Final Report of Entomological Survey and Assessment of Middlewick Ranges, Colchester, 2024 - 2025

Colchester City Council

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1. Introduction

1.1 Part of the MOD Middlewick Ranges, Colchester has been identified in the Local Plan as being suitable for residential development and has been offered for sale by MOD as the range facility is surplus to their modern requirements. In support of the proposed sale for meeting the Local Plan Housing Allocation Stantec produced an Ecological Evidence Base Report in 2020.

1.2 There has been considerable local disquiet regarding the future of the site. This disquiet has led to the questioning of the level of detail provided in the initial ecological assessments provided for the site, especially those relating to invertebrate interest and the interaction of this with the botanical and physical features.

1.3 Consequently, Colchester Borough Council have commissioned independent botanical and invertebrate surveys in order to inform masterplanning. This approach was also advised by Natural England. Although the 'Red Line' boundary runs close to the existing fenced range on the western and southern edges, it is wider on the northern and eastern side, running to the extant roads. A considerable further area to the south was identified as potential Mitigation Land (Stantec Report, Site Location Plan pg 58). Our advice to Colchester City Council (CCC) was, therefore, that any survey should cover sample areas of distinct macro-habitat within this larger boundary, as well as similar areas within the 'Red Line'.

1.4 A detailed National Vegetation Classification (NVC) survey was undertaken by Giles Groome, based on the Red Line Boundary. This completed report was presented to CCC concurrently with the interim invertebrate report (20241207). It needs to be consulted alongside both the interim and final invertebrate reports.

1.5 Giles also made a 'walk-over' botanical survey of the wider area of the invertebrate survey, using the same sample components as the invertebrate survey (see below). The output from this survey may then be used to inform the interpretation of the entomological survey. A major question here is to what extent is the overall area a scarce and significant ecological resource and whether the end-use of any components of the overall area need further consideration. Historical, current and eventual site management procedures are inevitable considerations within this.

1.6 The invertebrate surveys were undertaken by Mike Edwards and Scotty Dodd. Between them they cover a potential fauna in excess of 3,000 species. Both have considerable experience in invertebrate survey and reporting as well as site management and autecological research. Scotty Dodd concentrates on Aranaeae (Spiders); Hemiptera-Heteroptera (True Bugs); Coleoptera (Beetles), and Mike Edwards concentrates on Orthoptera (Crickets and Grasshoppers); Some Diptera (Fly) groups and aculeate Hymenoptera (Ants, Bees and Wasps). Both recorders record a range of further species from other invertebrate groups which are recorded as seen. Survey is through a mixture of direct observation, hand-netting, sweeping and suction sampling, the last most appropriate for the sparsely-vegetated open areas. The interim report was provided before all planned visits were completed and all material taken had been identified. Further visits were made in 2025 - April (all accessible sample areas) and May (all accessible sample areas North and Centre). It was not possible to get access to the fenced area of grassland for these final visits. With this exception all areas had an approximately equal coverage over the duration of the survey.

1.7 The entire area is too big for a complete survey, so a fixed time/identified macro-habitat component approach has been taken. Samples are taken for each identified component within the allocated time window, providing a level of quantified sampling effort. The outcome of this approach is intended to allow a level of comparison between different samples within a component and between components. It would not provide a complete inventory, nor was it concerned with directed searching for any specific known species. The area to the south of Weir Lane was excluded from this process.

1.8 A relatively small section of the eastern Birch Brook and the scrubby grassland to the south of the fishing lake were surveyed although they may not be within the MOD Estate and certainly are outside the identified potential Mitigation Land. They did, however, provide relevant habitat elements which undoubtedly relate to the overall area. The 2015 Essex Wildlife Trust Review of Local Wildlife Sites includes the scrubby grassland as part of Donylands Wetlands, though the 2020 Stantec map of LoWS does not include this with the lake. The section of Birch Brook is all part of the Birch Brook LoWS.

1.9 Using the aerial map to guide decisions, plus a short walk-over of part of the larger site carried out in January 2024, the overall site was divided into three main areas, North, Centre, South, as shown on Map 1. Sample component features were identified within these as shown in Map 2. The walk-over survey by Giles Groome used the same classification. Each sample was given a nominal time of 1 hour, but this needed to include moving between each sample, approximately 5 minutes each movement. The order of sampling was dictated by the need to minimise this movement time, so was the same on each survey visit. We are very grateful to the local MOD Range Office which allowed us to use a car to sample within the fenced area for the 2024 sampling. Other movements were made on foot.

1.9.1 The components (sample features as numbered on Map 3) were:

a) Grassland, with no significant scrub component. There were four samples, one in each main area, with an extra within the fenced zone. (1, 5, 8, 12)

b) The historic area of the butts, outside the fenced zone. This zone had a distinct heathy flora with areas of bare and re-vegetating ground, although a very large proportion was covered in Gorse. It was visually very distinct to other parts of the Ranges. A small area of similar ground was discovered within the fence, but this was included in the fenced grassland. (2)

c) Woodland edge/hedgerow. This includes a 4m grassland strip alongside the wooded vegetation. There were three samples, one in each main area. (4, 7, 11)

d) Wet woodland associated with the Birch Brook. There were initially three identified sample areas within this, but practical considerations of access and sampling within the allocated time meant that these needed to be modified as follows.

1.9.2 The western access traversing the woodland (footpath) ran between the north and central woodland areas. Whilst this was a good length it was not possible to follow the stream closely to the north in order to survey any wet seepage areas. There was better access going to the south, but this was still restricted. We tried accessing at several points within the Central woodland, but this increased the proportion of 'movement time' greatly and the location of important 'seepages' was not always successful. Much of this north and central woodland belt was, in fact, historically abandoned fields with numerous large, once open-grown, Pedunculate Oak *Quercus robor* standards over a dry woodland field layer which had been invaded by smaller trees. As such it did not meet the 'wet woodland' criteria well. Although some recording of invertebrates did initially distinguish between the two areas, it was decided to treat them as one component sampled from the footpath (3 plus 6). The walk-over botanical survey treated them as completely separate samples but they have been combined here. Both data sets are shown in this final report as sample 13.


Colchester Ranges Ecological Survey
Survey areas by compartment
2024-01-15
Map 1
Legend
Survey Areas by compartment
Centre
North
South
N
0
100
200
300 m
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Imagery © 2024 Google


Colchester Ranges Ecological Survey
Survey areas by area
2024-01-15
Map 2
N
0 100 200 300 m
©2024 Edwards Ecological and Data Services Ltd
Imagery © 2024 Google

Colchester Ranges Ecological Survey

Survey areas by number

2024-12-10

Map 3

N

0 100 200 300 m

Main area	North	Central	South
Grassland	1, 5	8	12
Butts	2		
Woodland edge	4	7	11
Wet woodland	3	6	10
Special			9

Table 1, Summary of sample areas against main area

1.9.3 The sample to the far east (and of the smallest extent) was sub-divided to allow for separate recording of the more northerly area of scrub/woodland directly south of the old gravel working. This woodland was also traversed using a footpath as a basis, but this ran alongside a much more extensive seepage zone, with a good extension of this along the stream to the south. Just half an hour sampling took place in this component, but there was no movement time. (10)

1.9.4 The final sample (special) was the small area to the south of the old gravel working. From the aerial map this looked to be a transitory phase between dry grassland and wood, with a considerable scrub component, but not closed canopy, and sufficiently distinct to be worthy of separate recording. It was given its own sampling code, but for half an hour. (9)

1.9.5 There was an even smaller area of similar physical characteristics at the western end of the central area, but this was too isolated to be a sample site, as well as small.

1.10 The main areas and their associated sample site codes are summarised in table 1.

2. Sample Area descriptions

2.1.1 N**orthern fenced grassland 1.** This area was within the fenced range. Although it had traditionally been mown frequently this had not taken place for several years before the survey. Consequently the grass had become dense and long over most of the area, although there were occasional indications of a previously shorter turf.

2.1.2 On the first survey visit ME made a walked transect running from north to south within the fence. There was little entomological interest throughout this transect until the extreme southern end was reached, within 20m of the butts themselves. Here the vegetation was sparse and generally shorter with more floral resources, and the frequency of all invertebrates increased greatly. The Landmark Ranger commented to me that this area had never needed much mowing, even when the range was active. At the same time SD had been surveying the shorter, sparser vegetation associated with the building and trackway. He had also made a short sample within the taller grassland close to the building, coming to the same conclusion regarding the low value of this component.

2.1.3 The decision was made to concentrate on these areas of shorter, sparser grassland around the easternmost butt in future visits as these were clearly closer to the original state of this area. Subsequent visits were all around the southern shorter grassland and included one of the ‘stops’ itself.

Photo 1. View across the fenced grassland, August 2024. The small area of sparse grassland can just be seen over the top of the butt to the left.

Photo 2. View towards butt, August 2024. The small area of sparse grassland is on the right. Note the good floral resources at the side of this area.

Photo 3. Side of butt where irregular disturbance has promoted an open-structured grassland/bare ground matrix with plenty of flowers. Note the presence of Gorse. August 2024.

Photo 4. View across the fenced grassland, August 2024. This shows the approximate route of the exploratory transect of the first visit, passing the small building to the right of the picture.

Photo 5. The northern edge of the Butts sample, with the adjacent regularly mown area with no Gorse, or Heather. The contrast between the regularly mown section to the left and the sample area to the right was stark. August 2024.

Photo 6. This restricted area of unmown and floriferous grassland was the most populous for mining bee and wasps. The invasion by Gorse was significant, but not as severe as elsewhere. August 2024

2.2.1 The historical butts 2, now outside the fenced area. A very large proportion of this sample area was covered in dense Gorse *Ulex europaeus,* within which were small areas of open ground, including highly compacted former turning areas, erosion gulleys, tracks and, most extensively, an area of sparse grassland and bare earth in the north-east immediately in front of the disused Butts. This was similar to the area already noted within the fence and relates to when the gravelly soil was stripped to push up to form the base of the butts. One large flowering plant of Heather *Calluna vulgaris* indicated a likely former heathy vegetation, indeed the district is called 'Old Heath'. As noted by Giles Groome in his report, this was easily the most populous area of all for mining bees and wasps.

2.2.2 There was no evidence of mowing or vehicle disturbance within recent years, the open areas being maintained by people walking across the area, especially climbing ot the top of the butt. Several of the paths were being closed up by developing gorse stands some 10 years old. Ted Benton drew my attention to a report he had made in the 1980s regarding Grayling Butterfly *Hipparchia semele* on the ranges. He warned, even then, of the invasive Gorse threatening the habitat for this species, so this is not solely a modern issue.

2.2.3 The area to the rear (south) of the butts was heavily Gorse invaded with almost 100% cover in most of it. Open areas were either the result of extreme compaction, possibly from when this had been a muster zone for troops, or current use as pathways. These compacted areas were not very productive for invertebrates, despite the open ground. There were several erosion gullies on the old butt which were well used as nesting sites by mining bees and wasps, but Gorse was rapidly obliterating these.

2.3.1 Northern Wet woodland 3. As noted in 1.9.2, this area was incorporated, for invertebrates with sample area 6 as it could not be readily sampled in its own right. Here after this shown as sample 13.

Photo 7. The interface between regularly mown grassland and the edge of woodland or hedgerow was sharp, with little transitional zone which had been mown occasionally. Northern hedgerow, August 2024.

Photo 8. This small area of the northern public grassland had escaped being mown for some time, although the edges were clearly being disturbed by passing traffic. Although not outstanding, it had more invertebrates than most of the sample area.

Photo 9. Most of the northern public grassland was being mown every year, note the old embankments with taller grass. The resultant habitat was very uniform for invertebrates. August 2024.

Photo 10. These small uncut areas in the northern grasslands were often floristically much more rich than the mown area, but overall not of great extent. August 2024.

2.4.1 Northern edge of woodland/hedgerow 4. This consisted of a block of predominately Pedunculate Oak, some 20 -30 years old with a degree of open canopy to the north of the range fence and several tongues of woodland/hedgerow running across the grassland to the boundary hedges in the north and east. These had a mix of tree species, mainly Oak and scrub English Elm *Ulmus procera*, with Bramble *Rubus* spp., Blackthorn *Prunus spinosa* and Hawthorn *Craetegus monogyna* frequent.

2.4.2 The grassland fringing this was generally a narrow strip of coarse grasses, poor in flowering resources, which changed abruptly to a mown, fairly short sward, but again mostly flower-poor. This was much less so along the edges of the northern scrub oak belt. There was a significant stand of Broom *Cystus scoparius* on the southern border of this. Generally the edges of the northern scrub oak area were the most productive for invertebrate species.

2.5.1 Northern public grassland 5. Towards the north, especially between to the Scrub Oak block and the fence, this was relatively flower-rich with a varied vegetation structure. Another more plant-diverse section was on the eastern side, especially were the regular mowing had been relaxed around notice boards and raised bunds. These areas were quite productive of invertebrate species. Generally, however, this was a uniform, low diversity, even-structured sward which produced relatively few invertebrates.

2.6.1 Central wet woodland 6. As noted in 1.9.2, a large proportion of this intended sample area was, in fact, abandoned dry field with large open-grown standard hedgerow oaks in filled with younger trees, notably Birch *Betula* sp. indeed on the northern side the remains of field fencing could be seen well within the wood. Two small wet areas, possibly originally ponds, were present within this, both were sampled for wetland associated invertebrates, but were not very productive. Otherwise, the path ran fairly quickly down to the stream, which had a small wet marginal area with old drainage ditches above on the southern side and then up again.

2.6.2 Walking up and downstream did not result in the discovery of extensive seepage areas from the gravels on either side. The wet edges appeared to be the result of flash-flooding, rather than ground water. This rapid flooding, with attendant debris, may well have been increased due to run-off from the hard surfaces of the surrounding housing.

2.7.1 Central **edge of woodland/hedgerow 7.** These hedgerows had a backbone of large, open-grown Oak standards and the sides had been allowed to expand into the grassland in many places, yet some of this grassland fringe had been cut intermittently, probably not deliberately, reducing the development of a tall, thatched vegetation structure. This grassland had a good level of flower-resource.

2.7.2 In other places, however, it was pinched hard against the expanding woodland edge, especially alongside the northern edge of the large triangular field immediately to the south of the Butts themselves. Unfortunately, both Oak scrub and Gorse were taking over, yet this area produced a good diversity of invertebrate species, possibly because it was on a relatively light soil. Here, again, Broom was a notable component of the flora.

2.7.3 A significant part of one field (the rectangular one at the northern edge of the sample with a fenceline running across it) had not been cut for several years, here the grassland fringe was tall and dense, with a much reduced invertebrate diversity.

2.7.4 Overall, this sample unit had a high representation of invertebrate species.

Photo 11. This photo of the central area, taken in October 2024, shows the open-grown Oak standards along the hedgerow, with its out-growth of scrubby species, here largely Blackthorn. It also demonstrates the structural outcome of the two extremes of grassland management. In the foreground is the uniform hard-mown grassland typical of both northern and central areas. This had been like this since early July. In the mid-ground is the long term unmown grassland, tall dense and species poor for floral resources and invertebrates. However, alongside the fence in the right mid-ground was an area, beyond the style, which had been intermittently cut. This had more diverse floral resources and associated invertebrates.

Photo 12. Looking across the mown central grassland towards the butts. The edge of the far woodland has been noted as having a good invertebrate diversity (2.7.2). However this mown grassland, with all its food resources removed in early July, had extremely low invertebrate presence, despite the soils being the same. July 2024.

2.8.1 Central grassland 8. As with the northern grassland much of this area was extremely uniform in structure. Despite some areas of open-structured vegetation and reasonable floral diversity, the range of invertebrates recorded was low. We were surprised at the low numbers of common grasshoppers here - until we saw the way in which it was being cut - everything went on the cut, leaving little chance for species such as grasshoppers to complete their life-cycle. There were almost no small uncut areas within this unit.

2.8.2 Except where fields had been taken completely out of cutting management for a number of years, from the size of some of the oak scrub perhaps as much as 10 years. These areas were dense grass and floristically poor (see 2.7.3 above).

2.9.2 'Special' 9. This was given the name 'special' as it was not clear from the aerial exactly what it was, but it was clearly different to most of the other areas. It was, in fact a gravelly soil supporting an open grassland which was being invaded by Oak/Hawthorn/Willow *Salix* spp scrub and Bramble, originally part of the adjacent gravel working.

2.9.2 It was water-logged in parts and dry in others. The grassland, though tall, was still open and fairly flower-rich. Although it was sampled for a reduced time of half an hour it had a good representation of both plants and invertebrates, though the later were not numerous, which may be, as elsewhere, a reflection of the generally unfavourable weather conditions of the recent years as much as its basic carrying capacity.

2.9.3 The vegetation structure was at a transitional stage from open grassland with some scrub to closing woodland. This is often a high diversity situation as regards invertebrates, there area lot of micro-habitat niches present. However, sites often pass through this stage in less than five years, then either being managed back toward a higher grassland content or being allowed to

Photo 13. Sample area 9 'Special' was structurally and botanically diverse, with an accompanying invertebrate diversity. It will not take long, however, for this to pass into a young woodland stage, with an accompanying drop in invertebrate diversity. July 2024.

Photo 14. Birch Brook wet woodland south. The woodland floor here was more consistently moist, with several clear seepages running into the brook from both sides. It is some 10m lower than the brook at the north, which may well have brought it much nearer the natural water table. July 2024.

pass into woodland. Keeping an area somewhere near this 'sweet point' requires deliberate management input of one sort or other, although drought can help prolong it.

2.9.4 Although the area was just outside the MOD potential Mitigation Area, doing the survey here was valuable as it gave an insight into what might happen if elsewhere were to not to be under extremes of cutting management - or no cutting at all. Within the rest of the site the hedgerows, especially those in the south area, were, structurally, the nearest to this situation.

2.10.1 Southern wet woodland, 10. This was by far the most extensive area of wet woodland sampled during the survey. There were several seepages running into the brook from both edges of the woodland and the northern bank generally, against the old gravel working, was consistently moist, possibly seepage driven by the water held in this working. The sample area is some 10m lower than the brook at the north/central sample point, so may be closer to the natural water table and hence wetter. On this point the section of Wier Lane close to the wood was wet every time we passed along it during the year, another indication that the water table is close to the surface here.

Photo 15. Southern Hedgerow/woodland edge. These were more diverse, both structurally and botanically, than those in the central block with less dominance by mature Oak. July 2024.

2.10.2 The southern margin of the woodland graded into rather drier habitat, but with some open sunny patches, which helped increase the number of invertebrates recorded. This was noted in the LoWS report as more ancient woodland than the rest of Birch Brook.

2.10.3 This sample had the highest number of unique (recorded here but not elsewhere) invertebrate species recorded and it was also high for botanical uniqueness, although this was not a distinctly so as for invertebrates. This reflects its 'non typical' status as a longer-established wetland and woodland area. It must be remembered that this area was sampled for half an hour only.

2.11.1 Southern hedges and woodland edge. Many of the hedges here less uniform structurally, with more gaps between the standards than in the north area and slightly more species diversity, including several good stands of Aspen *Populus tremula*, indicating underground seepages. This tree has a large number of invertebrate species associated with it. At Middlewick, however, we were unable to find many of these, despite hard searching.

2.11.2 In common with the northern (4) and central (7) edges this was a highly invertebrate species-rich component. This is to be expected as there are the resources contributed by the old trees as well as the scrub and grassland. However, the structural diversity also contributed, providing small enclaves of warm habitat.

2.11.3 Perhaps significantly, some of the species recorded were also typical of the more heathy parts of the northern area, such as the fern Bracken *Pteridium aquilinum* and invertebrates such as the digger wasp *Ammophila sabulosa* and the Tachinid fly *Cistogaster globosa*, indicating that the underlying environmental conditions here were similar, in parts, even if the overall habitat is not currently extensive.

Photo 16. Southern grasslands. These had developed over former agricultural land, which use had included arable cultivation. However, the 'remnant' plant species present in places, especially where the soil was lighter, suggests that such arable use had not been long term. July 2024.

Photo 17. Southern grasslands. Scrub within the grasslands was between 1 and 2m tall, indicating a likely period since cutting of about 5 years.

2.11.4 Although there had been no widespread cutting of grass in the recent past, the grassland itself was generally less species diverse in most places, although along the southern edge of Birch Brook the botanical variety was rather better, if becoming overwhelmed by advancing Bramble. Path cutting, undertaken by Landmark, we assume, as well as simple foot pressure contributed to this local increase in structural and species diversity.

2.12.1 The southern grasslands were a mix of vegetation types, from Sheep's Sorrel *Rumex acetosella* and Broom, indicating more sandy, acidic conditions to the rather more neutral/basic soil associated Wild Carrot *Daucus carota* and Field Scabious *Knautia arvensis*. The overall vegetation was rather rank due to both residual nutrient levels due to previous farming practice and the long term lack of cutting or grazing management. (Some of these fields were actually cut during the survey.)

2.12.2 The influence of previous farming practices, including application of nutrients, was very evident in the presence of regular stands of Creeping Thistle *Cirsium arvense* and large-leaved Docks *Rumex* spp.; clumps of Stinging Nettle *Urtica dioica* were less frequent. Despite this, the regular occurrence of plant species not normally present in long-term, intensively cultivated fields argues that any arable usage was fairly short term and not very intensive.

2.12.3 Given suitable management regimes, these fields could be reverted to something similar to those of the northern area, without resorting to the dubious practice of adding Sulphur to acidify them, or re-seeding with an acid grassland mix, two poorly-informed suggestions in the Stantec Report.

2.12.4 Many of the invertebrate species present in the northern section are already present in the southern grasslands; what is required to improve the available habitat is more varied management geographically and temporally, which would open further ecological spaces for yet other species. This general comment applies throughout the site.

3. Analysis of the invertebrate data

3.1 This report updates the data for the invertebrate survey and means that both botanical and invertebrate data is complete, as far as this survey is concerned. As set out in the introduction, neither dataset claims to be exhaustive. As noted earlier, his data shows the amalgamated outcome for the original samples 3 and six as sample 13.

3.2. The analysis offered here does not deal with detailed species-level information and relationships between habitat resources. However, there is the capacity to do so in the future if specific, species-level, queries are required. The spreadsheet giving the invertebrate species list does, however, provide location information (amalgamated presence information) and some notes on each species (see appendix 1 for further information).

3.3 In this report we treat both botanical and invertebrate information in terms of known totals with broad comparisons between sample areas. The comparison in terms of species recorded in each sample component is a key feature of the brief for the survey. Such a comparison gives an index which may be used to gauge the contribution of any one sample component to the overall biodiversity value of the whole site.

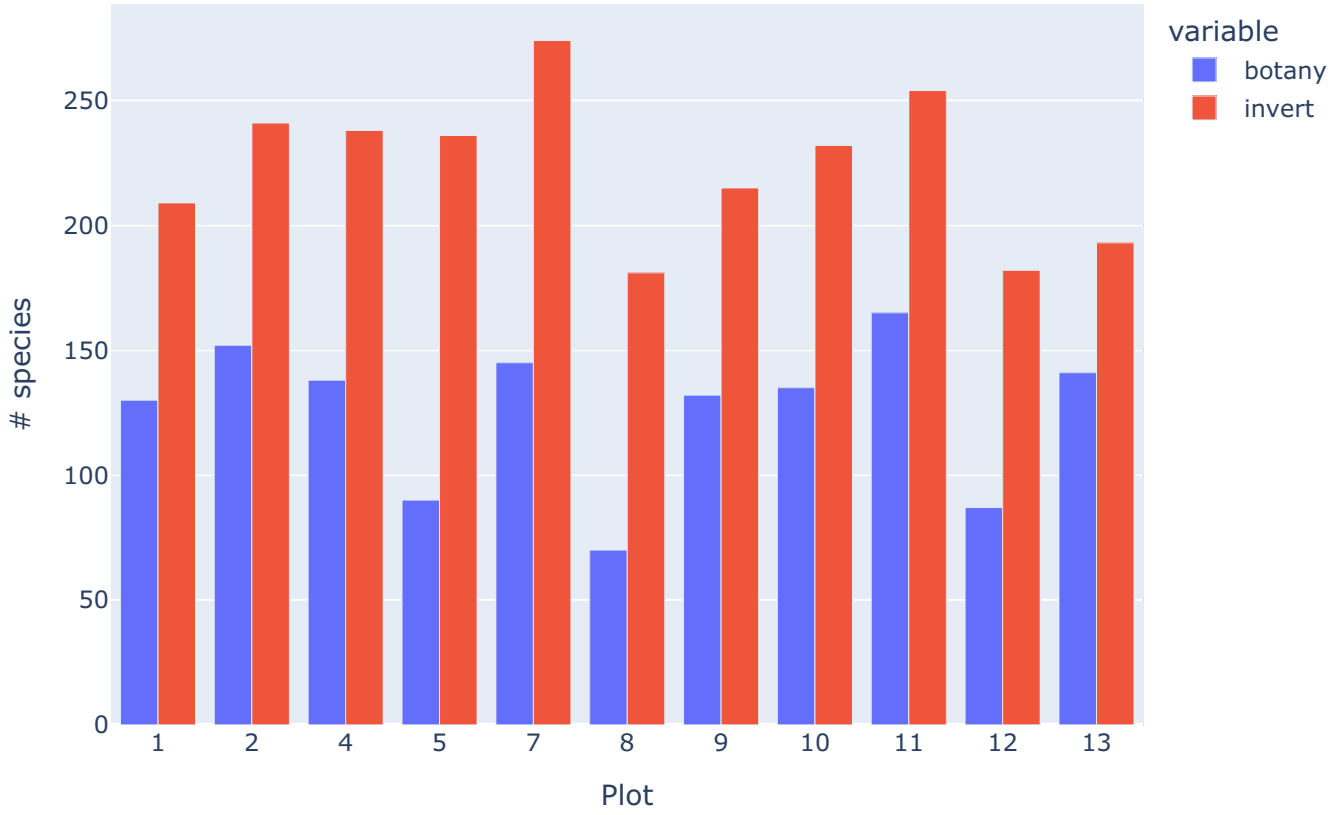
3.4 These comparisons are presented here as a short series of graphs. The raw data, including dates, underlying these are available on request, but are not reproduced here for each sample unit, being species totals alone.

3.5 This summary data is shown in graphic form as Graph 1 (Botany and Invertebrate separately) and Graph 2 (Botany and Invertebrate combined) plotted against sample area.

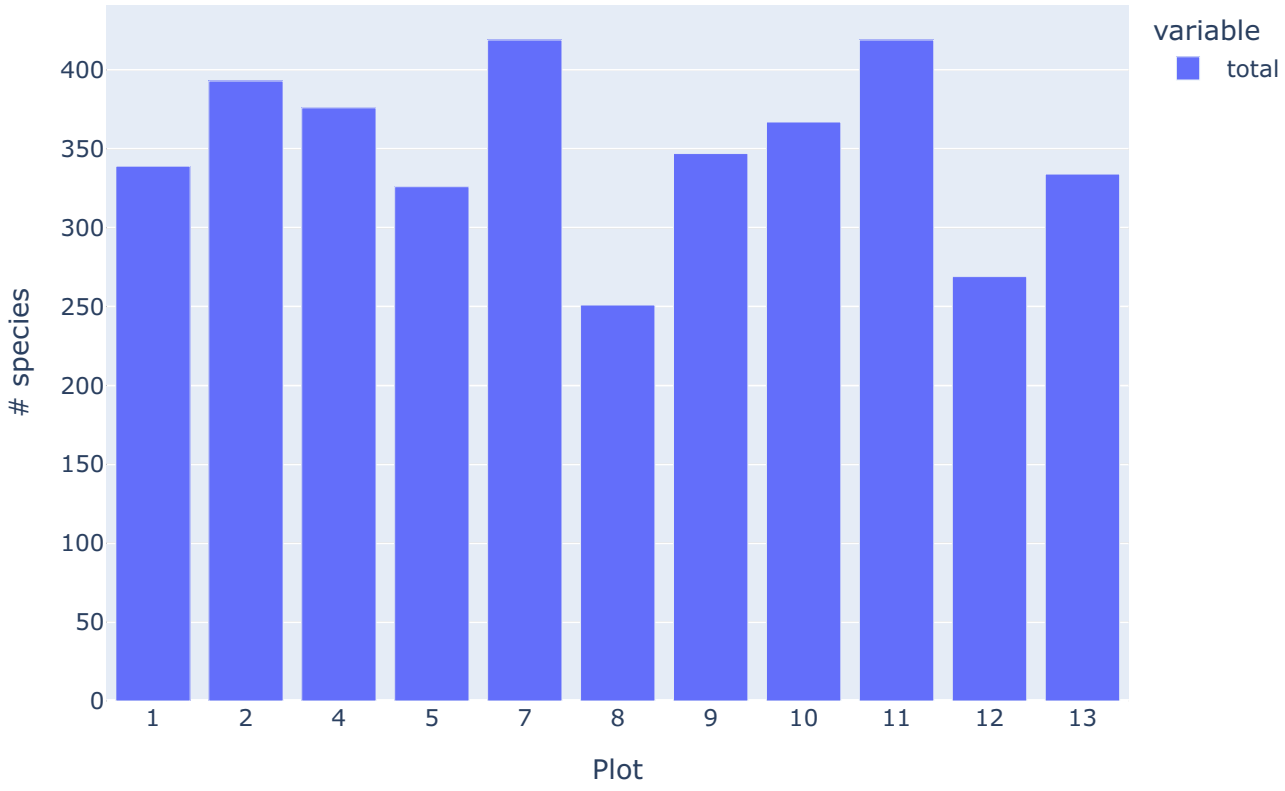
3.6 No attempt has been made to include any organism outside the brief of the survey. For instance, Nightingales *Luscinia megarhynchos* (a much quoted factor at Middlewick) have territories in developing scrub with tall grassland between thick scrub stands. Nesting is close to ground level in dense scrub, but foraging requires more open habitat. This is typical of woodland edges and hedgerows with a good ecotone development. These conditions, especially where there is reasonable botanical diversity, also suit invertebrate diversity (regarded as an index, rather than an absolute measure of food availability). The presence of such food resources is, from the Nightingale habitat viewpoint, highly significant.

3.6 Graph 3 shows the number of taxa recorded only at the sample component numbered (unique). Botany and Invertebrates are shown separately for each sample. A ‘unique’ record does not mean that the taxon was not present elsewhere, it was just not recorded under the protocol for the survey. There may be very good reasons why such a taxon is not likely to be present in a sample, but it is not possible to attempt such analysis on the intensity of data collection for this survey, it would need a very much greater time input for each sample. Highly contrasting levels of ‘uniqueness’ are likely, however, to indicate real differences between samples.

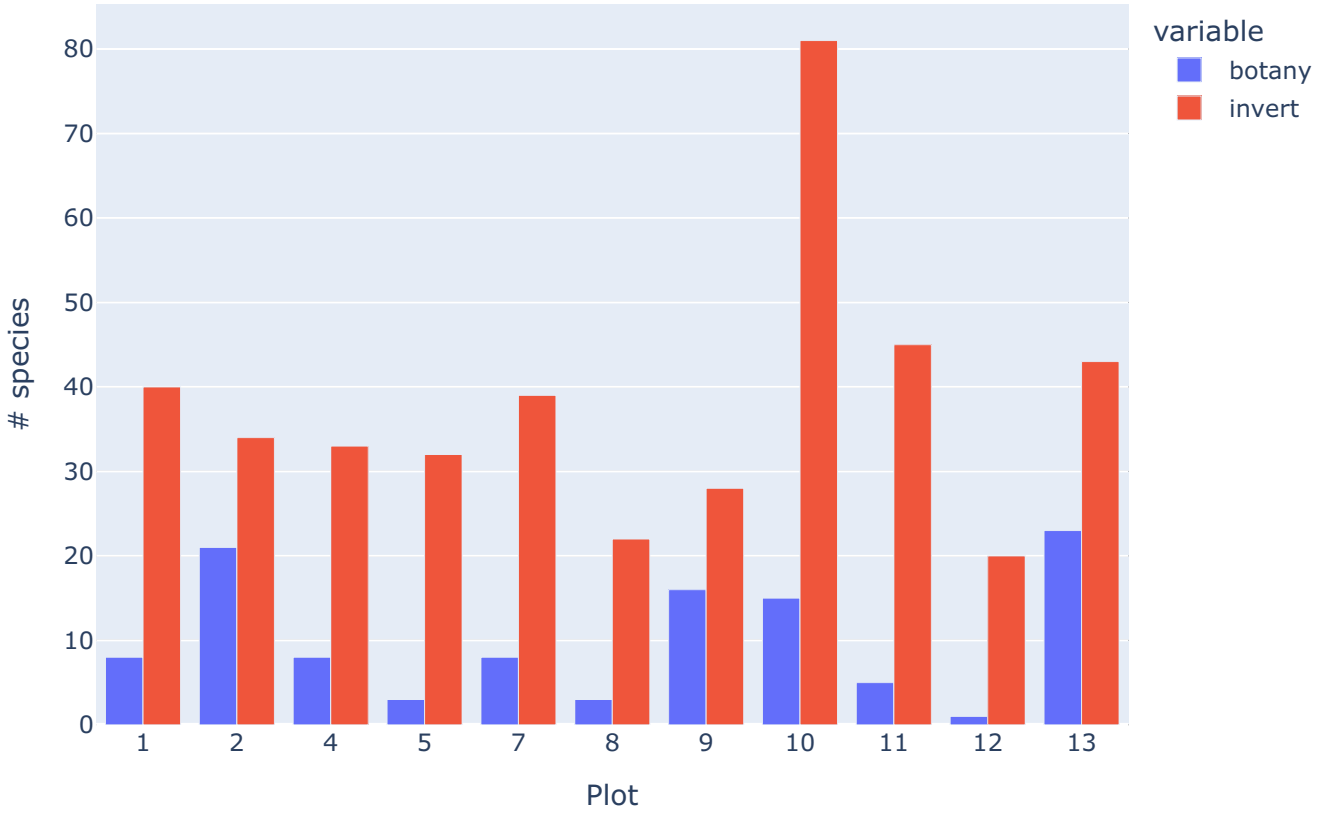
3.7 Graph 4 shows the unique species for botany and invertebrates combined per sample plot.



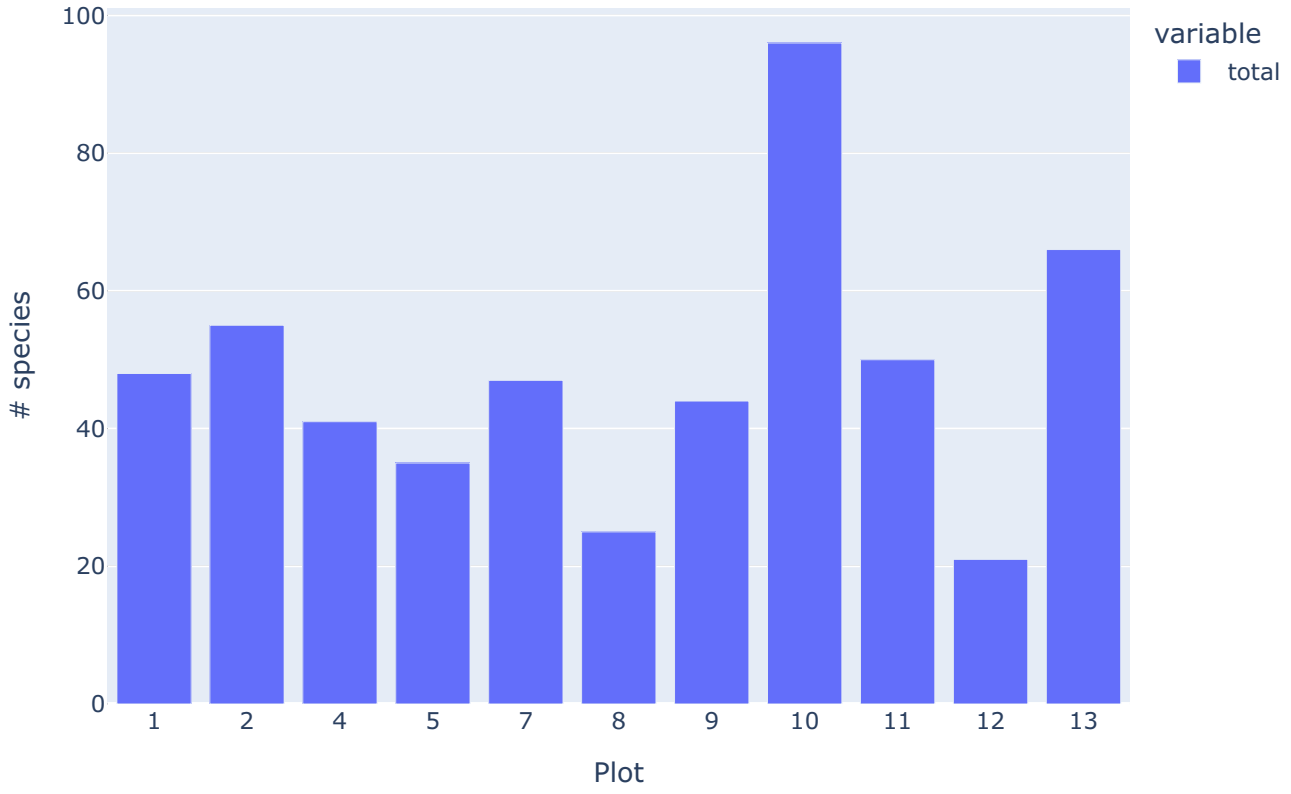
Graph 1 , Summary of survey species numbers (Botany and Invertebrates separately) by sample number



Graph 2, Summary of survey species numbers (Botany and Invertebrates combined) by sample number



Graph 3, Summary of unique species (Botany and Invertebrates separate) by sample number



Graph 3, Summary of unique species (Botany and Invertebrates combined) by sample number

4. Interpretation of the graphs

4.1.1 **Graph 1** In all areas there are more invertebrate species per sample than plant species, which is to be expected. Many of the invertebrate recorded in area 1 required more intensive examination than had been possible in preparing the interim report, hence the difference in totals note in that document. It should also be borne in mind that access to this area was not possible for the last two survey rounds.

4.1.2 The currently mown grasslands (5 (most), 8, 12) have the lowest number of botanical species. The totals for invertebrates in 8 and 12 were similar and considerably higher than the botanical diversity for these grasslands. The total for grassland 5 is higher, probably because of the small area of unmown grassland with a varied scrub edge (photo 8). 8 and 12 were, however, among the lowest invertebrate totals. The botanical totals and number of unique species are also low. All three samples have the lowest combined totals of the entire survey.

4.1.3 This overall pattern reflects the universal mowing regime over the northern and central samples and the coarse and relatively recent nature of the southern grassland. Consistent mid-summer mowing interrupts the life-cycle of many plants and invertebrates, leading to lower overall botanical and invertebrate diversity; species and vegetation structure is a major driver of invertebrate diversity. A complete lack of disturbance (mowing being one such cause) also leads to lower diversity.

4.1.4 Both the targeted parts of area 1 and 2 (butts) had a sparse grassland with plenty of bare ground, structural variety and reasonable floral diversity. Of these, area 2 stood out as having a high diversity and numbers of mining bees and wasps, including several of conservation significance.

4.1.4 All three wood edge and hedgerow samples (4, 7, 11) had high numbers of invertebrate species and numbers of unique species. This reflects, in part, the added botanical diversity of the wood-edge and narrow sampled grassland strip. However, the fact that the grassland strip often 'missed' the cutting regime, being only intermittently cut of a number of years, was also a factor.

4.1.5 The wet woodlands (13, 10) were clearly different in species composition to the other samples, 10 markedly so (graph 3, unique species), which supports the interpretation of these areas made in 2.6 and 2.10.

4.1.6 With a total number of invertebrate species of 937 it is clear that each sample area is making a good contribution to the overall invertebrate biodiversity, with around 150 species per sample area recorded. This confirms that the whole area is greater than its individual parts and must be thought of as a whole, rather than a series of independent 'bits'.

4.1.7 Although areas 9 and 10 received less sampling effort than the other samples, this does not mean that double the sampling effort would have resulted in double the totals. They would, undoubtedly, be higher, but, without further information to create species accumulation curves (not available) how much higher cannot be known.

4.3.1 Looking at the relative numbers of 'unique' species in each sample gives insight regarding the areas which are different to each other and those which are similar in terms of the actual species concerned (graphs 3 and 4).

4.3.2 The two 'standout' samples are 2 for the botany and 10 for the invertebrates. The comparison of 10 with 13 supports our field opinion that the two woodlands were rather different for invertebrates (graph 3). Looking at the botanical data, this difference is supported here too. Wet woodland 10 is clearly something rather different to anything else in the whole area, which is emphasised in the plot for the two factors combined (graph 4).

4.3.3 Of the woodland edge/hedgerow samples, 7 had the highest total of invertebrates and a strong 'unique' component. 11, in the south, had, like area 1, a number of species which required a greater degree of identification than available at the time of the interim report. In fact it

eventually reported high numbers of species, both botanical and invertebrate. The unique invertebrates were actually the highest total for this sample type.

4.3.4 The grasslands (5, 8, 12) are fairly even in this metric for the invertebrates. The botanical result for 12 reflects its generally low botanical diversity.

4.3.5 Taken as a whole, 1 and 2 are well represented by 'unique' species (graph 4), although the botany contributes more to 2 and the invertebrates more to 1.

5. In summary

5.1 The brief for this survey was to be independent. Consequently, although both the Stantec reports and the LoWS reports were included with the original bidding papers, these were skimmed over to give enough to bid against and not read or analysed in any detail until the point of writing the interim report (December 2024). Any comment made about the coverage and interpretation in these reports follows the majority of our data collection and is based on the outcome of this data. This final report does not change our view of the overall situation, although some of the detail is slightly different to that of the interim report.

5.2 Equally, although we have been contacted regarding the 'Friends' data, and indeed do now (November 2024) have a summary copy of the biological records held by Essex Field Club, this has not been used to inform the survey procedure or the comments in this report. Indeed, it requires considerable re-ordering and additional information to be used in any depth at the moment.

5.3 It must be remembered that, whilst the botanical information for the invertebrate survey is reasonably complete at the level intended (no bryophytes or mosses), that for the invertebrates is most emphatically not. More survey effort would, of course, result in more species, especially if additional target groups are considered. Again however, we think it unlikely that the overall picture would change greatly, at least while the current management regimes are in operation.

5.4 The number of taxa recorded for the invertebrates strongly supports the entire area as being of conservation significance for invertebrates. Most importantly, there is no one sample type which stands out as being of irreplaceable significance at this level of analysis. The closest to this situation is the southern wet woodland (10), though a part of this is outside the Mitigation Area. The area around the butts (both inside and outside the fence), with its more open, heathy nature, but with a good variety of flower resources is highly significant for the aculeate Hymenoptera (Bees, Wasps and Ants). This does not mean that other components are of lower value, they are just different.

5.5 Although the Stantec report notes the presence of invertebrates and an invertebrate assemblage of significance, in practice this is a superficial recognition. Only two days were identified for invertebrate survey, out of an overall period between 2017 and 2020. Even then these were cancelled on the basis of poor weather conditions when the range was open (no firing). Why were no alternative dates explored over the entire time period?

5.6 The map produced showing the assessment of invertebrate habitat is, in the light of the (incomplete) results of the current survey woefully inadequate. This was based, apparently, on a walk-over survey which failed to recognise the potential significance of the hedgerows in the southern area, despite the presence of a recognised significant population of an invertebrate-feeding bird (Nightingales are related to Flycatchers), quite apart from the habitat resources for invertebrates presented by this varied vegetation structure.

5.7 In fact, the only invertebrates noted in any form are a small set of ground-nesting species, plus one (the bee *Ceratina cyanea*) which utilises old Bramble stems for its nest, itself a hedgerow feature. The report copies the section from the LoWS report in providing this information. No separate survey was carried out.

5.8 With regard to the ground-nesting wasps, the conditions required for nesting by these species (bare ground - just one of several partial habitat requirements for the named species) were taken as indicative of habitat quality for a very much larger range of invertebrates, likely to be well in excess of 1000 species (including known species not recorded by the current survey). The current sample-based assessment provides ample evidence of the unsupportable nature of this claim as summarised by the map.

5.9 It is quite clear that there could be significant biodiversity improvements through changes in the overall management of the area, which is currently dominated by the operational requirements of the MOD. These have resulted in some biodiversity gains, especially the expanding hedges and woodland edges, but also some losses. However, vegetational successions make these essentially 'expanding woodland' situations transitory processes and the feature would need to continue expanding indefinitely across the grasslands, to the detriment of the grasslands themselves - as has happened historically along Birch Brook. It is encouraging to note that the MOD is open to adjustments of its management on the land it is retaining, provided this is does not impact its operational imperatives.

5.10 At some point there needs to be re-setting of the process by cutting back the woody growth and letting it grow again if the grasslands are not to be lost eventually and the whole area turn to woodland. Rotational management interference is key here.

5.11 This example emphasises the core of the issue at Middlewick. It currently has an excellent biodiversity presence and the sheer size of the overall area is a major factor in its long-term sustainability. The drivers which maintained the area in the past, even if not the best for biodiversity, are now gone on at least part of the area and the site is changing, largely for the worst overall.

5.12 A revised combined use, ideally taking full account of the protection of the biodiversity value, needs to be decided for it as a whole. This needs to be done working with the landowners, whoever they may become, and within their operational requirements. A source of funding to support the necessary management input needs to be identified. Realising this aim will not necessarily completely please everyone concerned about the site; there will be losers and winners. Realistic co-operation and creative thinking is needed to explore the opportunities for finding the best way forward. The site and its biodiversity as well as its current use as a large public open space, which we have seen to be sensitive during our survey, deserves this.

5.13 Two species of bee, *Lasioglossum fulvicorne* and *Sphecodes albilabris*, were recorded by Ted Benton who accompanied us for part of the April and May visits, both from the butts area (2). These are not included in the main report or species lists as that would upset the comparable survey effort approach.

5.14 However, they serve to underline the fact that there is more to be discovered regarding the fauna (and probably flora) of Middlewick. *Lasioglossum fulvicorne* is a very widespread and frequently found species, *Sphecodes albilabris* is a very recent arrival in GB which is a cuckoo parasitising the, also recently arrived (in eastern England) bee *Colletes cunicularius*. This is the first time this species has been found at Middlewick.