

**Ecological Survey
at
Waun Gwla
St David's, Pembrokeshire**



Client: Pembrokeshire Nature Partnership

Survey Dates: June 2021 – February 2022

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1. Site Description

The surveyed land comprises a small National Trust owned common on the edge of St David's. This lies on a gentle, west-facing slope to the east of the Afon Alun at around 50m above sea level. A spring arises on the common (formerly used as one of the main wells for the city), and the ground below this is now poorly drained. A shallow stream forms the northern boundary, draining the site to the west.

The site is adjoined by housing and a concrete works to the south and east, and farmland to the north and west. It has not had obvious recent management, other than mowing of footpaths.



Aerial photo of site

2. Survey Details

A rapid assessment visit was made on 1st June 2021. This aimed to do the following:

- Record habitats, according to the 'Phase I habitat survey' classification (Joint Nature Conservation Committee, 1993). The methods provide quick and accurate classification of habitats.
- Record birds.
- Record plants.
- Record any protected species of mammals or their signs
- Record any reptiles and amphibians
- Note the locations of any invasive, non-native species of plant or animal.

A desk exercise comprising a search of the West Wales Biodiversity Information Centre database returned no records for the site.

Subsequently, more detailed survey was carried out of the following groups:

- Breeding birds
- Reptiles
- Bats
- Other Mammals
- Invertebrates
- Wintering birds

3. Habitat survey

The common has a diversity of habitat types. These were classified according to Phase I survey guidelines as semi-improved neutral grassland, marshy grassland, running water, dense and scattered scrub, dense bracken and hedgerow. The characteristic plants which form the basis of each of these habitats were recorded.

Each habitat was mapped, and is described and assessed below.

**Waun Gwla
Habitat Map**



TN1: Reed canary grass-dominated dry grassland

TN2: Patch of giant montbretia

3.1 Marshy Grassland (B5)



Meadowsweet dominates much of the marshy grassland

Wetter ground in the lower half of the site has marshy grassland, some of it dominated by rushes and some of it by meadowsweet. Both soft rush (with tough, white pith-filled stems) and sharp-flowered rush (with hollow stems) are present. The rush-dominated areas have a reasonable range of typical marshy grassland species, including common fleabane, wild angelica, marsh thistle and greater bird's-foot trefoil. A few shorter areas alongside paths on the northern side are open enough for a few lower-growing species such as marsh pennywort and tormentil. Several spikes of southern marsh orchid were also noted. There are a few tussocks of purple moor-grass towards the north-west corner, but no areas dominated by this grass. Drier areas to the south have an abundance of tufted hair-grass amongst the soft rush and meadowsweet, and bramble is frequent here.

Although marshy grassland is a BAP priority habitat, this example is neither particularly extensive or species-rich, and it does not hold any uncommon plant species. It is of only local ecological significance as a result.

3.2 Running Water (G2)



Northern boundary stream, with marsh marigold on edge

The stream flowing west along the northern boundary is too shallow and overgrown to hold aquatic plants, but there is some fool's watercress, together with marsh marigold and hemp agrimony at the channel edge.

3.3 Semi-improved Neutral Grassland (B2.2)



Knapweed amongst cock's-foot in rank grassland

Most of the dry grassland is unmanaged and rank as a result. Some of this on the upper, eastern part of the site is dominated by reed canary-grass, more typically associated with wet ground but here perhaps a garden escape and dominating with a few other garden plants including Italian lord's-and-ladies, pendulous sedge and greater periwinkle. Cock's-foot dominates the grassland around the centre of the site. Bracken and bramble are also prominent here, and the vegetation is rank and species-poor. Shorter areas alongside the path network are a little more species-rich, having a few finer-leaved grasses such as red fescue and sweet vernal grass, together with wildflowers such as lesser knapweed, greater bird's-foot trefoil and cat's-ear.

Although some semi-improved grassland is a BAP priority habitat ('lowland meadows'), this example is a less species-rich type corresponding to *Arrhenatherum elatius* grassland (MG1) in the National Vegetation Classification. It is neither particularly extensive or species-rich, and it does not hold any uncommon plant species. It is of only minor ecological significance as a result.

3.4 Dense Bracken (C3.1)



Dense bracken, showing frost damage to early fronds

Much of the northern part of the site has a cover of dense bracken. This has invaded drier grassland, and a few species such as cock's-foot and wild angelica are still apparent in places. Most, however, has a dense litter and there are very few other associates, other than bramble which is invading. No tree saplings were noted.

The habitat is of no botanical significance, but may potentially provide cover for reptiles and small mammals.

3.5 Hedgerows and Scrub (J2.2.2 / A2.1 / A2.2)



Grey willow fringe on northern boundary

Most of the boundaries have a bushy, but in places rather sparse growth of shrubs. Hawthorn is dominant, and there are sycamores in places. The northern boundary has a fringe of grey willow scrub along the central part – this has a rather dry and species-poor ground-flora with some honeysuckle, ivy and nettle. Although not species-rich, these hedges provide good habitat for insects, as well as some cover for nesting birds.

3.6 Invasive Non-Native Species

The site lies behind gardens, and inevitably has non-native species naturalised in places as a result. Some of these, such as greater periwinkle, Italian lords-and-ladies, hybrid bluebell and peppermint are not classed as invasives. However, montbretia and great montbretia were both scattered in the rank grassland in the eastern fringe of the site – the former is listed on Schedule 9 of the Wildlife and Countryside act, and it is illegal to plant it in the wild.

3.7 Plants recorded at the site

Creeping Bent	<i>Agrostis stolonifera</i>
Meadow Foxtail	<i>Alopecurus pratensis</i>
Wild Angelica	<i>Angelica sylvestris</i>
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>
Cow Parsley	<i>Anthriscus sylvestris</i>
Italian Lords-and-ladies	<i>Arum italicum</i>
Daisy	<i>Bellis perennis</i>
Hedge Bindweed	<i>Calystegia sepium</i>
Cuckoo-flower	<i>Cardamine pratensis</i>
Star Sedge	<i>Carex echinata</i>
Hairy Sedge	<i>Carex hirta</i>
Oval Sedge	<i>Carex leporina</i>
Carnation Sedge	<i>Carex panicea</i>
Pendulous Sedge	<i>Carex pendula</i>
Lesser Knapweed	<i>Centaurea nigra</i>
Common Mouse-ear	<i>Cerastium fontanum</i>
Creeping Thistle	<i>Cirsium arvense</i>
Marsh Thistle	<i>Cirsium palustre</i>
Great Montbretia	<i>Crocsmia cf. masoniorum</i>
Montbretia	<i>Crocsmia x crocosmiiflora</i>
Crested Dog's-tail	<i>Cynosurus cristatus</i>
Cock's-foot	<i>Dactylis glomerata</i>
Southern Marsh Orchid	<i>Dactylorhiza praetermissa</i>
Tufted Hair-grass	<i>Deschampsia cespitosa</i>
Broad Buckler-fern	<i>Dryopteris dilatata</i>
Male Fern	<i>Dryopteris filix-mas</i>
Hairy Willowherb	<i>Epilobium hirsutum</i>
Field Horsetail	<i>Equisetum arvense</i>
Red Fescue	<i>Festuca rubra</i>
Red Fescue	<i>Festuca rubra</i>
Goose-grass	<i>Galium aparine</i>
Herb Robert	<i>Geranium robertianum</i>
Endres's Cranesbill	<i>Geranium x endressii</i>
Atlantic Ivy	<i>Hedera helix hibernica</i>
Hogweed	<i>Heracleum sphondylium</i>
Yorkshire Fog	<i>Holcus lanatus</i>
Hybrid Bluebell	<i>Hyacinthoides x massartiana</i>
Marsh Pennywort	<i>Hydrocotyle vulgaris</i>
Square-stemmed St. John's-wort	<i>Hypericum tetrapetrum</i>
Cat's-ear	<i>Hypochoeris radicata</i>
Common Ragwort	<i>Jacobaea vulgaris</i>
Sharp-flowered Rush	<i>Juncus acutiflorus</i>
Soft Rush	<i>Juncus effusus</i>
Honeysuckle	<i>Lonicera periclymneum</i>
Italian Honeysuckle	<i>Lonicera x italica</i>

Greater Bird's-foot Trefoil	<i>Lotus uliginosus</i>
Heath Woodrush	<i>Luzula multiflora</i>
Ragged Robin	<i>Lychnis flos-cuculi</i>
Water Mint	<i>Mentha aquatica</i>
Peppermint	<i>Mentha x piperita</i>
Purple Moor-grass	<i>Molinia caerulea</i>
Changing Forget-me-not	<i>Myosotis discolor</i>
Reed Canary-grass	<i>Phalaris arundinacea</i>
Hart's-tongue Fern	<i>Phyllitis scolopendrium</i>
Ribwort Plantain	<i>Plantago lanceolata</i>
Smooth Meadow-grass	<i>Poa pratensis</i>
Tormentil	<i>Potentilla erecta</i>
Bracken	<i>Pteridium aquilinum</i>
Common Fleabane	<i>Pulicaria dysenterica</i>
Meadow Buttercup	<i>Ranunculus acris</i>
Lesser Celandine	<i>Ranunculus ficaria</i>
Creeping Buttercup	<i>Ranunculus repens</i>
Bramble	<i>Rubus fruticosus</i>
Common Sorrel	<i>Rumex acetosa</i>
Broad-leaved Dock	<i>Rumex obtusifolius</i>
Grey Willow	<i>Salix cinerea</i>
Osier	<i>Salix viminalis</i>
Red Campion	<i>Silene dioica</i>
Hedge Woundwort	<i>Stachys sylvatica</i>
Bog Stitchwort	<i>Stellaria uliginosa</i>
Red Clover	<i>Trifolium pratense</i>
White Clover	<i>Trifolium repens</i>
Nettle	<i>Urtica dioica</i>
Germander Speedwell	<i>Veronica chamaedrys</i>
Ivy-leaved Speedwell	<i>Veronica hederacea</i>
Common Vetch	<i>Vicia sativa</i>
Greater Periwinkle	<i>Vinca major</i>



(left) Great montbretia; (right) Reed Canary-grass

4. Breeding Bird Survey



Areas of bramble scrub and other coarse growth in the western part of the site support whitethroat, dunnock and sedge warbler

4.1 Survey Methodology

Two visits were made to the site in June 2021, the late start date to the contract limiting the number of visits. These started shortly after dawn and carried on for approximately 1 hour. A circular route was slowly walked around the site, with frequent stops to observe bird activity.

Following the visits, the records of birds made were collated to determine the approximate location and numbers of breeding pairs for each species. Maps were then produced to display the approximate locations for bird species of conservation concern (Eaton et al, 2015) across the site. Other birds observed within the survey area were not mapped, but are tabulated.

4.2 Results

The survey area comprises a mixture of grassland, marshy grassland and scrub. The latter mostly comprises low bramble; there is a stand of grey willow on the northern edge.

7 bird species were apparently breeding within the survey area; 3 of these were confirmed as breeding. 2 'Birds of Conservation Concern' were amongst those breeding or probably breeding:

- Dunnock (*Prunella modularis*). 3 or 4 territories noted around the site, although given the polygamous nature of the species, the number of nests may have been more.
- Whitethroat (*Sylvia communis*). 3 territories noted in bramble scrub across the central part of the site, and 1 around the hedge in the north-east corner.

In addition, 2 species of conservation concern were recorded as possibly breeding:

- House Sparrow (*Passer domesticus*). Seen on both visits on the eastern boundary of the site, but perhaps more likely to be breeding in nearby housing rather than in scrub on the site. A singing bird in the north-western corner may have related to a bird breeding in the scrub here.
- Linnet (*Carduelis cannabina*). Usually a semi-colonial breeder, a single bird on one occasion in the north-eastern corner of the site may have represented a non-breeding or foraging bird.

Three further species of conservation concern were recorded overhead:

- Greenfinch (*Carduelis chloris*). A single bird overhead on one occasion
- Starling (*Sterna vulgaris*). A family group of 9 birds seen overhead on one occasion.
- Swift (*Apus apus*). A single bird was seen overhead on one occasion.

A further 5 species were breeding or probably breeding, based on singing or displaying birds holding territory in suitable habitat on more than one survey visit (see table 4.1). An additional 3 species were classed as possibly breeding, based on individual birds seen in suitable breeding habitat on one occasion only.

Minimum counts for the survey area have been based on the number of different singing birds recorded. Locations of territories for Birds of Conservation Concern are shown in Map 4.1.

4.3 Conservation Assessment

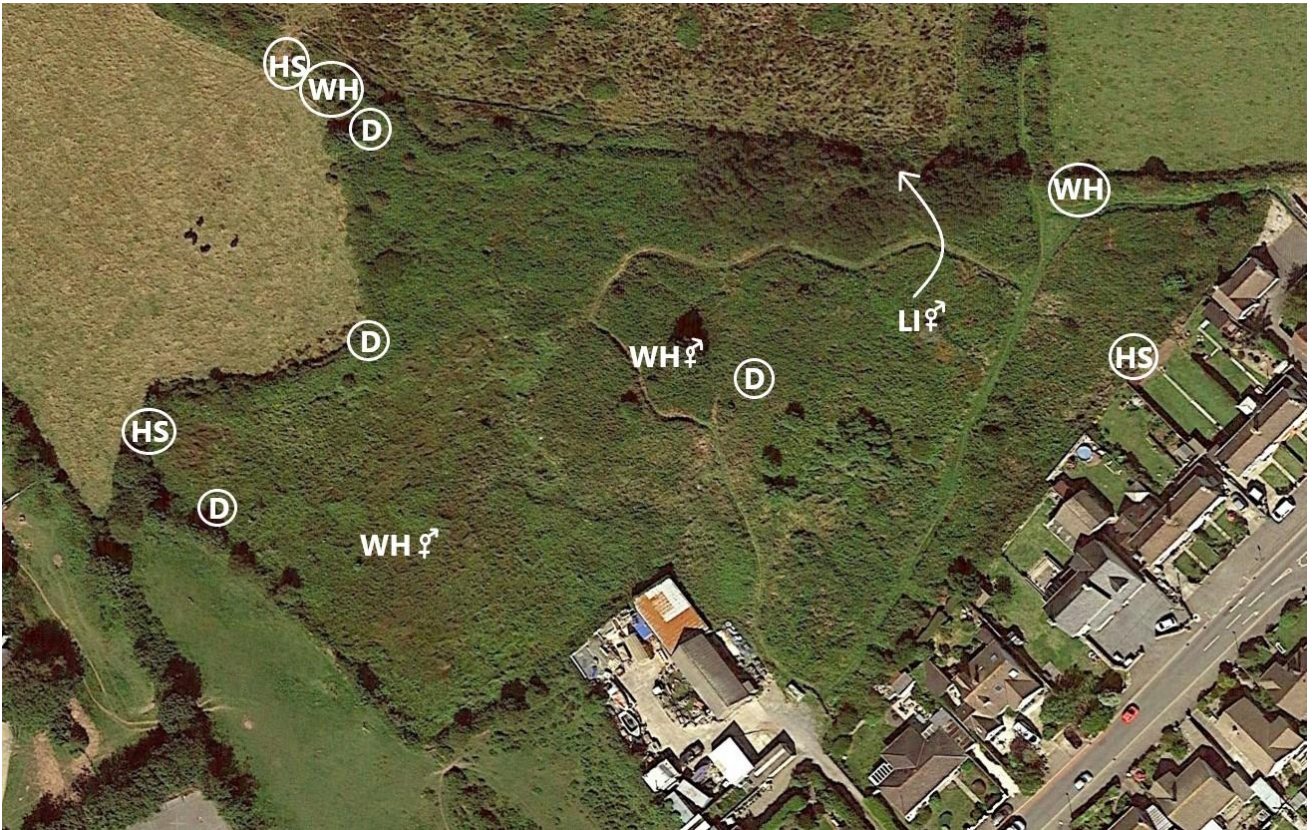
The small site supports low numbers of typical birds of scrub, with only two species of conservation concern apparently breeding. The scrub on the western boundary is of most significance, perhaps due to the relative distance from housing.

Succession to denser scrub and woodland could increase the numbers and diversity of breeding birds here. Introduction of grazing and scrub management, conversely, is likely to reduce numbers.

Table 4.1 Summary of Birds Seen within the Survey Area During Breeding Season

Species	Map Code	Status within survey area	Number of Territories	Welsh Status ¹	UK Status ²
Dunnock	D	Breeding	3-4		Amber
Wren	WR	Breeding	2		
Goldfinch	GO	Breeding	1		
Whitethroat	WH	Probable Breeding	4	Red	
Chaffinch	CH	Probable Breeding	1		
Blackbird	B	Probable Breeding	1		
Sedge Warbler	SW	Probable Breeding	1		
House Sparrow	HS	Possible Breeding	3	Amber	Red
Linnet	LI	Possible Breeding	1	Red	Red
Robin	R	Possible Breeding	1		
Chiffchaff	CC	Possible Breeding	1		
Blackcap	BC	Possible Breeding	1		
Woodpigeon	WP	Commuting	n/a		
Greenfinch	GR	Commuting	n/a	Amber	Red
Rook	RO	Commuting	n/a		
Jackdaw	JD	Commuting	n/a	Amber	
Starling	SG	Commuting	n/a	Red	Red
Pied Wagtail	PW	Commuting	n/a		
Siskin	SK	Passage	n/a		
Swift	SI	Passage / Commuting	n/a	Amber	
Barn Swallow	SL	Passage / Foraging	n/a		

¹The Population Status of Birds in Wales (2009) RSPB; ²Eaton et al (2015) Birds of Conservation Concern 4. British Birds 108



Map 4.1: Approximate locations of Birds of Conservation Concern seen

Species codes are included in the above table. Symbology follows standard Common Bird Census protocols, available [here](#). Where birds were seen or heard in a similar location on the second visit, these were assumed to relate to the same territory and have not been mapped.

5. Wintering Birds

Between December and February, a visit was made on one morning each month to assess the use of the site by wintering birds. Results are shown in the table below.

Table 5.1 Numbers of Birds seen on Winter Survey Visits

Species	17 th December	11 th January	
Snipe	10	6	
Jack Snipe		1	
Woodpigeon		1	
Redwing	3	2	
Fieldfare		(3 over)	
Song Thrush	1	1	
Mistle Thrush		2	
Blackbird	4	2	
Robin		1	
Dunnock		4	
Wren		1	
Grey Wagtail	1		
Blue Tit	5		
Great Tit	1		
Goldcrest		1	
Goldfinch	4	12	
Chaffinch	1	1	
Siskin		1	
Carrion Crow		3	
Jackdaw		(4 over)	

The survey results show that use of the site by wintering birds is limited. A few resident species, such as dunnock, wren and blue tit remain in small numbers. Winter visiting snipe were attracted to the soft mud exposed by recent scrub clearance along the lower boundary, and a single jack snipe was also recorded here. Two winter visiting thrushes – redwing and fieldfare - were seen in small numbers alongside the resident thrush species.

6. Bats

A bat survey was carried out in late August 2021. A transect route was walked, which involved walking slowly around the site with an Echometer bat-detector for approximately one hour pre-dawn on August 18th. Following this, a static detector was left hanging from a small tree in the southern part of the site to record bat activity over a period of seven nights, from August 26th to 1st September.

The site holds no buildings or trees with potential for roosting bats, so all records relate to foraging or commuting bats. The transect survey recorded limited activity, with a single common pipistrelle seen commuting east along the line of willows on the northern boundary, and a second common pipistrelle foraging across the centre of the site.

The following table summarises the bat activity recorded by the static detector survey.

Date 26 th August – 1 st September 2021						
	BAT SPECIES (number of passes)					
	Common pipistrelle	Soprano pipistrelle	Brown long-eared	<i>Myotis</i> sp.	Greater horseshoe	Noctule
26 th August	21	4	42 (peak 0240-0325hrs)	0	0	0
27 th August	8	8	1	10	0	0
28 th August	12	7	38 (peak 0240-0335hrs)	9	0	4
29 th August	27	13	9	5	0	2
30 th August	44 (peak 0400-0545hrs)	39 (peak 0400-0600hrs)	0	8	1	6
31 st August	35 (peak 0530-0615hrs)	42 (peak 0420-0530hrs)	28 (peak 0155-0315hrs)	23	0	2
1 st September	20	26	20	4	0	1

The most notable species recorded was the greater horseshoe, but the single pass on one occasion suggested that this related to a commuting individual, rather than a forager. The number and timing of common and soprano pipistrelle passes is suggestive of a nearby roost or roosts. Brown long-eared bats were also recorded in good numbers.

7. Other Mammals

Survey of other mammals was limited to searches of suitable habitat for field signs such as burrows, nests or droppings. This produced the following results:

- A possible badger path was noted in the north-eastern corner, but no setts were encountered.
- A fox scat was noted on the northern boundary.
- No signs of otter were seen by the northern watercourse, but they may use it on occasions.
- Harvest mouse has reportedly been seen in a garden adjoining the site to the east. Over one hour in June was spent searching areas of reed canary-grass dominated grassland in the eastern part of the site, but no nests were found. Bramble cover in the central and western part of the site limited the possibility of searching here.
- Nests of small mammals, probably common shrew, were found under two reptile survey sheets in the central part of the site.

8. Reptiles and Amphibians

8.1 Aims and objectives

The aims and objectives of the reptile and amphibian survey were to:

- identify the presence of any reptile or amphibian species using the site
- advise of any implications their presence would have on proposed management
- suggest appropriate mitigation methods where necessary

To undertake the reptile survey, artificial cover objects (ACO) were used. These increase the chances of observing otherwise elusive reptiles, which are attracted to these 'refuges' as they can bask on top or regulate their body temperature below the refuges, out of sight from predators. Amphibians also shelter below such refuges on occasion. The lack of standing water on site meant that no other amphibian survey was carried out.

Twelve ACOs comprising a mixture of black Onduline (bituminous roofing sheets), and corrugated metal sheets each measuring either 0.5m² or 1m², were laid in early June 2021. They were then left to 'bed-in' for a significantly longer period than the 4 weeks recommended in survey guidelines (Froglife, 1999).

The ACOs were laid in areas of suitable habitat for reptiles, throughout the site but concentrated on the limited areas of more open grassland. Map 7.1 shows refuge locations.

On each visit, ACOs were approached slowly and observed from a distance using binoculars. This survey method was adopted to observe reptiles basking in the sun. Each ACO was then approached cautiously and turned over to survey for reptile species using the refuge to warm

up or shelter underneath. A transect route was also walked slowly, to cover the areas of open ground and potential basking spots between ACOs and any pre-existing natural or artificial refugia.

8.2 Survey Results

Records from the five survey visits are summarised in Table 8.1. A plan showing the location of the reptiles recorded on the site is shown in Map 8.1.

Barred grass snake (*Natrix helvetica*) and adder (*Vipera berus*) were both recorded under ACOs. An adult barred grass snake was also seen basking near the western boundary during the rapid assessment visit on 1st June. An adder was also noted under ACO 3 at 5.40 am following bat survey on 18th August. No amphibians were recorded.

Table 8.1: Summary of transect results for reptile species

Visit	Date	Weather	Adder	Grass Snake	Common Lizard	Slow Worm
1	10.8.21	15.6°C 80% cloud Beaufort 1				
2	17.8.21	17.2°C 0/8 cloud Beaufort 0		1 adult		
3	26.8.21 (15.30)	17.6°C partial sea mist Beaufort 2	1 adult	1 juvenile		
4	4.9.21	14.5°C 70% cloud Beaufort 2				
5	20.9.21	Not recorded				



Map 8.1: Location of ACOs and Reptiles Recorded

8.3 Reptile Population Assessment

Froglife (1999) provides means of evaluating reptile populations based on survey results using a density of 10 refuges per hectare. “Low”, “good” or “exceptional” populations are based on numbers of adult reptiles recorded by one surveyor in one visit (see Table 2).

Table 2: Reptile population assessment *Froglife* (1999)

Species	Low Population	Good Population	Exceptional Population
Grass snake	Less than 5	5-10	Greater than 10
Adder	Less than 5	5-10	Greater than 10
Slow worm	Less than 5	5-20	Greater than 20
Common lizard	Less than 5	5-20	Greater than 20

Figures in the table refer to the minimum number of adults seen by one surveyor in one day at a refuge density of up to 10 per hectare. The density of refuges used during this survey was approximately that suggested, allowing a comparison using the above table to be made.

As a maximum daily count of only one barred grass snake was recorded on a single visit, the population using the site can be described as Low. As a maximum of one adder was seen during survey visits, the population using the site can also be described as Low.



Barred grass snake basking near western boundary

8.4 Discussion and Recommendations

Individual adult and juvenile barred grass snakes and adders were recorded under ACOs in the central and western parts of the site. None were recorded in the eastern part of the site.

August - September is an optimal survey period for reptiles. Survey visits were all carried out in suitable weather conditions, and the recommended density of refugia (10 per 1ha of suitable habitat at the site) was met or exceeded. Therefore, the survey results are considered to provide an accurate account of the status of reptiles on the site.

Wildlife legislation (The Wildlife and Countryside Act 1981, as amended) states that it is an offence to deliberately harm or kill any reptile. Management of the site in the knowledge that reptiles are present consequently requires a strategy to reasonably protect them. A precautionary approach will need to be taken to meet best practice and ensure observance of regulations.

Mechanical scrub control with a flail-mower is proposed prior to boundary fencing. The proposed work will impact on an area where barred grass snake has been recorded basking. As such, clearance work should take place during the winter hibernation period, or when day time temperatures are between 16-24°C, ie. when reptiles and amphibians are alert and mobile and can move out of an area subject to disturbance.

8.5 Summary and Conclusions

A small population of barred grass snakes and adders is present on the site, and development of a strategy to avoid killing or injuring them during any management work should be required. Particular care should be taken during the implementation of any mechanical scrub control. Work should be undertaken at a time when reptiles are suitably active and mobile and more likely to be able to avoid being harmed, or during the winter months when they are hibernating.

8.6 References

Froglife (1999). Reptile survey, an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife advice sheet 10,

Sewell D, Griffiths RA, Beebee TJC, Foster J and Wilkinson JW (2013) Survey Protocols for the British Herpetofauna. ARG / Universities of Kent and Sussex

9. Invertebrates

9.1 Aims and objectives

The aims and objectives of this survey were to:

- Identify key habitat elements for invertebrates on the site
- Characterise the invertebrate assemblage, focussing on key groups
- Assess whether any notable or protected species are present or likely to be present
- Suggest appropriate mitigation methods where necessary

9.2 Survey Details

A transect survey was carried out over a two-hour period on the afternoon of August 26th 2021. A few incidental records were also made during the rapid assessment and reptile survey work before this date. The survey was conducted during warm, still and sunny conditions - it is at this time that most insects, particularly bees and wasps, are most active.

The principal focus of the survey was to characterise the use of the site by aculeate hymenoptera ('aculeates'), ie. social bees/wasps and solitary bees/wasps. Other readily-identified invertebrates were noted in the field and a limited number of specimens were collected for subsequent identification. The latter included flies (Diptera), 'true bugs' (Heteroptera), the former included butterflies and day-flying moths (Lepidoptera), and grasshoppers and crickets (Orthoptera).

The survey was carried out by sweep netting and direct searching in areas considered of value to aculeates. Sweep netting of low-growing vegetation was conducted using a 40cm diameter net. Direct searching was undertaken in combination with sweep netting and involved recording readily identifiable insects on flower-heads, in flight etc. Floristically-rich areas were searched so as to record any flower-visiting aculeates.

9.3 Results

9.3.1 Overview of Invertebrate Records

The habitat quality is relatively low, with no areas of bare ground, and nectaring opportunities limited - at the time of survey - to small wet grassland areas near the western and northern boundaries. The rough grassland and patches of bramble and other scrub offer limited structural diversity.

A full list of species recorded is given in Table 9.1 below.

Five species of bee were recorded – a low number, but reflective of the limited nature of the survey effort. These did, however, include the sharp-collared furrow bee (*Lasioglossum malachurum*), a new species for Pembrokeshire, nectaring on common fleabane. Another

species with few local records, Davies' colletes (*Colletes daviesanus*), was nectaring on michaelmas daisy in the north-eastern part of the site.

Five common butterfly species were recorded in low numbers, including common blue and orange tip. Meadow grasshoppers were the only species of Orthoptera noted. A single nest of yellow meadow ants was present in one of the small remnant areas of shorter grassland near the centre of the site. Only a small sample of five common hoverfly species was recorded.



This patch of common fleabane near the western boundary (left) was the main nectar source available at the time of survey, supporting insects such as this dock beetle (right)

9.3.2 Key Species and Habitat Requirements

The following accounts focus on the species of particular conservation concern recorded during the survey. The information is largely derived from Falk (2015) and the Bees, Wasps and Ants Recording Society (BWARS) website (<http://www.bwars.com/>).

Sharp-collared Furrow Bee (*Lasioglossum malachurum*) Formerly Scarce

Although previously considered very local and scarce, this species has undergone a significant range increase and is now widespread across the southern counties of England. There are few Welsh records on NBN, and these are confined to south-east Wales. A variety of habitats are exploited, including cliffs, quarries, commons and private gardens. The wide variety of flowers visited includes cinquefoil, dandelion, common fleabane and creeping thistle. Nests are in aggregations in bare soil, such as well-trodden footpaths. A single female of this species was recorded on common fleabane near the western boundary - this appears to be the first record for Pembrokeshire.

Table 9.1 Summary of Invertebrates Seen within the Survey Area

Species	English Name	Sex	Date
Bees			
<i>Bombus terrestris</i>	Buff-tailed Bumblebee	Worker	10-Aug
<i>Bombus pascuorum</i>	Common Carder Bee	Queen	10-Aug
<i>Andrena bicolor</i>	Gwynne's Mining Bee	Female	26-Aug
<i>Colletes daviesanus</i>	Davies' Colletes	Female	26-Aug
<i>Lasioglossum malachurum</i>	Sharp-collared Furrow Bee	Female	26-Aug
Ants			
<i>Lasius flavus</i>	Yellow Meadow Ant	Worker	01-Jun
Flies			
<i>Eristalis tenax</i>	The Dronefly	Adult	26-Aug
<i>Rhingia campestris</i>	Common Snout Hoverfly	Adult	26-Aug
<i>Episyrphus balteatus</i>	Marmalade Hoverfly	Adult	26-Aug
<i>Platycheirus albimanus</i>	White-footed Hoverfly	Adult	26-Aug
<i>Syrirta pipiens</i>	Thick-legged Hoverfly	Adult	26-Aug
Moths			
<i>Autographa gamma</i>	Silver Y	Adult	26-Aug
<i>Chrysoteuchia culmella</i>	Garden Grass Veneer	Adult	26-Aug
Butterflies			
<i>Anthocharis cardamines</i>	Orange-tip	Adult	01-Jun
<i>Aglais urticae</i>	Small Tortoiseshell	Adult	26-Aug
<i>Pararge aegeria</i>	Speckled Wood	Adult	26-Aug
<i>Pieris brassicae</i>	Large White	Adult	26-Aug
<i>Polyommatus icarus</i>	Common Blue	Adult	26-Aug
Grasshoppers and Groundhoppers			
<i>Chorthippus parallelus</i>	Meadow Grasshopper	Adult	26-Aug
Spiders			
<i>Araneus diadematus</i>	Garden Orb Spider	Adult	26-Aug
Bugs			
<i>Coreus marginatus</i>	Dock Bug	Nymph	26-Aug
Beetles			
<i>Coccinella septempunctata</i>	7-spot ladybird	Adult	26-Aug
<i>Oedemera nobilis</i>	Thick-legged Flower Beetle	Adult	26-Aug

10. Management

10.1 Past Management



Site of old well

Little information is discernible from aerial photography. A photograph from 1969 is not of sufficient resolution to determine the degree of grazing or other management, but no *Molinia*-dominated vegetation is apparent. A well is marked on old maps, which was apparently a significant water source for the city. This is now unused and overgrown.

10.2 Future Management Recommendations

Mowing and Grazing

In the absence of mowing or grazing, even the wetter areas currently dominated by rushes or meadowsweet will succeed to bramble or willow scrub. It is possible that light summer grazing could actually encourage this process by favouring meadowsweet and avoiding bramble, whilst simultaneously providing germination gaps for seed of the scrub species within swards which are currently closed. Sustained cattle grazing coupled to some scrub management may be appropriate, but 'one-off' grazing trials in particular should be avoided, as they may well kickstart this succession. Early spring grazing if conditions are dry, and/or a period of grazing

in late summer through to early autumn or as conditions allow would be preferable to grazing in summer or winter. Some footpath damage may be inevitable at any time, and conflicts with recreational access are possible.

If mowing is used instead of or as well as grazing, this should seek to create a variety of structures within the marshy grassland, by creating meandering paths rather than mowing larger blocks, and by targeting edges where bramble encroachment is apparent. Removal of cut material to avoid a mulching effect would be necessary, and this should be left as a series of small or piles on areas currently dominated by bracken or bramble. These piles may be used by grass snakes and small mammals as they decay. Given the small size of the site and the logistical difficulties with machine access, an extended programme of clearance alongside the existing path network with brush-cutters and rakes may be the only option for this approach if considered desirable. Given the presence of grass snake on the site, any clearance should take place during warm weather (above 16°C) in late summer, or during the winter hibernation period.

Hedges and Scrub

Retaining bushy, unmanaged hedges and a fringe of scrub would be desirable for insects and birds. Any clearance of vegetation prior to fencing should be carried out sensitively, retaining the few patches of common fleabane alongside the western boundary which provide a focus for insect activity, and avoiding accidental killing or injuring of grass snakes and adders.

Invasive Non-native Species

Complete removal of non-native species would be time consuming, but mowing programmes should seek to reduce the spread of species such as montbretia and giant montbretia by targeting them for cutting.

Ponds

Given the tendency for the site to attract non-native plants, it would perhaps be undesirable to dig a pond which could attract invasive species such as Australian swamp stonecrop. Suitable spoil disposal options would also be difficult for all but the smallest of ponds. However, if a natural water supply is required for any grazing animals, a small, shallow pond towards the north-west corner may be suitable.

If a new pond is dug, creating a fluctuating water table would make it more interesting, and the sides should have a very shallow profile to emphasise this 'drawdown zone'. The margins should also be irregularly shaped where possible.