

Repeat Botanical Survey of the River Adur & Lancing Brook Knepp Estate

Dolphin Ecological Surveys 2018



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INTRODUCTION

As part of the ongoing Knepp Wildlands biological monitoring programme a botanical survey of parts of the River Adur and Lancing Brook on the Knepp Estate in West Sussex was carried out by Kate Ryland of Dolphin Ecological Surveys.

This is the third time that the riparian vegetation survey has been undertaken. The original survey was carried out on 17th August 2005, a repeat of the survey took place earlier in the field season on 24th and 25th May 2007 and the current survey took place on 21st and 22nd August 2018.

The survey included aquatic plants found within the channels as well as semi-aquatic marginal species and plants growing on the banks of the watercourses up to the change of slope at the top of the banks. Aquatic vegetation was sampled at regular intervals along the watercourses using a grapnel.

Comparisons between the species recorded and their abundance from one survey to the next should be made with caution and awareness of the survey constraints. This walkover survey method of recording the plants found along the river and stream is prone to seasonal bias and there is always the possibility of recorder bias.

The botanical survey of these watercourses was originally set up in 2005 with very limited financial resources available to pay for the survey time. It was intended to at least provide an overview of the type of plant communities present and to allow some subjective comparison of their changes over time as the Knepp Wildlands project progressed.

A more time-consuming and expensive survey method based on regular recording of vegetation in fixed plots or transects would yield data that could be compared over time with a greater degree of accuracy.

In 2005 and 2007 the survey covered four different sections of the River Adur and Lancing Brook. These were:

- Section 1. River Adur, Shipley Windmill to Capps Bridge (TQ144217 to TQ148217)
- Section 2. River Adur, Capps Bridge to A24 (TQ148217 to TQ164207)
- Section 3. Lancing Brook, Hammer Pond (TQ148208 to TQ144208)
- Section 4. Lancing Brook, Hammer Pond to Tenchford Bridge/Adur confluence (TQ148208 to TQ153210)

Resources for biological surveys at Knepp remain scarce and as a result it was decided to only repeat the botanical survey along three of the original four sections of river.

The first section of the River Adur, from Shipley Windmill to Capps Bridge, is outside the Southern Block and has not been subject to the same changes in land use as the remaining sections that are within the Wildlands boundary. Section 1 was therefore excluded from the 2018 survey in order to allow more time for surveying the remaining three sections that are likely to have changed most in the last 11 years and that will probably be subject to greatest change in the future.

Unfortunately the original survey method did not include taking photographs of the watercourses and adjoining habitats. However, in 2018 photos were taken along the three sections surveyed and these should be useful in future to supplement the botanical survey data and to help document further changes.

As part of the 2018 fieldwork a brief botanical assessment was made of the Hammer Stream Lagg, which lies upstream of the Hammer Pond, just outside the original Section 3. This was included in view of possible future changes to wetland habitats adjacent to the Hammer Pond.

RESULTS

Section 2. River Adur, Capps Bridge to A24 (Bay Bridge)

This section of the River Adur is just over 2km long and is quite varied along its length, not least as a result of recent river restoration and habitat enhancement work. It is described here in four separate reaches.

Reach 1. Capps Bridge to Pound Farm Bridge

Upstream the river channel is unmodified and is mostly shaded by trees on the western bank. The channel vegetation is predominantly yellow water-lily and locally frequent reed canary-grass. In the north a willow has fallen across the channel and alder with osier occur at the upstream extent near Capps Bridge.



The new wetland habitats within the floodplain to the east of the upstream part of this section enhance the riparian habitat overall but the channel is largely unaffected. The scrapes within the floodplain have abundant soft rush.



Towards Pound Farm Bridge the newly created channels are separated from the old channel by fenced blocks of newly planted trees. Much of the straightened channel adjacent to the tree planting is shaded and has very sparse vegetation.

There are occasional stands of alga and bare clay is visible in the channel bed of the new meanders in places. It is still early in the development of an aquatic flora but the marginal and emergent vegetation that has established in the new reaches shows promise.



The vegetation within this narrow part of the River Adur is generally quite diverse in its structure and species composition. The channel contains much fat duckweed with branched bur-reed, unbranched bur-reed, narrow-leaved water-plantain, reed canary-grass and reed sweet-grass.

The river banks along this reach are steep in places and grassy with some vertical bare soil faces caused by bank erosion. The bankside vegetation is very average but there are patches of herbs including fleabane and common ragwort on the inaccessible western bank where tussocks of tufted hair-grass are also locally frequent. Anthills are scattered along the eastern banktop.

The upstream reach of Section 2 was surveyed from the eastern bank since most of the western bank is inaccessible.

Reach 2. Pound Farm Bridge to the Adur and Lancing Brook Confluence

Downstream from the Pound Farm bridge, the river now flows in new and restored meandering channels within the floodplain. The floodplain itself has extensive areas of rush pasture between the old and new channels with fenced blocks of planted trees on the river banks.



Water levels in this reach were low in summer 2018 but there is locally abundant emergent vegetation with fat duckweed, common duckweed, frequent algal blooms and water-starwort present in parts of the channel.

Interesting new plant colonists in the least heavily vegetated parts of a new channel are the small rafts of fine-leaved pondweeds. Most of this is fennel pondweed but small pondweed *Potamogeton berchtoldii* may

also be present (not enough material was collected to be sure of the latter). This sparsely vegetated reach has few emergent plants, frequent soft rush on the banks and abundant alga in the channel.

Near the footbridges there are some vertical, eroded bank faces. The channel splits into two parts under the footbridges which rejoin further downstream. The margins of this reach were conspicuously poached because the banks are less steep and much more accessible to the cattle than they are upstream of Pound Farm bridge. Perhaps as a consequence of animals congregating in the river, the water quality around the footbridge appears to be quite poor. Downstream of the bridges curled pondweed is present in the channel where the water is deep enough for aquatic vegetation.



Towards the confluence of the River Adur and the Lancing Brook near Tenchford Bridge there are increasing amounts of branched bur-reed and unbranched bur-reed in the channel with occasional great yellow-cress and frequent water-pepper on the shallow margins. Occasional narrow-leaved water-plantain, frequent floating sweet-grass and trifid bur-marigold were also noted in this reach.



The new, meandering channel has an increasingly diverse emergent flora in its downstream parts and a small amount of flowering-rush was noted near its confluence with the River Adur.

The banks near the confluence are very steep and support fragments of quite flowery grassland with fine-leaved grasses and large amounts of fleabane.

There have been some physical changes to the river since 2007. For example there are fenced plantations alongside the river and wooden reinforcements on the outer edges of some meanders. This has restricted access for survey to some degree.

A fallen tree trunk draped in debris illustrates how high the river level can rise at times of peak flow.

Reach 3. River Adur and Lancing Brook confluence to Swallows Furzefield

River restoration and habitat creation work has also taken place along this reach of the Adur and includes the creation of new bays and re-engineered sections of the channel. Scrapes have been dug in the floodplain north of the river.

Where the Lancing Brook meets the old course of the River Adur there is a wide bay, shaded by willows, with much branched bur-reed and water-pepper on the margins. Common duckweed is abundant on the water's surface here.

From this point the channel is much wider and generally more botanically diverse than upstream with a wider range of plant species than was recorded in the upstream reaches.

Great yellow-cress occurs on the river margins along with branched bur-reed, reed canary-grass, bur-marigold, water forget-me-not and common club-rush. Celery-leaved buttercup and lesser bulrush are present in small quantities.



Downstream of the weir there are willows and patches of scrub on the southern bank and a mature oak with tangled, exposed roots overhanging the river from the north bank. This has created a combination of open and shaded sections of the channel.



Water chickweed is a feature of the muddy edges of shaded bays. In the open, sunny sections of the river the channel is dominated by dense emergent vegetation which is grazed by the cattle and there is little open water.

The upper banks have a rather coarse, dry grassy flora with locally frequent teasel, false oat-grass, stinging nettle, toadflax and fleabane as well as some large old anthills.

This part of the river had very little flowing water in August 2018 and only shallow, turbid patches of open water. However it does have a good varied vegetation structure, enhanced by the action of grazing cattle. Branched bur-reed and common club-rush are particularly prominent but no aquatic vegetation was evident.



The floodplain to the north of the river contains wet grassland sward with some large scrapes. This area was not surveyed but a diverse wetland flora was noted in passing, characterised by typical wetland plants of seasonally inundated habitats such as rushes, tufted hair-grass, water-pepper, water mint, branched bur-reed, marsh yellow-cress, amphibious bistort and marsh foxtail.



Reach 4. Swallows Furzefield to Bay Bridge (A24)

The final, downstream reach of the River Adur within this survey section has a quite wide channel with deeper water than upstream and a very dense and diverse aquatic and emergent flora.

Most of this reach has open, unshaded banks although there are fenced groups of newly planted trees on the southern bank which may eventually change the nature of this part of the river. Moderate levels of poaching by livestock along the river margins adds to the structural diversity of this reach.



The most notable plant in this part of the river is the shining pondweed, which is concentrated here. Also of interest are the fennel pondweed and curled pondweed that occur in the channel and the flowering-rush on the margins. Other plants present in this area are yellow water-lily, amphibious bistort, arrowhead, purple loosestrife, water-pepper, branched bur-reed, reed canary-grass and common club-rush.

Immediately downstream of the weir near Bay Bridge there is a deep pool with locally frequent yellow water-lily and some fringed water-lily. Away from the deeper water, the channel is once more dominated by emergent vegetation that includes much common club-rush, branched bur-reed and reed canary-grass with scattered arrowhead and common water-plantain.



Where the river leaves Knepp at Bay Bridge there is a dense stand of wood club-rush in the shallow water of the channel.

The river banks near Knepp Castle are very steep and have a reasonably species-rich sward with herbs such as agrimony and stone-parsley as well as frequent anthills.

Section 3. Hammer Pond

The Hammer Pond is little changed from 2007 and the plants recorded within this section in 2018 are very similar to those from the previous surveys in 2005 and 2007.

It is an extensive area of open water with a diverse wetland flora and a mixture of different vegetation structure that ranges from dense stands of emergent vegetation to shaded, scrubby areas over largely bare mud with limited emergent or marginal vegetation. Gipsywort, purple loosestrife, common marsh-bedstraw, water horsetail and yellow loosestrife are all quite prominent within the marginal flora.



At the upstream end of the Hammer Pond survey section, where the Hammer Stream feeds into the pond, there are wide margins of mixed fen vegetation. This includes much hemlock water-dropwort, bulrush, wood club-rush and reed canary-grass.



The open water has little in the way of aquatic plants apart from large rafts of amphibious bistort and alga.

The largely grassy banks of the Hammer Pond include some quite flowery grazed patches to the north where the amount of fleabane seems to have increased considerably since 2007. There are also frequent areas of tall, coarse vegetation with frequent thistles, nettle and robust grasses.

Hammer Stream Lagg

Hammer Stream Lagg is an area approximately 450m long, upstream of the Hammer Pond and extends to Pen Bridge where Penbridge Lane crosses the stream. It was not included in the previous surveys in 2005 and 2007 but a brief assessment of this streamside area was made in 2018 because it could potentially fall within a beaver enclosure if the introduction project goes ahead in future.

The lagg (a local term) is a long, narrow strip of wet grassland and wetland vegetation in the floodplain surrounding the stream. At the western, upstream end of the lagg there is a group of planted native black poplars. The edges of the lagg adjoin areas of scrub and outgrown hedges on banks to the north and south.



The grassland sward is a structurally varied mixture of rush tussocks interspersed with sprawling grasses typical of inundation grassland such as creeping bent-grass and marsh foxtail with abundant silverweed and fleabane.



The ground in the lagg is very poached and uneven as a result of cattle poaching and pig rootling on the soft wet ground in winter.



The Hammer Stream is a small, narrow watercourse that flows through the centre of the lagg towards the Hammer Pond. Its channel is densely vegetated with a mixture of wetland plants such as rushes, hemlock water-dropwort and water-pepper.

Section 4. Tenchford Bridge to Hammer Pond

There has been little change to this short section of the Lancing Brook and the Hammer Stream since 2007, though native woody species have continued to develop along the banks in places.

The upstream part of this section is the Hammer Stream which extends from the Hammer Pond outlet to its confluence with Lancing Brook. This stream has a very narrow and shaded channel, parts of which were dry in August 2018. The upstream extent is fenced and lined with dense trees and shrubs which almost obscure it from view. There appears to be little wetland vegetation along most of this reach of the watercourse.



The channel of the Lancing Brook from the confluence downstream to Tenchford Bridge is also partially shaded by the mixture of native trees and shrubs on the banks but there are some open areas where light is able to reach the stream and emergent vegetation is locally dense. The banktops support quite flowery grassland where the shade is less dense and fleabane has become established here in some quantity since 2007.



This part of the Lancing Brook was opened up between 2005 and 2007 by the removal of a poplar plantation and the colonisation of mixed scrub on the banks along this reach has gradually continued. There does not appear to have been any significant change in the wetland flora since 2007 though water-pepper was noted for the first time in 2018 and is locally frequent.

The 2007 survey carried out in May recorded greater pond-sedge as being locally frequent in this section of the Lancing Brook but by 2018 this sedge appeared to be less frequent whilst wood club-rush has now become established.

At Tenchford Bridge the Lancing Brook has abundant emergent vegetation, mostly branched bur-reed and reed canary-grass, with yellow water-lily and common duckweed as the only aquatic vegetation observed.

This remains the only section of the Lancing Brook where common reed was recorded during the survey.



Summary

There have been some significant changes to parts of the floodplains and along the channels of the Adur and the Lancing Brook since 2007. The direct effects of river restoration engineering and ground work between Capps Bridge and Bay Bridge (at the A24) have enhanced the wetland habitats along this section of the river.

The evolving herbivore-driven, landscape scale changes that are taking place within the Southern Block of Knepp Wildlands have also started to have a more subtle impact on the riparian zones.

The floodplain around Section 2, the River Adur from Capps Bridge to the A24, has been modified the most with old river meanders restored and the canalised channel now largely bypassed. The scope of the botanical survey was increased to include the newly created, braided river channels.

There are likely to be even more significant changes to some of the riparian and wetland habitats along the Lancing Brook and the River Adur in the near future if an application for a trial enclosed introduction of beavers to the Hammer Pond area is successful.

Figure 1 gives the results of the botanical surveys from 2005, 2007 and 2018. The table shows the vascular plant species observed in each section of the survey area with an estimate of their abundance on the DAFOR scale (D = Dominant, A = Abundant, F = Frequent, O = Occasional, R = Rare, L = Locally).

The plant species and their abundance recorded along the survey sections have shown some modest changes over time though for the most part the vegetation remains reasonably stable. Many of these minor variations are likely to be due to seasonal factors.

Where river restoration work has taken place along the River Adur there have been some more interesting changes in the wetland species recorded. Narrow-leaved water-plantain, jointed rush, curled pondweed and fennel pondweed were recorded for the first time in 2018 from these areas.

Water chickweed seems to be more prominent in all the areas surveyed whilst arrowhead and wood club-rush were seen in Section 4 Lancing Brook for the first time. Marsh yellow-cress was observed in Section 4 and around the Hammer Pond for the first time in 2018.

Over the next few years the habitats modified and created by river restoration work along the River Adur will continue to change and develop. The next repeat of the botanical survey may provide the most interesting results of all.

Figure 1. Table of Results from the 2005, 2007 and 2018 Surveys

SPECIES	Section 1 Shipley to Capps Bridge		Section 2 Capps Bridge to A24			Section 3 Hammer Pond			Hammer Pond Lagg	Section 4 Hammer Pond to River Adur		
	2005	2007	2005	2007	2018	2005	2007	2018	2018	2005	2007	2018
<i>Acer campestre</i> Field maple	O	O	R	RLO	RLO					R	R	R
<i>Achillea millefolium</i> Yarrow	O	O	O	O	O	O				R	R	R
<i>Adoxa moschatellina</i> Moschatel		R										
<i>Agrimonia eupatoria</i> Agrimony					R							
<i>Agrostis stolonifera</i> Creeping bent	A	A	F	F	FLA	A	A	A	A	F	F	F
<i>Alisma lanceolatum</i> Narrow-leaved water-plantain					O							
<i>Alisma plantago-aquatica</i> Common water-plantain		R	O	O	O	OLF	R	O		O	R	O
<i>Alliaria petiolata</i> Garlic mustard		R		O								R
<i>Alnus glutinosa</i> Alder	OLF	OLF	OLF	O	LF			R				
<i>Alopecurus geniculatus</i> Marsh foxtail				O	O	OLA	OLA		F			
<i>Alopecurus pratensis</i> Meadow foxtail		F		F	O	OLA	FLA	O			F	
<i>Angelica sylvestris</i> Wild angelica	O		RLO	R						OLF	O	O
<i>Anisantha sterilis</i> Barren brome	O	O					LF					
<i>Anthriscus sylvestris</i> Cow parsley		OLF		O							O	
<i>Apium nodiflorum</i> Fools water-cress	R		O		O		R	R	O		R	R
<i>Arctium minus</i> Lesser burdock	O	O	R		R							R
<i>Arrhenatherum elatius</i> False oat-grass	F	OLF		O	LF	F	OLF		O			
<i>Barbarea vulgaris</i> Winter-cress			R	O	R						R	
<i>Bellis perennis</i> Daisy				R								
<i>Bidens tripartita</i> Trifid bur-marigold			R	R	O	OLF	O	O	O			R
<i>Brachypodium sylvaticum</i> False-brome		R										
<i>Brassica nigra</i> Black mustard			R	R								
<i>Bromus hordeaceus</i> Soft brome			O	O								
<i>Butomus umbellatus</i> Flowering rush			O		O							
<i>Callitriche</i> agg. Water-starwort			R		O					O		
<i>Calystegia sepium</i> Hedge bindweed	A	A	OLF	OLF	OLF	FLA	FLA	F	F	A	A	F
<i>Cardamine flexuosa</i> Wavy bittercress				R								R
<i>Cardamine pratensis</i> Cuckoo-flower							O					
<i>Carex hirta</i> Hairy sedge					LF	OLA	OLA	F	F			
<i>Carex otrubae</i> False fox-sedge				R			R					

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	2005	2007	2005	2007	2018	2005	2007	2018	2018	2005	2007	2018
<i>Carex pendula</i> Pendulous sedge			O									
<i>Carex riparia</i> Greater pond sedge		R		RLO							LF	O
<i>Carex</i> spp. Sedge spp.			LF		R		OLF	R	LF	R		R
<i>Centaurea nigra</i> Common knapweed	O	R	R			R	R	R				
<i>Chenopodium</i> sp. Goosefoot sp.				LF	LF		LF					R
<i>Cirsium arvense</i> Creeping thistle	FLA	F	OLF	OLF	O	OLF	OLF	O		LF	O	
<i>Cirsium vulgare</i> Spear thistle			O		R	OLF	O	R	R			
<i>Conium maculatum</i> Hemlock	R		O	OLF								
<i>Cornus sanguinea</i> Dogwood	R	R		R								
<i>Corylus avellana</i> Hazel			RLO	R								
<i>Crataegus monogyna</i> Hawthorn		R		R	R			R				R
<i>Cruciata laevipes</i> Crosswort	R	OLF	R	O		OLF	O				O	R
<i>Cynosurus cristatus</i> Crested dogs-tail			O									
<i>Dactylis glomerata</i> Cocks-foot	F	F	O	O	O	OLF	OLF	OLF		O	O	OLF
<i>Deschampsia cespitosa</i> Tufted hair-grass	O	O	O	O	OLF							
<i>Dipsacus fullonum</i> Teasel	OLF	O	RLO	O	O	O	O	R			R	R
<i>Dryopteris filix-mas</i> Male fern										R		
<i>Eleocharis palustris</i> Common spike-rush							R	R				
<i>Elytrigia repens</i> Common couch		LF	OLF	OLF	OLF	LA	LA	LA				
<i>Epilobium hirsutum</i> Great willowherb	F	F	O	R						R	O	R
<i>Epilobium</i> sp. Willowherb sp.					R		O					
<i>Equisetum arvense</i> Field horsetail			O	R						R	O	O
<i>Equisetum fluviatile</i> Water horsetail							OLF	OLF	O	LF	OLF	O
<i>Equisetum</i> sp. Horsetail sp.				LO			O					
<i>Euonymus europaeus</i> Spindle					R							
<i>Festuca rubra</i> Red fescue		R										
<i>Filipendula ulmaria</i> Meadowsweet	F	F	O	O	O					O	O	O
<i>Fraxinus excelsior</i> Ash	O	O	O	O	O					R		
<i>Galeopsis tetrahit</i> Common hemp-nettle					R							
<i>Galium aparine</i> Common cleavers		OLF				OLF	F	OLF		F	F	O
<i>Galium palustre</i> Common marsh-bedstraw						OLF	OLF	OLF	OLF			
<i>Geranium dissectum</i> Cut-leaved cranesbill		R	R	R							O	
<i>Geum urbanum</i> Wood avens		R										
<i>Glechoma hederacea</i> Ground-ivy	O	O		R			R	R		LF	O	

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	2005	2007	2005	2007	2018	2005	2007	2018	2018	2005	2007	2018
<i>Glyceria fluitans</i> Floating sweet-grass					LA	LA	LA	LF	OLF			
<i>Glyceria maxima</i> Reed sweet-grass			LF	RLO	OLF							
<i>Gnaphalium uliginosum</i> Marsh cudweed					R				R			
<i>Hedera helix</i> Ivy		O								LA	O	OLF
<i>Heracleum sphondylium</i> Hogweed	O	O	RLO	R		O	R				O	R
<i>Hieracium agg.</i> Hawkweed				R								
<i>Holcus lanatus</i> Yorkshire fog	F	F	O	OLF	OLF	F	F	F			OLF	F
<i>Hordeum secalinum</i> Meadow barley		O	FLA	F	F	O	O					
<i>Humulus lupulus</i> Hop		R	OLF	O	R							
<i>Hypericum perforatum</i> Perforate St John's-wort					O							
<i>Hypochaeris radicata</i> Common cats-ear			R		R							
<i>Iris pseudacorus</i> Yellow flag		O	R	O	O		O	O	O	R	O	R
<i>Juncus articulatus</i> Jointed rush					OLF				O			
<i>Juncus effusus</i> Soft rush	O	O	O	OLF	FLA	OLF	OLF	OLF	FLA	O	O	O
<i>Juncus inflexus</i> Hard rush		R	O	O	O		R	R				
<i>Lathyrus nissolia</i> Grass vetchling		R										
<i>Lathyrus pratensis</i> Meadow vetchling	O	O	O		R							
<i>Lemna gibba</i> Fat duckweed	ALD		ALD		FLA						LF	
<i>Lemna minor</i> Common duckweed	LA	OLA	O	O	OLF		R	LF	LA	LA	LF	LF
<i>Linaria vulgaris</i> Common toadflax				R	LF							
<i>Lolium perenne</i> Perennial rye-grass			F	F	F		OLF	F			O	F
<i>Lotus pedunculatus</i> Greater bird's-foot-trefoil								R				
<i>Lychnis flos-cuculi</i> Ragged robin				R								
<i>Lycopus europaeus</i> Gipsywort	F		O	OLF	O	F	F	F	O		R	O
<i>Lysimachia vulgaris</i> Yellow loosestrife	O	O				F	FLA	OLF	O	O	OLF	
<i>Lythrum salicaria</i> Purple loosestrife	F	F	OLF	OLF	OLF	O	O	F		O	R	OLF
<i>Malva sylvestris</i> Common mallow			R	R								
<i>Mentha aquatica</i> Water mint	F	OLF	OLF	F	OLF	F	F	FLA	F	OLF	OLF	OLF
<i>Myosotis scorpioides</i> Water forget-me-not			OLF	OLF	OLF	OLF	F	FLA	O	OLF	R	O
<i>Myosoton aquaticum</i> Water chickweed			R	R	O			O	R	OLF		O
<i>Nuphar lutea</i> Yellow water-lily	OLF	F	F	F	F					O	R	O
<i>Nymphoides peltata</i> Fringed water-lily			O	R	R							
<i>Oenanthe crocata</i> Hemlock water-dropwort	F	FLA	OLF	OLF	R	F	FLA	OLF	O	OLF	FLA	OLF
<i>Persicaria amphibia</i> Amphibious bistort			OLF	O	OLF	FLA	FLA	FLA	R			

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	2005	2007	2005	2007	2018	2005	2007	2018	2018	2005	2007	2018
<i>Persicaria hydropiper</i> Water-pepper			F	FLA	FLA	OLF	OLF	OLF	FLA			OLF
<i>Persicaria maculosa</i> Redshank			OLF	O	O	OLF	OLF	O	O	O	O	R
<i>Phalaris arundinacea</i> Reed canary-grass	ALD	ALD	A	ALD	A	ALD	ALD	ALD	OLF	OLF	F	F
<i>Phleum pratense</i> Timothy			OLF		OLF	OLF			F			
<i>Phragmites australis</i> Common reed										OLA	OLA	O
<i>Picris echioides</i> Bristly ox-tongue											R	
<i>Pimpinella saxifraga</i> Burnet saxifrage			R									
<i>Plantago lanceolata</i> Ribwort plantain	R			R	O							
<i>Plantago major</i> Greater plantain					R							O
<i>Poa trivialis</i> Rough meadow-grass		F	O	F	OLF		F	F			A	A
<i>Polygonum aviculare</i> Knotgrass					OLF							
<i>Populus nigra ssp. betulifolia</i> Black poplar									LF			
<i>Populus x Poplar</i> hybrid											O	O
<i>Potamogeton crispus</i> Curled pondweed					O							
<i>Potamogeton lucens</i> Shining pondweed			FLA	RLO	LA							
<i>Potamogeton pectinatus</i> Fennel pondweed					R							
<i>Potentilla anserina</i> Silverweed						ALD	FLA	FLA	A			R
<i>Potentilla reptans</i> Creeping cinquefoil	O	R			O		O	R				
<i>Prunus spinosa</i> Blackthorn	OLF	OLF	OLF	OLF	OLF	OLF	OLF	F		F	O	FLA
<i>Pteridium aquilinum</i> Bracken			O	R	LF							
<i>Pulicaria dysenterica</i> Fleabane			O	R	OLF	O		FLA	A			F
<i>Quercus robur</i> Pedunculate oak		R	R	R	R					R		O
<i>Ranunculus acris</i> Meadow buttercup		O		O							R	
<i>Ranunculus ficaria</i> Lesser celandine				O								
<i>Ranunculus repens</i> Creeping buttercup		O	OLF	OLF	O	F	F	OLF	F	OLF	O	O
<i>Ranunculus sceleratus</i> Celery-leaved buttercup			R	R	R							R
<i>Rorippa amphibia</i> Great yellow-cress			LO	O	O							
<i>Rorippa palustris</i> Marsh yellow-cress								R	O			R
<i>Rosa canina</i> Dog rose		O		R	R		R	R		O	O	O
<i>Rubus fruticosus</i> Bramble	A	A	O	O	O					OLF	OLF	OLF
<i>Rumex acetosa</i> Common sorrel		R		R	R							
<i>Rumex conglomeratus</i> Clustered dock		R	O	R	R				O			
<i>Rumex crispus</i> Curled dock		O	O	O	R		OLF	O	O			
<i>Rumex obtusifolius</i> Broad-leaved dock	O	O	O	O	R	O	O	R	OLF	O	O	R

Repeat Botanical Survey of the River Adur & Lancing Brook, Knepp Estate – Dolphin Ecological Surveys 2018

SPECIES	Section 1 Shipley to Capps Bridge		Section 2 Capps Bridge to A24			Section 3 Hammer Pond			Hammer Pond Lagg	Section 4 Hammer Pond to River Adur		
	2005	2007	2005	2007	2018	2005	2007	2018	2018	2005	2007	2018
<i>Sagittaria sagittifolia</i> Arrowhead	O		OLF		OLF							R
<i>Salix alba</i> White willow						R	R					
<i>Salix babylonica</i> Weeping willow	R	R										
<i>Salix caprea</i> Goat willow			R	R	R					R		
<i>Salix cinerea</i> Grey willow		R	OLA	OLA	OLA	F	F	F		F	O	O
<i>Salix fragilis</i> Crack willow								R				R
<i>Salix viminalis</i> Osier			O	O	O							
<i>Sambucus nigra</i> Elder	O	O	R	R						R		
<i>Schoenoplectus lacustris</i> Common club-rush			OLF	OLF	OLF	FLA	OLF	F				
<i>Scirpus sylvaticus</i> Wood club-rush					OLF	OLF	OLF	OLF	LF			LF
<i>Scorzoneroideis (= Leontodon) saxatilis</i> Lesser hawkbit			O	R								
<i>Scrophularia auriculata</i> Water figwort	F	F	O	O	R					O	O	O
<i>Scutellaria galericulata</i> Common skullcap	R				R							
<i>Senecio aquaticus</i> Marsh ragwort	O				R	R	R		R			R
<i>Senecio erucifolius</i> Hoary ragwort	R	O	O	R	OLF							
<i>Senecio jacobaea</i> Common ragwort	O		O	O	R			O				R
<i>Silaum silaus</i> Pepper-saxifrage			R									
<i>Sison amomum</i> Stone parsley	F	OLF	F	FLA	OLF					R	OLF	R
<i>Solanum dulcamara</i> Bittersweet		O	O	O		O	O	R	O	R	R	O
<i>Sonchus arvensis</i> Perennial sow-thistle		R				RLO				R		
<i>Sonchus asper</i> Prickly sow-thistle			R	R								
<i>Sparganium emersum</i> Unbranched bur-reed	R		O	O	OLF							
<i>Sparganium erectum</i> Branched bur-reed	ALD	FLA	FLA	FLA	FLA	OLF	OLF	OLF	O	OLF	OLF	F
<i>Stachys palustris</i> Marsh woundwort	O		F	OLF	O	FLA	OLF	OLF	O	OLF	O	O
<i>Stachys sylvatica</i> Hedge woundwort							R					
<i>Stellaria graminea</i> Lesser stitchwort		O		R			O					
<i>Taraxacum</i> agg. Dandelion		R	O	O	O						R	
<i>Tragopogon pratensis</i> Goat's-beard				R								
<i>Trifolium campestre</i> Hop trefoil				R								
<i>Trifolium pratense</i> Red clover		R	R	R		OLF						
<i>Trifolium repens</i> White clover			LF	LF	LF			O	F			F
<i>Tripleurospermum inodorum</i> Scentless mayweed									O			
<i>Typha angustifolia</i> Lesser bulrush					O							

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	2005	2007	2005	2007	2018	2005	2007	2018	2018	2005	2007	2018
<i>Typha latifolia</i> Bulrush	OLF	O	OLF	R		FLA	FLA	FLA				
<i>Urtica dioica</i> Nettle	A	A	FLA	FLA	FLA	FLA	FLA	OLF		ALD	ALD	FLA
<i>Veronica beccabunga</i> Brooklime				R								
<i>Veronica chamaedrys</i> Germander speedwell		R		R								
<i>Veronica hederifolia</i> Ivy-leaved speedwell		R										
<i>Vicia cracca</i> Tufted vetch	O	R	O	R			R			R		R
<i>Vicia sp.</i> Vetch sp.								R				

Fauna observed during the 2018 survey

Section 1

Reach 1: Mallard, carp, small heath, small white, blue-tailed damselfly, wren, 7-spot ladybird.

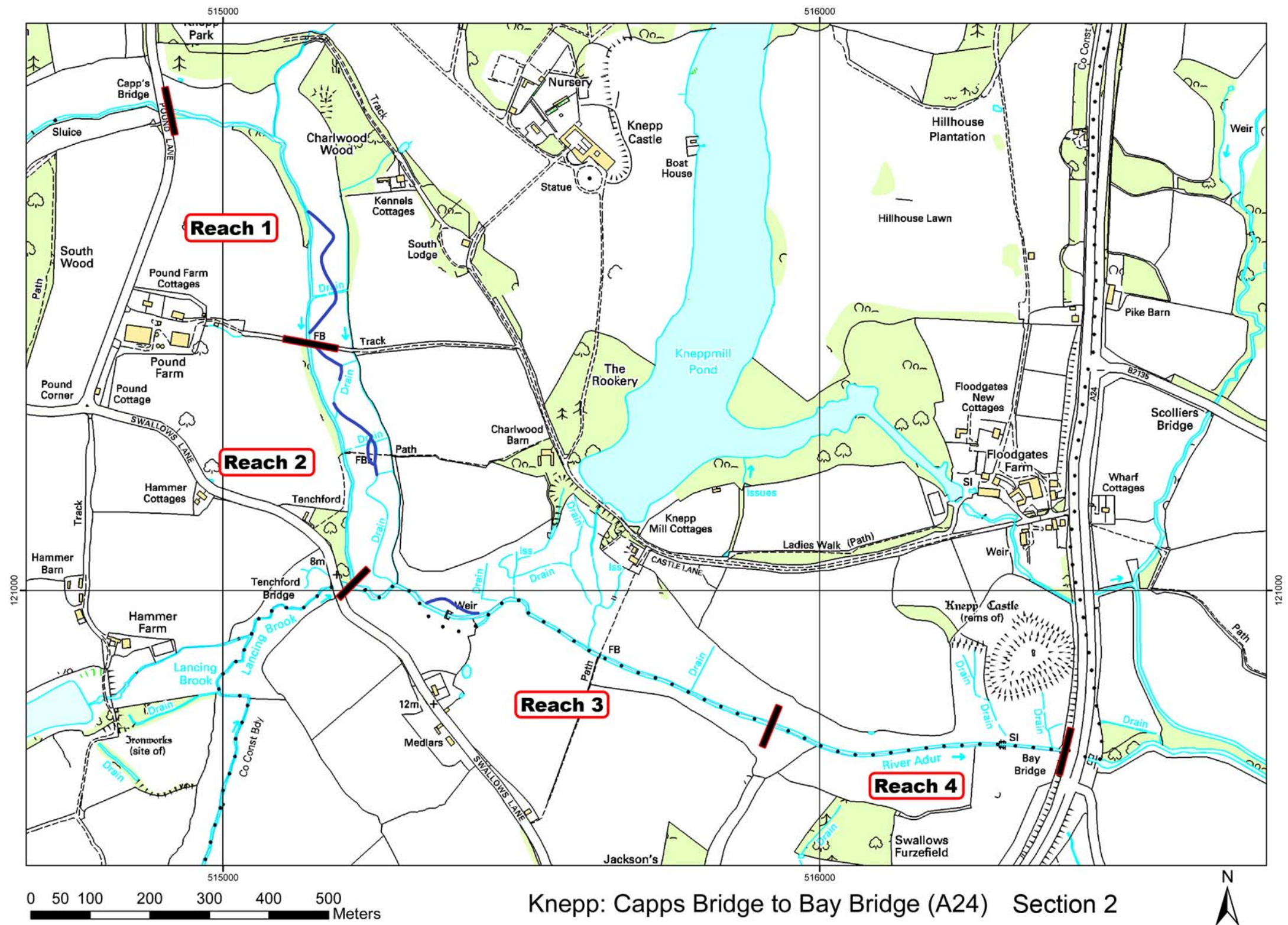
Reach 2: Banded demoiselle, beautiful demoiselle, common darter, ruddy darter, common blue, wasp spider (TQ15195 21307)

Reach 3: Speckled wood, common frog, reed bunting.

Reach 4: Fox, grey wagtail

Section 4

Common frog, comma, speckled wood, 16-spot ladybird, meadow brown



Knepp: Capps Bridge to Bay Bridge (A24) Section 2

