Resurvey of the vegetation and structure of the open areas of Wild Ken Hill rewilding area, 2022

Graeme Lyons

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Fig. 1. Smooth Cat's-ear at Ken Hill in June.

0 – Summary

Wild Ken Hill rewilded a large area of some 422.7 ha of itsfarm during 2019 and 2020. The summer of 2019 was the last crop for much of this area and as such, the 2019 survey season was an exciting opportunity to collect baseline data before any changes were made to the site. The author was commissioned to carry out a wide range of surveys in 2019, including the baseline vegetation composition and structure survey and this report contains details of a partial repeat of the open areas of this survey in June 2022.

The rewilding area was gridded into a 200 x 200 m grid and circular plots placed at the nodes of the grid. A high-accuracy GPS was used to accurately mark the centre of each 300 m^2 circle (a radius of 9.77m). In each plot, species-richness, nectar abundance and diversity, structural types, seedlings, saplings, canopy trees and dead wood were all counted, identified and measured. A total of 57 open plots (out of a set of 98) were recorded in this resurvey, excluding the woodland plots where little change was expected.

In 2019, the open plots had a slightly higher species-richness of 16.8 ± 2.1 than the whole site average. In 2022, the number of species per plot had nearly doubled to 33.2 ± 1.1 and this was a highly significant result (W=104, n=57, P<0.001). The highest species total in any plot was now plot 2, with an impressive 60 species (this was also relatively high in 2019 with 37 species). The lowest number of species recorded in a plot had risen to 13 (two in 2019 on six arable plots). Surprisingly, this was a species-poor area of the Plain.

Yorkshire-fog is now the most frequent plant recorded in the plots, noted in 47/56 (85.5%) of them. After this it was **Creeping Thistle, Ribwort Plantain** and **Rough Meadow-grass** (all 41/57). In joint 5th place, **Common Cat's-ear, Common Ragwort** and **Soft Brome** (all recorded in 40 plots each) added a significant nectar source that was not present in 2019, in the form of yellow composites. In 2019, **Black-grass** was the most frequent species in 25 plots (in 2022 – only in 19), followed by **Yorkshire-fog** at 21 and **Creeping Thistle, Ribwort Plantain** and **Knot-grass agg.** (all recorded in 19 plots each).

The mean number of species with status per plot rose significantly, from 0.21 ± 0.08 species with status/plot in 2019, to 0.81 ± 0.08 in 2022 (W=98, P<0.001). Seven species with conservation were recorded in the open plots in 2019, while only five species were recorded in the open plots in 2022. All but one of these (**Hoary Mullein**) could be considered an arable weed. **Smooth Cat's-ear** was new to the plots and is now the second most frequent species with status on site, recorded in seven plots. **Common Cudweed** (Near Threatened) was now the most frequently recorded, noted in 35 plots and was ranked the 11th most frequently recorded species of all (only recorded in three plots in 2019). **Dwarf Spurge, Stinking Chamomile, Field Woundwort** and **Corn Marigold** were not recorded in the plots in 2022.

The mean species-richness in the 57 nested quadrats in 2022 was 8.7 ± 0.3 species/m^2. The minimum number of species was two in plot 104 and the maximum was 20 species in plot 96, and remarkably these plots are diagonally adjacent to one another in the southern fields.

A total of 24 species of arable plant have now been recorded (21 in 2019 and only 13 in 2022). The three new arable weeds in the plots in 2022 were **Smooth Cat's-ear, Dwarf Mallow** and **Hairy Buttercup**. The mean number of arable plants per plot rose significantly from 1.19 ± 0.16 species/plot in 2019 to 2.21 ± 0.23 in 2022 (t=4.00, P<0.001). The most species in any one plot, was seven species in plot 103 (the same plot that had the most species in 2019, with six). This is the plot that is still fenced out of the grazing/rewilding project and is currently managed as a bulb field. **Oak-leaved Goosefoot** was also recorded here new to 2022.

In 2019, a total of 26 species were classed as non-native across all plots but this figure was only 16 when looking at the open plots in 2019 and only nine species in 2022. The only new non-native species in the plots in 2022 was unusually, **Fox-and-cubs**. The most frequent non-native species was **Canadian Fleabane**, a common ruderal that was found in 26 of the 57 plots in 2022, yet only one of these in 2019. The second most frequent alien in the open plots in 2022 was **Turkey Oak**, occurring in seven of the 57 plots.

The mean number of non-natives per plot dropped from 1.18 ± 0.09 in 2019 to 0.89 ± 0.09 in 2022 but this was not significant (W=192, P=0.09). All crop species were classed as non-native and as these were greatly reduced on the 2019 survey, the number of non-natives per plot was simultaneously boosted by the spread of species such as **Canadian Fleabane** and **Turkey Oak** etc, cancelling one another out.

Of the 57 plots recorded, 46 showed an increase in the number of species, ten were found to have a decline in the number of species and one, no change. The 57 plots were assessed as either coming from an arable origin, being situated in existing grassland or an arable edge or margin which generally had elements of both but usually always a higher species count than those coming from arable originally. The data was then analysed to see if the significant difference between species-richness at the landscape level held up within the three different plot types. Only the plots that were arable initially showed a highly significant increase in species-richness between 2019 and 2022 while the edge and grassland plots showed no significant increase.

A total of 1075 seedlings were recorded in 2022, as compared to 651 in 2019. The mean was 18.5 ± 5.2 in 2022, as compared to 11.4 ± 4.2 in 2019. This difference was statistically significant (W=163, P<0.001). Seedlings were recorded in 40/57 open plots in 2022 (as compared to 22 plots in 2019). This was also found to be statistically significant (X^2= 11.5, P<0.001). The most abundant seedling was **Ash** at 357 seedlings, followed by **Pedunculate Oak** at 134 and **Broom** at 116. The most abundant seedling in 2019 was **Broom**, at 139 seedlings. The most frequent seedling was **Hawthorn**, found in 20/57 open plots, followed by **Pedunculate Oak** at 19 and **rose sp.** at 15. In 2019, the most frequent seedling was **Pedunculate Oak** in 12/57 plots.

Very few saplings were recorded in the open plots. In 2019, a total of 80 were counted while in 2022, there were 117 in all. In 2019, the mean number of saplings per open plot was 1.40 ± 0.69 and in 2022 it was 2.05 ± 0.70. This was not statistically significant (W=20.5, P=0.29).

Mean cover of **Bramble** rose from 3.01 ± 1.37%/plot in 2019 to 3.43 ± 1.07% in 2022. This is a very subtle difference and only the weaker Wilcoxon test ws used with many matched pairs (that is, there were a lot of zeros in the data). Although this test did show a signficant increase, it should be taken interpeted cautiosuly, despite Bramble inevitably spreading in time (W=85.5, P=0.02).

A total of 14 qualifying canopy stems were counted and measured in the open plots in 2019 (a tiny fraction of the 594 stems in all), compared to 20 in 2022. The mean number per plot was 0.25 ± 0.12 in 2019, rising to 0.35 ± 0.17 in 2022. There were so many zeros in this dataset that not only were parametric tests not available, the non-parametric ones were misleading, so it is best to report this result as not being significant.

A total of 1.45m^2 of basal area was measured in the open plots in 2019 (41.7m^2 in the whole survey) compared to 1.69m^2 in 2022. This being a combination of trees growing and new trees reaching the 20 cm GBH qualifying threshold. As with the above, statistically it is not good practice to make any realistic statement on this but the reader can assume this difference is not significant.

Plots with only two structural layers were the most abundant type in 2019 and were almost always crops, where the only layers present were the crop layer and almost always some bare ground. By 2022, no plots were recorded with less than three structural layers and the most frequent number of layers per plot was four. The distribution is already much healthier looking and less skewed to the left. Rank grass and the four woody layers are now the least represented in the open plots, while short and medium grass have spread.

The mean number of structural layers rose significantly from 3.6 ± 0.27 in 2019 to 4.8 ± 0.21 per plot in 2022 ($W=142$, $P<0.001$).

The mean nectar abundance, diversity and index all rose significantly. The abundance and diversity both rose from a mode of zero to a mode of two and the nectar index rose from a mode of zero to a mode of four. In 2019, 33 open plots scored zero for nectar abundance and diversity while in 2022, there was only a single plot where there were no nectar sources at all.

No measurable deadwood was found in the open plots.

The rewilding area at Wild Ken Hill is generally progressing well, especially at the landscape level, with mean botanical species-richness, arable plants, plants with conservation status, number of structural types, nectar abundance and diversity all improving in the right direction and statistically significant. However, much of this gain is in the ex-arable plots, some existing grassland and arable margins showed little improvement or in some cases, a decline and this is covered in detail in the management recommendations, being a side effect of the crude “one-size fits all” approach to rewilding, where animal numbers are kept static in space and time.

Extensive, year-round grazing is in the short term, beneficial, especially as compared to intensive agriculture. Yet by doing the same thing, everywhere all of the time, livestock can start to act as a homogenising force, rather than increasing diversity. Pulsing is key. That is, allowing for large parts of the site to be rested at any one time, bring a disturbance cycle into the mix. In terms of rewilding, this is actually far more naturalistic than keeping grazing levels continuous in one (albeit relatively large) area, as it emulates predator/prey relationships and seasonal migration. Nofence technology is increasingly becoming a way to achieve this.

Management recommendations based chiefly on not leaving grazing animals on site, everywhere, all of the time are provided. Significant rest periods for large areas of sites annually are vital to restore good biodiversity habitat in the long term.

This survey should be repeated in between three and five years but if there are rapid changes that need capturing, this could be brought forward.

1 – Introduction

Wild Ken Hill rewilded a large area of 422.7 ha of its farm from 2019 and 2020. The summer of 2019 was the last crop for much of this area and as such the 2019 survey season was an exciting opportunity to collect baseline data before any changes were made to the site.

The author was commissioned to carry out a wide range of surveys in 2019, including the baseline compositional and structural vegetation survey, of which this survey is a partial repeat, focusing only on the open areas where the effects of grazing are more evident and the rapid vegetation change from crop to grassland is also more notable than under the canopy.

The aim of the survey was to create a robust baseline for assessing change over the coming years, using an 'atlas' like approach. That is to generate grid maps of the 98 points to allow for the spatial analyses of a wide variety of biometrics, as well as numerical analyses. The true power of this approach will be realised when more data points are collected in the future. It should be noted that more data has been collected here than could be analysed in this report and Wild Ken Hill is encouraged to come up with analyses based on the data that has been collected that they think will be of benefit.

Three years on and grazing has been in place for approximately 18 months at the time of survey, with very few other interventions in the rewilding area. Cattle, ponies and pigs all have access to the 400+ ha enclosure and at the time of survey, the animals could access all areas and had all been on continuously, without a pause in the grazing, anywhere on site, with the exception only of the ~20 ha beaver enclosure. This survey will also help to inform the grazing at Ken Hill.

2 – Methodologies

2.1 – Logistics

2.1.1 – The grid

A 200 m grid was selected to give approximately 100 sample points across the site, this being a compromise between a large number of samples and cost-effectiveness. The nodes of this grid were posted at multiples of 100 m (rather than 200 m) due to logistical reasons of where the 200 m posts fell. Plots were labelled 1 to 104.

Seven points were not sampled for various reasons. One plot was added that appeared on paper to be too close to the edge (any plots that were partially intersected by the proposed boundary fence were discounted). The full survey therefore consists of 98 plots.

This partial survey targeted only the open areas, of which 57 (59%) plots qualified as such. Therefore, to make valid comparisons, only these data from the 2019 data set are used when comparing to the 2022 data set. This also means that any statistics reported from 2019 are going to be different to those reported in the 2019 report proper, as that covered the entire data set. It is best therefore to carefully define these data sets and subsets as; 2019 entire, 2019 open and 2022 open.

As each plot is 300m^2, 98 plots cover an area of 2.94 ha. This means that only 0.7% of the 422.7 ha rewilding was sampled and this proportion will be approximately the same for just the open areas.

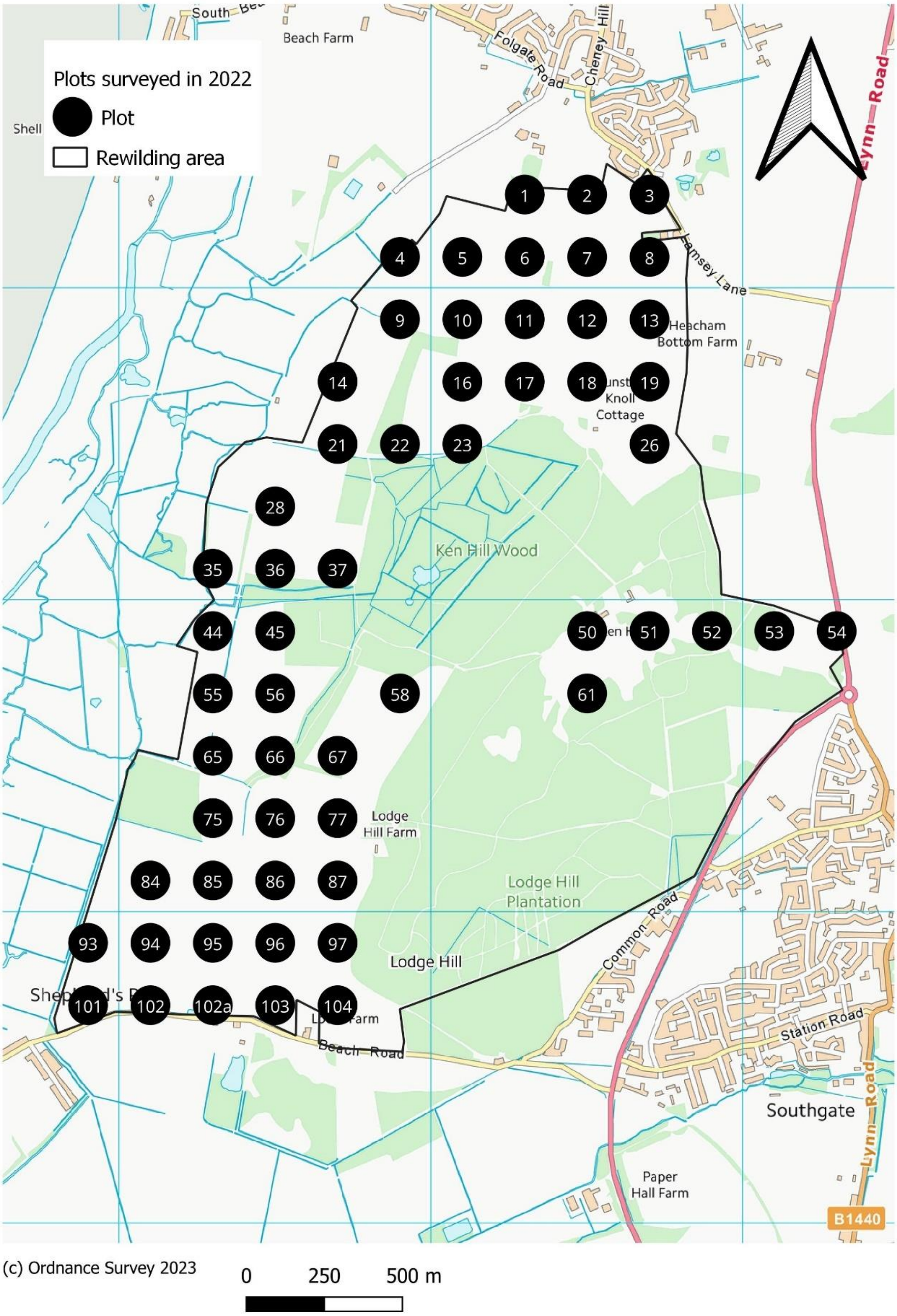


Fig. 2. Map of the survey plots

2.1.2 – Locating the points

A high-powered GPS (Leica Z-Rover) was again hired by the author to carry out the survey in one week in June. This allowed the author to get within 2-3 cm of the exact grid reference. This is crucial for measuring the regeneration of woody plants and other variables. Placing markers was thought to be too problematic with the changes in management that are planned, large numbers of livestock would likely destroy any markers, as would any mechanical intervention. The hire of the device cost around £180 for the week.

2.2 – Survey plots

The basic methodology of the plots follows that of Swift with a number of additional methods targeted at monitoring rewilding, added by the author. It is summarised here as follows:

Once the exact location had been found, a stake was placed in the ground at the exact spot and the high-powered GPS placed on stand by and laid carefully on the ground. A Tape measure was connected to the top of the stake and run out to exactly 9.77 m. This would delineate a circle of exactly 300 m^2.

2.2.1 – Species-richness of all plants

All species of plant (including those only found in the other layers below) were recorded using the DAFOR scale.

- Dominant
- Abundant
- Frequent
- Occasional
- Rare

Plants were recorded to species where possible but in some occasions were only recorded to genus or family.

2.2.1.1 – One metre nested quadrat (newly added feature)

In 2021, the author added a 1 x 1 m nested quadrat to the methodology. Mainly so it was possible to give a mean species-richness per square metre. This was clearly not carried out during the 2019 survey. It was completed in the same way using DAFOR and the GPS point was always placed at the south west corner (the origin) of the quadrat.

2.2.2 – Seedling layer

All seedlings were counted, measured and identified within each plot. Where large quantities were present, estimates were made. A seedling was considered as any tree or shrub under 1.3 m in height. It was decided to remove Bramble from the seedling count as it wasn't possible to accurately count it. Raspberry was also removed.

2.2.3 – Sapling layer

The sapling layer was considered as all plants over 1.3 m in height but with a GBH of under 20 cm. Multi-stemmed plants, such as Hazel, were counted as stems rather than individual plants (e.g., a 400m tall Hazel with 20 stems would count as 20). Bramble was not included in the calculations as it was not possible to count individual plants, instead an overall percentage score was made for Bramble.

2.2.4 – Canopy layer

All trees with a Girth at Breast Height (GBH) of over 20 cm were classed in this category. They were measured using the same tape attached to the central point. This allowed for a total basal area per ha to be calculated.

2.2.5 – Structure survey

Each of the following structural layers was assessed at the end of the plot using the same DAFOR scale above. It helps to do the easier and more obvious layers first, those that are Rare or Dominant, that way the less obvious layers that sit between these extremes, can be calibrated between them. There are a maximum of nine structural layers, these being:

1. Bare
2. Short grass
3. Medium grass (beat was placed here for want of a closer fit)
4. Rank grass (including cereal crops)
5. Tall herb (Oilseed Rape was also placed here)
6. Low scrub
7. Medium scrub
8. Established scrub
9. Established trees/woodland

2.2.6 – Nectar sources

Nectar sources were assessed in two ways; abundance and diversity. Each was assessed on a scale of 0 to 3. Clearly if abundance was scored as 0, diversity was also 0. The product of the two numbers was then calculated (called here 'nectar index'), allowing for scores of between 0 and 9 (or 0, 1, 2, 3, 4, 6 & 9).

2.2.7 – Mean vegetation height

This was only carried out in open areas away from the woodland. There was only enough time to take a single reading at each sampling point.

2.2.8 – Deadwood

All deadwood was measured as both a diameter and a length in order to be able to calculate the volume. In practice, this was often estimated. The total number of pieces was also counted while measuring the wood. Each piece was also assessed as either hanging, standing or fallen.

3 – Results

With such a large amount of data collected, there are far more ways of analysing this data than are presented here. Repeats of this methodology in the future would also naturally generate more creative analyses. Wild Ken Hill is therefore encouraged to consider other ways that this data can be analysed and interpreted.

For example, it is easily possible to generate distribution maps using the DAFOR scale for abundance for all of the species recorded during the survey. A selection of relevant species have had maps generated for them in this report but any species could be mapped in further detail either by Wild Ken Hill using QGIS and the master spreadsheet, or at the request of the author.

All means are followed by ± one standard error. All maps show 2019 on the left and 2022 on the right.

3.1 – Species-richness

In 2019, a total of 232 species were recorded to species, an additional 22 species were record to only genus or family. Additionally, 15 lower plants were recorded (14 mosses and *Cladonia* lichen) but these were not counted in the analyses. When looking at just the open plots in 2019, this total fell to 209 species. In 2022, the total number of plants was actually slightly lower, at 208 species. This was a surprising result considering how much species-richness has improved at the plot level, over the period. This suggests that at the landscape level, botanical species-richness has not yet changed that much but at the field level, it has more than doubled.

The most species-rich plot was plot 85 with 56 species in 2019 (unsurprisingly, this was an open plot), along the edge of the railway. It is completely surrounded by very species-poor plots dominated by Sugar Beat and is a good indicator of the direction the southern fields will head in. The lowest plots held only two species each, this low total was actually recorded in six arable (all open) plots. The mean species-richness across all plots combined was 15.5 ± 1.3 in 2019

3.1.1 – Species-richness across just the open plots in 2019 as compared to 2022

In 2019, the open plots had a slightly higher than the site average of 16.8 ± 2.1. In 2022, the number of species per plot had nearly doubled to 33.2 ± 1.1 and this was a highly significant result ($W=104$, $n=57$, $P<0.001$). The highest plot was now plot 2, with an impressive 60 species (this was also relatively high in 2019 with 37 species). The lowest number of species recorded in a plot had risen to 13. Surprisingly, this was a species-poor area of the Plain, acid-grassland and heathland can often be very poor botanically so this is nothing to be concerned about.

The following 31 species were recorded new to the plots in 2022; Black Nightshade, Dogwood, Dwarf Mallow, False Fox-sedge, Field Wood-rush, Fox-and-cubs, Grey Sedge, Hairy Buttercup, Hard Rush, Hemp-agrimony, Long-headed Poppy, Marsh Foxtail, Meadow Barley, Meadow Buttercup, Meadow Foxtail, Meadow Vetchling, Mouse-ear Hawkweed, Oak-leaved Goosefoot, Oval Sedge, Phacelia, Rat's-tail Fescue, Sheep's Fescue, Silverweed, Silvery Hair-grass, Smooth Cat's-ear, Teasel, Thyme-leaved Speedwell, Timothy, Trailing St. John's-wort, Wall Barley, Wild Carrot

The assemblage of Smooth Cat's-ear, Silvery Hair-grass, Rat's-tail Fescue, Trailing St. John's-wort, Small-flowered Crane's-bill and Common Cudweed etc, is indicative of low nutrient, species-rich Breck-like soils/swards and is a good indicator of what some of the site that has not received historic input on lighter soils might progress towards. Around 290 species have been recorded in the plots over the two years.

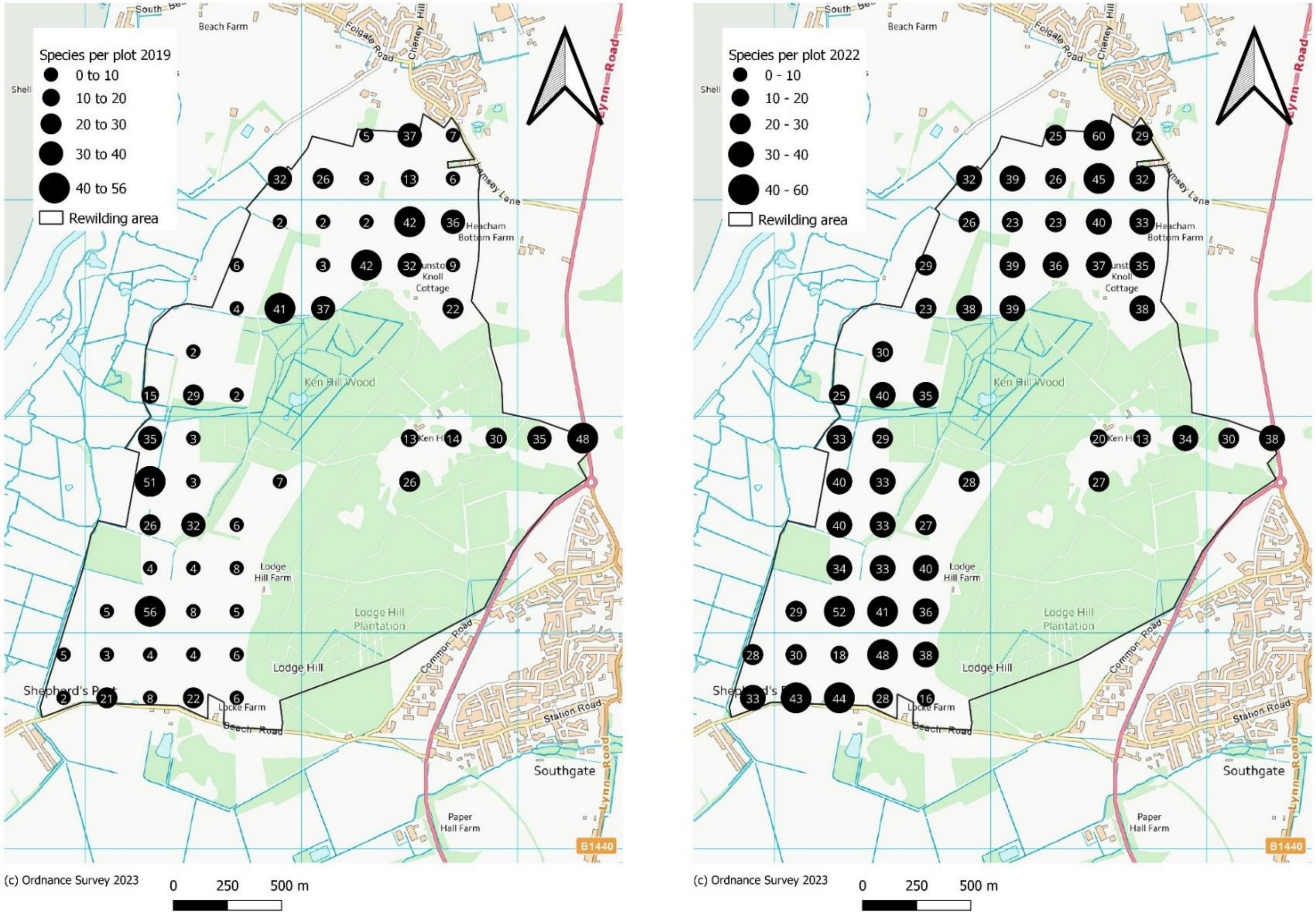


Fig. 3. Species-richness of vascular plants per open plot in 2019 (left) and 2022 (right).

3.1.2 – Most frequent species recorded.

Tab. 1. The most frequent species across all 98 plots in 2019.

Rank	Species	Number of plots	%age of plots
1	Bramble agg.	57	58.2
2	Yorkshire-fog	37	37.8
3	Pedunculate Oak	29	29.6
4	Sycamore	28	28.6
5	Honeysuckle	26	26.5
6	Broad Buckler-fern	26	26.5
7	Black-grass	26	26.5
8	Holly	24	24.5
9	False Oat-grass	23	23.4
10	Rough Meadow-grass	22	22.4

Bramble was by far the most frequent plant in the plots and the only species to be seen in more than half of the plots in 2019.

Tab. 2. The most frequent species across the 57 'open' plots in 2019.

Rank	Species	Plots 2019	%age of plots surveyed 2019	Plots 2022	%age of plots surveyed 2019
1	Black-grass	25	43.9	19	33.3
2	Yorkshire-fog	21	36.8	47	82.5
3	Creeping Thistle	19	33.3	41	71.9
3	Ribwort Plantain	19	33.3	41	71.9
3	Knot-grass agg.	19	33.3	8	14.0
6	Winter Wheat	18	31.6	2	3.5
7	Rough Meadow-grass	17	29.8	41	71.9
7	Scarlet Pimpernel	17	29.8	34	59.6
7	Bramble agg.	17	29.8	28	49.1
10	False Oat-grass	16	28.1	16	28.1
10	Annual Meadow-grass	15	43.9	18	33.3

Tab. 3. The most frequent species across the 57 'open' plots in 2022.

Rank	Species	Plots 2019	%age of plots surveyed 2019	Plots 2022	%age of plots surveyed 2022
1	Yorkshire-fog	47	82.5	21	36.8
2	Creeping Thistle	41	71.9	19	33.3
2	Ribwort Plantain	41	71.9	19	33.3
2	Rough meadow-grass	41	71.9	17	29.8
5	Common Cat's-ear	40	70.2	8	14.0
5	Common Ragwort	40	70.2	10	17.5
5	Soft Brome	40	70.2	13	22.8

8	Hoary Willowherb	39	68.4	3	5.3
9	Bristly Ox-tongue	38	66.7	7	12.3
10	Smooth Hawk's-beard	36	63.2	2	3.5

Common Cudweed just misses a place in the top ten, being joint 11th (with Dandelion agg.). It was found in 35 plots (61.4%) compared to just three in 2019 (5.3%).

Tab.4. The most frequent species scoring as 'Dominant' in 2019 in open plots.

Rank	**Species**	**Number of plots where 'Dominant'**	**%age of plots**
1	Winter Wheat	14	24.6
2	Spring Barley	10	17.5
3	Sugar Beet	9	15.8
4	Oilseed Rape	6	10.5
4	False Oat-grass	6	10.5
6	Yorkshire-fog	4	7.0
7	Bramble agg.	3	5.3
7	Cock's-foot	3	5.3
9	Common Bent	2	3.5
9	Rough Meadow-grass	2	3.5

In the open plots in 2019, it is not surprising that crops dominated the landscape, taking up the first four places in table 4 above.

Tab.5. The most frequent species scoring as 'Dominant' in 2022.

Rank	**Species**	**Number of plots where 'Dominant'**	**%age of plots**
1	Yorkshire-fog	18	31.6
2	Black-grass	6	10.5
3	Bramble agg.	4	7.0
3	Creeping Thistle	4	7.0
5	Common Cudweed	3	5.3
5	Common Ragwort	3	5.3
7	Bristly Oxtongue	2	3.5
8	There are 13 species in joint 8th place, each only having one plot where that species is dominant	1	1.8

3.1.3 – Species-richness at the 1m^2 nested quadrat

The mean species-richness in the 57 nested quadrats in 2022 was 8.7 ± 0.3 species/m^2. The minimum number of species was two in plot 104 and the maximum was 20 species in plot 96, and remarkably these plots are diagonally adjacent to one another in the southern fields.

Tab. 6. Top ten species in the nested, 1m^2 quadrat.

Rank	Species	%age of plots surveyed	Plots 2022
1	Yorkshire-fog	61.4	35
2	Common Ragwort	43.9	25
3	Hoary Willowherb	38.6	22
4	Rough Meadow-grass	35.1	20
5	Willowherb sp.	33.3	19
6	Ribwort Plantain	31.6	18
7	Creeping Thistle	28.1	16
7	Common Cudweed	28.1	16
7	Bristly Ox-tongue	28.1	16
10	Common Cat's-ear	26.3	15

3.1.4 – Species with conservation status

Seven species with conservation were recorded in the open plots in 2019, while only five species were recorded in the open plots in 2022. All but one of these (Hoary Mullein) could be considered an arable weed. These were:

Tab. 7. Frequency of occurrence of species with conservation status

Species	Status	Plots recorded in 2019	Plots recorded in 2022
Common Cudweed	NT	3	35
Corn Marigold	VU	1	0
Corn Spurrey	VU	4	3
Dwarf Spurge	NT	1	0
Field Woundwort	NT	1	0
Hoary Mullein	NS	1	1
Prickly Poppy	VU	1	1
Smooth Cat's-ear	VU???	0	7
Stinking Chamomile	VU	0*	0
Total species		**7**	**5**

*Stinking Chamomile was recorded in plot 29 but this was not included in this survey being mostly woody vegetation.

The mean number of species with status per plot rose significantly, from 0.21 ± 0.08 species/plot in 2019, to 0.81 ± 0.08 in 2022 (W=98, P<0.001).

Common Cudweed – Red List, Near Threatened

This species has spread rapidly on the site since 2019, when it was still quite widespread. It did however, only occur in three of the plots in 2019, by 2022 this had changed significantly, being recorded in 35/57 plots. And it was widespread around the site, often occurring at great densities.

Fig. 4. A particularly dense patch of Common Cudweed between points 37 and 28.

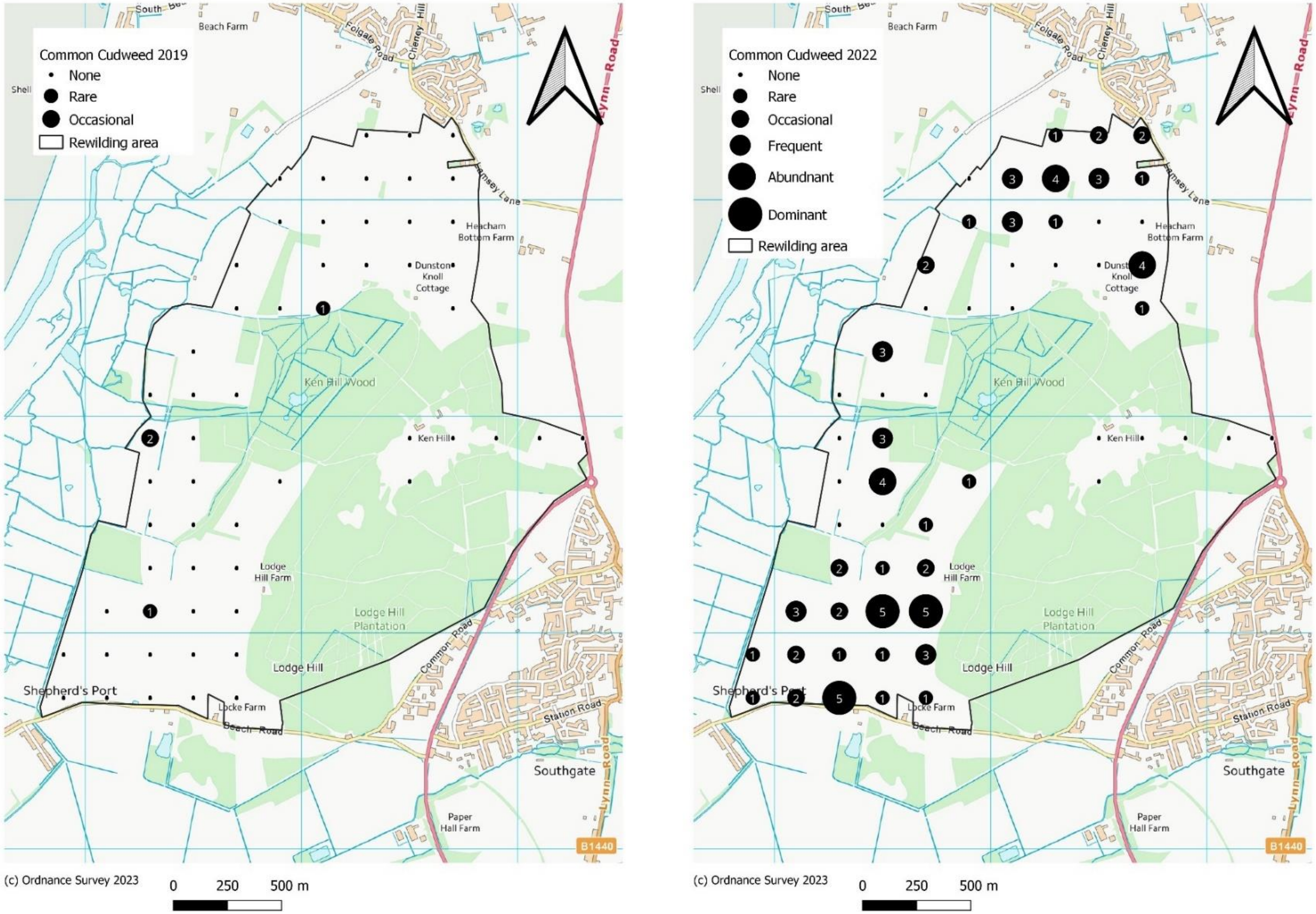


Fig. 5. Common Cudweed across the open plots (DAFOR).

Corn Marigold – Red List, Vulnerable

Not recorded at all in 2022. This is a late flowering species but it is very much a species of arable fields and is likely to disappear under the current management. An area north of plot 3 was searched for this plant in 2022 and none were found, not even rosettes. Given that the eastern part of the Estate is now in regenerative agriculture, the expected loss of plants like this are not so much an issue as they will almost certainly be spreading on the active farmed area, assuming there is some acid soils there too (which this plants prefers to the chalk).

Corn Spurrey – Red List, Vulnerable

Recorded in four plots around the site in 2019 and in slightly less in 2022 (just three plots). It is surprising that this species was not recorded in greater amounts and frequencies than it was, as it is often one of the commoner species on sandy soils.

Fig.6. Corn Spurrey.

Dwarf Spurge – Red List, Near Threatened

In this survey it was only recorded in one plot in 2019, this being plot 55. It was not recorded in 2022.

Field Woundwort – Red List, Near Threatened

Another species that was recorded at very high levels across the site in 2019, too frequent to be mapped in the NVC survey. Recorded only in plot 55 in 2019 along with Dwarf Spurge, the plot with the most species with conservation status in, in 2019. It was not recorded in any plots in 2022 but it was noted to still be present in the sandy ex-bulb field to the extreme east of the site.

Prickly Poppy – Red List, Vulnerable

Recorded only from one plot, plot 103 at the extreme south end of the site near the breeding Woodlark in 2019. The species was only ever found in this general area and then at low levels. It was not recorded in 2022.

Stinking Chamomile – Red List, Vulnerable

This species was locally frequent but was just about mappable during the NVC survey. In the plots, it was only recorded in one plot, plot 29 in 2019 but it was not recorded in 2022. This was to the north west of the site on a plot that was about half arable and half scrub.

An attempt to search for the plant where it formed huge patches in the corners of a field to the north (north and south of plot 3) found only a small number of plants. As with Corn Marigold, this species is likely to diminish under the new management but should be thriving on the regenerative agriculture part of the Estate.

Hoary Mullein – Nationally Scarce

This species is somewhat of an East Anglian speciality and is only occasionally encountered on the site. Recorded in the plots in the fields to the east of the site. This species was recorded at a low enough frequency for all individuals to be mapped by GPS. It was noted in two plots in 2019 and just one in 2022.

Fig. 7. The distinctive ‘candelabra’ of Hoary Mullein.

Smooth Cat's-ear - Vulnerable

Fig. 8. A dense patch of Smooth Cat's-ear and Common Cudweed in the southern plot 97.

A local species that is not uncommon on arable reversions in Norfolk on suitable, sandy soils. It was not recorded on any of the plots in 2019 but it was found to be abundant in one field then, the delightfully named Ragged Arse, where it was extremely common. Although it was common here, it was localised to a long linear feature in the field. After discussions with Nick Padwick on site in early 2021, it is clear that this area of grass burnt several years earlier after a machinery accident. This burnt off the thick Yorkshire-fog thatch and exposed the sandy mineral soils. Annual Knawel, Night-flowering Catchfly and more were present in the same area in 2019.

Since cropping ceased and livestock have been added, this plant has spread significantly and is now found in seven plots in three discrete areas. There is no map generated for 2019 as it was not present at all then.

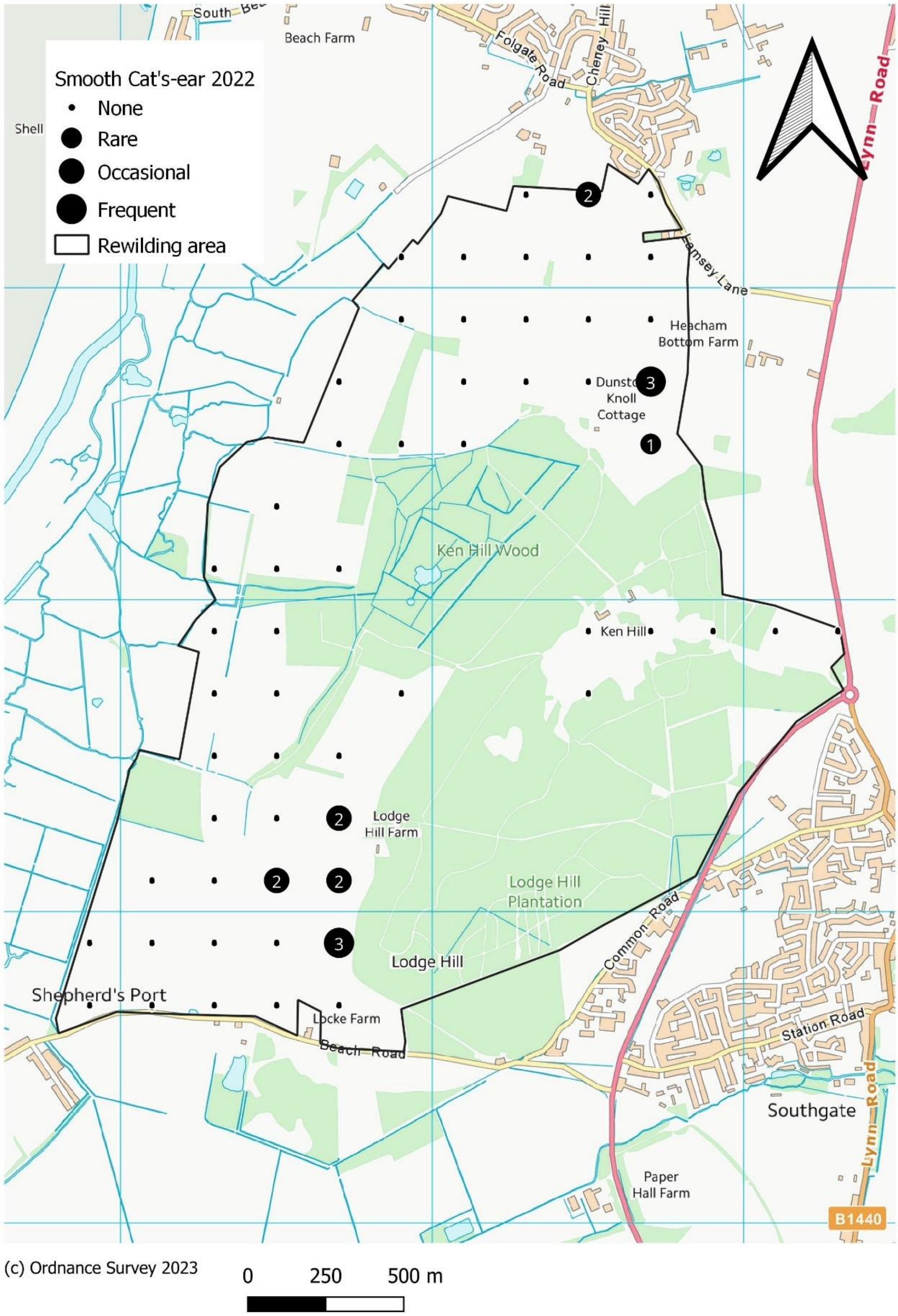


Fig. 9. Distribution of Smooth Cat's-ear in the plots in 2022.

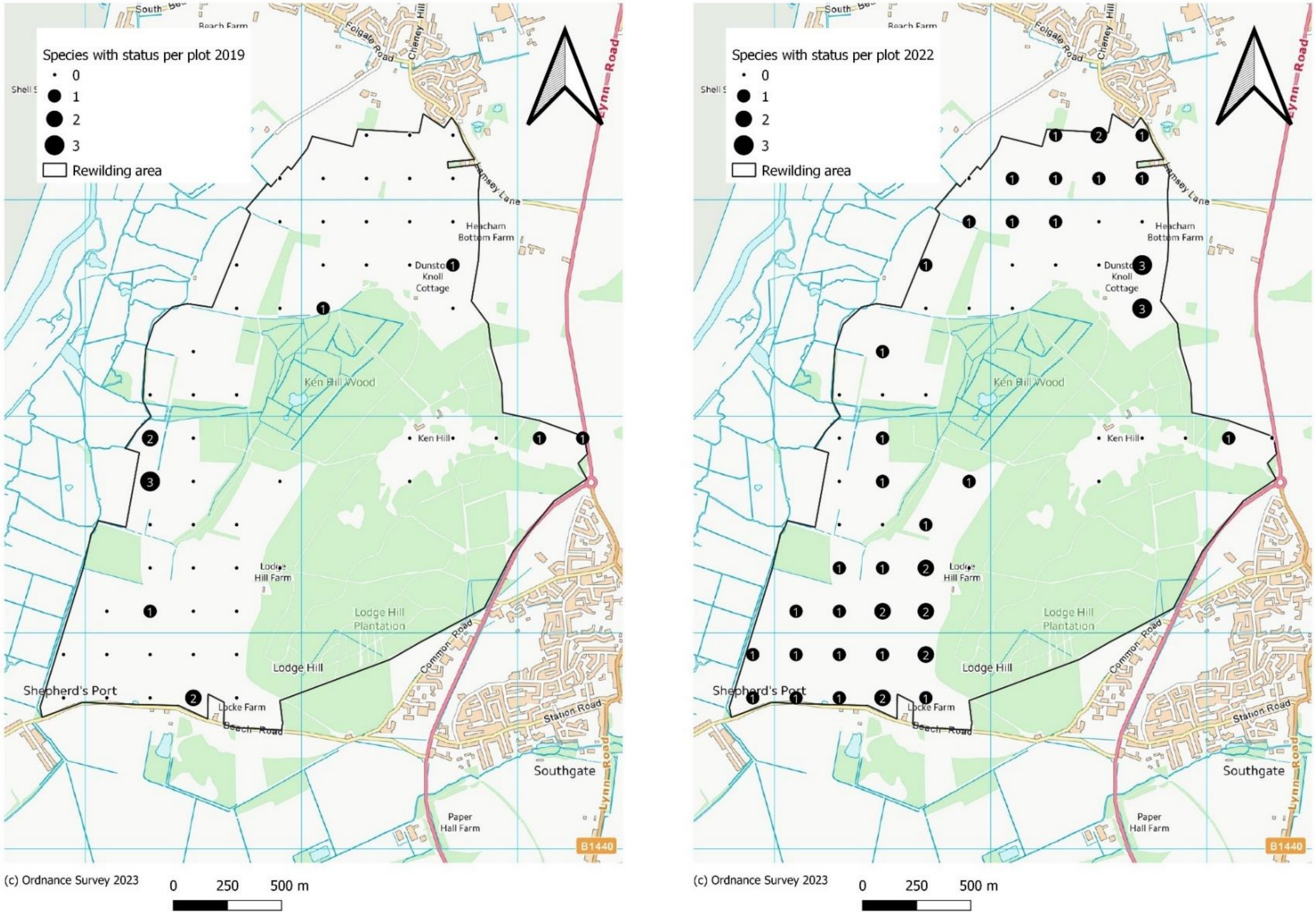


Fig. 10. Species with conservation status per plot.

The spread of Common Cudweed and Smooth Cat's-ear have greatly increased the frequency of species with status across the site, the two plots just north of Ragged Arse now having the most species with status, each with three species each. Although the frequency of plots with species with status has clearly increased, the assemblage has changed a little with an overall decline in the number of species with status recorded, at the landscape level. This being more evidence that extensive, year-round grazing reduces heterogeneity at the landscape level. The way to avert this is to have regular, significant periods where grazing is removed from large areas of the site to allow recovery and promote a disturbance cycle.

3.1.5 – Arable plants

A total of 24 species have now been recorded (21 in 2019 and only 13 in 2022). The three new arable weeds in the plots in 2022 were Smooth Cat's-ear, Dwarf Mallow and Hairy Buttercup. The mean number of arable plants per plot rose significantly from 1.19 ± 0.16 species/plot in 2019 to 2.21 ± 0.23 in 2022 ($t=4.00$, $n=57$, $P<0.001$). The most species in any one plot was seven species in plot 103 (the same plot that had the most species in 2019 with six). This is the plot that is still fenced out of the grazing/rewilding project and is currently managed as a bulb field. Oak-leaved Goosefoot was also recorded here new to 2022.

Fig.11. A new species for the site but surprisingly, Oak-leaved Goosefoot is not classed as an arable plant. Recorded in the bulb field that is currently fenced out from the grazing in the rewilding area (plot 103).

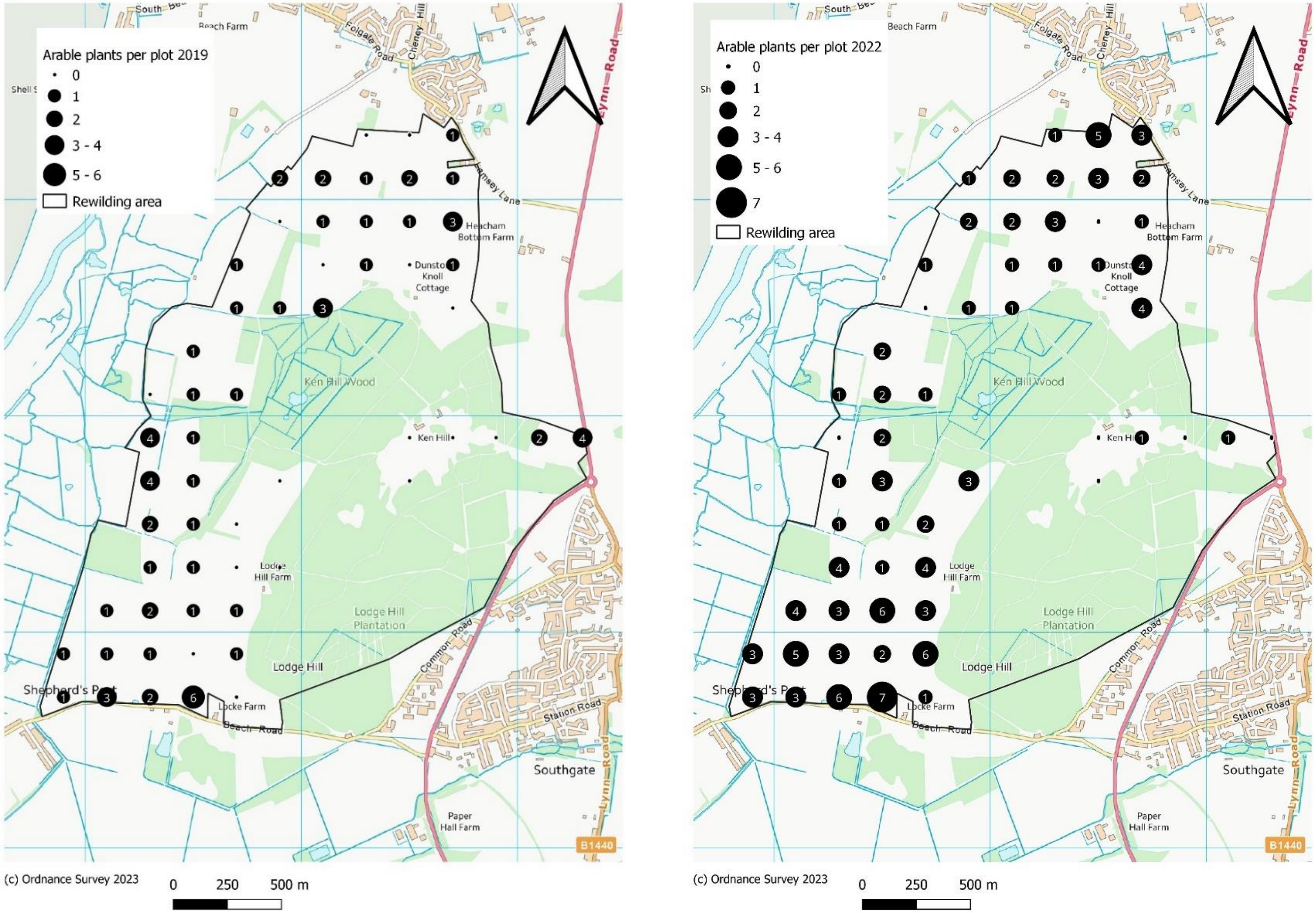


Fig. 12. Arable plants per plot, 2019 (left), 2022 (right).

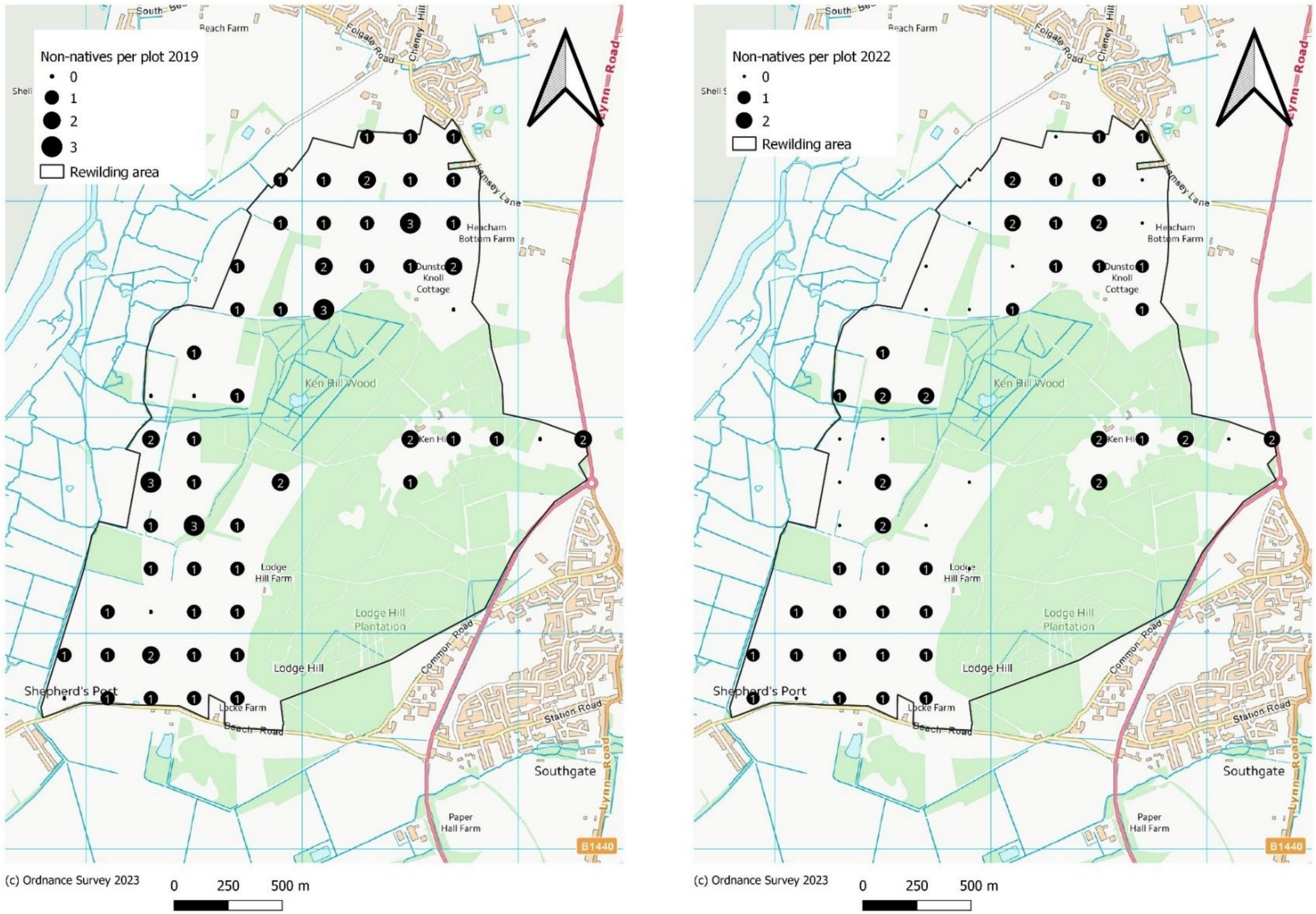


Fig. 13. None-native species per plot.

3.1.6 – Non-native species per plot

In 2019, a total of 26 species were classed as non-native across all plots but this figure was only 16 when looking at the open plots in 2019 and only nine species in 2022. The only new non-native species in the plots in 2022 was unusually, Fox-and-cubs.

The most frequent non-native species was Canadian Fleabane, a common ruderal that was found in 26 of the 57 plots in 2022, yet only one of these in 2019. The second most frequent alien in the open plots in 2022 was Turkey Oak, occurring in seven of the 57 plots.

The mean number of non-natives per plot dropped from 1.18 ± 0.09 in 2019 to 0.89 ± 0.09 in 2022 but this was not significant (W=192, P=0.09). All crop species were classed as non-native and as these were greatly reduced on the 2019 survey, the number of non-natives per plot was simultaneously boosted by the spread of species such as Canadian Fleabane and Turkey Oak etc, cancelling one another out.

Fig.14. Fox-and-Cubs. An unusual species to colonise an arable field, in plot 56. Not thought to be a likely threat to the site.

3.1.7 – Comparison between arable plots and existing grassland plots

Of the 57 plots recorded, 46 showed an increase in the number of species, ten were found to have a decline in the number of species and one, no change.

The 57 plots were assessed as either coming from an arable origin, being situated in existing grassland or an arable edge or margin which generally had elements of both but usually always a higher species count than those coming from arable originally. The data was then analysed to see if the significant difference between species-richness at the landscape level held up within the three different plot types.

Tab. 8. Each of the 57 plots surveyed in 2022, all were assessed as (in 2019) being either:

Type	Plots	Percentage
Arable	34	60.0%
Edge	13	22.8%
Grassland	10	17.5%

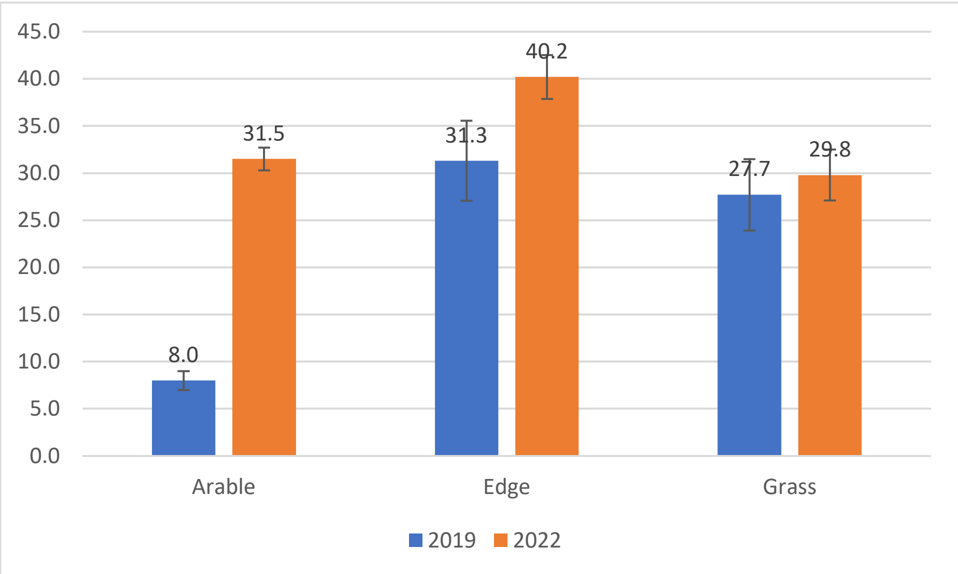


Fig. 15. Mean species-richness per plot across the three broad types of open plot.

Tab. 9. Statistical analyses of the above dataset.

Plot type	Species richness 2019	Species-richness 2022	t/W	P	Significance
Arable	8.0 ± 1.6	31.5 ± 1.2	W=590	<0.001	Highly significant
Edge	31.3 ± 4.25	40.2 ± 2.34	W=77	0.13	Not significant
Grassland	27.7 ± 3.8	29.8 ± 2.7	t=0.962	0.36	Not significant

Only the plots that were arable initially, showed a highly significant increase in species-richness between 2019 and 2022, while the edge and grassland plots showed no significant increase.

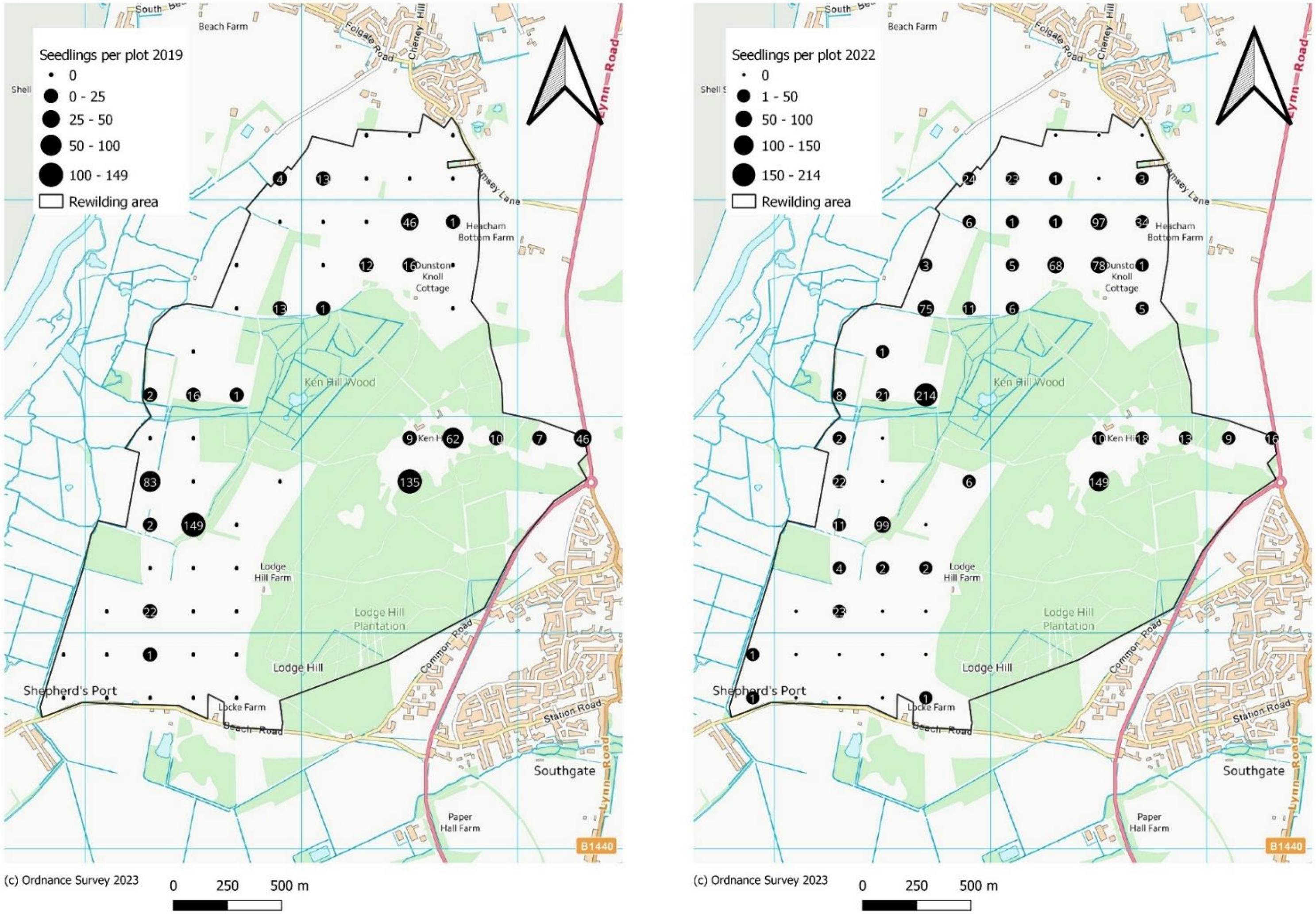


Fig. 16. Total number of woody sedlings per plot.

3.2 – Seedling layer

Bramble was removed from this exercise and is displayed in its own map below (see figure 18 below).

A total of 1075 seedlings were recorded in 2022, as compared to 651 in 2019. The mean was 18.5 ± 5.2 in 2022, as compared to 11.4 ± 4.2 in 2019. This difference was statistically significant (W=163, P<0.001). Seedlings were recorded in 40/57 open plots in 2022 (as compared to 22 plots in 2019). This was also found to be statistically significant (X^2= 11.5, P<0.001).

The most abundant seedling was Ash at 357 seedlings, followed by oak at 134 and Broom at 116. The most abundant seedling in 2019 was Broom, at 139 seedlings. The most frequent seedling was Hawthorn, found in 20/57 open plots, followed by oak at 19 and rose at 15. In 2019, the most frequent seedling was oak in 12/57 plots.

Seedling regeneration is more evident in the north of the site.

3.3 – Sapling layer

Very few saplings were recorded in the open plots. In 2019, a total of 80 were counted while in 2022, there were 117 in all. In 2019, the mean number of saplings per open plot was 1.40 ± 0.69 and in 2022 it was 2.05 ± 0.70. This was not statistically significant (W=20.5, P=0.29).

Mean cover of Bramble rose from 3.01 ± 1.37%/plot in 2019 to 3.43 ± 1.07 in 2022. This is a very subtle difference and only the weaker Wilcoxon test ws used with many matched pairs (that is, there were a lot of zeros in the data). Although this test did show a signficant increase, it should be interpeted cautiosuly, despite Bramble inevtably spreading in time (W=85.5, P=0.02).

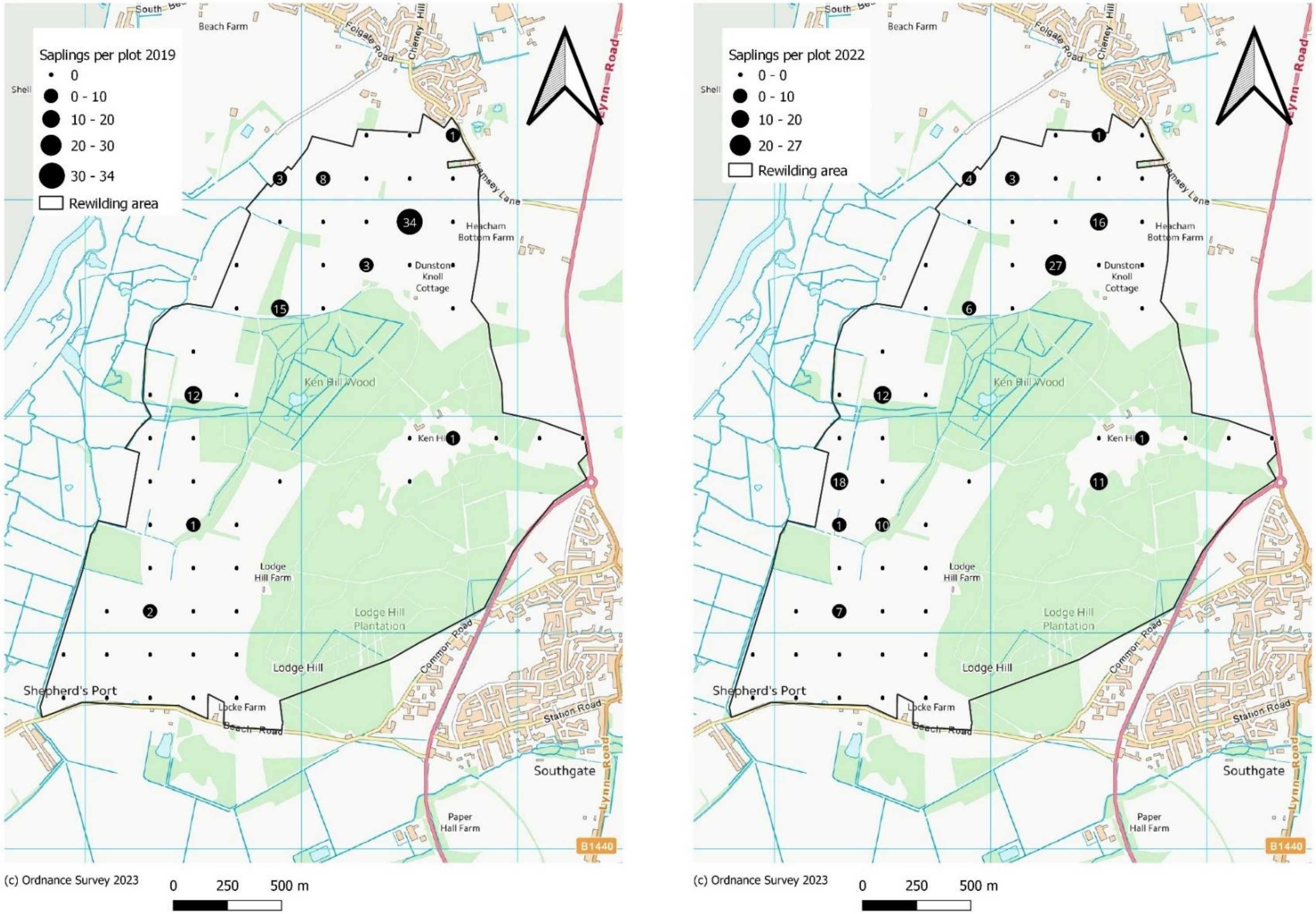


Fig. 17. Number of saplings per plot.

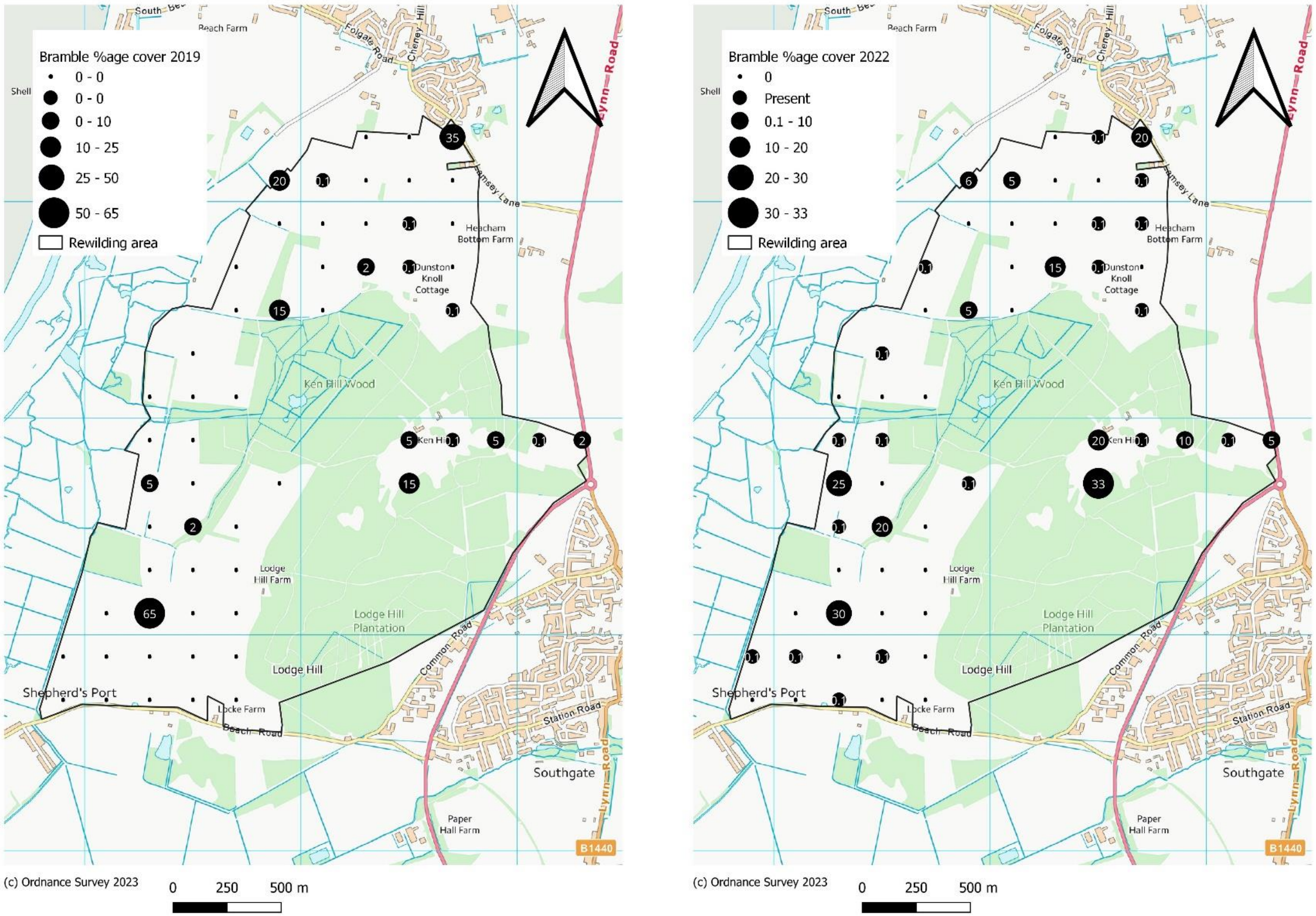


Fig. 18. Percentage cover of Bramble per plot.

3.4 – Canopy layer

A total of 14 qualifying canopy stems were counted in measured in the open plots in 2019 (a tiny fraction of the 594 stems in all), compared to 20 in 2022. The mean number per plot was 0.25 ± 0.12 in 2019, rising to 0.35 ± 0.17. There were so many zeros in this dataset that not only were parametric tests not available, the non-parametric ones were misleading, so it is best to report this result as not being significant.

A total of 1.45m^2 of basal area was measured in the open plots in 2019 (41.7m^2 in the whole survey) compared to 1.69m^2 in 2022. This being a combination of trees growing and new trees reaching the 20 cm GBH qualifying threshold. As with the above, statistically it is not good practice to make any realistic statement on this but the reader can assume this difference is not significant.

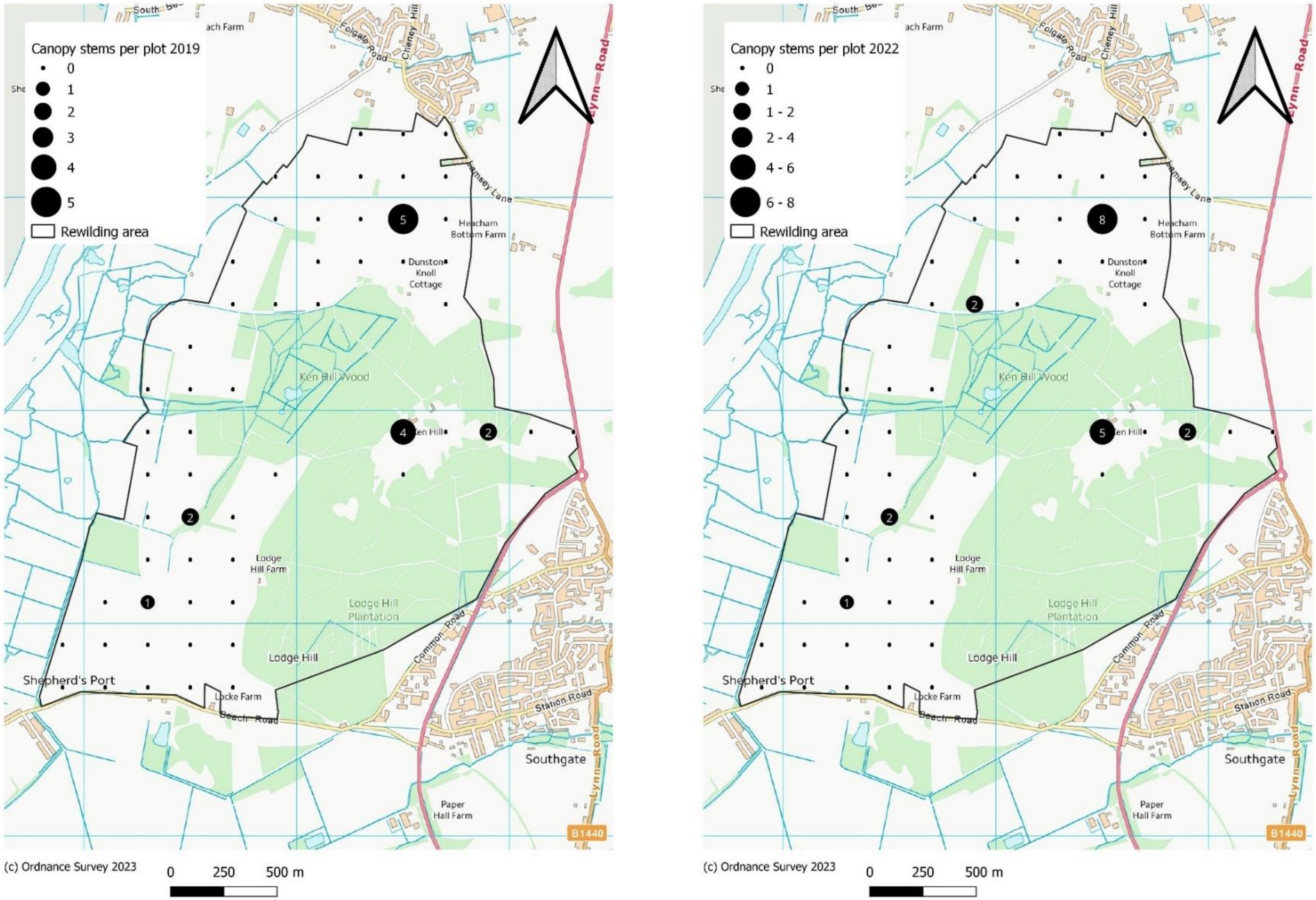


Fig. 19. Canopy stems per plot.

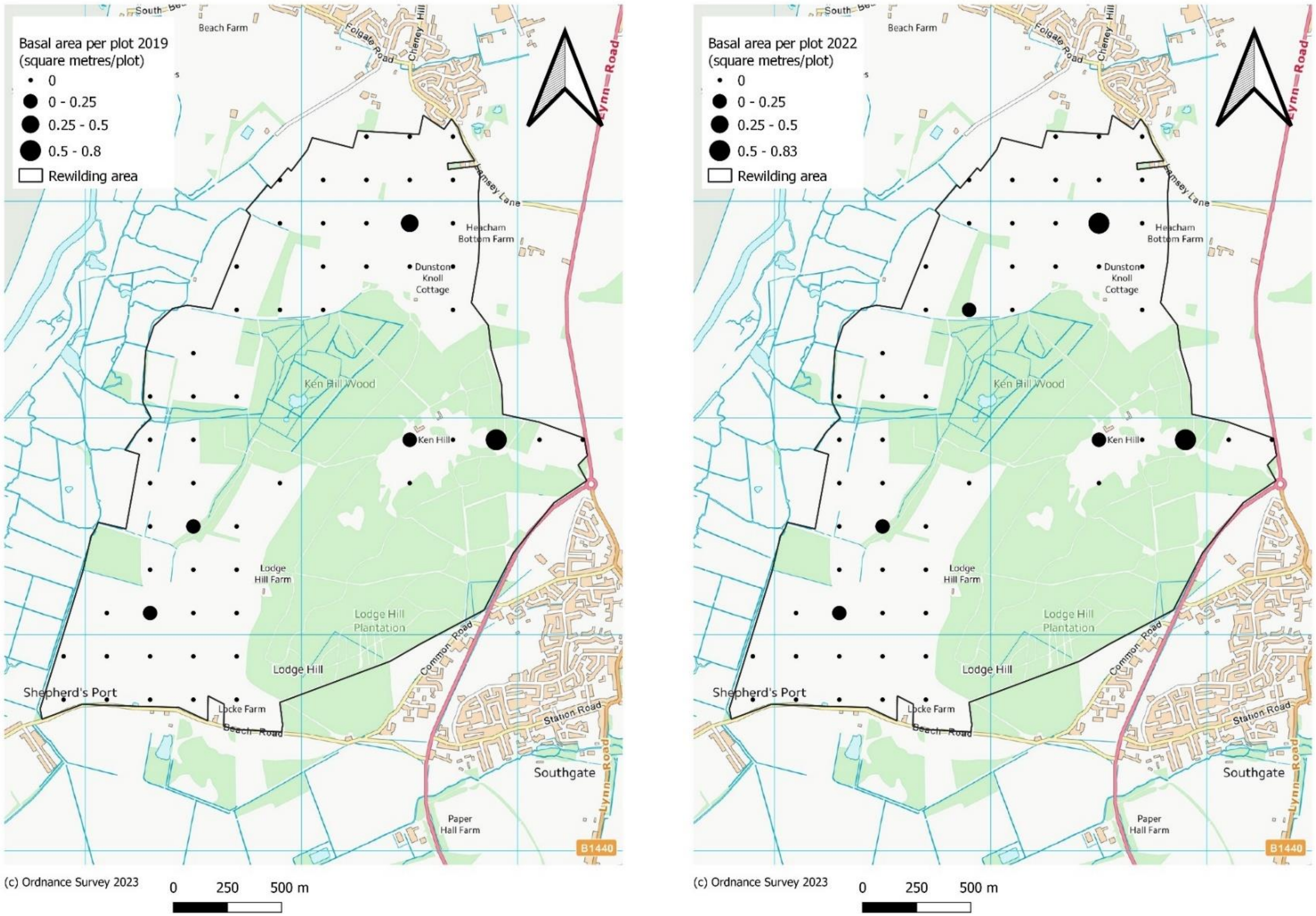


Fig. 20. Basal area per plot.

3.5 – Structure survey

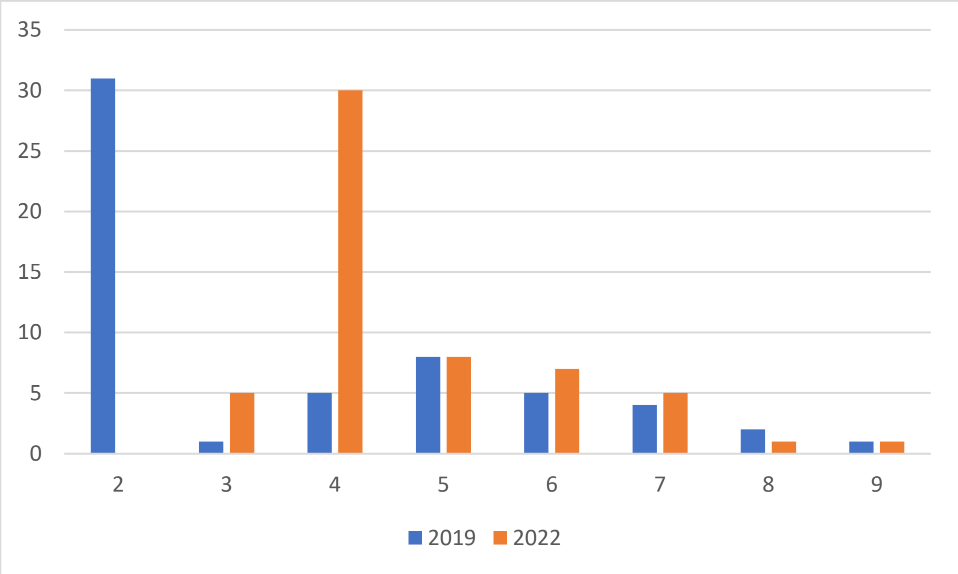


Fig. 21. Frequency distribution of the number of structural layers present in each open plot, in both years.

As can be seen from figure 21 above, the frequency distribution was skewed strongly to the left in 2019. Plots with only two structural were the most abundant type then and were almost always crops, where the only layers present were the crop layer and almost always some bare ground. By 2022, no plots were recorded with less than three structural layers and the most frequent number of layers per plot was four. The distribution is already much healthier looking and less skewed to the left.

The mean number of structural layers rose significantly from 3.6 ± 0.27 in 2019 to 4.8 ± 0.21 per plot in 2022 ($W=142$, $P<0.001$).

The nine structural layers are displayed sequentially. Rank grass and the four woody layers are now the least represented in the open plots, while short and medium grass have spread.

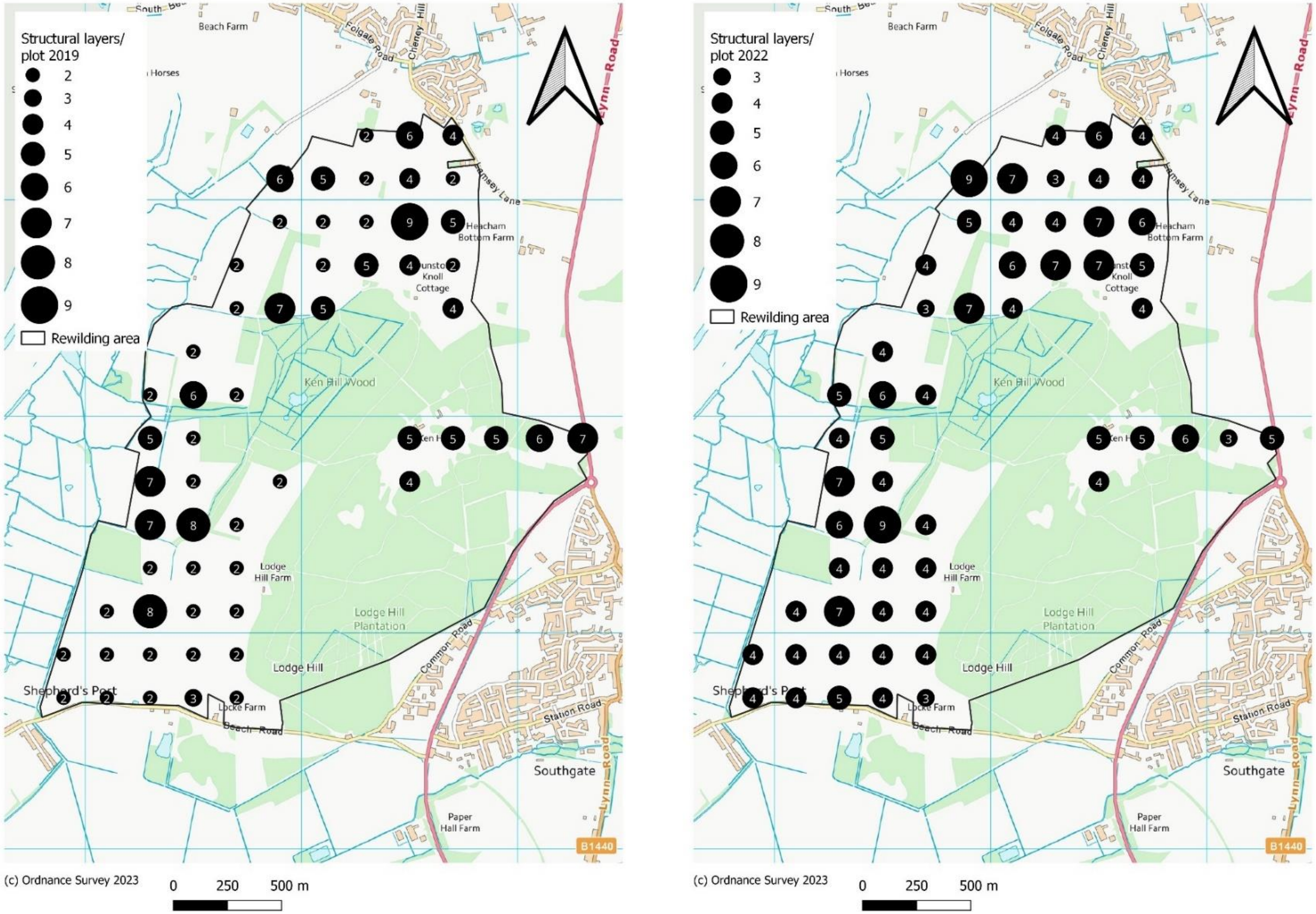
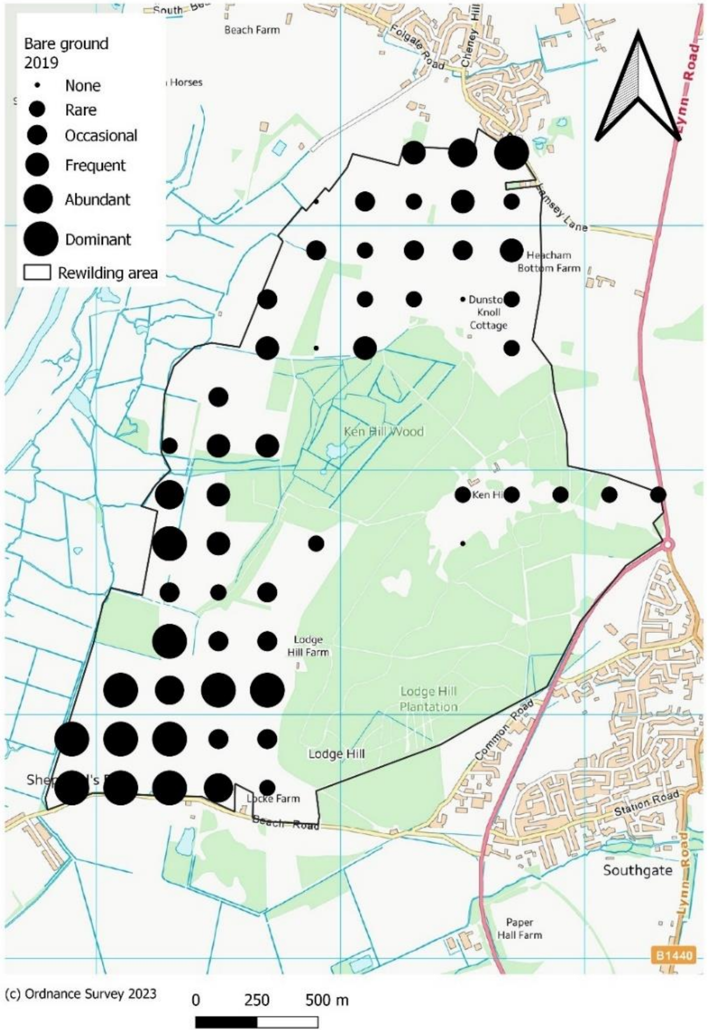


Fig. 22. Structural layers/plot.



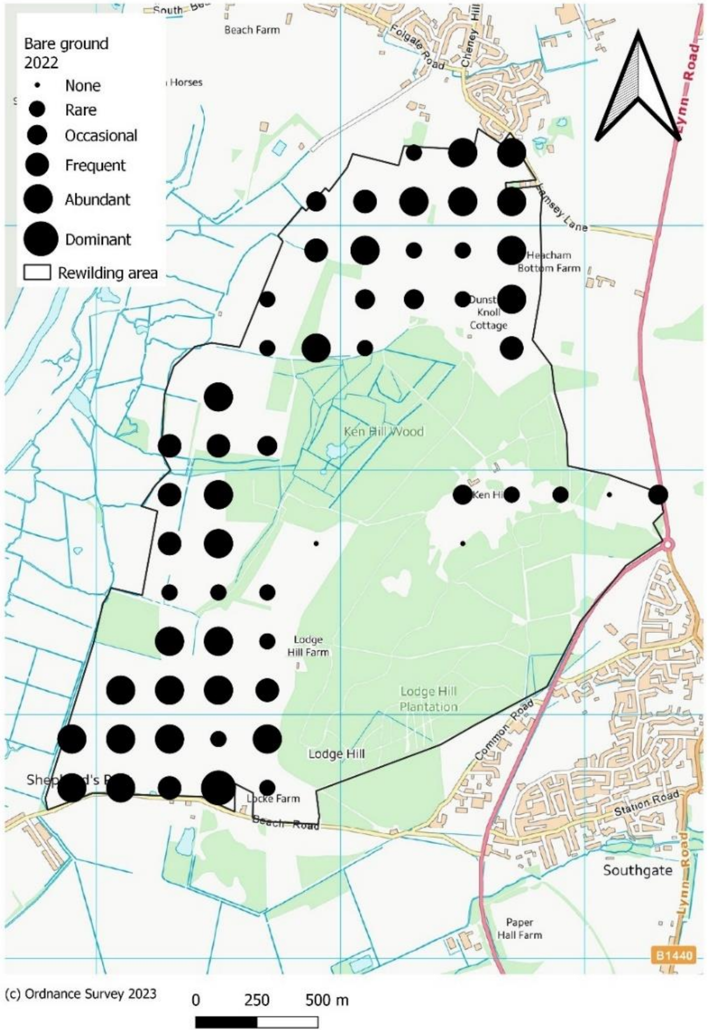


Fig. 23. Bare ground per plot (DAFOR).

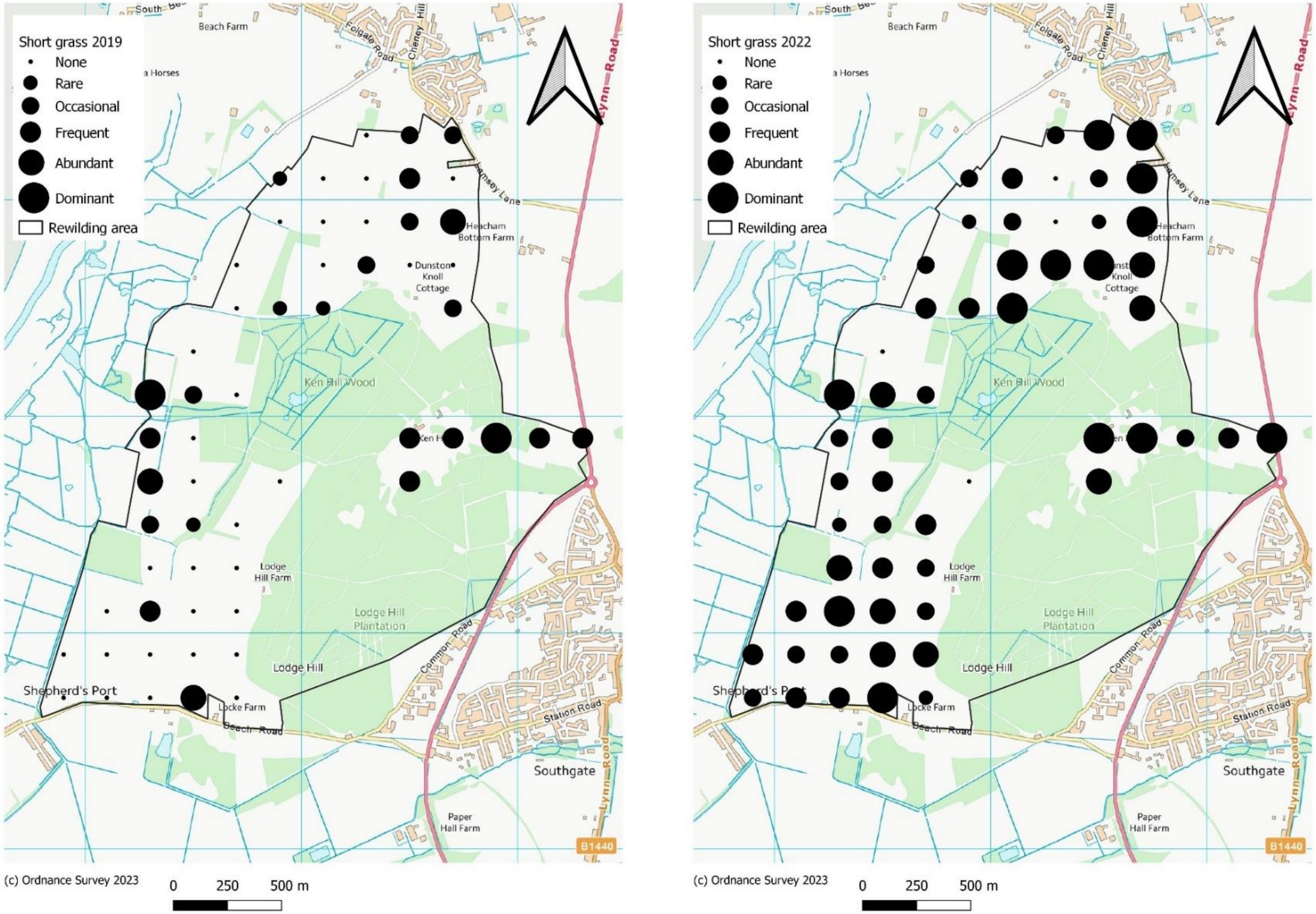


Fig. 24. Short grass per plot (DAFOR).

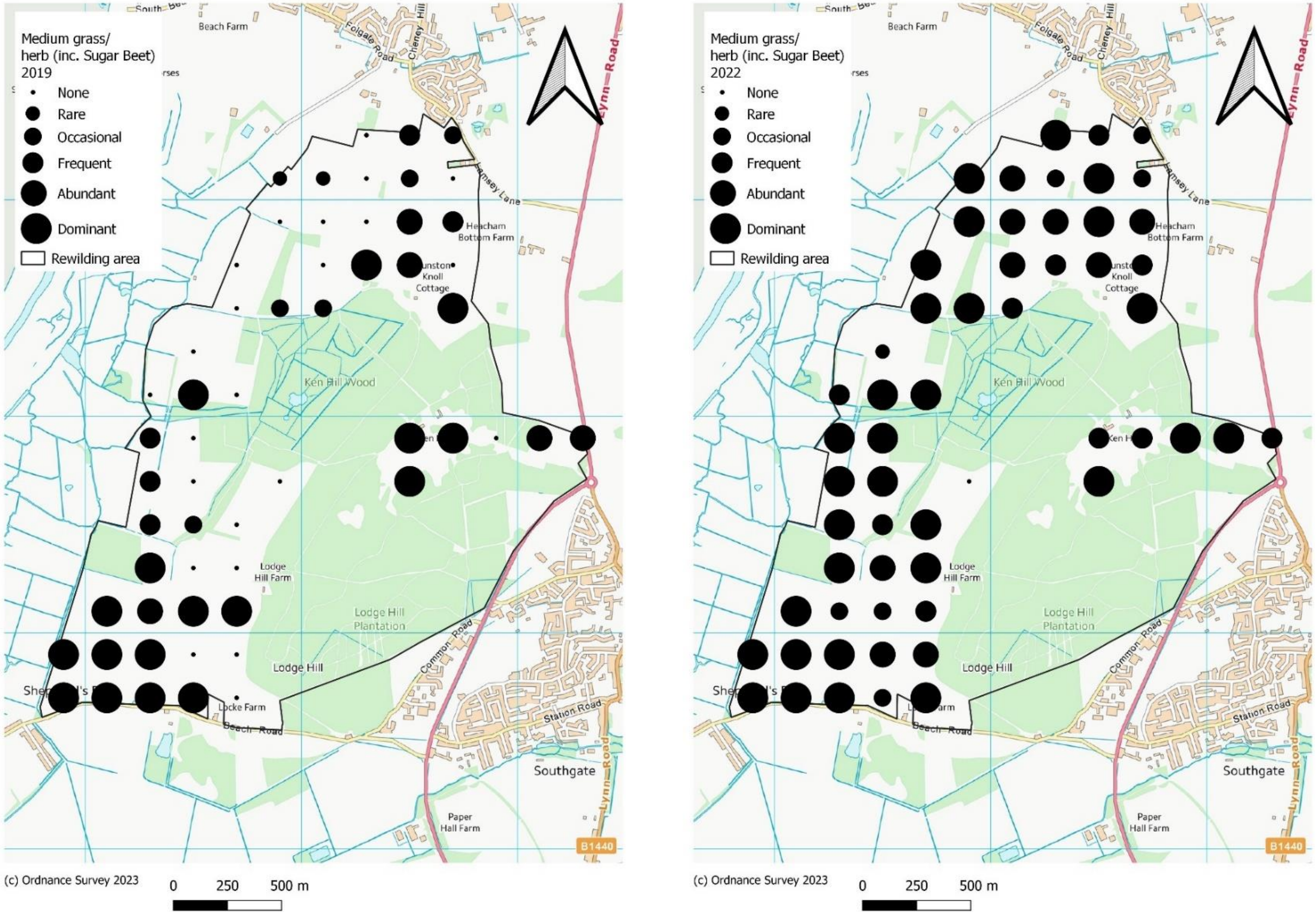
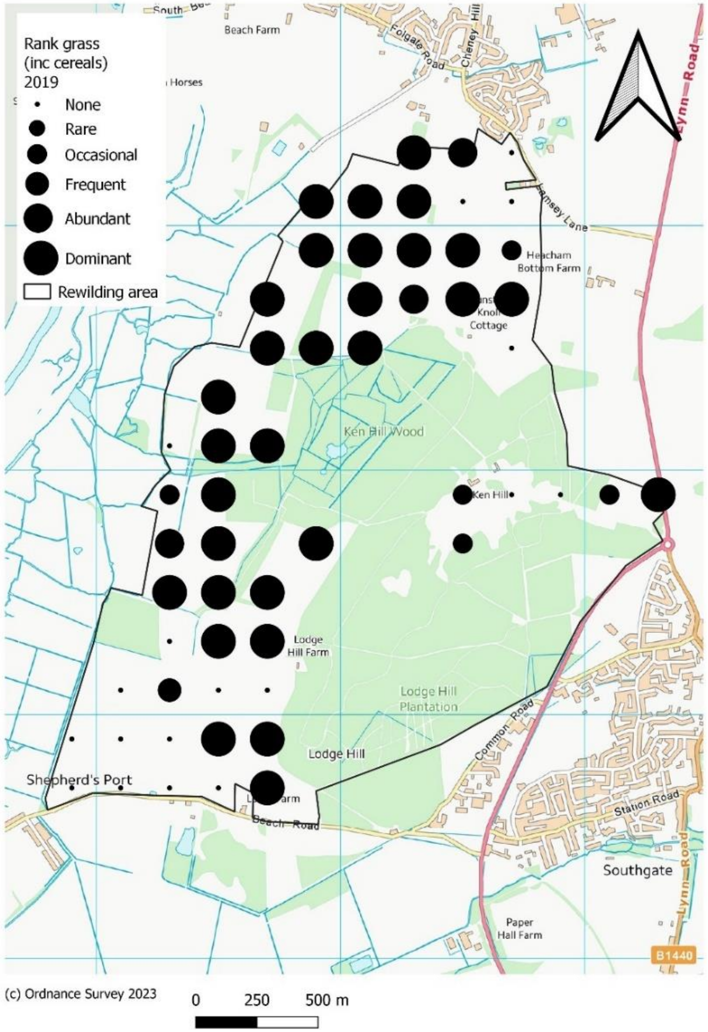


Fig. 25. Medium grass per plot (DAFOR).



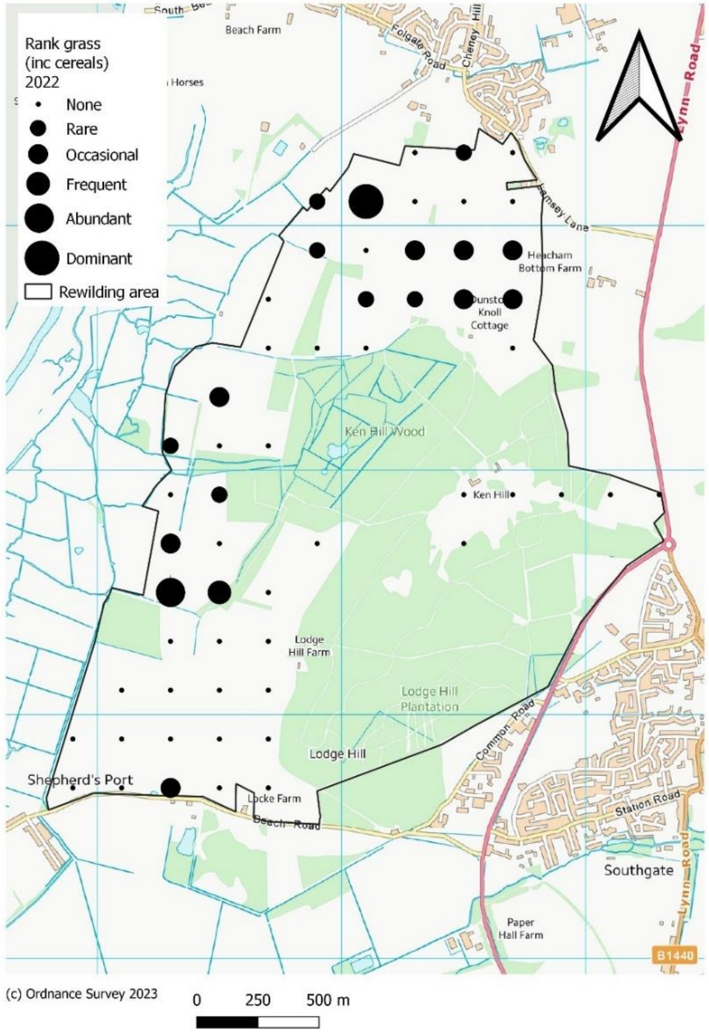


Fig. 26. Rank grass per plot (DAFOR).

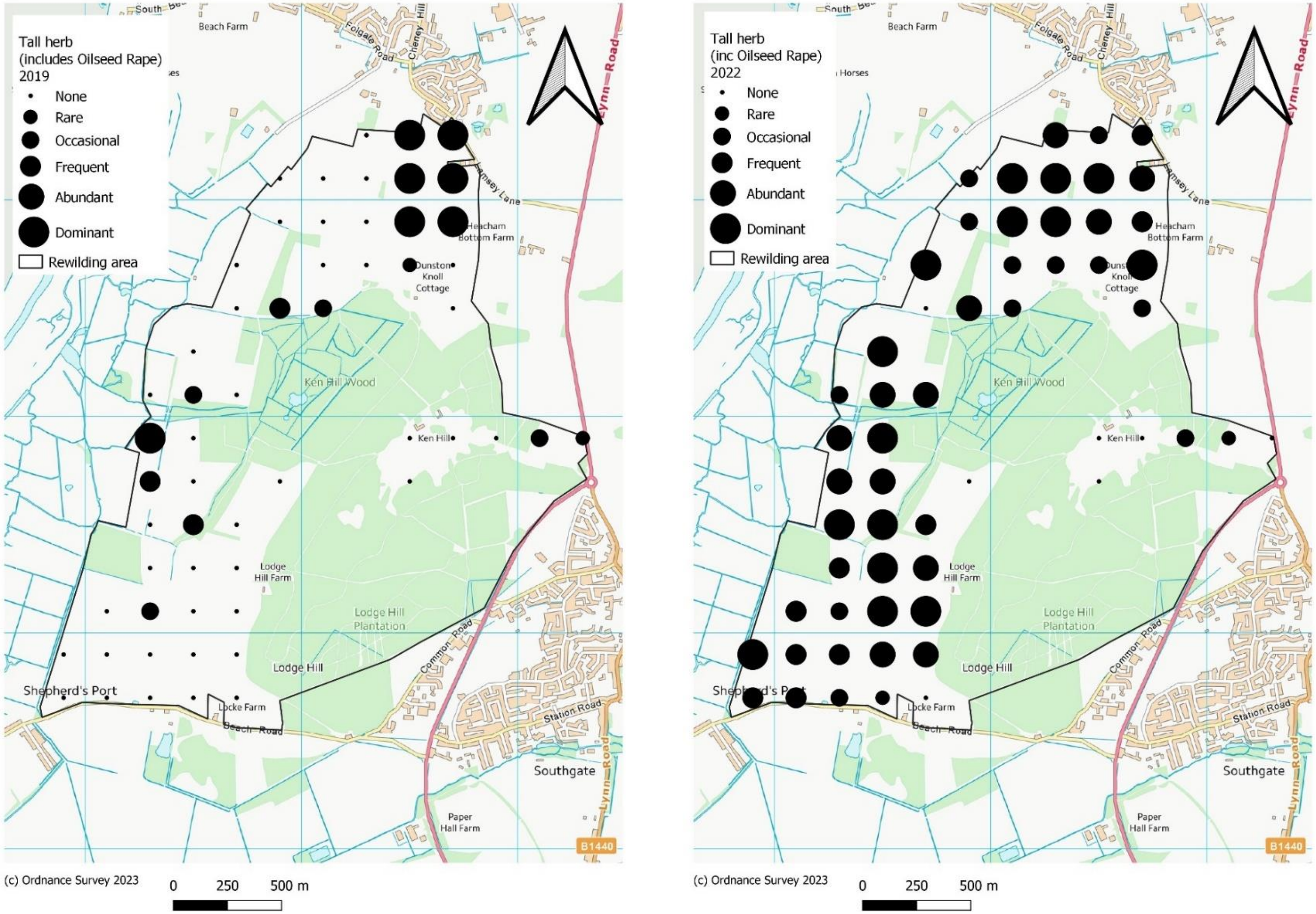
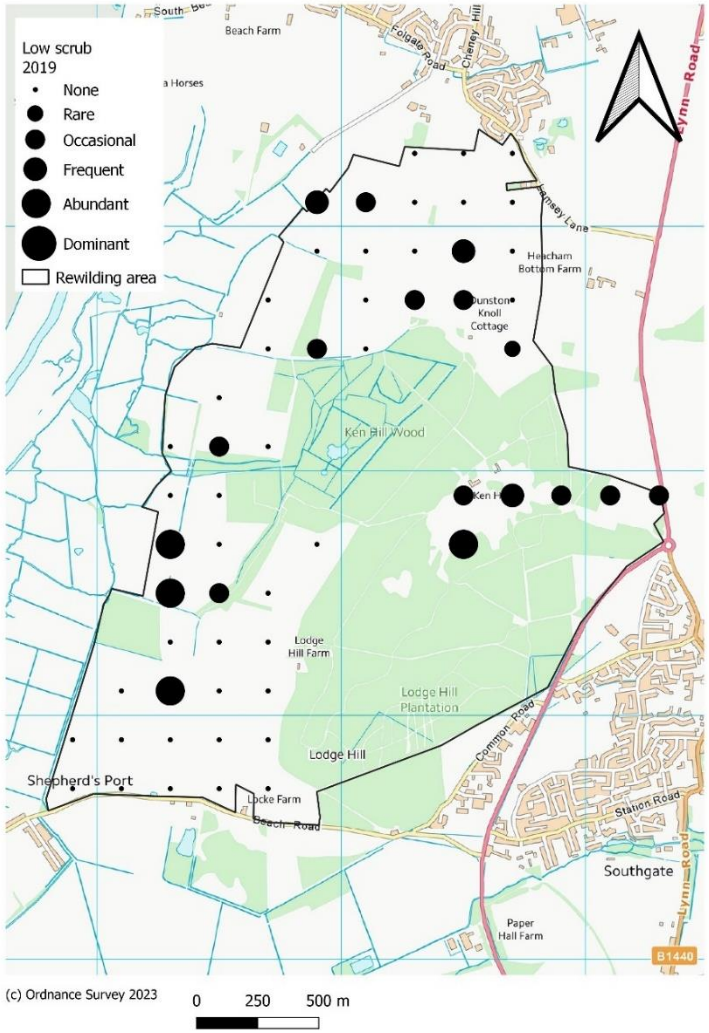


Fig. 27. Tall herb per plot (DAFOR).



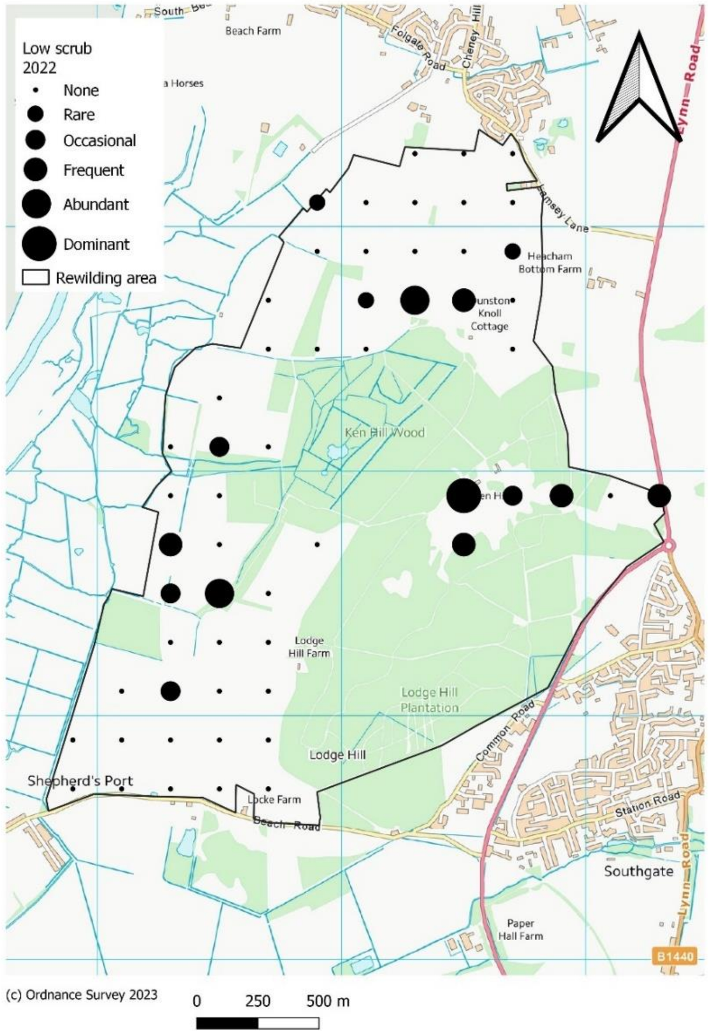


Fig. 28. Low scrub per plot (DAFOR).

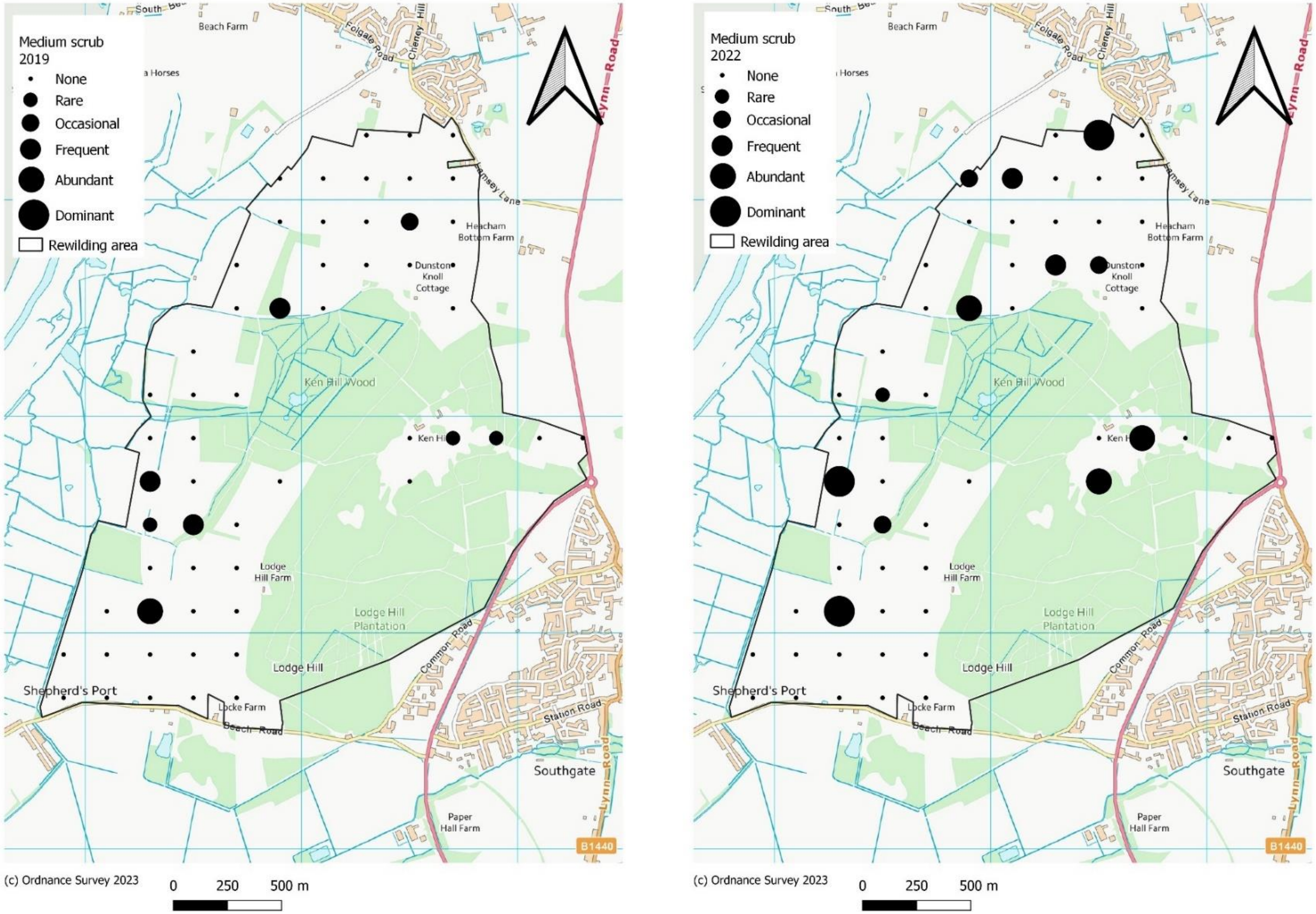


Fig. 29. Medium scrub per plot (DAFOR).

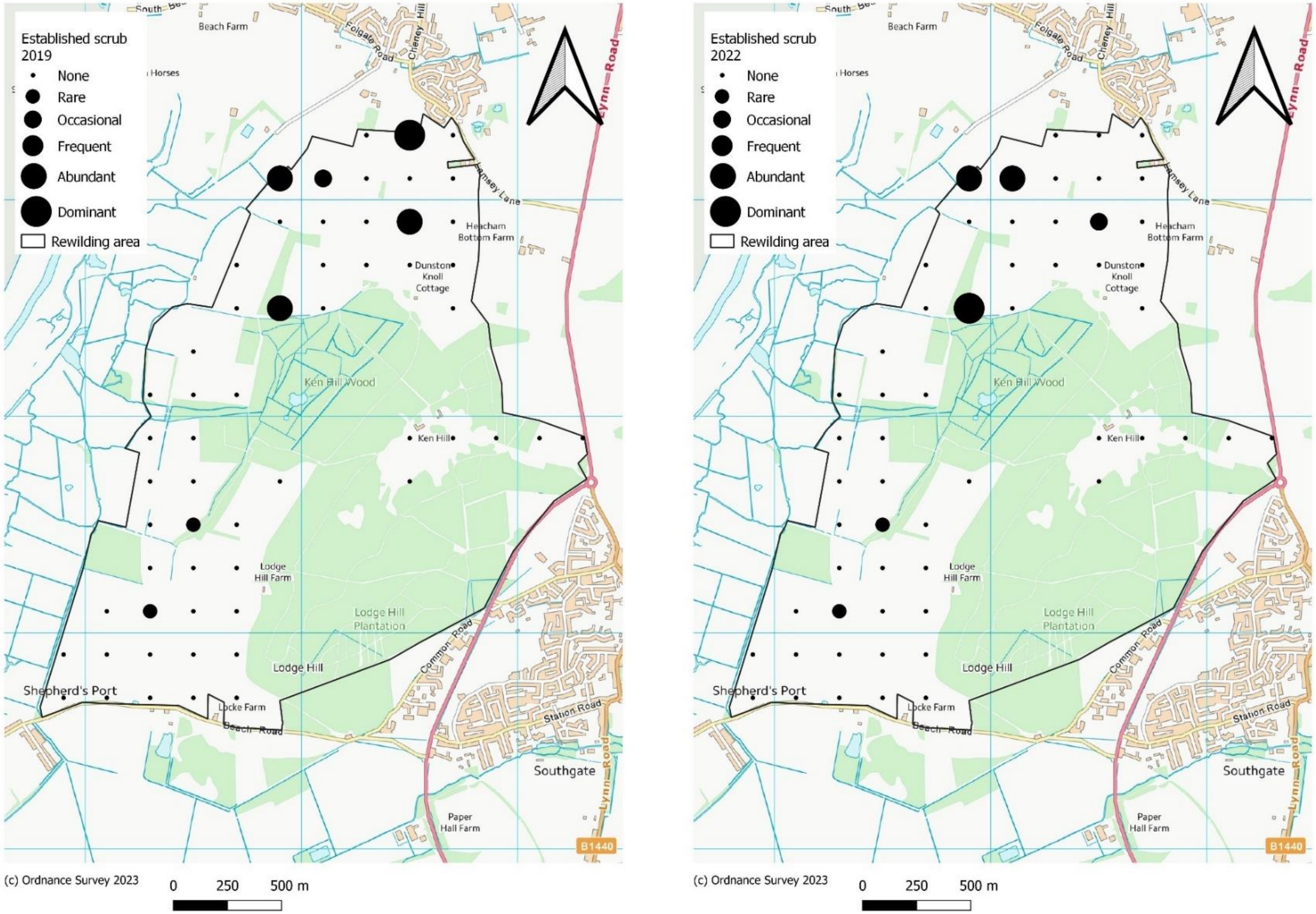


Fig. 30. Established scrub per plot (DAFOR).

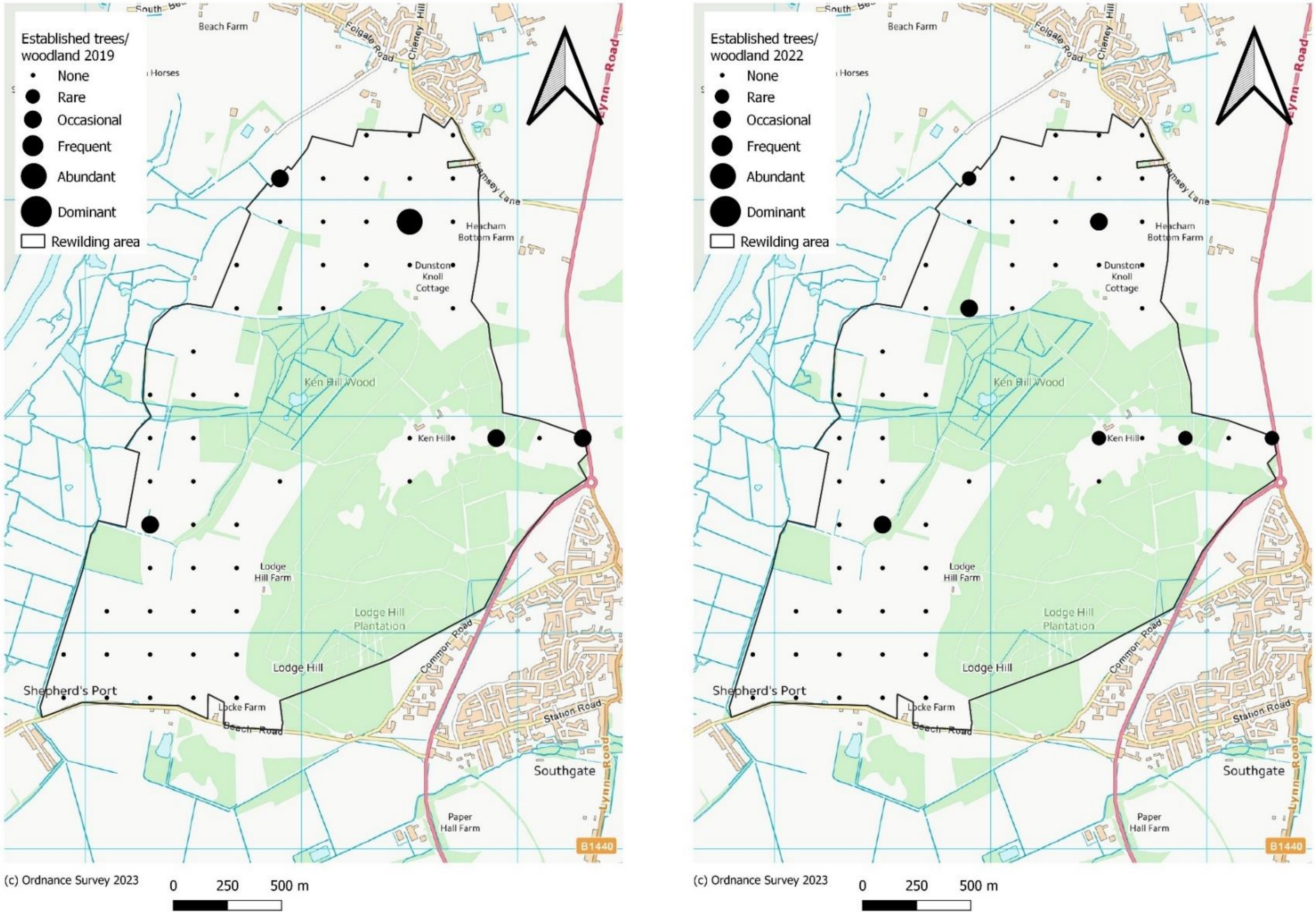


Fig. 31. Established trees/woodland per plot (DAFOR).

3.6 – Nectar sources

3.6.1 - Nectar abundance

The mean nectar abundance rose significantly from 0.81 ± 0.14 in 2019 to 1.91 ± 0.10 in 2022 and this was significant (W=127, P<0.001). The mode rose from 0 in 2019 to 2 in 2022, a very encouraging result.

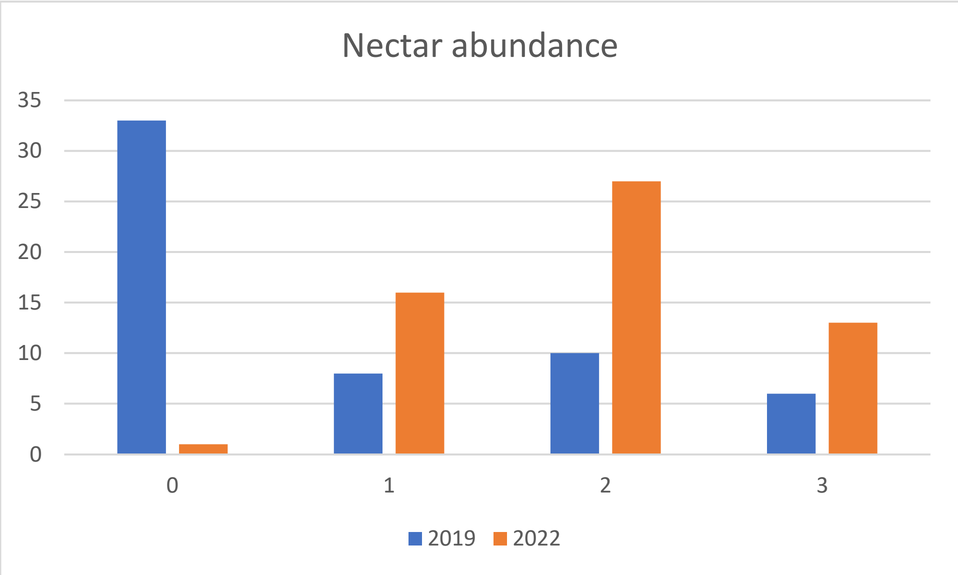


Fig. 32. Frequency distribution of the 'nectar abundance' from the open plots in both years.

The distribution of the abundance of nectar is clearly much less skewed to the left and is much healthier, with only one plot scoring zero.

3.6.2 - Nectar diversity

The mean nectar diversity rose significantly from 0.81 ± 0.15 in 2019 to 1.64 ± 0.09 in 2022 and this was significant (W=65, P<0.001). The mode rose from 0 in 2019 to 2 in 2022, another very encouraging result.

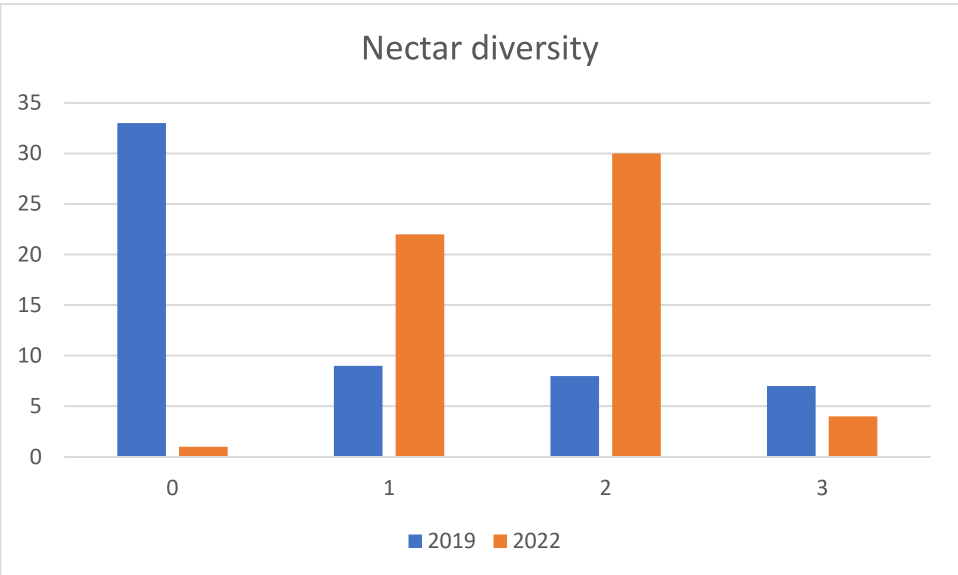


Fig. 33. Frequency distribution of the 'nectar diversity' from the open plots in both years.

Nectar diversity follows a similar positive trend to nectar abundance, with again only one plot scoring zero.

3.6.3 – Nectar index (the product of the above two measurements)

The mean nectar index rose significantly from 1.60 ± 0.32 in 2019 to 3.30 ± 0.24 in 2022 and this was significant (W=217, P<0.001). The mode rose from 0 in 2019 to 4 in 2022, another very encouraging result.

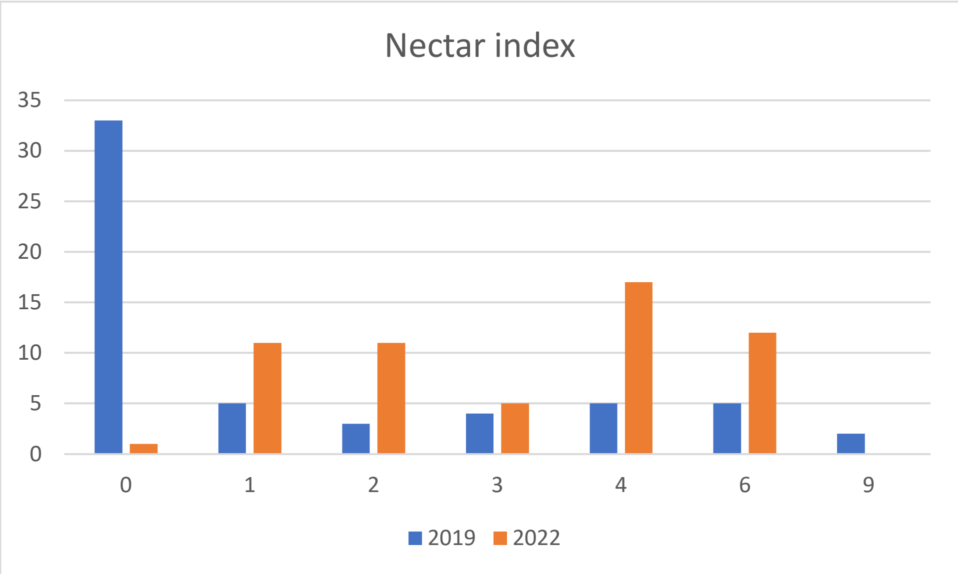


Fig. 34. Frequency distribution of the 'nectar index' from the open plots in both years.

Another much healthier distrinbution peaking at a score of four, rather than zero.

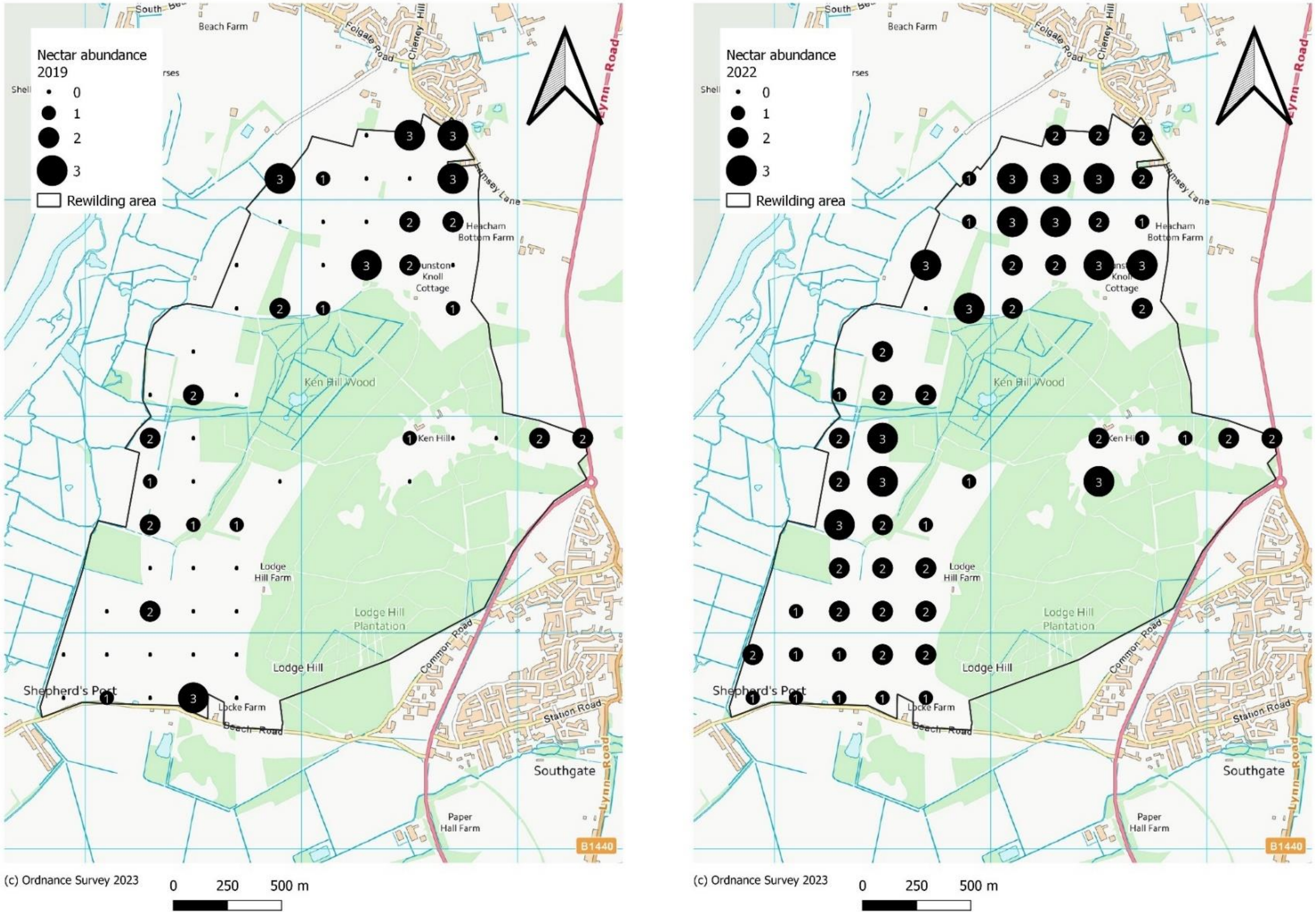
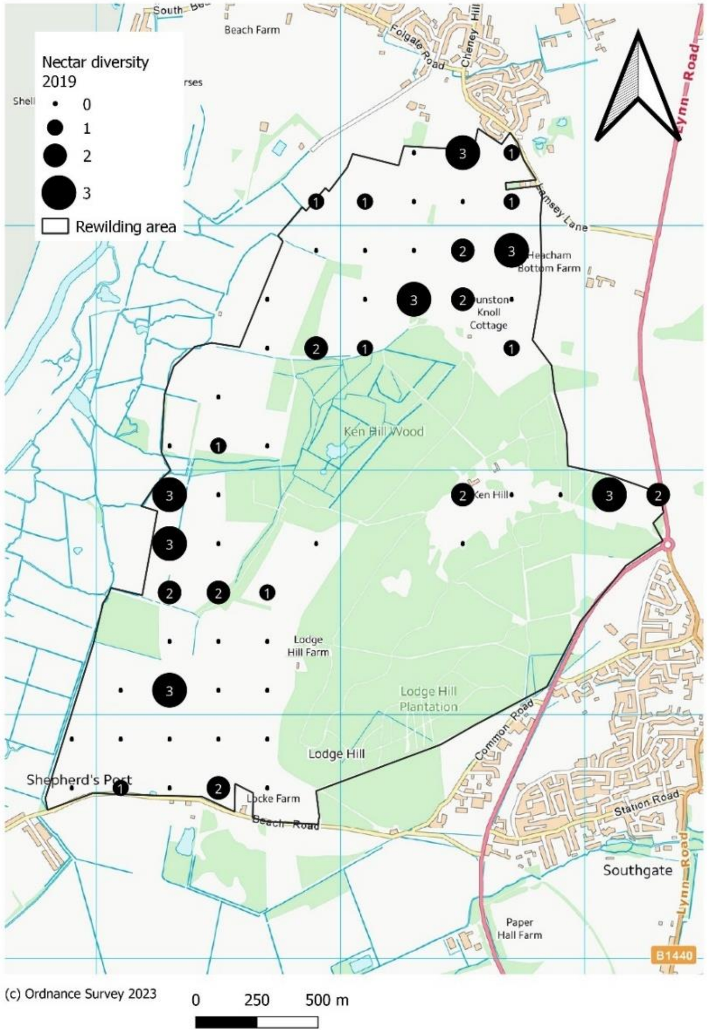


Fig. 35. Nectar abundance per plot.



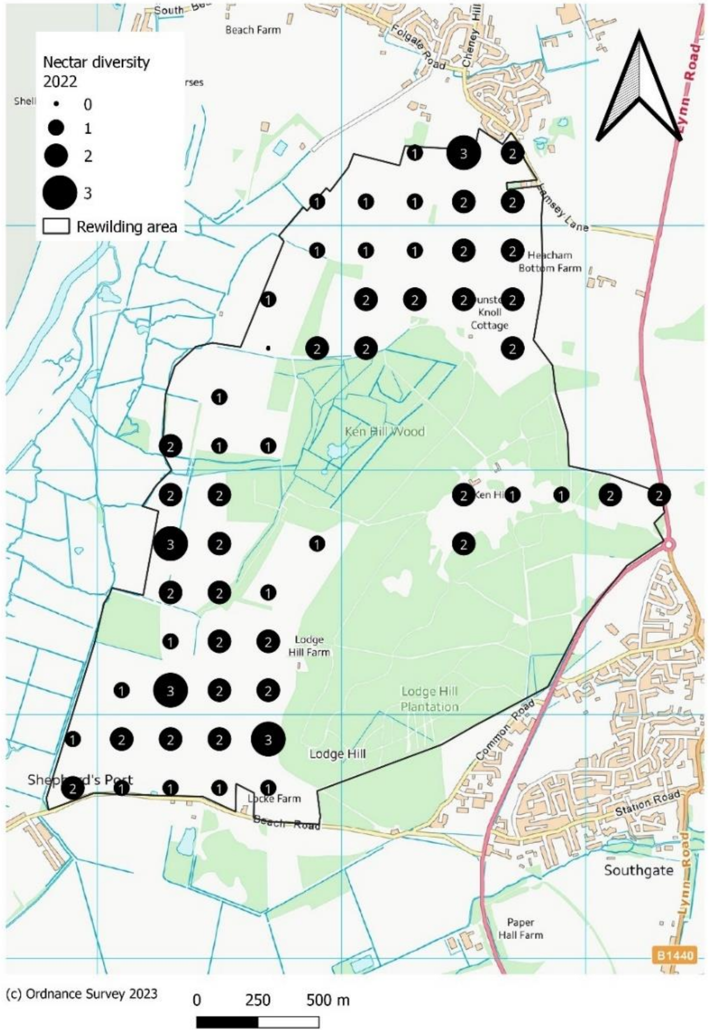


Fig. 36. Nectar diversity per plot.

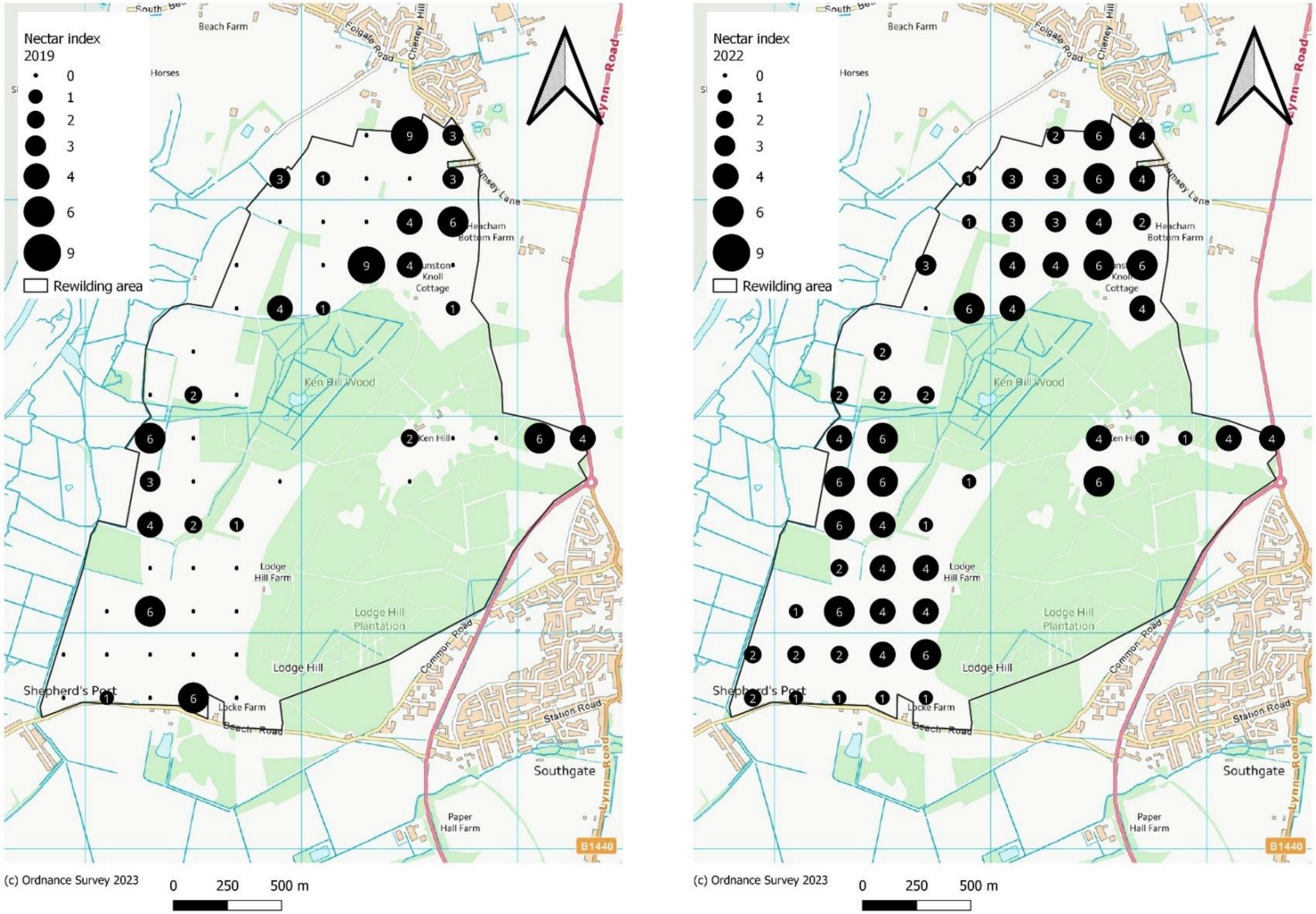
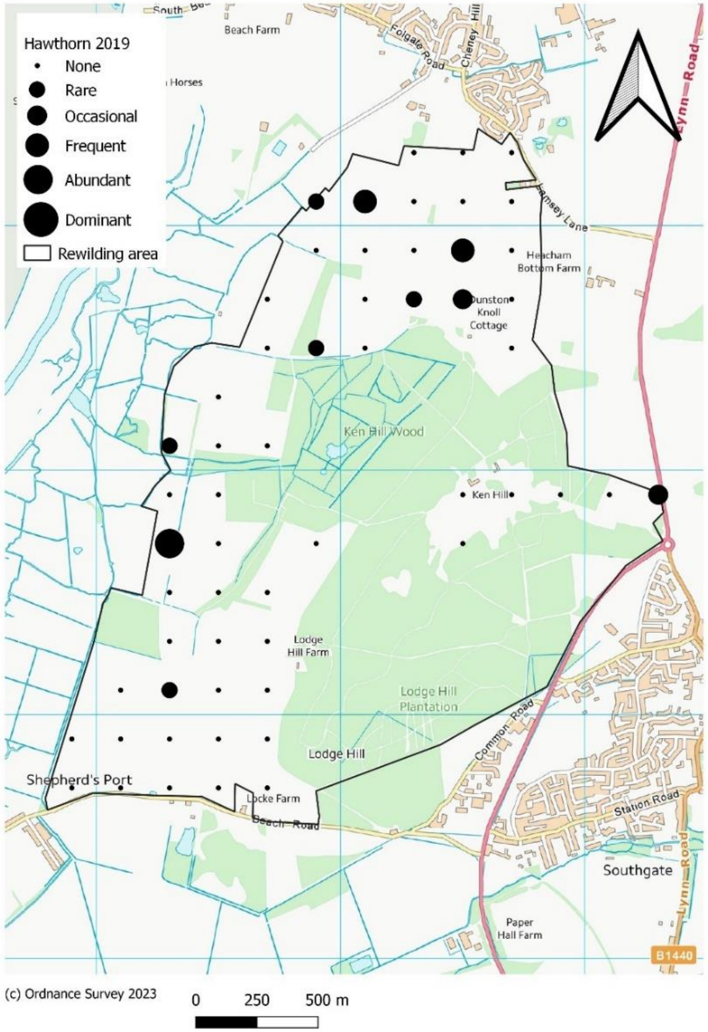


Fig. 37. Nectar diversity per plot.



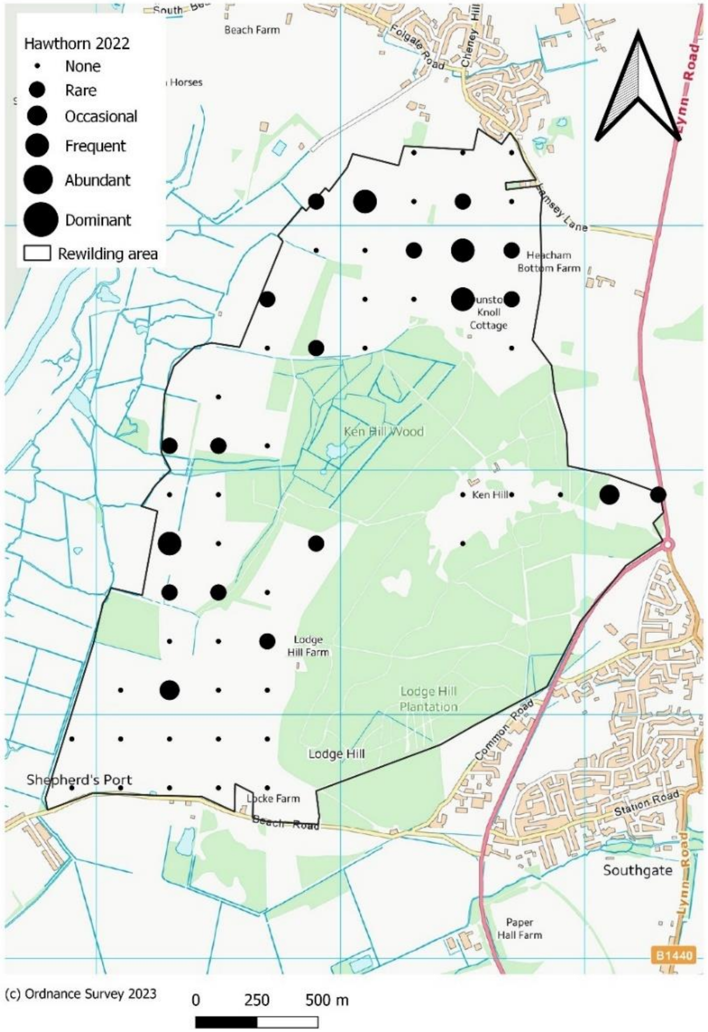


Fig.38. Hawthorn per plot (DAFOR).

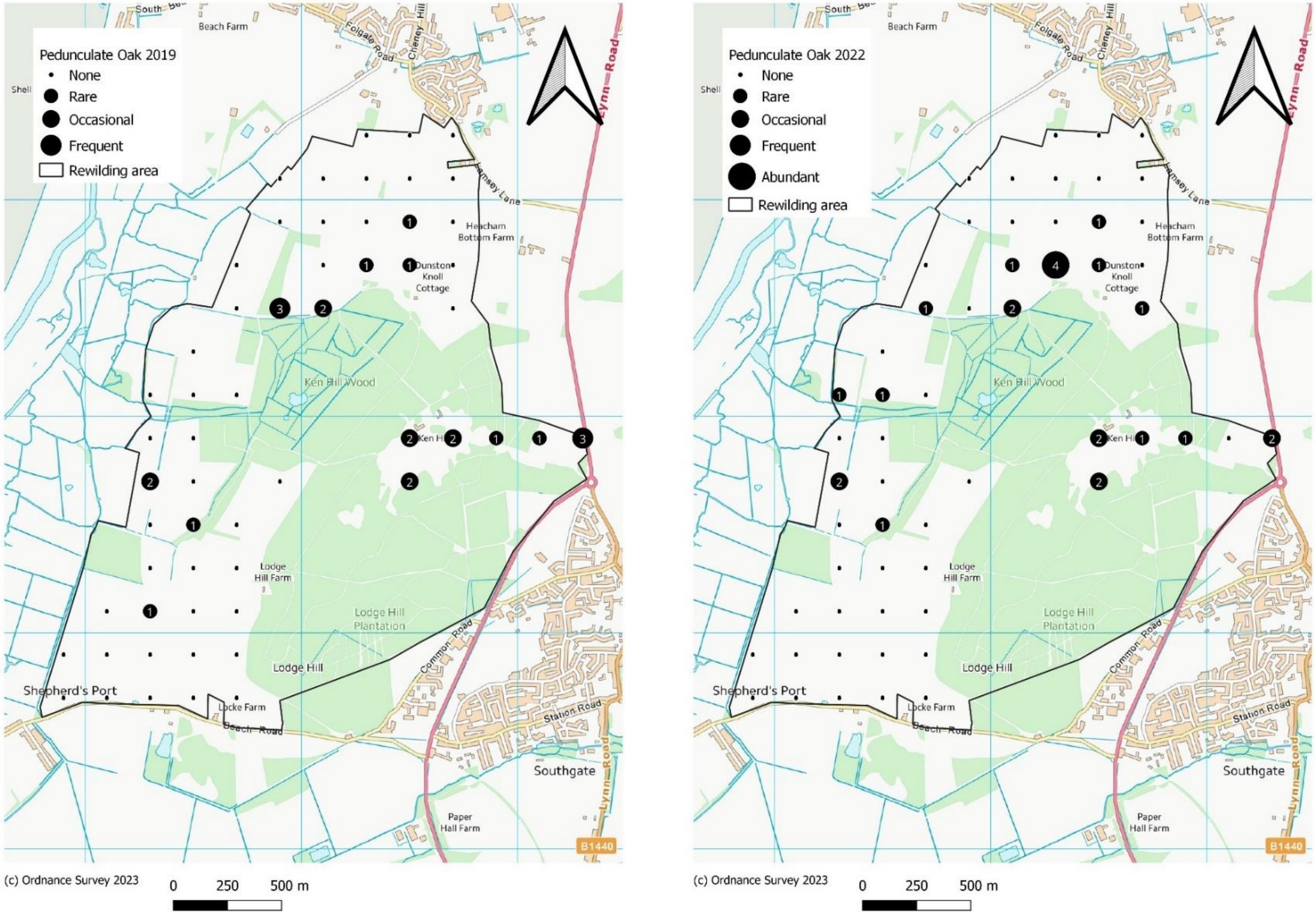


Fig. 39. Pedunculate Oak per plot (DAFOR).

3.7 – Mean vegetation height

Although the reader is urged not to read too much into a single measurement at each plot, the data does show that the mean sward height in the open plots has decreased from 64.3 ± 4.8 to 44.1 ± 2.8 ($t=3.86$, $P<0.001$).

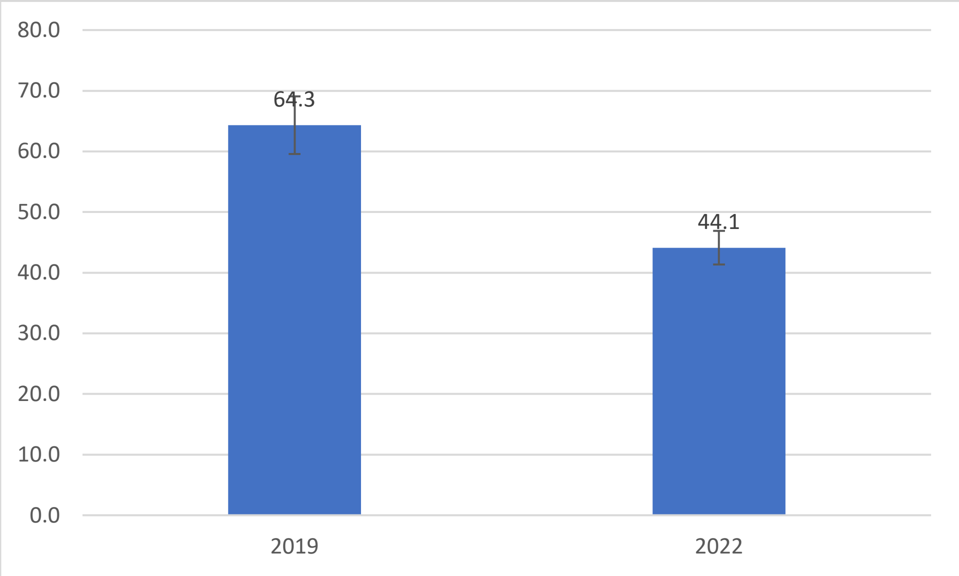


Fig. 40. Mean sward height in the open plots.

3.8 – Deadwood

No measurable deadwood was found in the open plots in either year, so this has not been mapped.

3.9 – Additional species

Breckland Leatherbug – Critically Rare

Fig. 41. Breckland Leatherbug.

No animals could be found in the vicinity of the railways line, where they were first found by the author in 2019, as there was hardly any of the foodplant, Common Stork's-bill. They were located to the south in an Estate property's garden and later by the author in the sandy arable field to the east of the site, where some management to remove non-native bulbs has recently gone ahead. It is likely that year-round grazing rather than pulsed grazing in a disturbance cycle, will negatively impact this species and others that require stork's-bill to feed.

Marbled Clover – Nationally Scarce

Fig.42. The day-flying moth, Marbled Clover.

Found between plots 58 and 67. A scarce species, restricted to the east of England (especially Brecks and North West Norfolk) but fairly frequent on these soils in Norfolk. A larva was recorded that may have been this species during the invertebrate survey in 2019 but it was not possible to say, meaning this day-flying moth might be a new record for the site.

4 – Analyses and conclusions

The rewilding area at Wild Ken Hill is generally progressing well, especially at the landscape level, with mean botanical species-richness, arable plants, plants with conservation status, number of structural types, nectar abundance and diversity all improving in the right direction and statistically significant. However, much of this gain is in the ex-arable plots, some existing grassland and arable margins showed little improvement or in some cases, a decline.

Extensive, year-round grazing is in the short term, beneficial, especially as compared to intensive agriculture. Yet by doing the same thing, everywhere all of the time, livestock can start to act as a homogenising force, rather than increasing diversity. Pulsing is key. That is, allowing for large parts of the site to be rested at any one time, bring a disturbance cycle into the mix. In terms of rewilding, this is actually far more naturalistic than keeping grazing levels continuous in one area, as it emulates predator/prey relationships and seasonal migration. Nofence technology is increasingly becoming a way to achieve this.

This survey should be repeated in between three and five years but if there are rapid changes that need capturing, this could be brought forward.

4.1 – Comparative analysis between different rewilding sites

Tab. 10. Comparative data from other sites where the same methodology has been used, blacked out cells were not completed.

Factor	Ken Hill (all)	Doddington	Waterhall	Butcherlands	Boothby	Knepp SB	Knepp RA	Ken Hill (open)	Ken Hill (open)
Surveyor	GL	GL	LJ	GN	LJ	LJ	GL	GL	GL
Year surveyed	2019	2021&22	2022	2021	2022	2022	2021	2019	2022
Year/s rewilded	2019	2021	2021	2005 to 2011	2022	2002 to 2011	n/a	2019	2019
Area/ha	422.7	720	90	c80	617	416	155	c250	c250
Number of plots	97	112	58	36	66	36	62	57	57
Percentage of area sampled	0.70	0.50	1.90	c1.4	0.32	0.26	1.20	c0.68	c0.68
Total number of species	232	226	155	175	123	137	182	209	208
Total species with status	8	4	1	0	1	0	0	8	5
Mean species-richness/plot - 300m²	15.5 ± 1.3	18.0 ± 0.11	28.0 ± 1.06	35.6 ± 5.9	8.0 ± 1.0	24.2 ± 1.2	23.8 ± 1.2	16.8 ± 2.07	33.2 ± 1.14
Mean species-richness - 1m²	[redacted]	4.46 ± 0.29	8.4 ± 0.44	[redacted]	2.3 ± 0.3	7.31 ± 0.41	6.21 ± 0.46	[redacted]	8.7 ± 0.5
Mean species with status per plot	0.13 ± 0.05	0.06 ± 0.02	0.4 ± 0.08	0	0.02	0	0	0.21 ± 0.08	0.81 ± 0.10
Maximum number in any plot	56	56	51	52	37	44	48	56	60
Minimum number in any plot	2	1	7	23*	1	12	3	2	13
Mean non-natives per plot	1.64 ± 0.10	1.50 ± 0.13	0.02 ± 0.02	0.94 ± 0.06	1.4 ± 0.1	0	0.13 ± 0.04	1.18 ± 0.09	0.89 ± 0.09
Mean arable plants per plot	0.77 ± 0.11	0.22 ± 0.05	n/a	n/a	1.2 ± 0.2	0.9	0.45 ± 0.06	1.19 ± 0.16	2.09 ± 0.21
Plant Life's arable plant index (all site)	105	34	n/a	n/a	3	2	7	105	[redacted]
Mean seedling per plot	72.3 ± 35.1	26.6 ± 5.87	22.4 ± 15.4	[redacted]	4.5 ± 2.1	45.1 ± 10.5	33.7 ± 7.34	11.4 ± 3.98	18.9 ± 5.31
Mean saplings per plot	14.4 ± 5.66	11.8 ± 2.74	5.1 ± 1.9		1.7 ± 1.2	27.8 ± 10.2	15.3 ± 4.26	1.40 ± 0.69	2.05 ± 0.70
Mean percentage cover of Bramble	14.8 ± 2.90	8.81 ± 2.00	9.7 ± 1.8		0.5 ± 0.04	14.7 ± 2.2	6.4 ± 1.8	3.01 ± 1.37	3.43 ± 1.07
Mean canopy stems per plot	6.06 ± 1.02	4.71 ± 0.89	7.8 ± 2.2		1.5 ± 0.75	15.5 ± 4.5	4.19 ± 1.21	0.25 ± 0.12	0.35 ± 0.17
Mean basal area per plot (m²)	0.43 ± 0.06	0.27 ± 0.05	0.10 ± 0.03		0.10 ± 0.06	0.20 ± 0.07	0.15 ± 1.21	0.026 ± 0.02	0.030 ± 0.02
Mean structural types per plot	4.3	3.9	4.3		2	5.4 ± 0.3	3.9	3.6 ± 0.27	4.8 ± 0.21
Mean nectar abundance per plot	0.6	1.1	1.6	2.3	1.2	2.5	0.9	0.81 ± 0.14	1.91 ± 0.10
Mean nectar diversity per plot	0.6	1.0	1.6	2.1	0.8	1.6	0.9	0.81 ± 0.15	1.64 ± 0.09
Mean nectar index per plot	1.1	1.9	3	4.1	1.5	3.9	1.5	1.60 ± 0.32	3.30 ± 0.24
Mode nectar index per plot	0	0	2	6	0	3	0	0	4

Mean volume of deadwood/plotm[3]	0.8 ± 0.4	0.57 ± 0.15	0.06 ± ???	[redacted]	0.01	0.06 ± 0.04	0.1 ± 0.4	0	0

4.2 – Statistical analyses between the open plots in 2019 and 2020

All data sets were first tested for normality before any statistical tests were applied and if so, non-parametric tests were used if data transformations could not rectify this. Chi-squared tests were used for any comparisons that involved frequencies rather than means.

Tab. 11. Summary of statistical tests carried out through this report.

Metric	Ken Hill open 2019	Ken Hill open 2022	Significance	Statistical test value*	P Value
Mean species-richness per plot (300m^2)	16.8 ± 2.07	33.2 ± 1.14	Highly significant	W=104	<0.001
Mean species with status per plot	0.21 ± 0.08	0.81 ± 0.08	Highly significant	W=98	<0.001
Mean arable species per plot	1.19 ± 0.16	2.21 ± 0.23	Highly significant	t=4.00	<0.001
Mean non-natives per plot	1.18 ± 0.09	0.89 ± 0.09	None	W=192	0.09
Mean seedlings per plot	11.4 ± 3.98	18.9 ± 5.31	Highly significant	W=163	<0.001
Mean saplings per plot	1.40 ± 0.69	2.05 ± 0.70	None	W=20.5	0.29
Mean percentage cover of Bramble	3.01 ± 1.37	3.43 ± 1.07	Significant	W=85.5	0.02
Mean canopy stems per plot	0.25 ± 0.12	0.35 ± 0.17	N/A	N/A	N/A
Mean structural types per plot	3.6 ± 0.27	4.8 ± 0.21	Highly significant	W=142	<0.001
Mean nectar abundance per plot (ordinal)	0.81 ± 0.14	1.91 ± 0.10	Highly significant	W=127	<0.001
Mean nectar diversity per plot (ordinal)	0.81 ± 0.15	1.64 ± 0.09	Highly significant	W=65	<0.001
Mean nectar index per plot (ordinal)	1.60 ± 0.32	3.30 ± 0.24	Highly significant	W=217	<0.001
Mean sward height (cm)	64.3 ± 4.8	44.1 ± 2.8	Highly significant	t=3.86	<0.001
Frequency of occurrence of Common Cudweed (nominal)	3/57	35/57	Highly significant	X^2=40.1	<0.001

4.3 – Further analysis

A more involved analysis of the plots could be done looking at Ellenberg values, especially those for 'nutrients', (N) and light (L).

5 – Management recommendations

Although the rewilding area at Wild Ken Hill is generally progressing in the right direction, there are some signs that existing good quality habitat has been negatively impacted. It is very difficult to have a negative impact on much of the arable land, as it was so species-poor in 2019. However, it is the areas that were already in good condition to start with, that should act as an assessment of the quality of management now. Some of the most biodiverse areas surveyed in 2019 are clearly receiving an inordinate amount of pressure from the livestock, such as along the railway in figures 43 and 44 below. These were the areas that the author described in the NVC survey and invertebrate reports as being important, Breck-like swards. The following is taken from that report, where the author created an NVC community to describe this area, as it was difficult to find a perfect fit.

"KH2 – Wild Clary *Salvia verbenaca* – Knotted Clover *Trifolium striatum* – Ribwort Plantain – *Plantago lanceolata* acid-grassland

Perhaps closest to the Breckland sub-community U1c, this rich and sandy community was present along the old railway line and a few other places south of Hill Field to the very south of the site. It was particularly rich in invertebrates and a number of species, such as *Alydus calcaratus* were found here."

Fig. 43. Ponies have had a significant negative impact on this area, both sides of the tracks, including removing much of the Broom scrub.

Taken from the author's invertebrate survey in 2019 regarding this specific area (Beach Road):

"Ken Hill is clearly an important invertebrate site, even as a working farm. The areas with the greatest invertebrate interest are those with bare, sandy soils. Beach Road and the Plain. Although similar in nature, the two sites are quite different. The wealth of bare ground creation on the Breck-like Beach Road is important but under arable was too regular and extensive to be beneficial to invertebrates except on one discrete bank/margin on the edge of the old railway.

During the ISIS analysis, this and section 5 were the only sections to have a favourable 'rich flower assemblage' and the wealth of nectar sources on the bank were rich and varied. Bare ground was abundant. Away from these areas however, farming was too destructive to create any valuable invertebrate habitat. The vast area of this field is dominated by beet, in time this may turn towards something more Breck-like."

This area was also very close to plot 85, the most speciose plot of the 2019 survey.

By 2022, there no flowers here and hardly any of the plants or invertebrates could be found that were found in 2019. Fencing this area out is not the answer, but a more nuanced grazing regime that factors in pauses in grazing (temporally and spatially) to be as important as the periods of grazing themselves, is needed. As this is when life will flourish.

The crude 'one-size fits all' approach to rewilding where animals have access to the same area, year on year, can often negatively impact existing good quality habitat. Yes, the whole may have improved overall but holding on to key existing areas is vital. This was by far the best area in the invertebrate survey, but it will most likely score badly in the 2024 invertebrate survey due to the excessive interest it gets from ponies, if this is not varied. It is also not possible for this habitat to simply appear somewhere else, as these soils are different to much of what has been seen elsewhere, due to not receiving fertiliser and having ecological continuity (and hence why the livestock are drawn to it). In a sea of fields regenerating from Sugar Beet, these areas rich in plant species will always be a draw to livestock. Holding on to these small islands of good habitat is vital at the start of a rewilding project, as they should act as donors to the rest of the project but if they are negatively impacted from the start, this can cause problems and is an own goal for rewilding.

Fig. 44. A huge dust bath was once the location of some of the richest grassland on the site.

Disturbance of this magnitude simultaneously creates and destroys habitat, effectively making it unusable for most plants and animals. A disturbance cycle is key and this is becoming clear from the author's work on a meta-analysis of a range of invertebrate surveys carried out on rewilding projects in the south east (see table 10 above to make comparisons with these different sites).

Fig. 45. Rabbit activity has clearly increased here between 2019 and 2022.

In figures 46 and 47 below, a sudden change from arable to grassland can be seen, with Corn Marigold disappearing in three years. Given how much land is being sympathetically managed by Wild Ken Hill to the east, this may be an acceptable loss but this plant favours more acidic soils and it is worth checking that the plant still thrives somewhere at Wild Ken Hill. If not, disturbance cycle is again key, whether this be created by animals or by intervention.

Fig. 46 (top 2022) & 47 (bottom 2019). A sward is developing very quickly across much of the site, at the expense of some arable plants like Corn Marigold and Stinking Chamomile, which was common in this area. The same view showing a wealth of Corn Marigold and some Stinking Chamomile in early summer 2019.

Observations of other key existing areas, chiefly The Plain, have shown a decrease in rank grasses and opened up germination space on the tops of old tussocks, where species like Shepherd's-cress have spread. However, the grazing pressure was also thought to be too consistently high, not allowing for much flowering and seeding. There may even be a negative impact in the long run on an ageing population of Heather, without generating enough germination space. Again, the answer to solve this problem is to graze for periods, then pause. These periods, areas and intensities do not need to be consistent but without variety, biodiversity will be limited.

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Appendices

The data is too big to attach directly to this report, instead it is attached as an associated Excel file.