Improvement Programme for England's Natura 2000 Sites (IPENS) – Planning for the Future IPENS061a

SAC status reporting on *Vertigo moulinsiana* at Westbere Marshes, Kent 2014

Stodmarsh Special Area of Conservation (SAC)

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This project is part of the IPENS programme (LIFE11NAT/UK/000384IPENS) which is financially supported by LIFE, a financial instrument of the European Community'.

Foreword

The **Improvement Programme for England's Natura 2000 sites (IPENS)**, supported by European Union LIFE+ funding, is a new strategic approach to managing England's Natura 2000 sites. It is enabling Natural England, the Environment Agency, and other key partners to plan what, how, where and when they will target their efforts on Natura 2000 sites and areas surrounding them.

As part of the IPENS programme, we are identifying gaps in our knowledge and, where possible, addressing these through a range of evidence projects. The project findings are being used to help develop our Theme Plans and Site Improvement Plans. This report is one of the evidence project studies we commissioned.

A survey of Desmoulin's whorled snail *Vertigo moulinsiana* was commissioned at Westbere Marshes, within the Stodmarsh Special Area of Conservation (SAC) to assess the current status of the species, which is a notified feature of the site. The study looked at the extent of the species occupation; the factors operating to threaten the population; and the remedies necessary to offset them.

A total of 41 sample sites where Desmoulin's whorled snail was found to be present in 2011 were re-examined. The 2014 surveys confirmed the presence of the snail at all six areas of the site. Only one area of the site reported an increase in population size. The survey revealed the loss of snail populations at 17 sample sites since last surveyed in 2010.

The report suggests the reasons for recent and confirmed population losses within the site as being due to (1) drier ground conditions across the site from lower water levels in the summer. (2) the scouring of river-side fen by prolonged river flooding.

Management options for the sites where population losses or declines were detected are discussed. These include reducing scrub from the site and maintaining an open fen habitat; hydrological monitoring of the site to ensure the water level is maintained at an appropriate level; opening up the canopy more; and maintaining the wet nature of the site.

The key audience for this work is the staff within Natural England. The survey will form the foundation of a wider whole site historical review, charting former locations and exploring how the losses may have happened and will inform how those adverse factors can be overcome.

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SAC status reporting on Vertigo moulinsiana at Westbere Marshes, Kent 2014

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Survey carried out in November and December 2014 by Abrehart Ecology

for Natural England

abrehart ecology

Contents

Executive summary

- This project is part of: *The Improvement Programme for England's Natura 2000 Sites (IPENS), supported by EU LIFE+, is a new strategic approach to managing England's Natura 2000 sites. It will enable Natural England, the Environment Agency, and other key partners to plan what, how, where and when they will target their efforts on Natura 2000 sites and areas surrounding them*.
- 41 sample sites were re-examined at Westbere Marshes, Kent, these were sites where *Vertigo moulinsiana* was found to be present in 2011.
- The 2014 surveys confirmed the presence of the snail at all six areas of the site. Only one area of the site was considered favourable (Area 6) population declines were noted at all the other five areas on the site.
- The surveys revealed the loss of *V. moulinsiana* populations from 17 sample sites since last surveyed in 2010.
- Reasons for recent and confirmed *V. moulinsiana* site losses are suggested as being due to (1) drier ground conditions across the site from lower water levels in the summer. (2) the scouring of river-side fen by prolonged river flooding.
- Options for site improvement are discussed at sites where *V. moulinsiana* losses or declines were detected.
- It is difficult to assess fully the changes across the site from previous years as there are wide fluctuations within the population. The population in 2014 is very similar to that in 2002. Though considerable decreases have been noted from 2011 in one main section of the site.
- A log of *V. moulinsiana* site histories is given showing full details from the first year of the snail's discovery at Westbere Marshes, Kent.
- The results of these surveys have shown that *Vertigo moulinsiana* was still found at each of the six main areas. Westbere was surveyed from 16th to 17th December 2014.

1. Introduction and background

1.1 Purpose of the report

The Improvement Programme for England's Natura 2000 Sites (IPENS), supported by EU LIFE+, is a new strategic approach to managing England's Natura 2000 sites. It will enable Natural England, the Environment Agency, and other key partners to plan what, how, where and when they will target their efforts on Natura 2000 sites and areas surrounding them.

See: www.naturalengland.org.uk/ipens2000

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Vertigo moulinsiana (Dupuy, 1849) is a small snail found mostly in old or semi-natural open calcareous fen and wetlands, usually adjacent or close to rivers, streams, lakes and ponds. In the UK it is chiefly distributed in a broad band of country from central-southern England to East Anglia (Kerney 1999). Outlying populations also exist in the midland meres, north Wales and north Cornwall.

The conservation importance of the species has meant its inclusion in various schedules and red data lists. Thus it is categorised as Rare (category 3) in the UK Red Data Books (Bratton 1991). Whilst more recently the snail has been and classed as vulnerable on the recent IUCN based UK red list review (Seddon *et al* 2014).The species is listed in Annex IIa of the European Community Habitats and Species Directive (92/43/EEC) is also an English Section 41 'Species of Principle Importance' (replacing the UK BAP priority species in 2006). Following the inclusion of *V. moulinsiana* as a Priority Species in 1995, many surveys have been undertaken (summary details of some of these appear in Drake, 1999).

V. moulinsiana is a qualifying feature (S1016) of the Westbere Marshes forms part of the Stodmarsh SAC (Code UK0030283). Populations of the snail have been recorded from Westbere in 2002 (Killeen 2002)

In 2011 a survey were undertaken to revisit the site for *V. moulinsiana* sites (Killeen 2011),

This project revisits the former 41 positive sites for *V. moulinsiana* at Westbere Marshes, Kent, all of which were also surveyed in 2011. These surveys are intended to determine if earlier recorded losses are continuing at formerly occupied sites.

In 2011 a total of 78 individual locations were sampled. These were focused primarily in areas where the snail had been recorded previously and in areas where there was high potential.

2. Methods

This section outlines the methods used to assess changes the distribution and abundance of *Vertigo moulinsiana* at a selection of seven sites in Norfolk and Suffolk.

2.1 Desktop study

Historical records for these sites outside data already collected by Abrehart Ecology of the past ten years was not located. It was these Abrehart Ecology data sets that were used for the comparisons across all the sites. Additional sources of records included those held of pro bono species specific surveying carried out by Abrehart Ecology in 2014.

2.2 Field survey method

To make this survey as comparable to previous surveys as possible, samples were re-surveyed as near as possible the exact locations of the previous surveys at each site.

Terrestrial mollusc sampling methods

The sampling strategy and recording procedure is designed to provide information on the population and distribution of *Vertigo moulinsiana*, including its finer scale distribution.

- terrestrial mollusc community—For the present survey Natural England requested that a plastic tray method be used. This requires that at each sample site, the vegetation is beaten into the tray at six places within an area of approximately 0.5m². These six samples were combined and the numbers of *Vertigo moulinsiana* (adult and juvenile) were counted.
- the vegetation from a 30cmx30cm quadrat was vigorously shaken over a large white tray to beat the molluscs out of the vegetation and frass. This was then inspected in the field for *V. moulinsiana* and other molluscs. Incidental rare molluscs (*Vertigo angustior* and *Mercuria similis*) were also collected by this sampling method. The number of individuals of each species were counted.
- moisture level of the soil (scale of 1-5, where 1= dry and 5=saturated); and
- vegetation composition (via recording the abundance of plant species on a DACFOR scale);

Botanical methods

Quadrats were used to provide information on vegetation composition throughout a (desirably uniform) stand of vegetation around the mollusc sample sites. Depending on the records made (here species present were specified), they can take less time than more detailed records typically made in permanent plots. Here, frequency determinations were made on a compartment basis.

In this "sample site specific survey", the emphasis was on covering the area immediately around the mollusc sample sites and detecting as many of the species as possible. At each site chosen by the surveyor for detailed works a minimum of five minutes was spent to record all within an area of one

metre from the centre point. This time was to focus the surveyor's attention at intervals on the whole ecosystem cross-section and to ensure that as much of value was found in the limited time available.

Each area had estimates of vegetation cover:

D – Dominant (over 70% cover)

A – Abundant (70-50% cover)

C – Common (50–30 % cover)

F – Frequent (10-30% cover)

O – Occasional (3-10% cover)

R – Rare (less than 3% cover)

The exact mid-point to a survey area was determined by GPS co-ordinates by ten figure grid references.

Table 1 shows the specific habitat definitions for the sites within this report.

Vegetation Classes (For condition assessment the plant species are classified into 4 groups): Class 1 the most favoured to class 4 which are unsuitable.	Class I Tall Carex species, Glyceria maxima	Class II Phragmites australis	Class III Juncus sp Phalaris arundinacea Angelica sylvestris	Class IV Urtica dioica Eupatorium cannabinum and all other species
Soil moisture classes (Ground moisture levels recorded on a scale of 1-5 at each replicate sampling point): classes 3 -5 are usually most favoured	1 - Dry. No visible moisture on ground surface	2 - Damp. Ground visibly damp, but water does not rise under pressure	3 - Wet. Water rises under light pressure 4 - Very wet. Pools of standing water, generally less than 5cm deep	5 - Site under water. Entire sampling site in standing or flowing water over 5cm deep.

2.3 Limitations of the study

The sampling was carried out quite late in the season and followed a period when there had been considerable flooding across a number of the sites in the proceeding weeks.

Surveys were completed over 2 days on 16-17th December 2014. Survey days were selected to ensure the dry conditions needed to undertake sampling. Survey locations at Westbere Marshes, Kent displayed on Fig. 1 with individual sites given in Appendix B

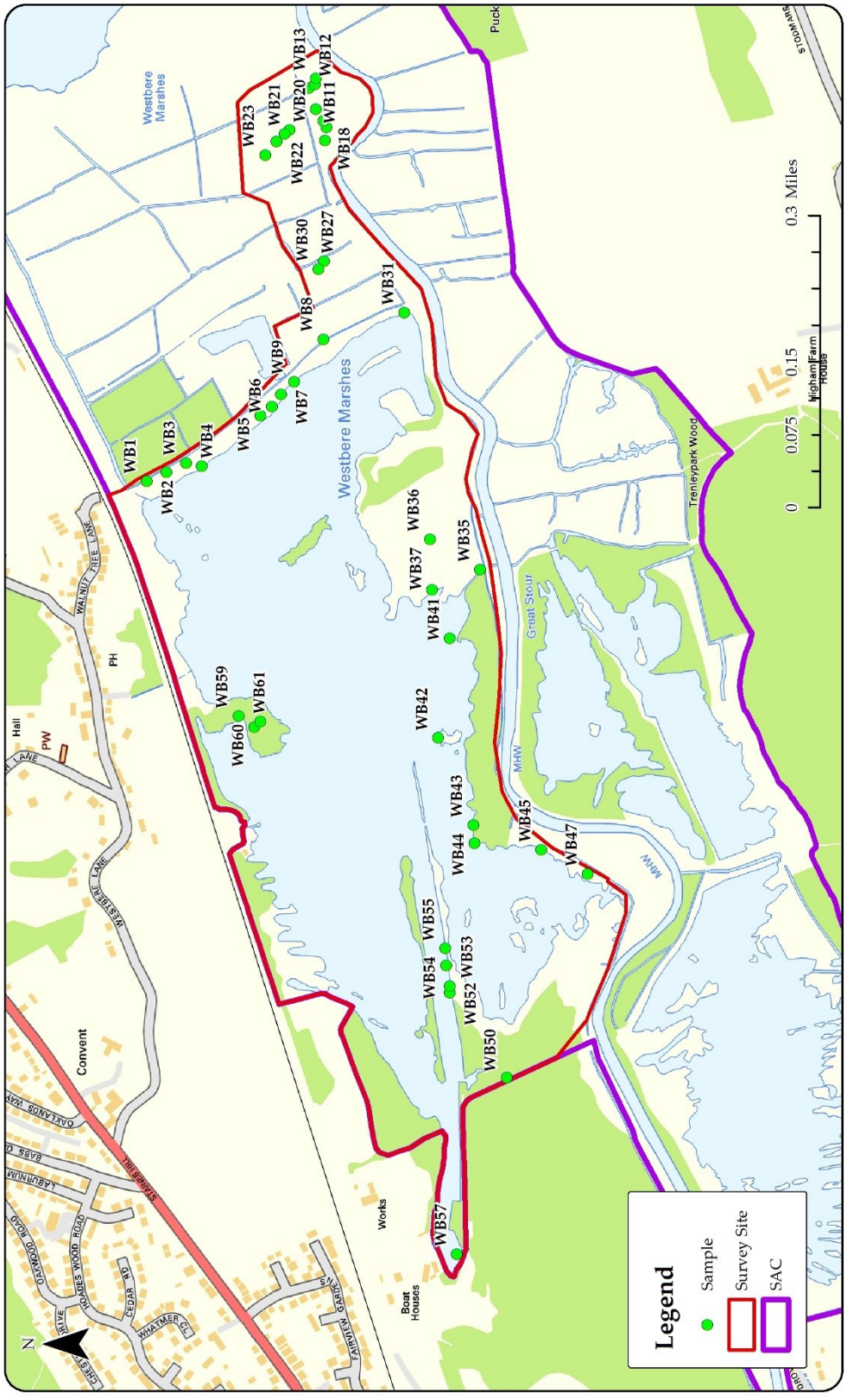

Figure 1. Westbere Marshes, Kent survey sites during *Vertigo moulinsiana* survey by Abrehart Ecology in December 2014.

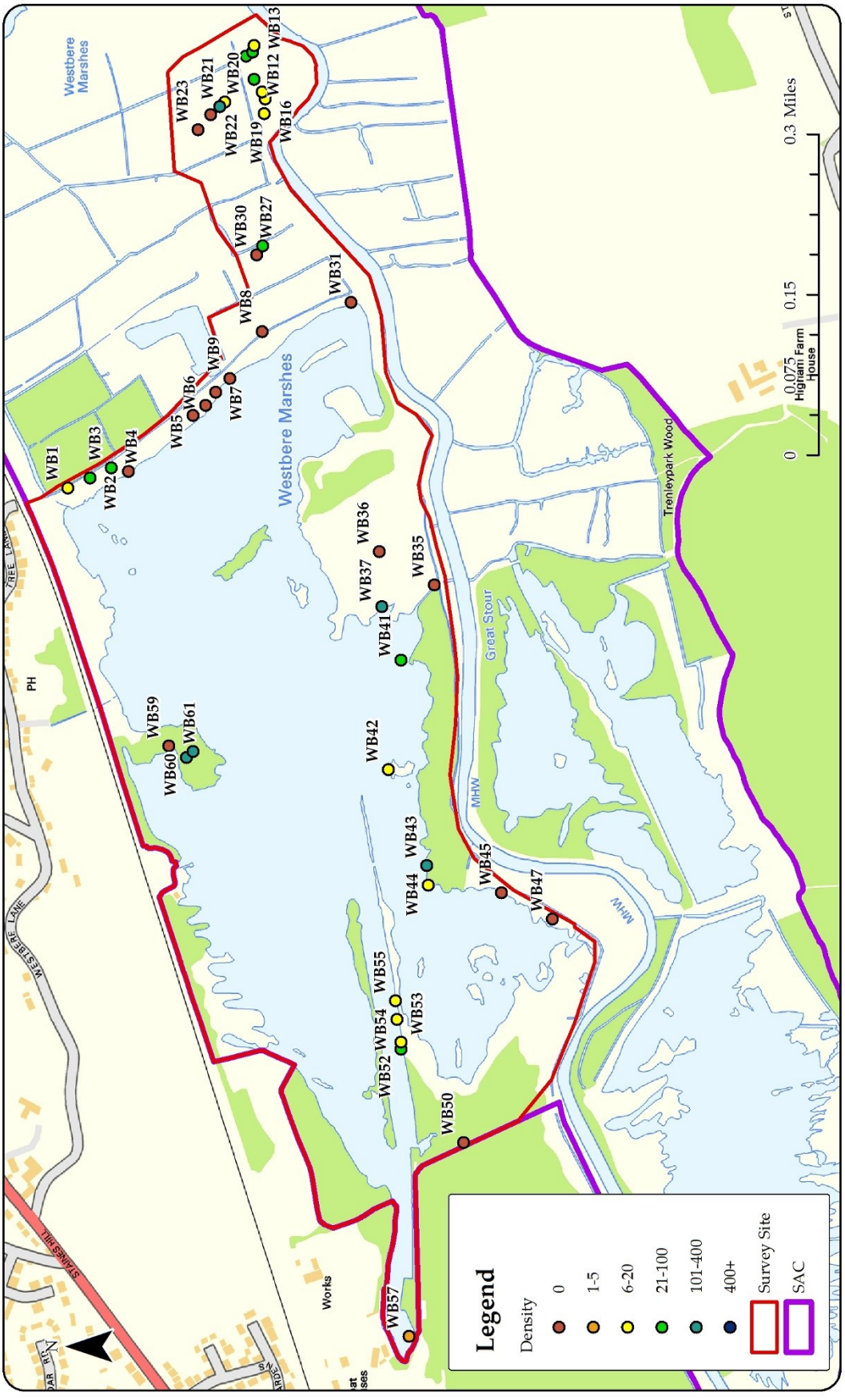

Figure 2. Population densities (presence /absence) for *Vertigo moulinsiana* at Westbere Marshes, Kent during survey by Abrehart Ecology in December 2014.

3. Results

Vertigo moulinsiana was not located at 17 of the former sites at Westbere Marshes, Kent where it was the present in 2011. The snail was in reduced numbers at 15 sites and had higher numbers at four sites. Comparison to previous surveys in Table 3.

Vertigo moulinsiana survey results are displayed in Appendix A and site descriptions are given in Appendix B.

Table 2: Summary of Results - Westbere Marshes, Kent 2014

Summary of results	December 2014	September 2011	September 2002	November 2002
No. of samples with V. moulinsiana	25	42	31	23
Total No. of V. moulinsiana	619	1798	554	560
Mean no. per sample	25	43	18	24
Range	0 - 13.	2-164	0-72	2.-77
Total no. of adults	232	1440	456	206
Mean no. per sample	9.3	34	12	8.96
Range	0-34.	2. - 164	0. - 63	1. - 30
Total no. of juveniles	387	358	98	354
Mean no. per sample	15.5	8.5	2.58	15.4
Percentage of adults	27%	80%	82%	37%

4. Discussion

Table 3 compares results of the 2010 and 2014 surveys and gives a summary of the conservation statuses of the surveyed sites.

Site:	Monitoring summary	Conservation status' summary
Site 1-9 Eastern side of lake	Detailed surveys of numerous small areas of sedge beds where *V. moulinsiana* previously recorded in 2011 located up to 186 animals. During this survey no more than 25 animals were found in a sample. Many of the sites though were underwater at the time of the survey showed signs of continued dryness in the recent past. There must be variable water levels across the site.	**Unfavourable** (Vertigo moulinsiana decreasing at this site. Only found in three samples in any numbers).
Sites 11-19	The site is apparently in the same condition as in 2011. Area of swampy fen with path on north side and River Stour as boundary. The population was mainly found in the *C. riparia* swamp with low numbers in the nearly submerged *G. maxima*.	**Unfavourable** (Vertigo moulinsiana decreasing at this site.).
Sites 20-27	Fen on north side of path, was flooded during this survey. *V. moulinsiana* was only found in one of the five samples and at a low density. All the site showed signs of being dry for some period of time prior to tis survey.	**Unfavourable** (Vertigo moulinsiana decreasing at this site. Only found in one sample in any numbers).
Sites 31-47 Southern edge of lake	Half of these ten samples held *V. moulinsiana* in similar number to those of the 2011 survey, in the other five sample none were found. The habitat was degraded and suitable areas of sedge swamp were difficult to find and often fragmented.	**Unfavourable** (Vertigo moulinsiana decreasing at this site).
Sites 50-57	*V. moulinsiana* was found in all but one (site 50) of these sample sites, in greatly reduced numbers from 2011. Much of the habitat was fragmented or reduced in size from 2011.	**Unfavourable** (Vertigo moulinsiana decreasing at this site).
Sites 59-61	This area of the site was on a small peninsular leading from the northern edge of the lake. Within this was a small 650m² of wet *C. paniculata* and *C. acutiformis* swamp within an area of alder carr. This was the highest density population on the site	**Favourable** (Vertigo moulinsiana increasing at this site. Found in good numbers in one very small area of sedge fen).

Table 4: Possible reasons for *Vertigo moulinsiana* loss or decline and suggested management options

Site:	If Vertigo moulinsiana loss or decline detected possible reasons for:	Possible management actions:
Site 1-9 Eastern side of lake	• All areas of Carex along this side of the lake were small and appeared to be smaller than in 2011. • There was still considerable shading on this side of the site. • The largest area of Carex was 300m2.The site was drier in 2011, V. moulinsiana was only found in the wettest sites. Urtica dioica was found in all sites.	Clearing some of the overhanging trees along the areas of greatest Carex density Monitoring the hydrological regime too will need to be carried out.
11-19	• prolonged river flooding between December 2013 –February 2014 (an alternative or additional cause of decline) that may have 'scoured' river side fen sweeping away climbing *V. moulinsiana.* • Though the fluctuations in the water level across the site may be having a longer lasting effect on the population within this system	Monitoring the hydrology of the site to ensure there is limited variation in water table height during the summer in particular. Continuing to reduce scrub from the site and maintaining an open fen habitat.
Sites 20-27	• This site is under pressure from changing hydrology. • Much of this site was underwater and recent flooding may have dislodged animals off the vegetation.. • Maintained stable water level in the summer may help in these sections. • Prolonged flooding in the winter of 2013 may have washed away animals on the stems. • Possible pollution running across the site from flood waters • Within the wooded areas along the lake margin there was a considerable amount of shade. • Access to the lake margin was difficult as most of the duck boards were in a very poor state.	To try and maintain the level of moisture on the site. Creating a wetter habitat should create more suitable habitat over a larger area.

Table 4 continued: Possible reasons for *Vertigo moulinsiana* loss or decline and suggested management options

Site:	If Vertigo moulinsiana loss or decline detected possible reasons for:	Possible management actions:
Southern edge of lake 31-47	• *Urtica dioica* was frequent in the wooded sites in this section. samples where previously it was not found. • Spreading Salix scrub along the lake margin is increasing the shading and reducing sward density. • The water level appears to vary creating a margin with increasing *Urtica dioica*. • Changes in water level across the site may be having a long lasting effect on the population within this system.	Trying to maintain a high water level on the site in the summer will be very important here. There may be larger issues locally with water abstraction.
50-57	• The habitat within the wood was drying out with greatly reduced sedge beds and heavy shading. • The dry ground conditions were allowing brambles to entre the community. • Along the lake margin there was considerable shading from Salix scrub.	Open the canopy in the areas around the densest Carex beds Surveying this section of the site from a boat to gain better access across the site should be considered in future surveys.
59-61	• The area at site 57 was heavily shaded and the Carex bed was greatly reduced. • There were signs of the site drying slightly from the 2011 survey. • Tree clearance has been carried out here and the more open canopy has been a positive action on this section of the site.	Open up the canopy more around this site. Maintain the wet nature of this site.

'It is difficult to identify the causes of *V. moulinsiana* declines or losses with certainty. This is because in most cases relatively long periods of time have elapsed between site-monitoring visits. In the case of most sites revisited on this project this is about 4.5 years. During this period the sites have experienced a series of potentially relevant natural events including extended flooding, long periods of drought, high summer and low winter temperatures. Additionally site management actions are unknown. Any single or combination of these factors might have had a negative effect on populations of the snail.

The chief causes of *V. moulinsiana* loss include:

Low ground moisture levels often resulting from a lowered ground water levels sometimes accentuated by water uptake (and transitional loss) by *Phragmites* or the spread of woody species (e.g. *Salix* spp);

Site shading due to a spread of woody species and / or tall reed growth;

Site damage due to a variety of factors' (Willing 2011)

5. Further work

The changes in the populations at these sites is very difficult to determine. The sites are searched only briefly and infrequently to catch any real changes at any of the sites. It is suggested that these sites be monitored on a more regular basis to try to determine the causes of change within the populations with greater precision.

Establishing transects through areas 2, 3 and 4 may show smaller scale changes within the site.

Surveying the lake margin from a boat to gain better access across the site should be considered in future surveys.

6. References

Report to cited as:

Abrehart T.R. 2014. Annex A: SAC status reporting on Vertigo moulinsiana at Westbere Marshes, Kent 2014. An ecological survey including vegetation and invertebrates observations undertaken for Natural England by Abrehart Ecology.

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7. Acknowledgements

Many thanks are due to the many landowners who allowed us access to their lands and special thanks to David Heaver of Natural England for commissioning this survey and Phil Williams of Natural England for gaining permissions onto the site..

Appendix A

Survey results (only sites with *V. moulinsiana* present are shown)

Sample site	1	2	3
Juvenile count	3	21	7
Adult count	4	4	1
Total number of V. moulinsiana	7	25	8
Approximate count of V. moulinsiana/m²	**14**	**50**	**24**

Table A1. Area 1 survey results from Westbere.

Sample site	11	12	13	15	16	18	19
Juvenile count	13	7	5	3	3	6	4
Adult count	11	9	2	2	1	4	5
Total number of V. moulinsiana	24	16	7	5	4	10	9
Approximate count of V. moulinsiana/m²	**48**	**32**	**14**	**60**	**8**	**20**	**18**

Table A2. Area 2 survey results from Westbere.

Sample site	20	21	27
Juvenile count	5	8	20
Adult count	4	6	2
Total number of V. moulinsiana	9	14	22
Approximate count of V. moulinsiana/m²	**18**	**168**	**53**

Table A3. Area 3 survey results from Westbere.

Sample site	37	41	42	43	44
Juvenile count	52	7	3	80	2
Adult count	43	11	3	19	1
Total number of V. moulinsiana	43	11	3	19	1
Approximate count of V. moulinsiana/m²	**190**	**43.2**	**12**	**198**	**6**

Table A4. Area 4 survey results from Westbere.

Sample site	52	53	54	55	57
Juvenile count	17	5	2	4	1
Adult count	2	1	3	0	0
Total number of V. moulinsiana	19	6	5	4	1
Approximate count of V. moulinsiana/m²	**38**	**12**	**10**	**8**	**2**

Table A5. Area 5 survey results from Westbere.

Sample site	60	61
Juvenile count	52	127
Adult count	30	64
Total number of V. moulinsiana	82	191
Approximate count of V. moulinsiana/m²	**164**	**382**

Table A6. Area 6 survey results from Westbere.

Appendix B

Sites locations and descriptions

The site at Westbere marshes was sub divided into six areas for this survey.

General description: Area 1 was within the eastern side of the lake and encompassed a number of small areas of sedge swamp. A ditch ran along either side of the footpath, in these were small 4 x 4m2 areas of either *C. riparia* or occasional *C. paniculata* plants. As the footpath headed south the margins of the dykes opened out and accordingly the marginal sedge beds increased in size. Between the dykes and the lake was a narrow strip of land that was in the main wooded and held a flora of *Phragmites australis*, *Urtica dioica*, *Rubus* sp., *Epilobium hirsutum* and *Eupatorium cannabinum*. Along the lake margin there were small narrow bands of *C. riparia* and *G. maxima*. Often these were shaded by the overhanging willow and alders here. Around sites 8 and 9 there was an area of *C. acutiformis* covering an area of 300m².

Nine samples were taken along this area of which only 1—3 held any *V. moulinsiana*.

Extent of habitat: Previous extent unknown, this survey has shown a reduction of positive sites by 60%.

Management: Limited with occasional tree felling.

Sample site	Grid reference	Wetness	Degree of shading	Principle plant species present	Approximate V. moulinsiana/m²
1	TR1967460936	5	12 (a considerable amount of woodland at the northern section)	Carex riparia and some scattered Phragmites australis.	14
2	TR1968960903	5	0	Glyceria maxima only	50
3	TR1970460871	5	0	A matrix of Carex riparia, Glyceria maxima and some Sparganium erectum. Urtica dioica developing at the edges of this habitat.	16

Table B1. Area 1 survey results of *Vertigo moulinsiana*. Only results from *V. moulinsiana* positive sites are shown.

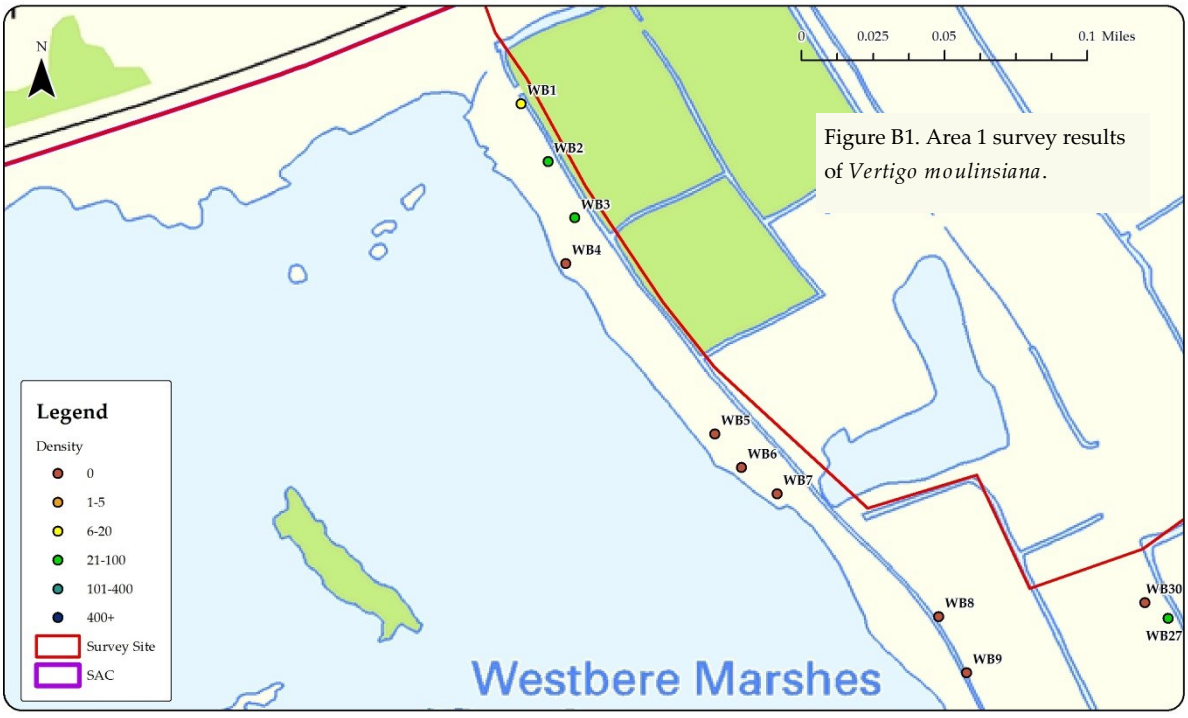


Figure B1. Area 1 survey results of *Vertigo moulinsiana*.

Photos B1: Sites in rows (left to right), 1-3, 4-6 and 7-9

General description: Area 2 comprised the area along the edge of the River Great Stour. This was a small area of flooded *G. maxima* and *C. riparia* swamp with a scattering of willows trees along the river edge and swamp. Although at the time of the survey all sites were wet, due in the main to recent rain and flooding events, the whole area showed signs of having been dry for a considerable period of time.

Nine samples were taken along this area of which five held any *V. moulinsiana*.

Extent of habitat: Previous extent unknown, this survey has shown no change from the 2011 survey.

Management: Limited.

Sample site	Grid reference	Wetness	Degree of shading	Principle plant species present	Approximate V. moulinsiana/m²
11	TR2032460668	5	0	This section of flooded marsh was dominated with Glyceria maxima, Carex riparia and Phalaris arundinacea scattered in distinct areas through this habitat.	48
12	TR2033060658	5	0		32
13	TR2034060656	5	0		14
15	TR2028960656	5	0		10
18	TR2027060644	5	0		20
19	TR2023760641	5	40		18

Table B2. Area 2 survey results of *Vertigo moulinsiana*. Only results from *V. moulinsiana* positive sites are shown.

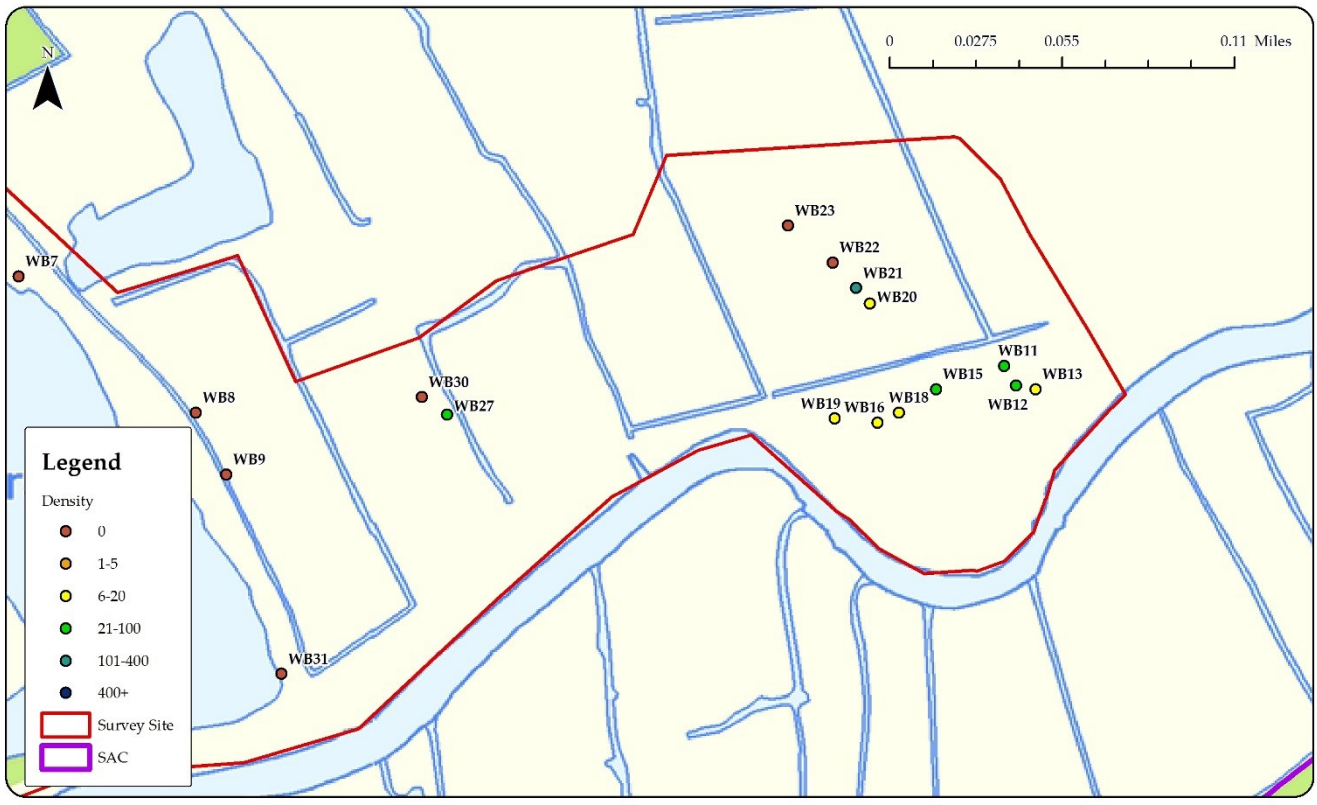


Figure B2. Area 2 survey results of *Vertigo moulinsiana*.


Photos B2:

Row 1: Sites 11 and 12


Row 2: Sites 15 and 16


Row 3: Sites 18 and 19

General description: Area 3 comprised the area to the north of area 2 and the River Great Stour. This was a large area of flooded *P. australis*, *G. maxima* and *C. riparia* swamp with a low number of willows trees over the site mainly along the edges of the dykes. Although at the time of the survey all sites were wet, due in the main to recent rain and flooding events, the whole area showed signs of having been dry for a considerable period of time.

Six samples were taken along this area of which only three (sites 20, 21 and 27) held any *V. moulinsiana*.

Extent of habitat: Previous extent unknown, this survey has shown a reduction in positive sites from the 2011 survey.

Management: Some tree and scrub clearance has been carried out recently, opening the site up.

Sample site	Grid reference	Wetness	Degree of shading	Principle plant species present	Approximate V. moulinsiana/m²
20	TR2025560700	5	0	Glyceria maxima dominated swamp surrounded by extensive areas of reedbed.	18
21	TR2024860708	5	0		28
27	TR2003860643	5	0		44

Table 3. Area 3 survey results of *Vertigo moulinsiana*. Only results from *V. moulinsiana* positive sites are shown.

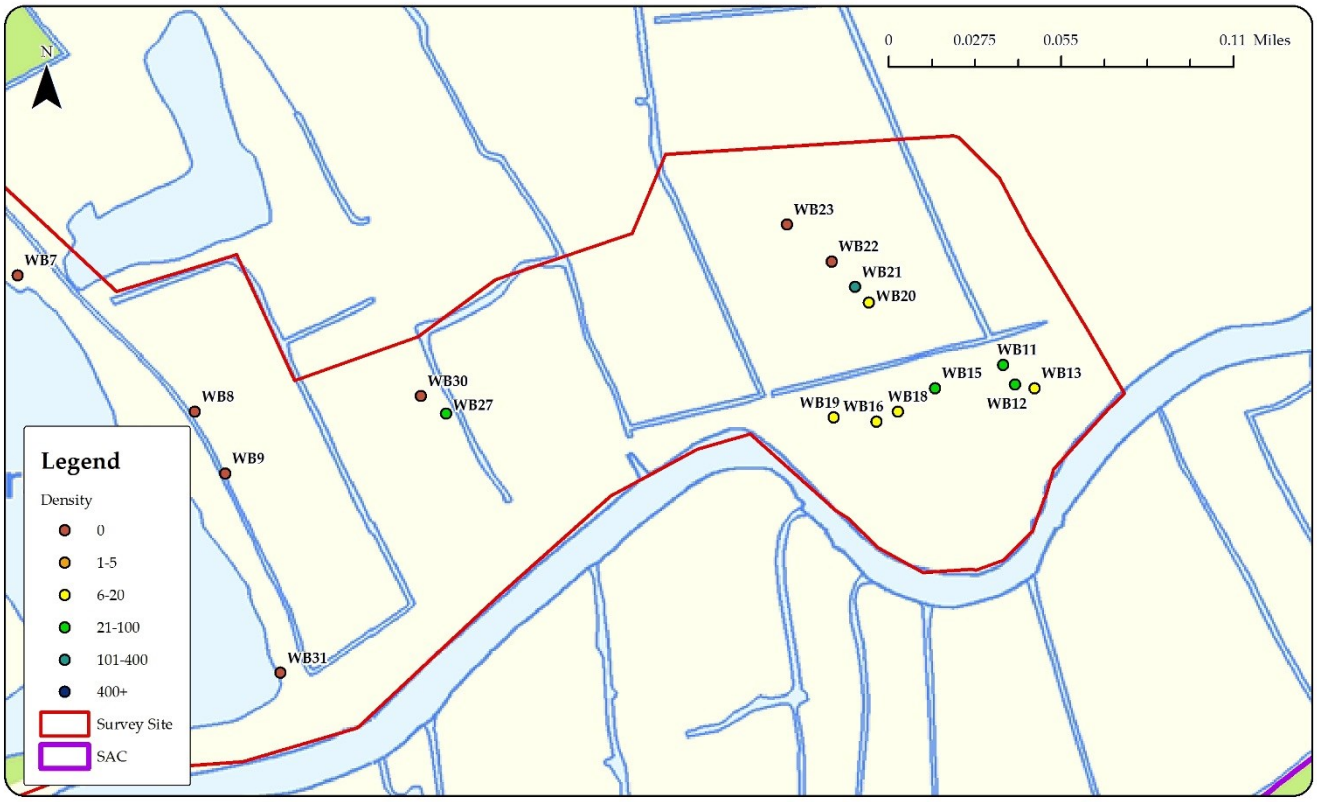


Figure B3. Area 3 survey results of *Vertigo moulinsiana*.

Photos **B**3:

Sites 20 and 21

Site 22 and 23

Sites 27 and 30

General description: Area 4 comprised the area along the southern edge of the lake. The south eastern end of the lake had had considerable tree and scrub clearance carried out in the recent past and is now recovering. This area though is still too dry to hold *V. moulinsiana*. The majority of the rest of this southern shore has a considerable amount of willow and alder carr throughout. Scattered through this habitat area small areas of sedge swamp. These appear to be decreasing with increased shading and drying of the marginal transitional habitat.

10 samples were taken along this area of which only five (sites 37, 41, 42, 43 and 44) held any *V. moulinsiana*. The area

Extent of habitat: Previous extent unknown, this survey has shown a reduction in positive sites from the 2011 survey.

Management: Some tree and scrub clearance has been carried.

Sample site	Grid reference	Wetness	Degree of shading	Principle plant species present	Approximate V. moulinsiana/m²
37	TR1949560464	5	0	Carex riparia in dense willow scrub	190
41	TR1941560435	5	0	Marginal swamp along the southern edge of the lake. Limited areas of suitable vegetation. Dominated with Carex riparia, Carex acutiformis and Phragmites australis	36
42	TR1925060454	5	0		12
43	TR1910660396	4	70		198
44	TR1907660394	5	0		6

Table 4. Area 4 survey results of *Vertigo moulinsiana*. Only results from *V. moulinsiana* positive sites are shown.

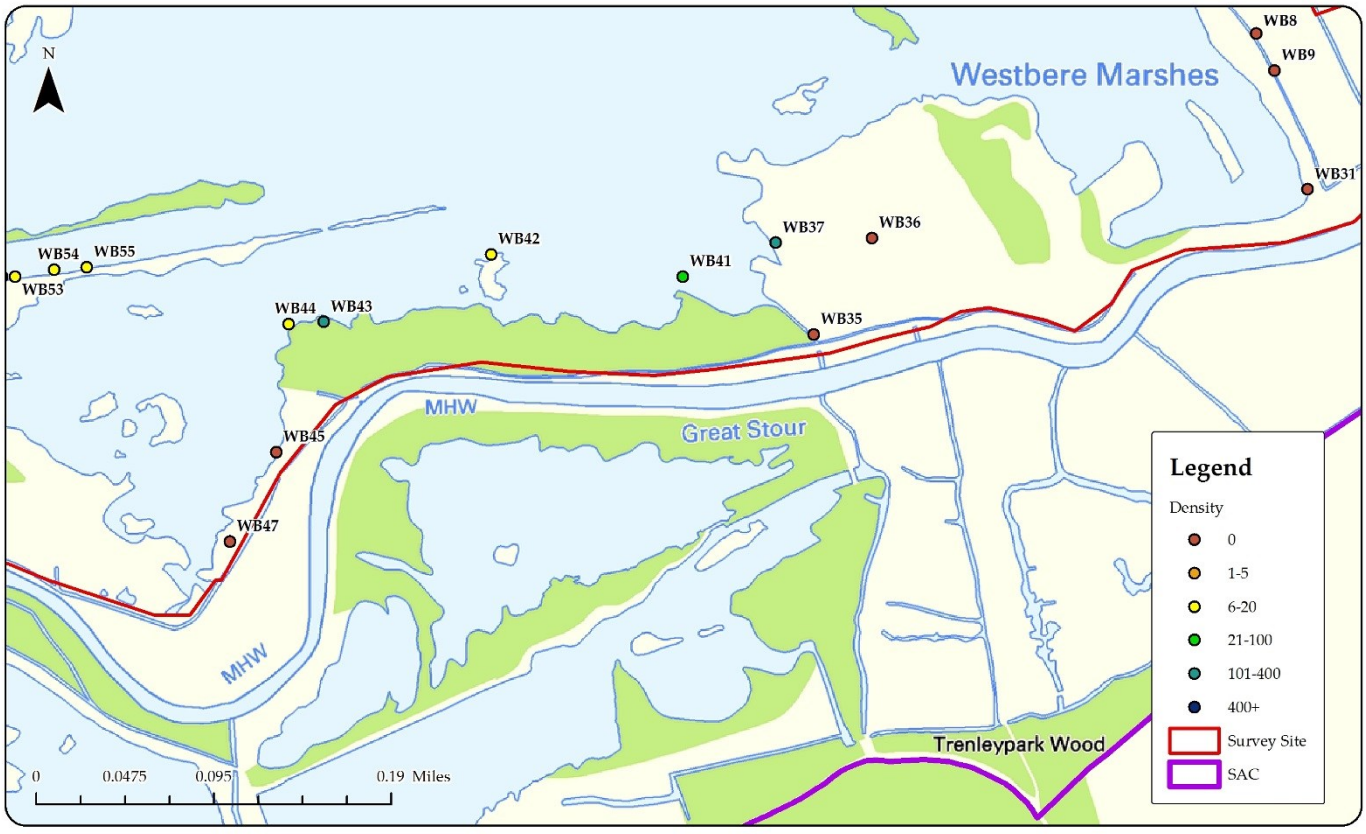
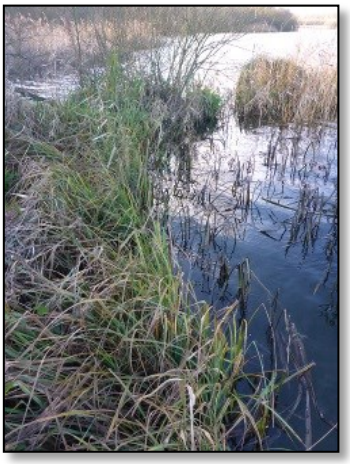


Figure B4. Area 4 survey results of *Vertigo moulinsiana*.







Photos B4:

Row 1: Sites 31, 35 and 36

Row 2: Sites 37, 41 and 42

Row 3: Sites 43, 44 and 45

Row 4: Site 47

General description: Area 5 comprised the area in the eastern side of the site near Fordwich. These samples were taken along the edges of the lake in the narrow zone of transitional habitat. The main vegetation here was *C. paniculata* and *C. riparia* swamp. There were always a number of willow or alder trees along the margins of this section of the site. The transition zone was very narrow.

Six samples were taken along this area of which four (sites 50, 52, 53, 54, 55 and 57) held any V. moulinsiana.

Extent of habitat: Previous extent unknown, this survey has shown a reduction in positive sites from the 2011 survey.

Management: Some tree and scrub clearance has been carried.

Sample site	Grid reference	Wetness	Degree of shading	Principle plant species present	Approximate V. moulinsiana/m²
52	TR1882960435	5	0		38
53	TR1884060435	5	0	Carex acutiformis swamp along this margin of the	12
54	TR1887460441	5	50	lake, beyond which was a dense reedbed.	10
55	TR1890260443	5	0		8
57	TR1839760423	5	100	An area of heavily shaded Carex acutiformis swamp.	2

Table 5. Area 5 survey results of *Vertigo moulinsiana*. Only results from *V. moulinsiana* positive sites are shown.

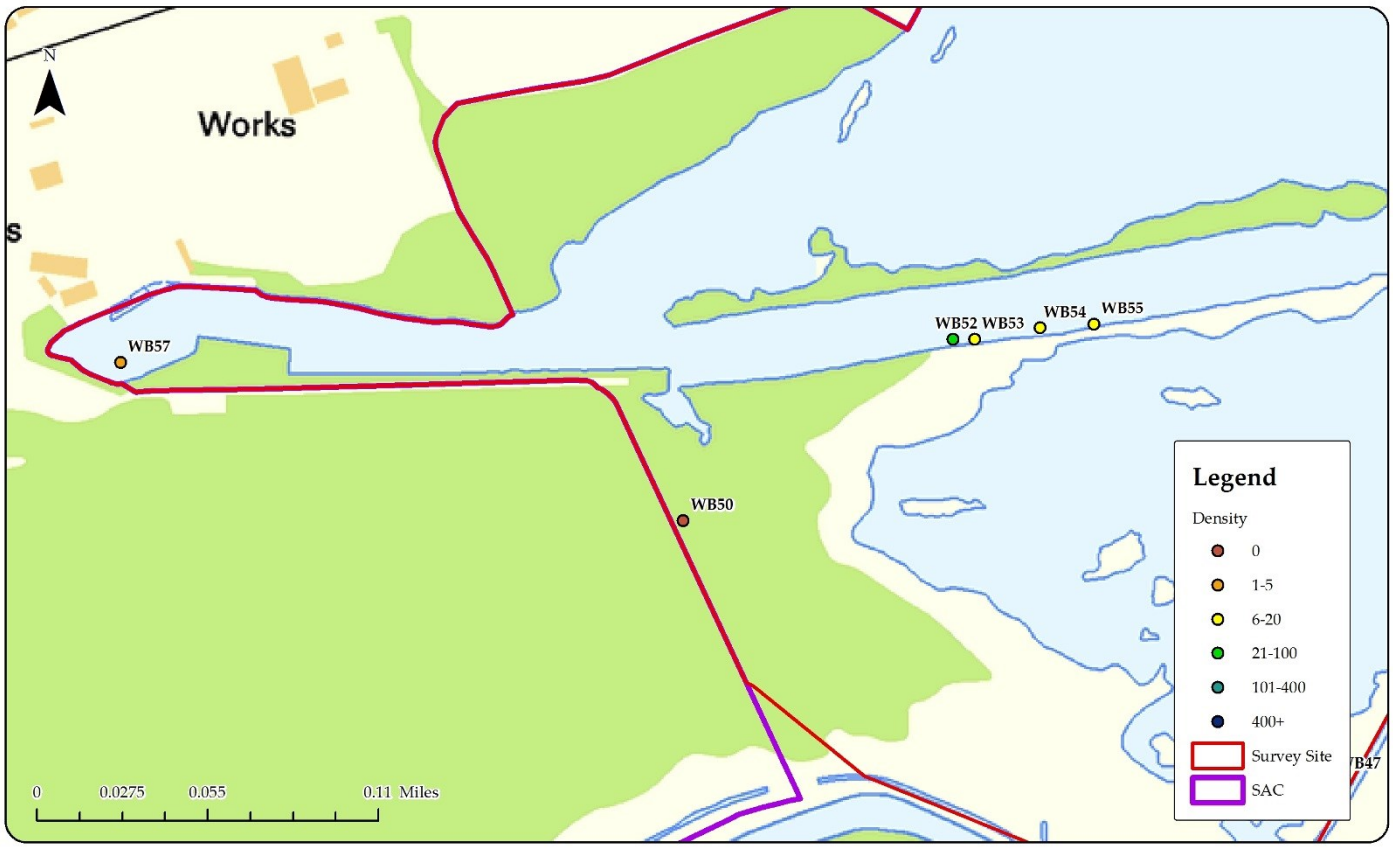


Figure B5. Area 5 survey results of *Vertigo moulinsiana*.







Photos B5:

Row 1: Sites 50, 52, 53

Row 2: Sites 54 and 55

Row 3: Site 57

General description: Area 6 comprised a small peninsular on the north side of the lake. This was mainly wooded with one small area of *Carex* swamp at the northern edge of the site and a large 630m2, area within the alder carr in the main section of the site.

Three samples were taken along this area of which two (sites 60 and 61) held any *V. moulinsiana*.

Extent of habitat: Previous extent unknown, this survey has shown a reduction in positive sites from the 2011 survey. The area inhabited here is approximately 600m2

Management: Some tree and scrub clearance has been carried.

Sample site	Grid reference	Wetness	Degree of shading	Principle plant species present	Approximate V. moulinsiana/m²
60	TR1926860758	4	0	An area of swamp within a wet woodland, dominated by Carex acutiformis and numerous Carex paniculata swamp. There was a considerable amount of Rubus and Eupatorium cannabinum.	164
61	TR1927760748	4	0		382

Table B6. Area 6 survey results of *Vertigo moulinsiana*. Only results from *V. moulinsiana* positive sites are shown.

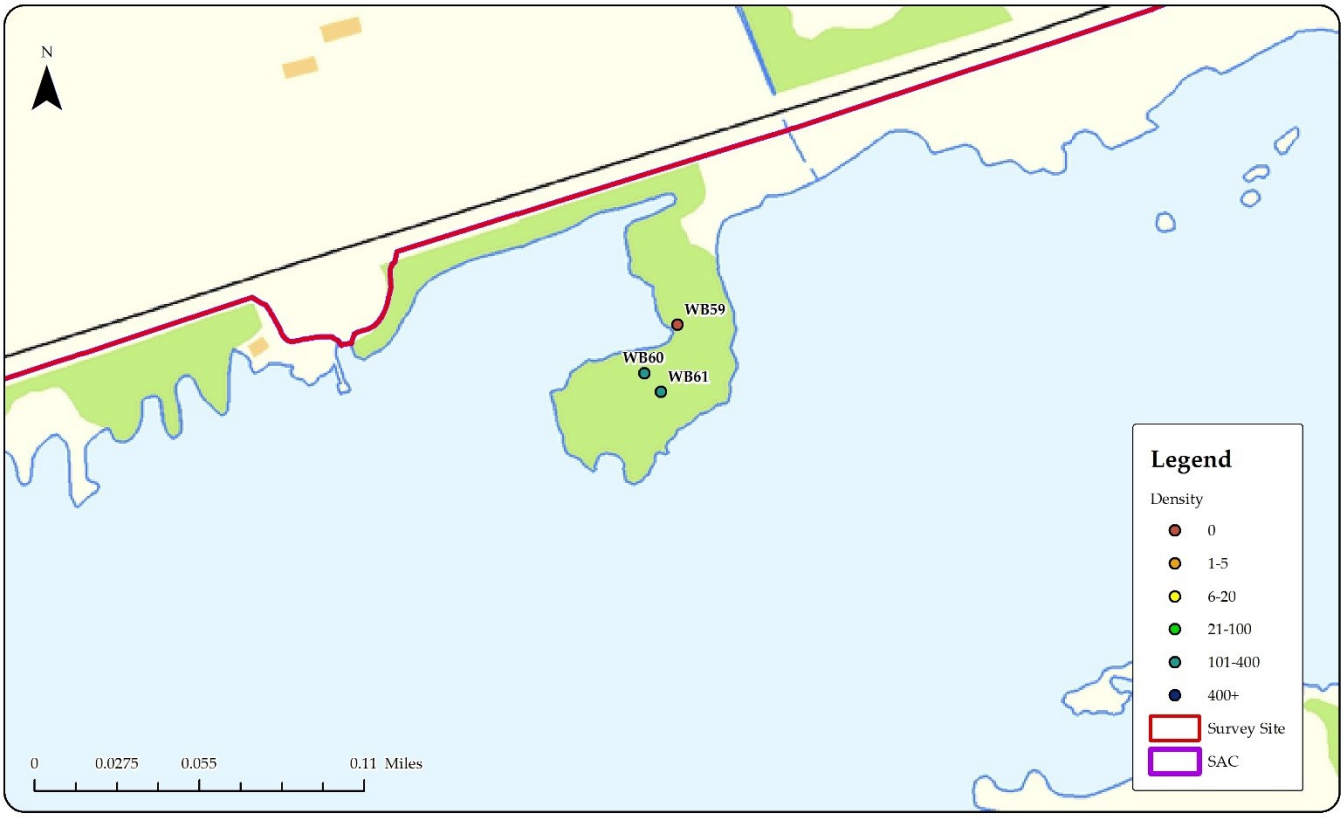


Figure B6. Area 6 survey results of *Vertigo moulinsiana*.

Photos B6:

Clockwise: Sites 59, 60 and 61

Appendix C

Vertigo moulinsiana site histories (including first known discovery dates)

Site:	
Westbere Marsh	• 1999: Specimens were first retrieved from a sample of freshwater molluscs collected from an overgrown grazing marsh ditch at Westbere Marshes (part of Stodmarsh SSSI) as part of a survey for the aquatic snail *Segmentina nitida* (Killeen 2000). • Survey in November found on both north and south sides of the River Great Stour with the north side found to be widespread and locally common (Killeen 2000). • 2002: located on the north side of the River Great Stour (south side of the river was not re-surveyed) (Killeen 2002). • 2011: found to be widespread on the north side of the River Great Stour. Fewer positive sites around the south-eastern part of the lake where 'management' had occurred. None found on the south side of the river. The mean number of individuals were found higher than in 2002 (Killeen 2011). • 2014: Found to be widespread across the survey area though reduced in number of positive sites. There was a continued reduction in sites at the south-eastern part of the lake and in the marshes due east of this section (this report).

Table C1. Vertigo moulinsiana site history.

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