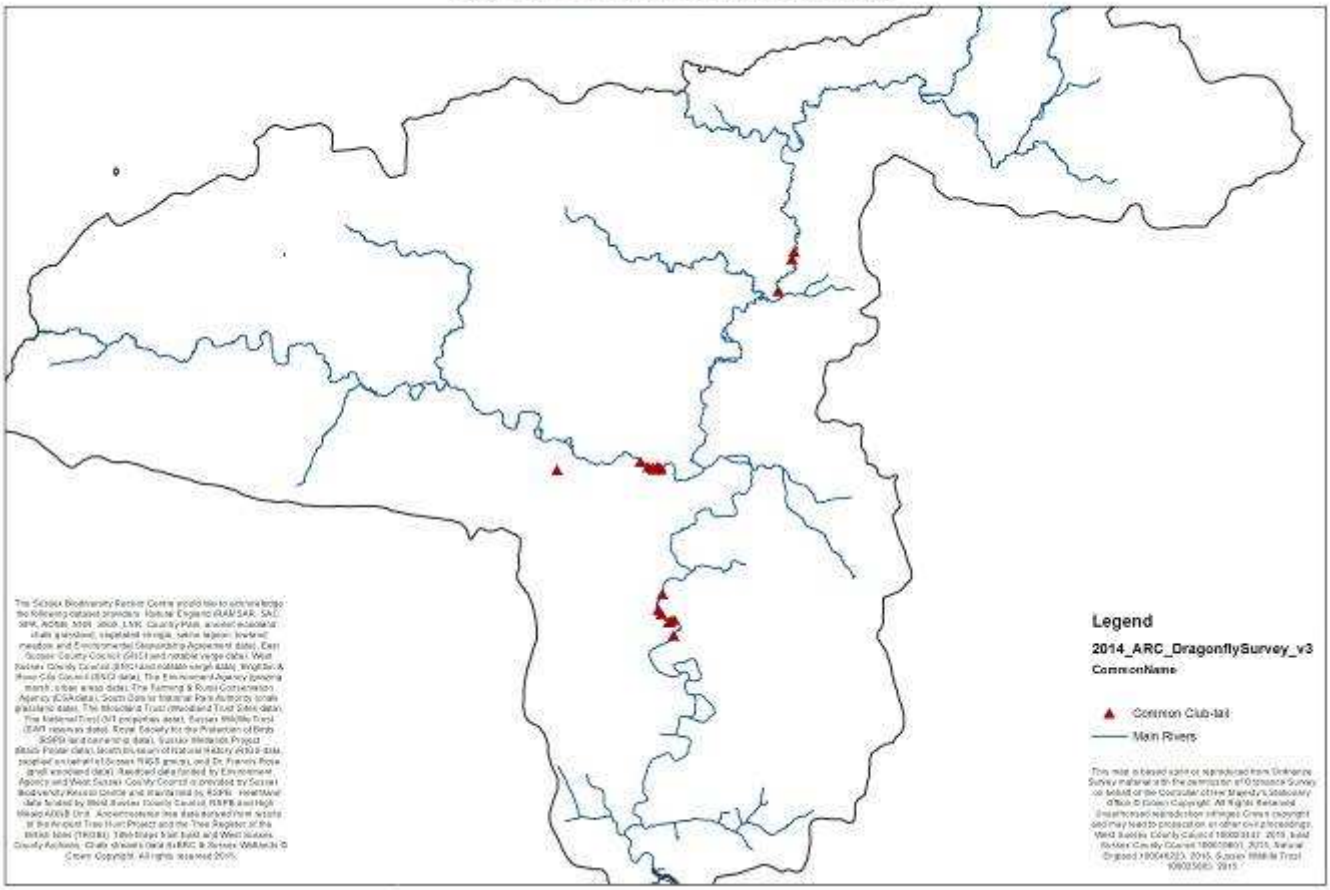
New Brown Hawker Records 2014



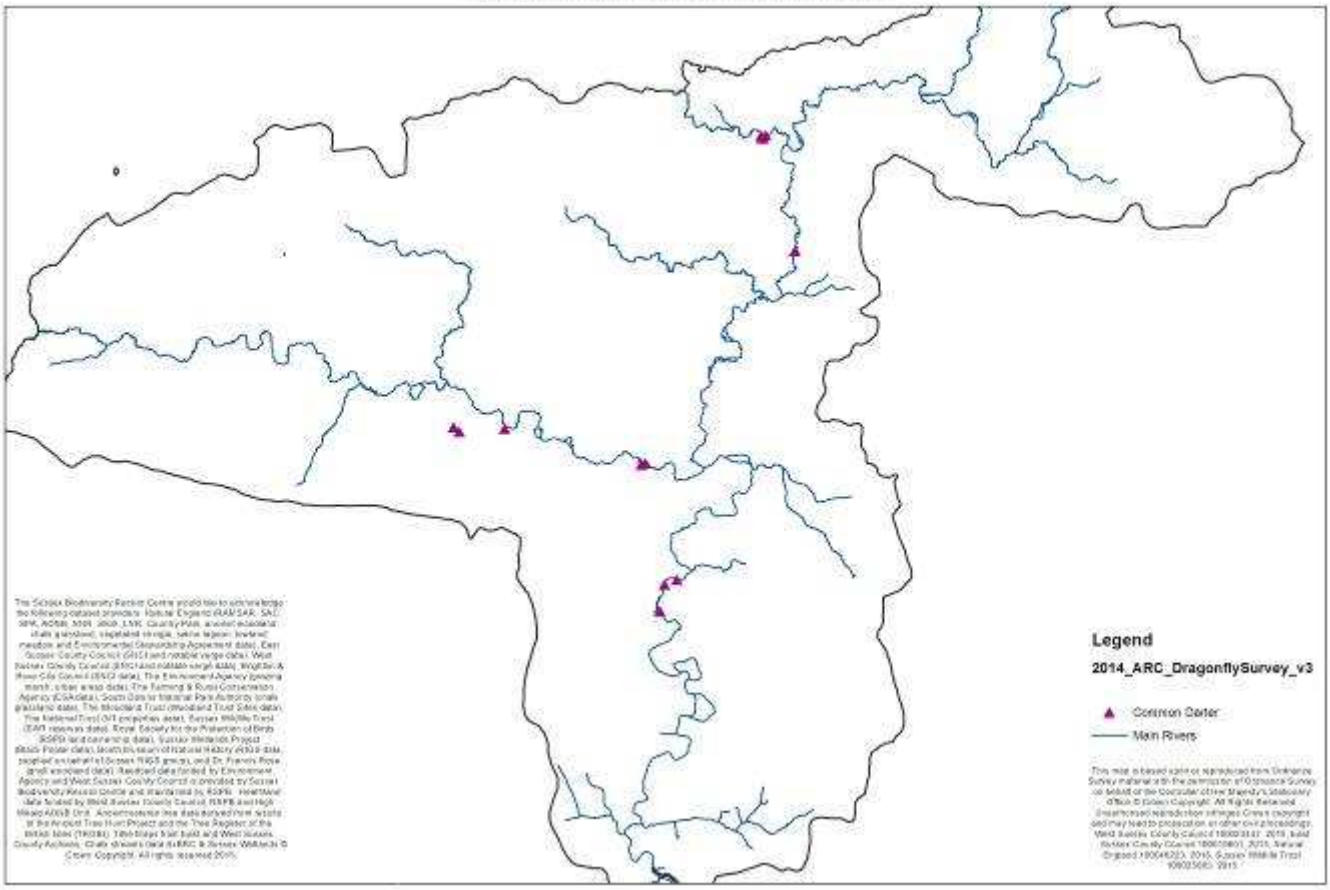
New Common Blue Damselfly Records 2014



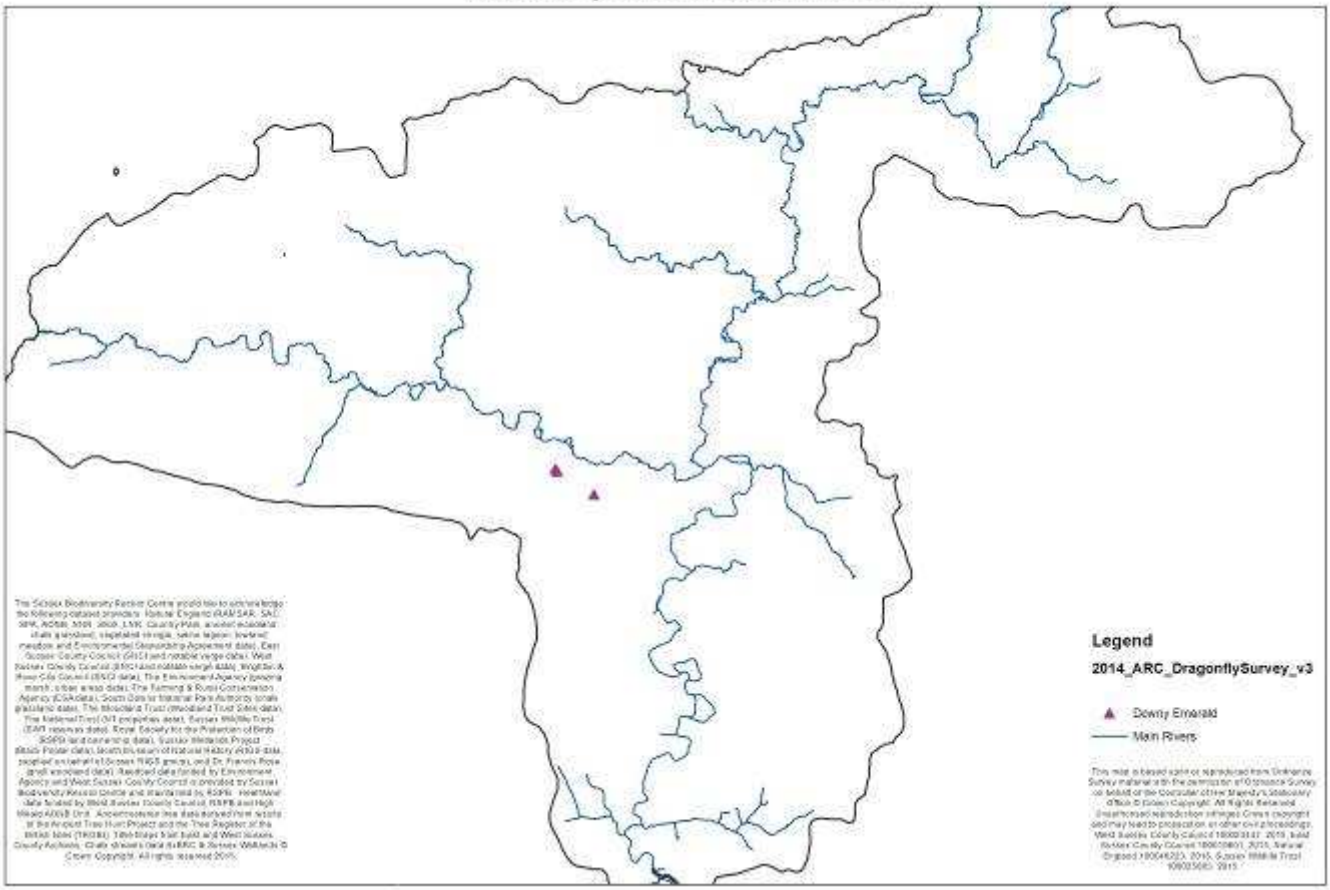
New Common Club-tail Records 2014



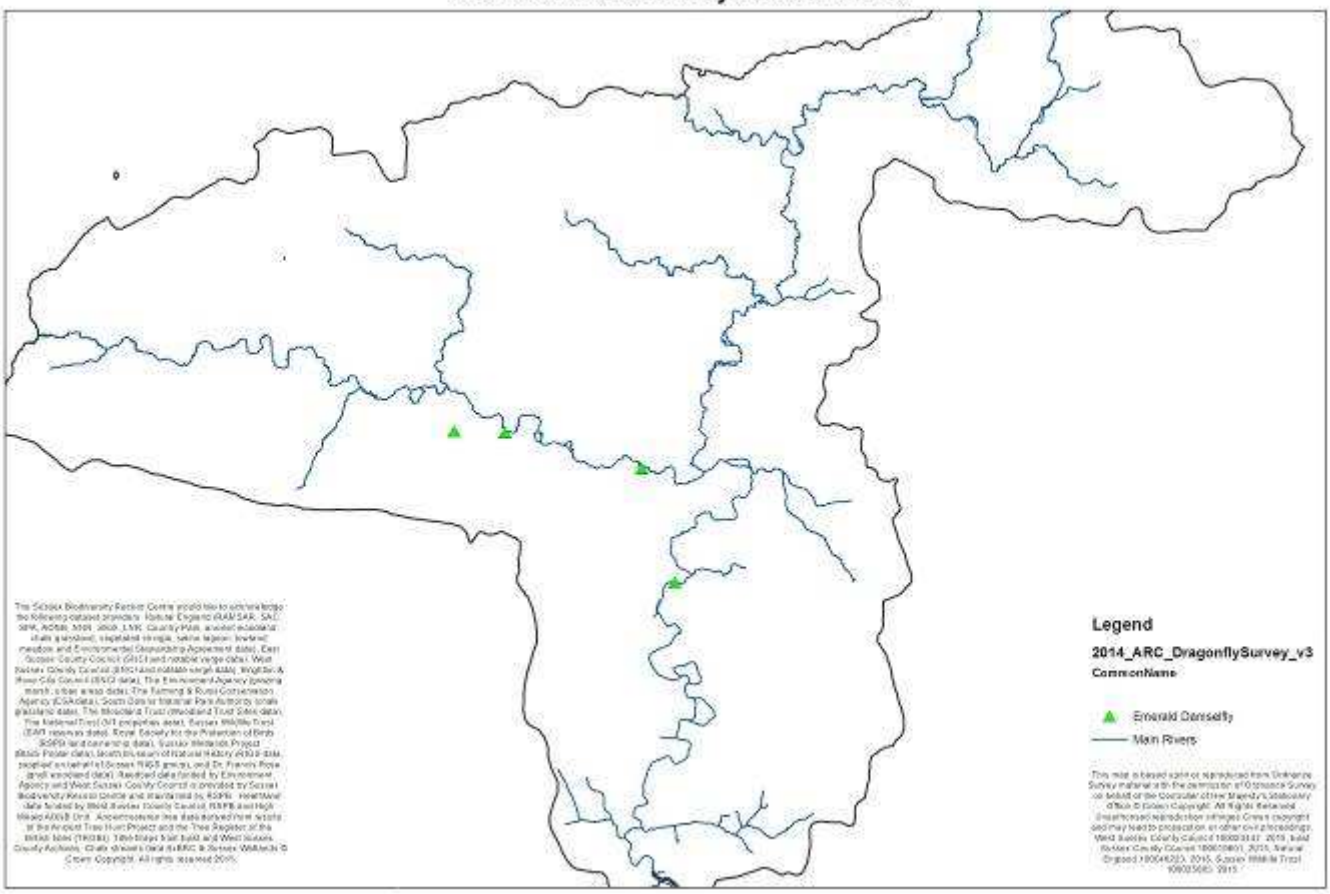
New Common Darter Records 2014



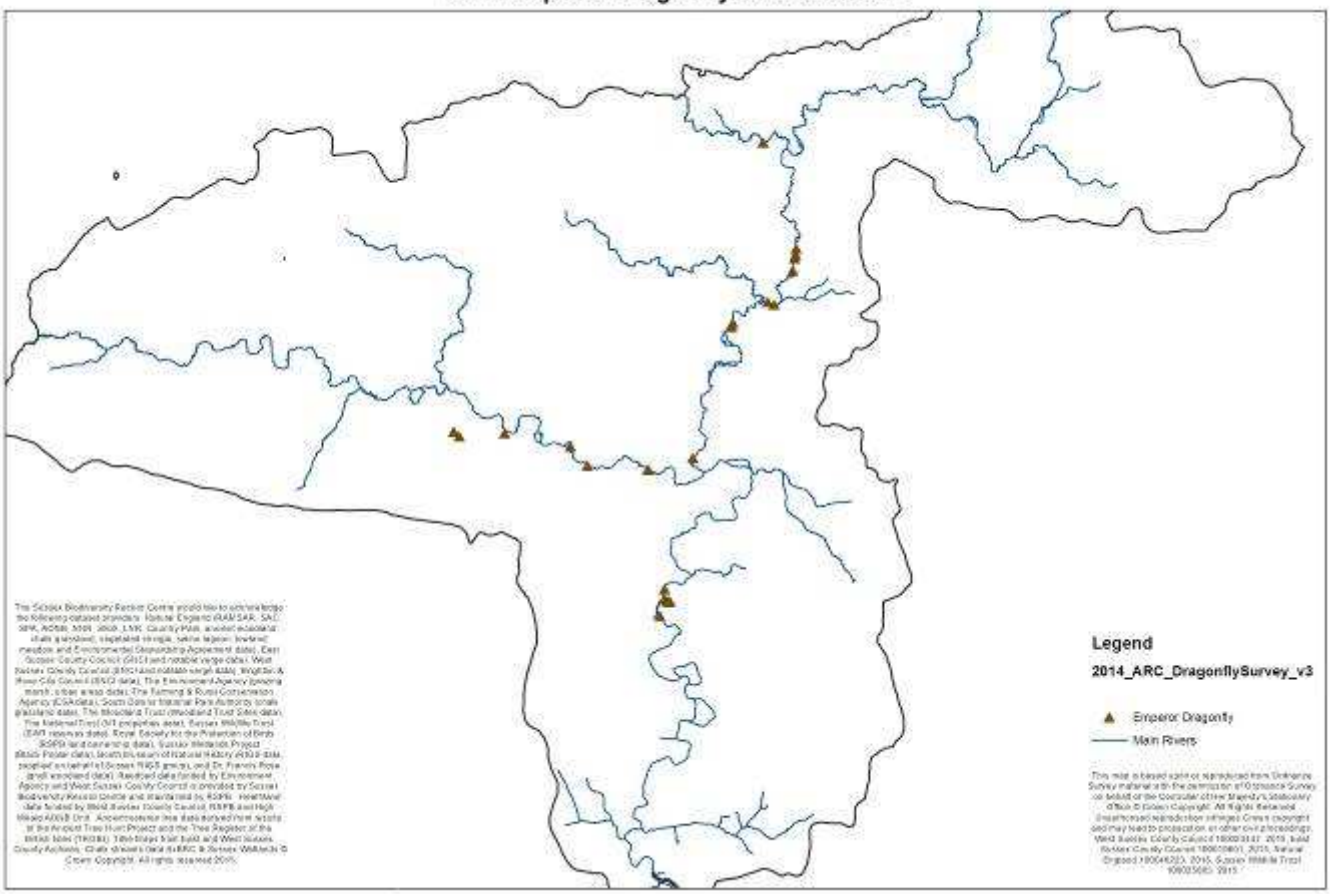
New Downy Emerald Records 2014



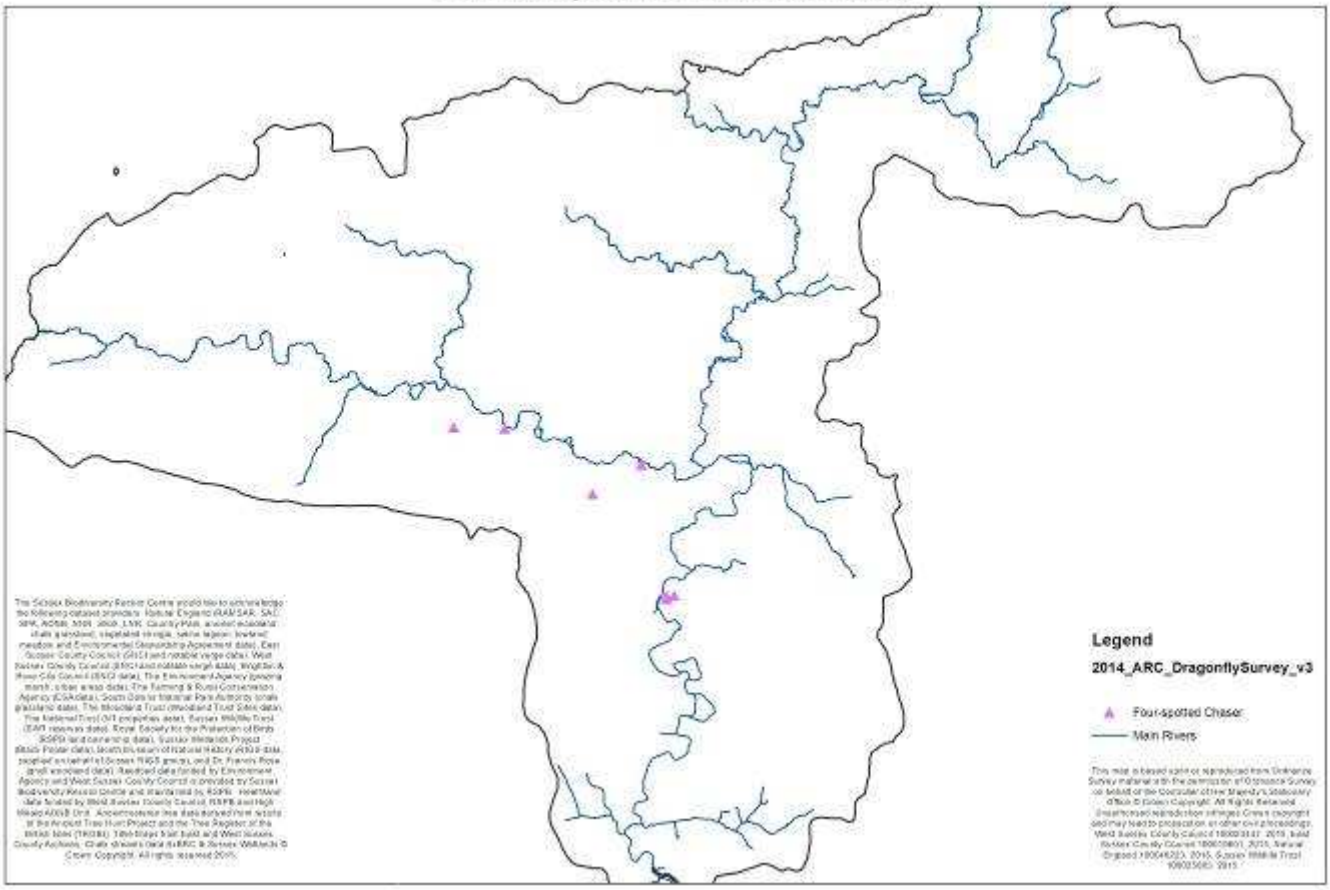
New Emerald Damselfly Records 2014



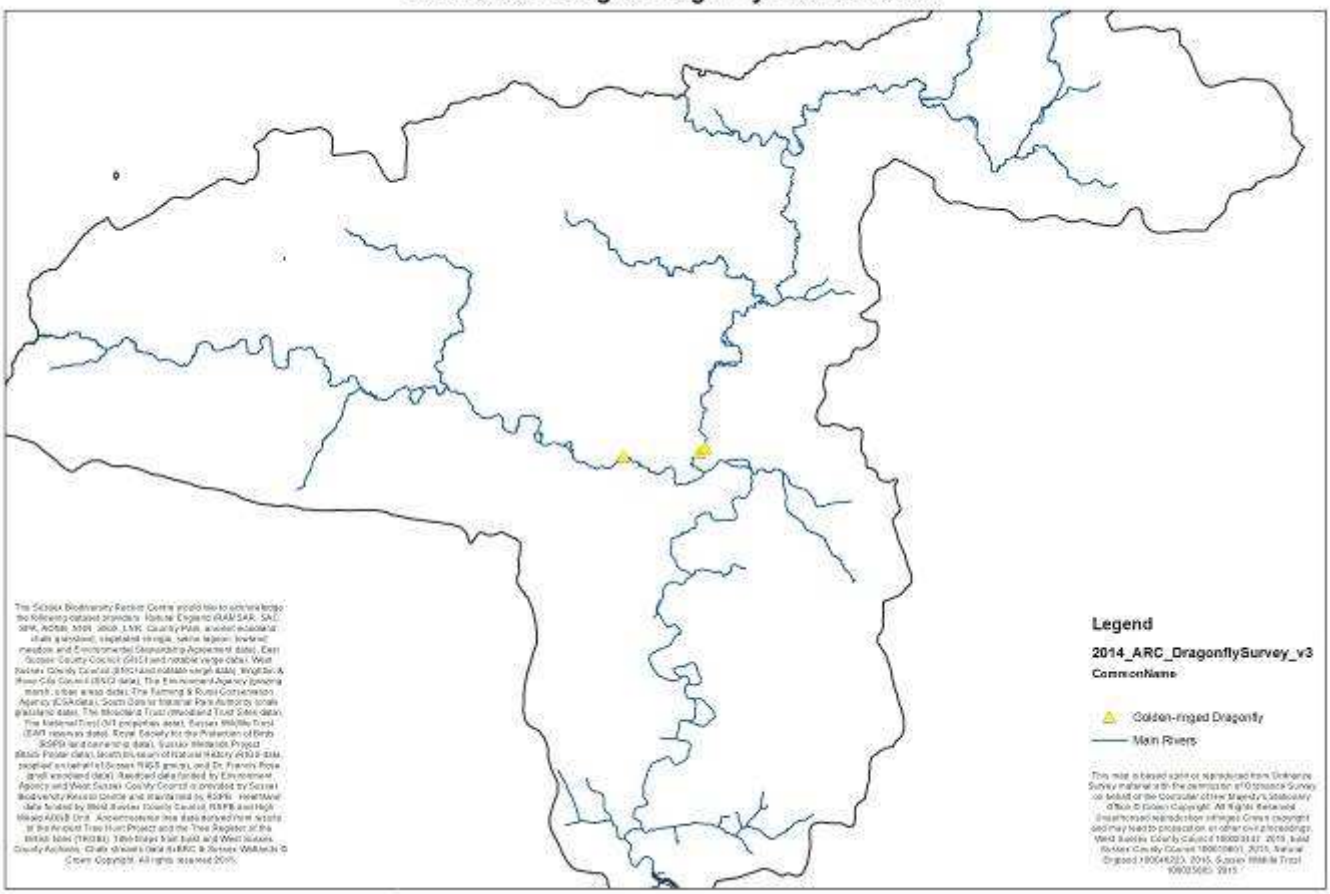
New Emperor Dragonfly Records 2014



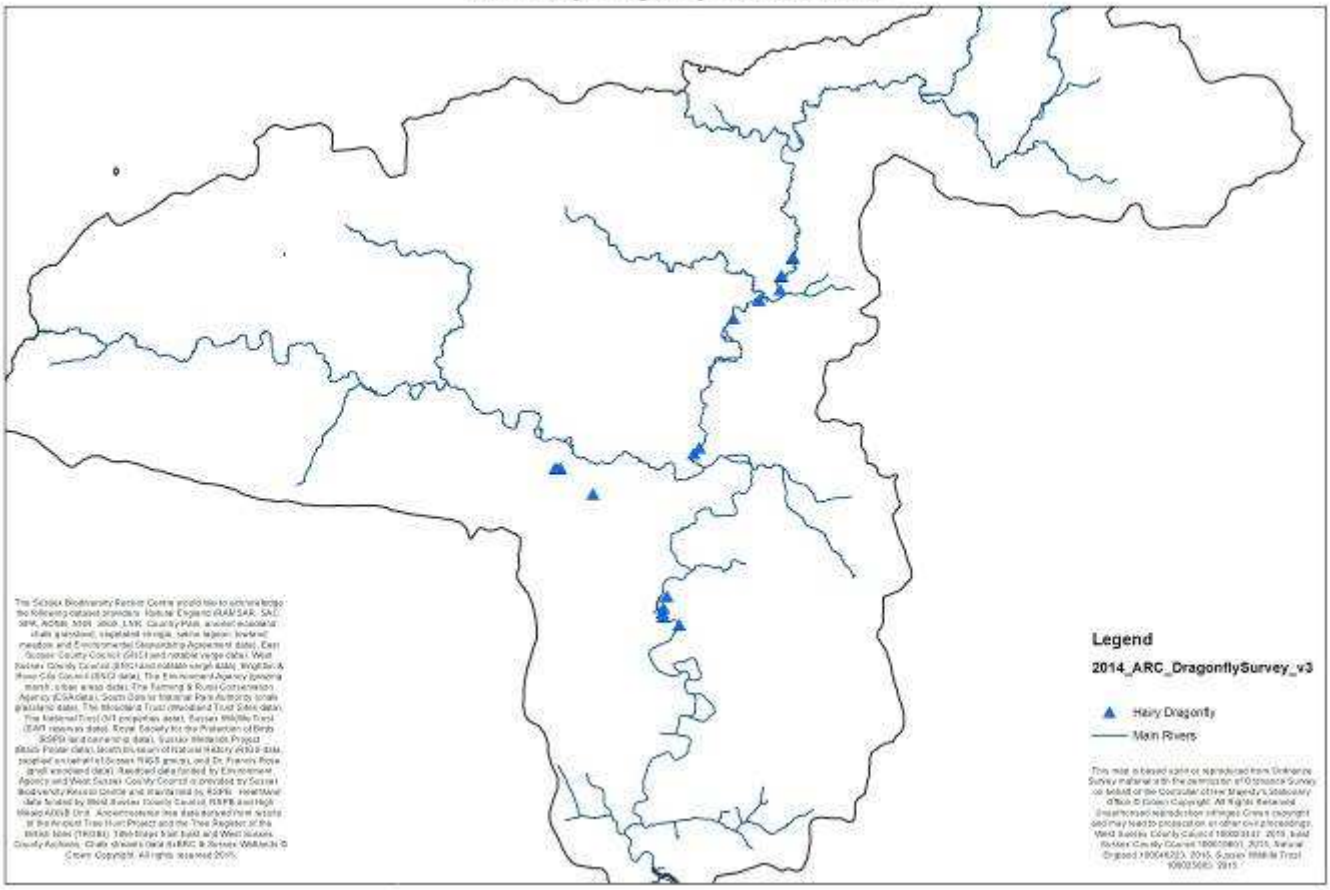
New Four-spotted Chaser Records 2014



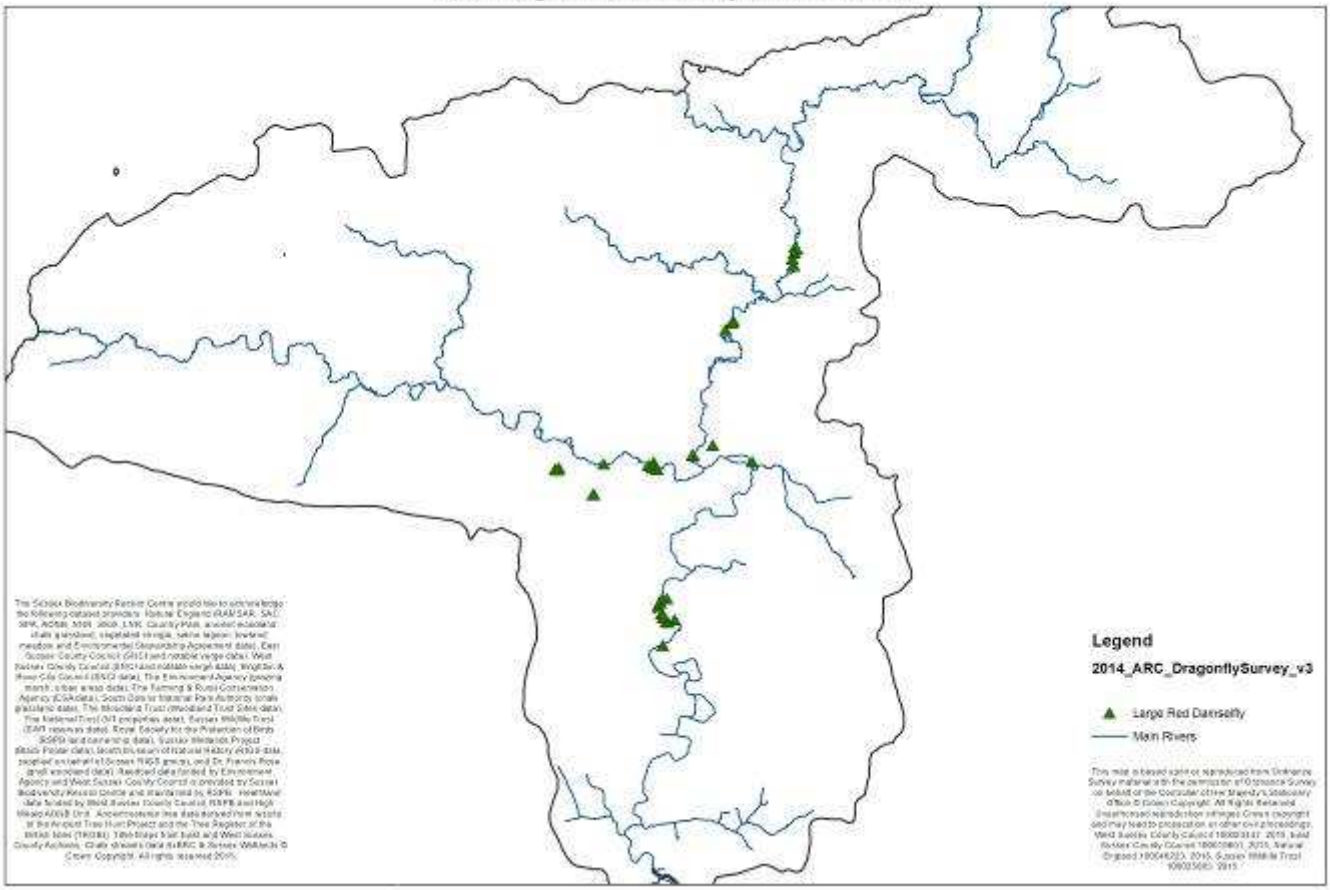
New Golden-ringed Dragonfly Records 2014



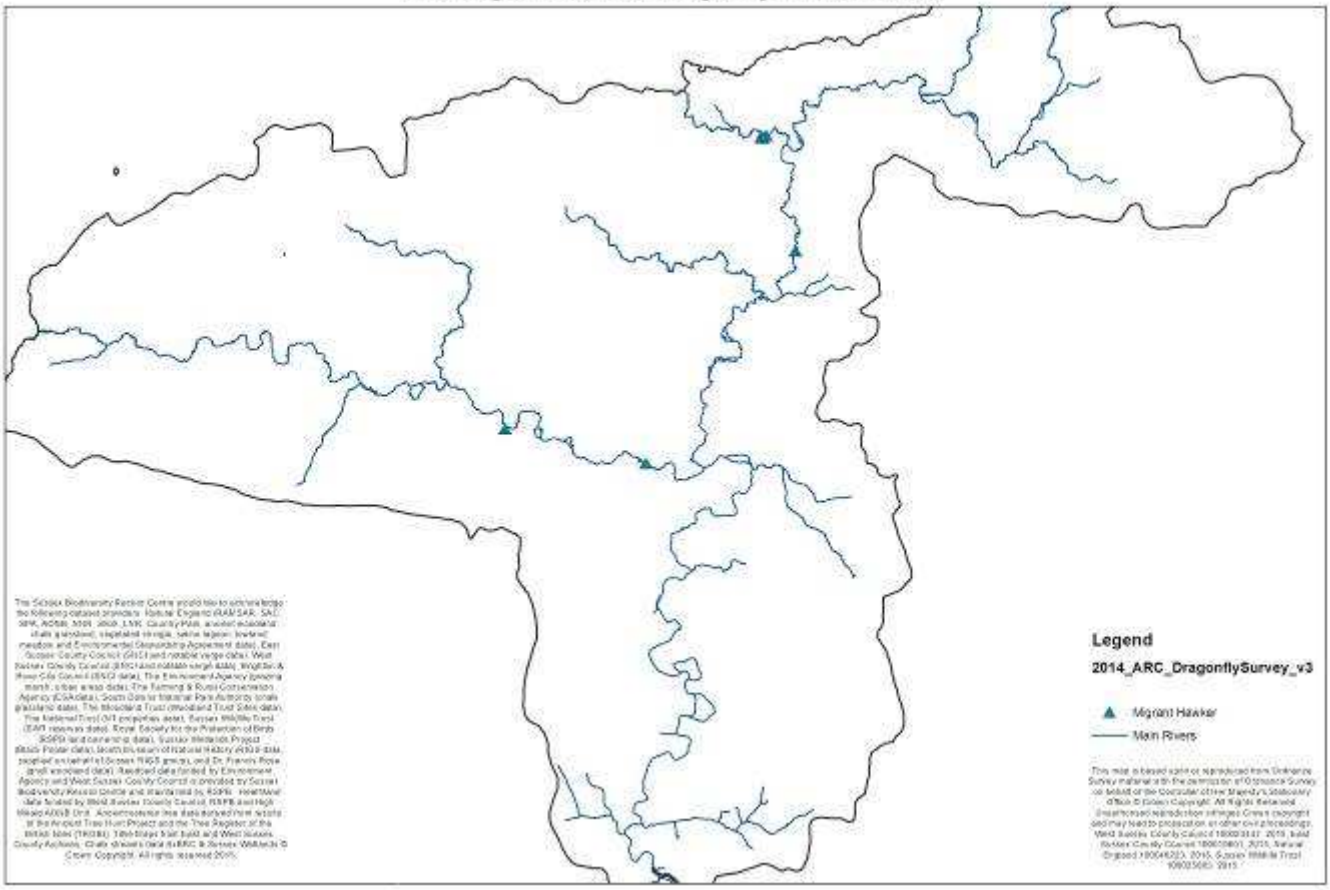
New Hairy Dragonfly Records 2014



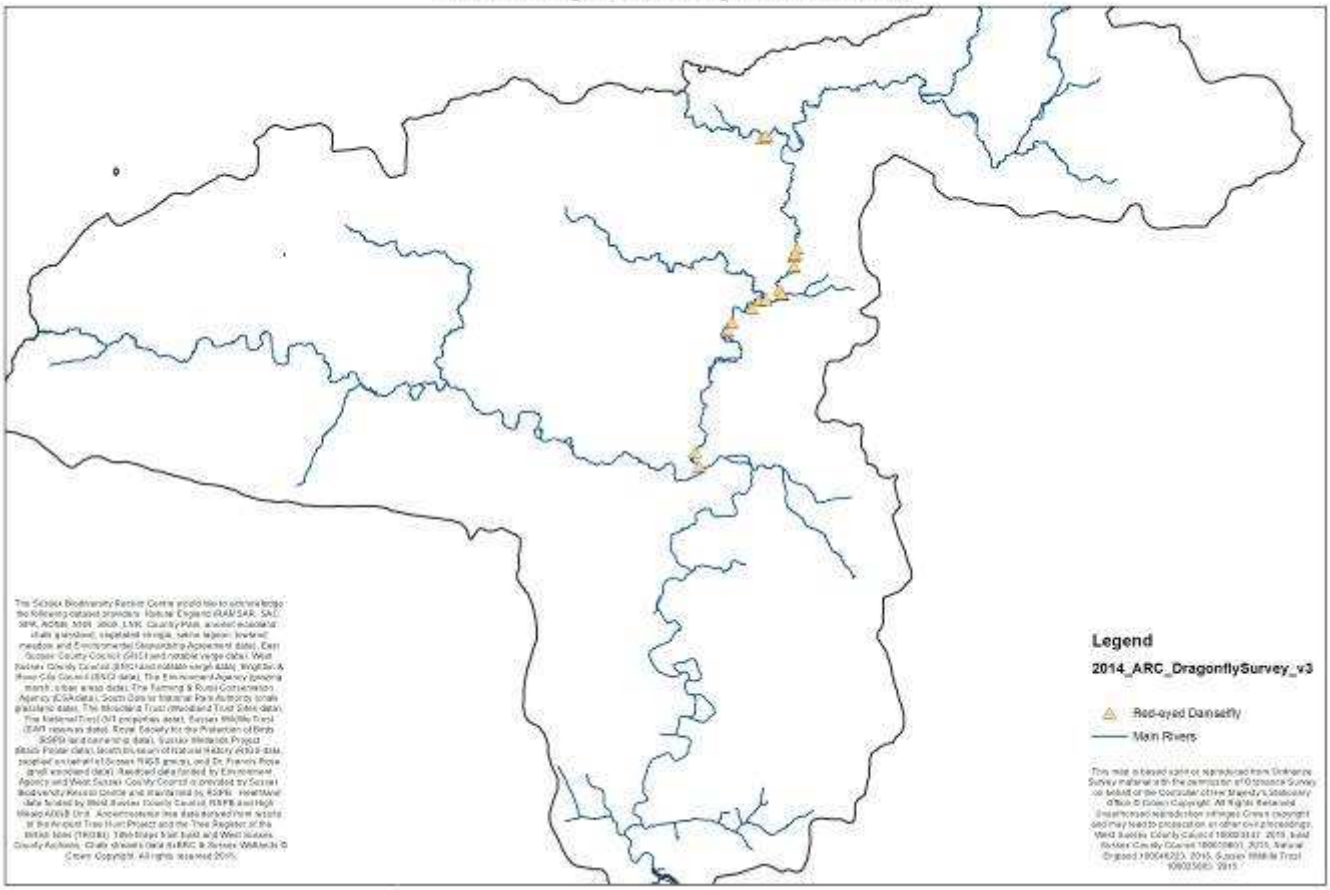
New Large Red Damselfly Records 2014



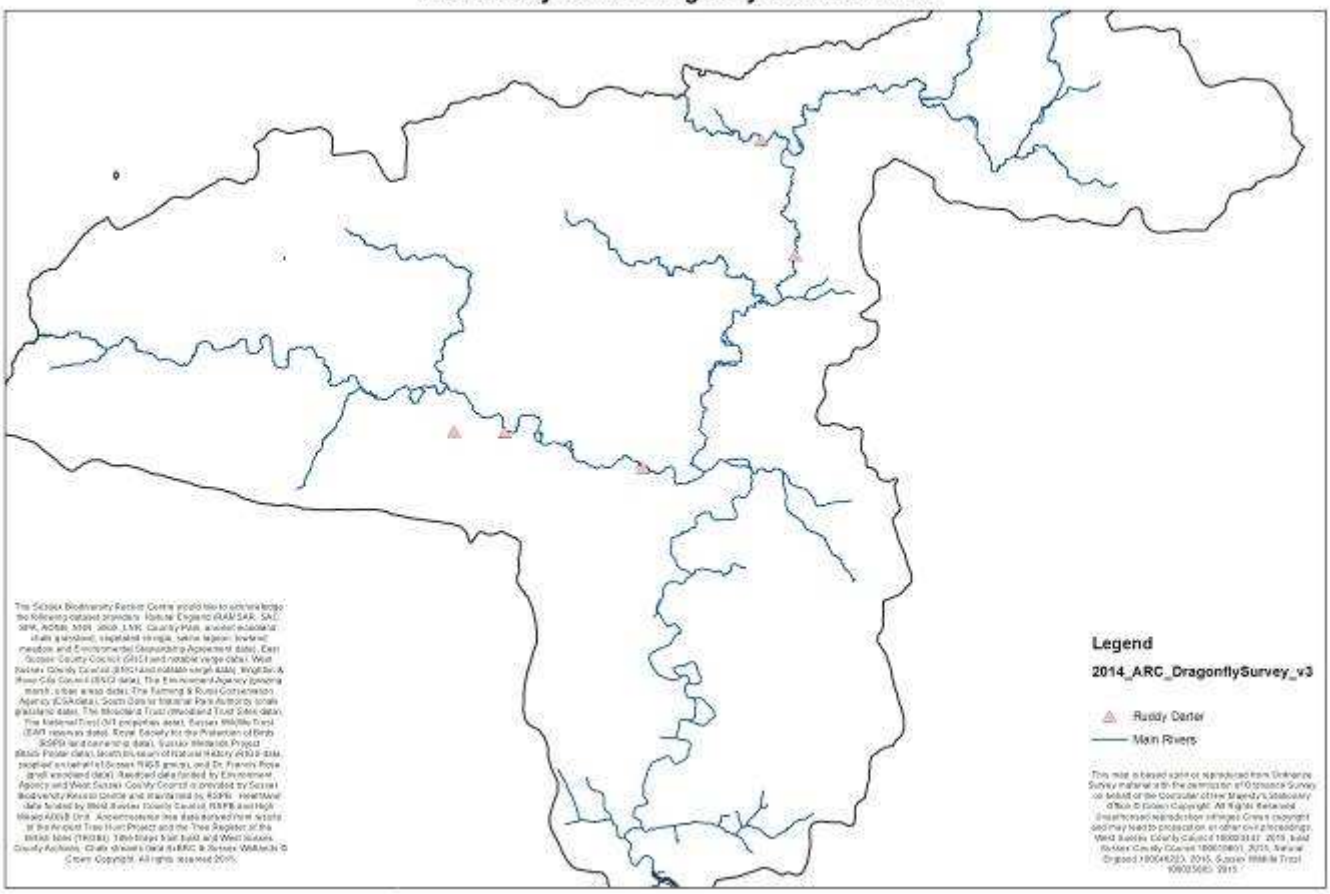
New Migrant Hawker Dragonfly Records 2014



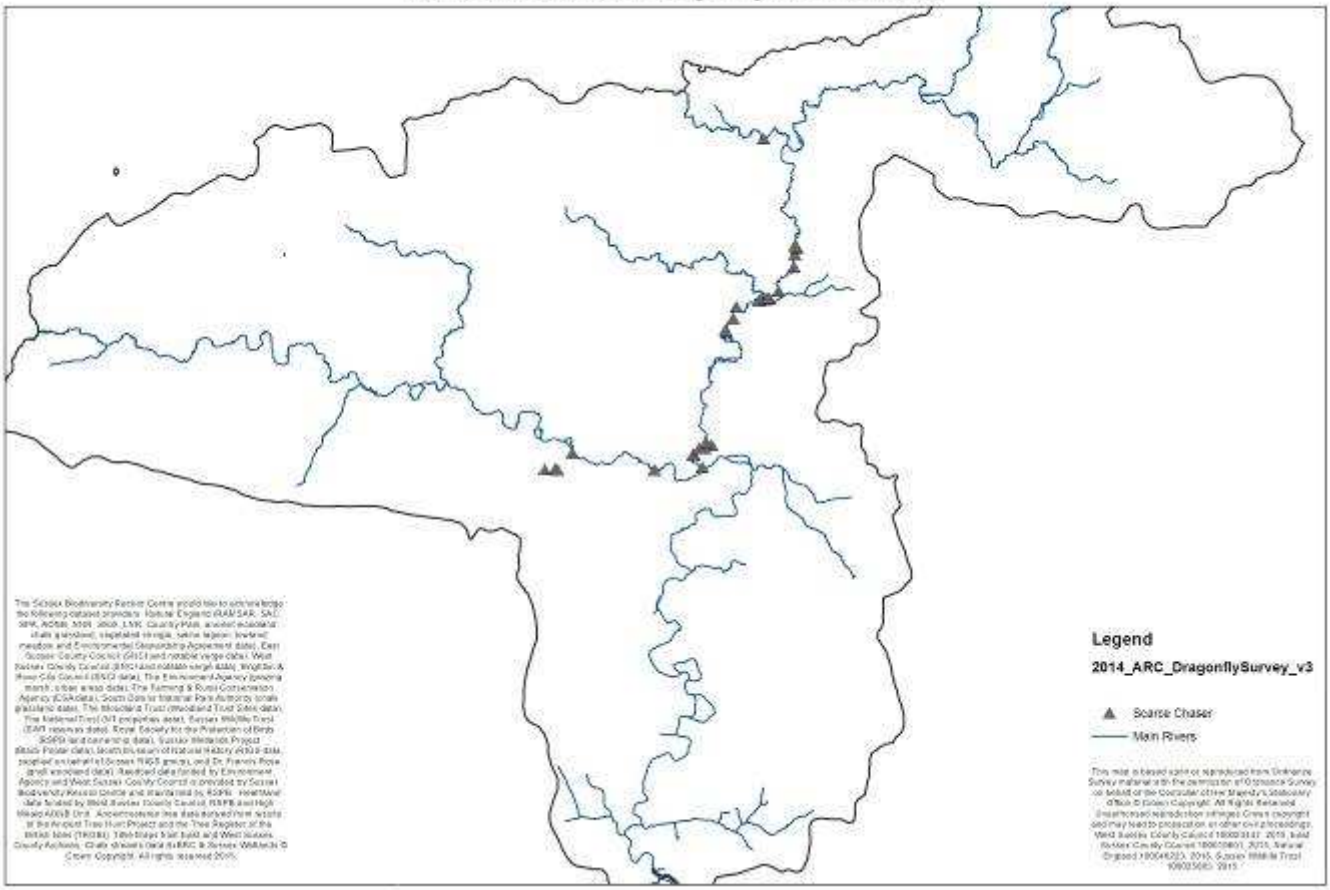
New Red-eyed Damsefly Records 2014



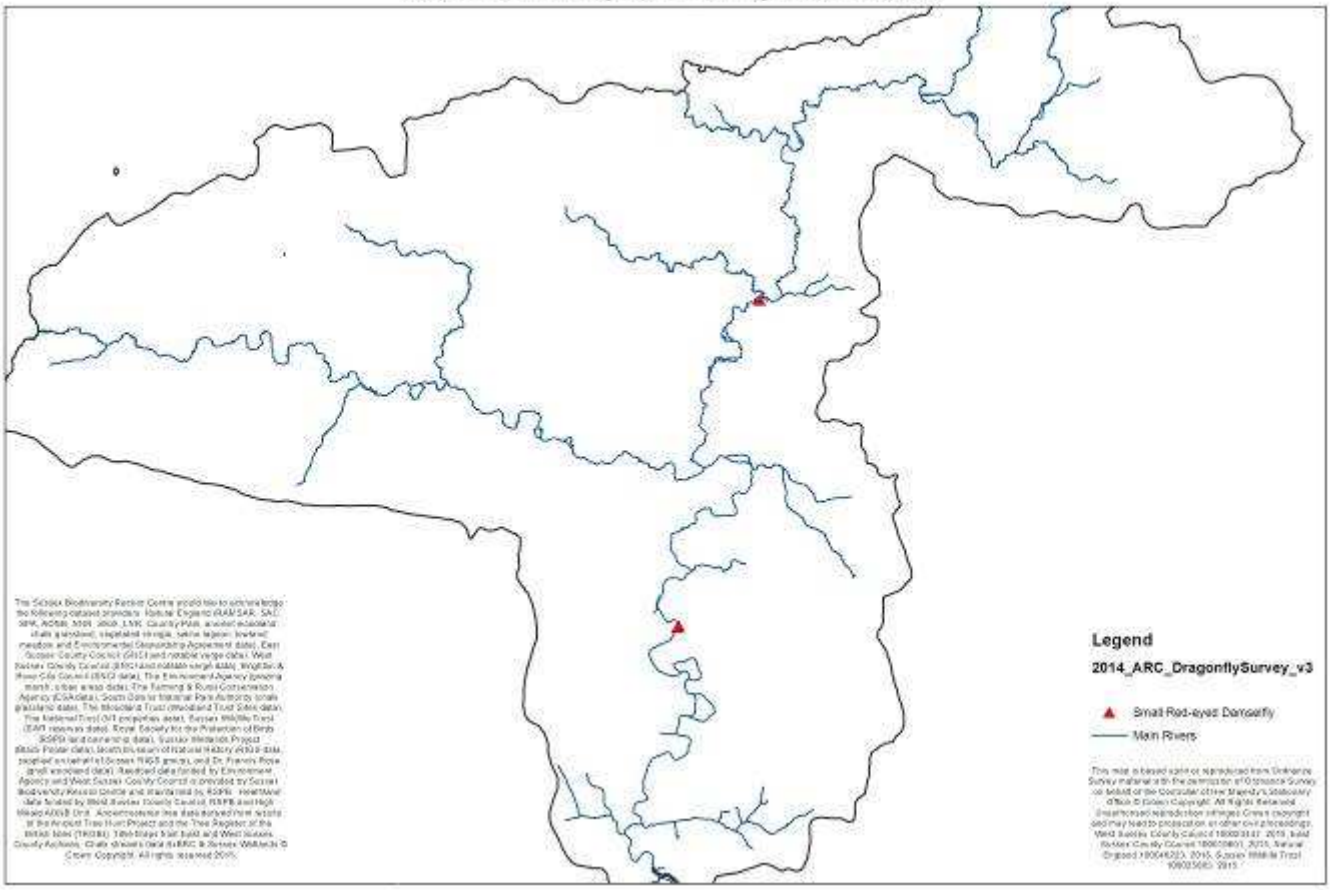
New Ruddy Darter Dragonfly Records 2014



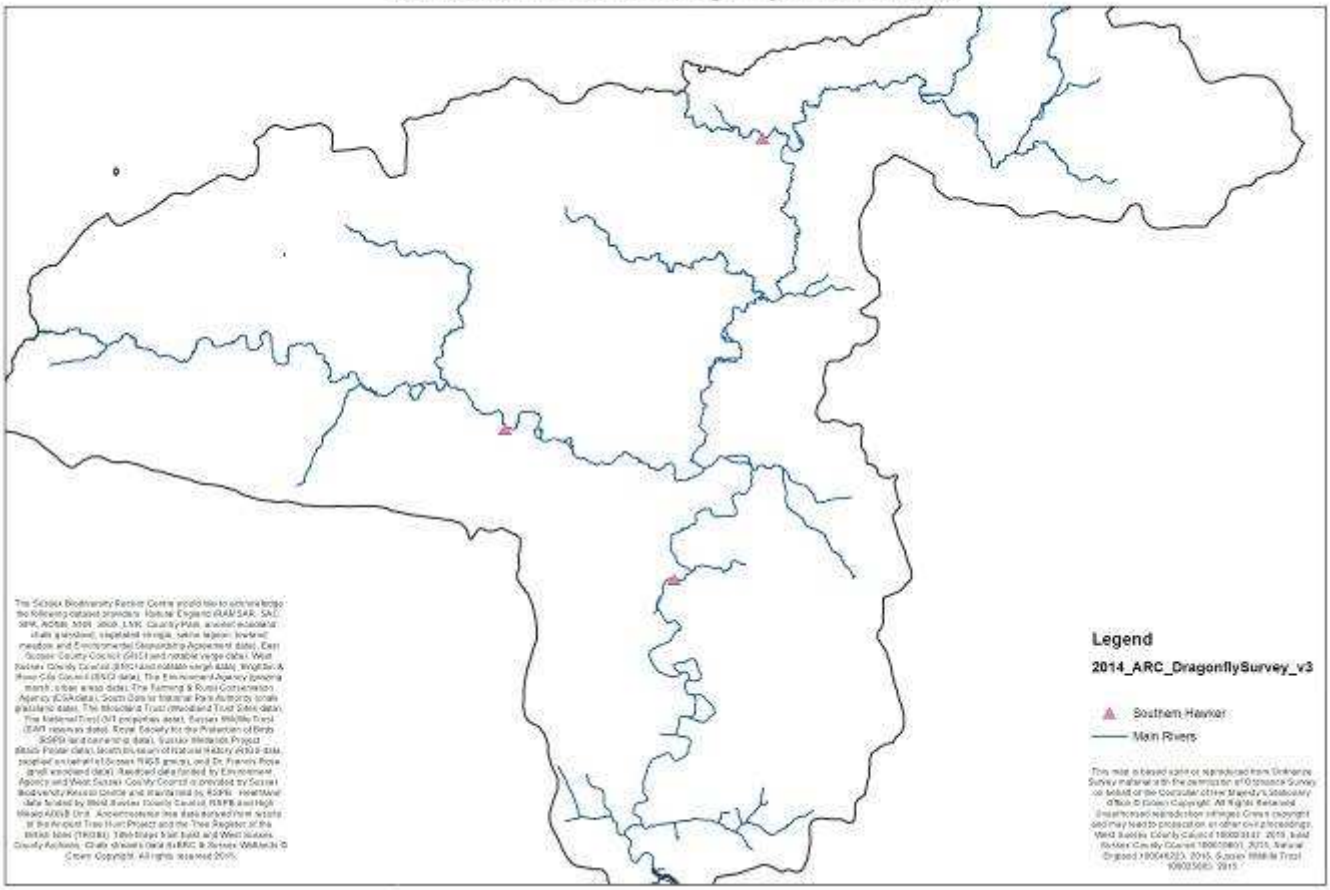
New Scarce Chaser Dragonfly Records 2014



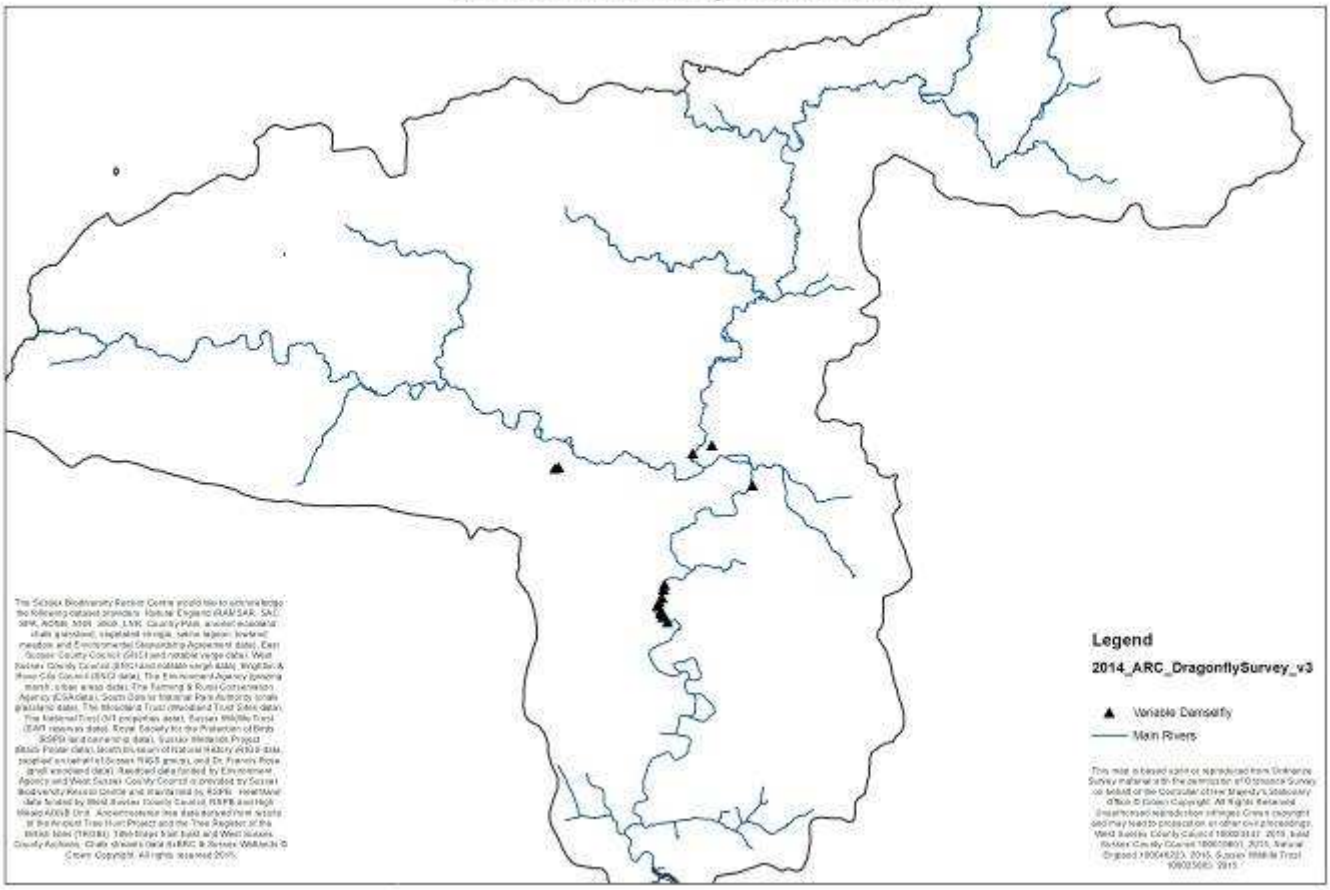
New Small Red-eyed Damselfly Records 2014



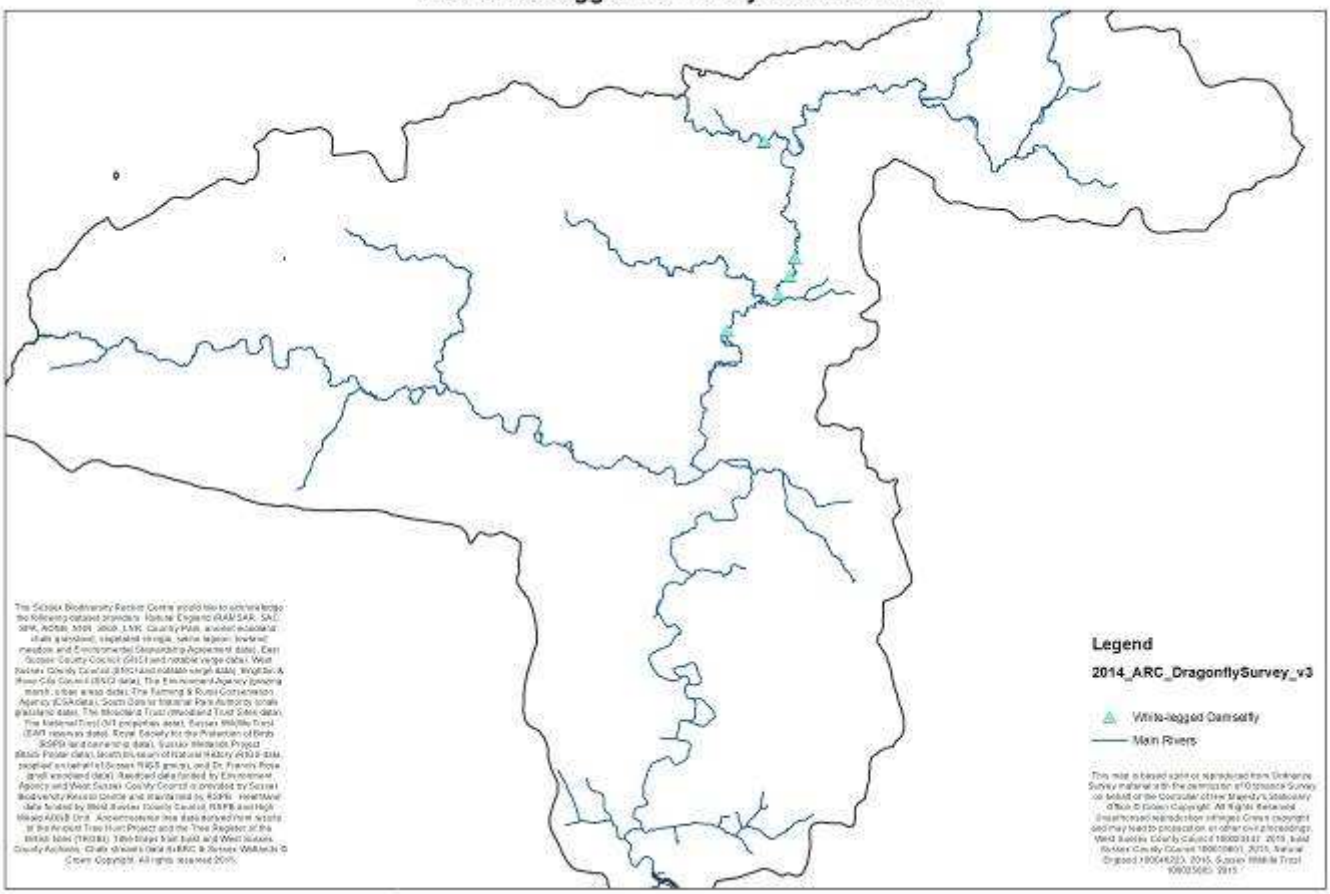
New Southern Hawker Dragonfly Records 2014



New Variable Damselfly Records 2014



New White-legged Damselfly Records 2014



APPENDIX 3

Invasive plant species observed

1) Himalayan Balsam

Frequently encountered along river and canal banks over the whole survey area.
Concentrations noted at:

- Houghton Bridge area and northwards eg TQ 02511180, TQ 02181212
- New Bridge southwards TQ 06192514
- New Bridge northwards TQ 06962690
- Wey & Arun Canal, Drungewick TQ 06053095

2) Giant Hogweed

Only noted on the south bank of the Wey & Arun Canal at Drungewick, TQ 06053095, growing amongst the Himalayan Balsam

3) Japanese Knotweed

South of Fittleworth, along the hedge adjacent to the road at TQ 00931817

The non-native invasive species Giant hogweed at Drungewick on the Arun

APPENDIX 4

Survey Dates, Locations and Weather conditions:

7. 4.5.14 Fittleworth Rother; New Bridge Arun; Sun/cloud, cool breeze
8. 6.5.14 Stopham Bridge Arun; Houghton Bridge Arun; Sun/cloud, increasing breeze
9. 14.5.14 Fittleworth; Burton Mill Pond; Lord's Piece Pond; Stopham Copse; Sun/cloud, c25C
10. 15.5.14 Fittleworth; Pallingham Quay Arun; Early sun, increasing cloud, up to 24C
11. 17.5.14 Fittleworth; Houghton north; Sunny, slight breeze c25C
12. 19.5.14 New Bridge south to Lording's Lock; New Bridge north; Burton Mill Pond; Sunny, up to 26C
13. 21.5.14 Houghton Bridge north and south; Fog clearing, up to 22C, then cloudy
14. 23.5.14 Burton Mill; Houghton Bridge; Cloudy, cool
15. 25.5.14 Stopham; Fittleworth; Burton Mill ;Houghton north; Sunny, breezy 23C
16. 31.5.14 Fittleworth; Scrace Fm to Lording's Lock Arun; New Bridge; Sun/cloud 22C
17. 5.6.14 Shopham Bridge east Rother; Burton Mill; Stopham Br; Sun/cloud breezy 22C
18. 6.6.14 Houghton Bridge north and south; Sunny, warm, breezy, up to 25C
19. 8.6.14 New Bridge north; Pulborough south Arun; Sunny, warm, some breeze 27C
20. 10.6.14 Shopham Br west Rother; Fittleworth; Stopham south; Greatham Bridge Sun/cloud, breezy 25C
21. 13.6.14 Fittleworth; Scrace Farm north; Greatham Bridge; Sun/cloud, up to 28C
22. 19.6.14 New Bridge north and south; Fittleworth; Houghton Br; Sun, increasing cloud 25C
23. 22.6.14 New Bridge north; Shopham Br east; Houghton Br; Sunny, increasing breeze, c25C
24. 23.6.14 Stopham Bridge; Pulborough south; Greatham Br; Sunny, increasing breeze 27C
25. 1.7.14 Houghton Bridge north to Amberley Wildbrooks; Sunny, quite breezy 25C
26. 2.7.14 New Bridge south and north; Sunny, up to 28C
27. 7.7.14 Houghton Bridge north and south; Sunny, breezy c24C
28. 14.7.14 Houghton Bridge north and south; Sunny, increasing breeze c25C
29. 21.7.14 New Bridge north; Wey and Arun Canal Drungewick; Sun/cloud c24C
30. 22.7.14 New Bridge south to Lording's Lock; Sunny, breezy, c28C
31. 30.7.14 Houghton Br north; Fittleworth; New Bridge north; Sunny, up to 25C
32. 3.8.14 Graffham Common; Mostly cloudy, some sunny breaks, breezy c21C
33. 13.8.14 Wey and Arun Canal; New Bridge; Graffham Common; Sun/cloud, breezy c23C
34. 16.8.14 Houghton Bridge north; Sun/cloud, breezy, 20C
35. 23.8.14 New Bridge north; Wey and Arun Canal; Sun, increasing cloud c23C
36. 31.8.14 Wey and Arun Canal; New Bridge north; Fittleworth; Sun/cloud 23C

APPENDIX 5

1km Grid Squares in Arun Catchment without Dragonfly Records

Prepared for Fran Southgate - 08/01/2015

Sussex Biodiversity Record Centre
Woods Mill, Henfield, West Sussex BN5 9SD
sxbrc@sussexwt.org.uk
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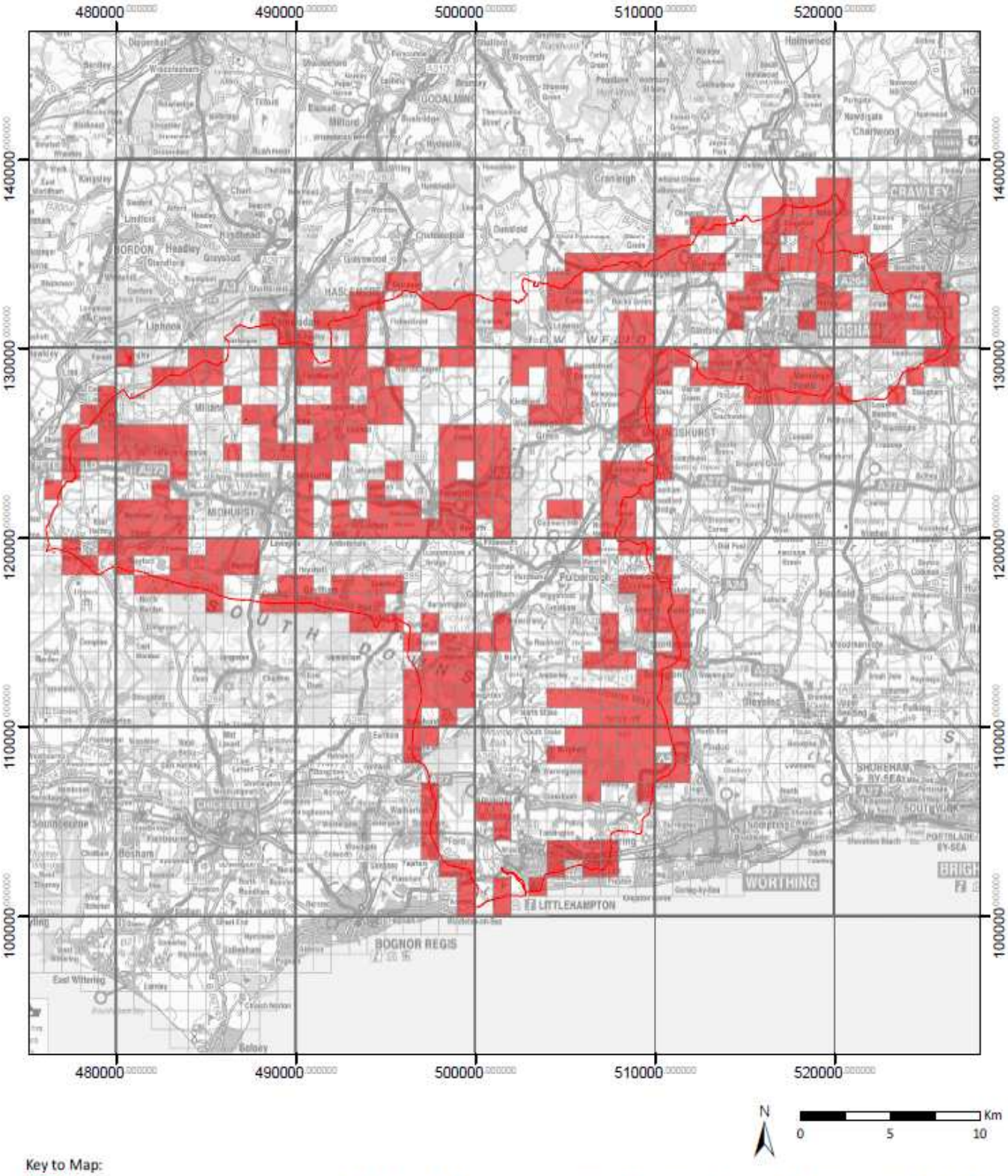

Key to Map:

- Arun catchment area
- 1km squares without dragonfly records

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