Conservation Evidence Report

Wilder Blean

Habitat structure and vegetation dynamics: spatially referenced vegetation baseline survey

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Survey leader: Kora Kunzmann

Survey type: Baseline monitoring

Date(s) of fieldwork: 08th June – 15th August 2021

Date of report: February 2023

1 Project introduction

Wilder Blean is a wilding project in West Blean and Thornden Woods that is reintroducing large grazing herbivores to reinstate natural processes in a woodland ecosystem and monitoring the effects of these animals on the vegetation and the taxa this will in turn influence. The project is designed as an experiment involving three grazing assemblage treatments: 1) 'Bison treatment' containing European Bison, Exmoor ponies and Iron-Age pigs; 2) 'Conservation Grazers treatment' containing Longhorn Cattle (in place of Bison), Exmoor Ponies and Iron-age pigs, and 3) 'Control treatment' which is a control area where no introduced grazing animals will be present. For ease of writing, treatment 2 ('Conservation Grazers') will be referred to as 'Proxy treatment' in this report.

The Blean woodland complex to the north and west of Canterbury forms one of the largest surviving blocks of ancient semi-natural woodland in England. West Blean and Thornden Woods, which forms part of the Blean complex, is a mosaic of different habitat types as a result of extensive replanting. The oldest and most natural types are the oak-hornbeam community and mixed broad-leaved coppice with standards. Of more recent origin are extensive stands of sweet chestnut coppice. During the last 55 years or so, extensive areas of the woodland have been cleared and replaced with conifer plantations, some of which have since been thinned or felled. Within the woodland there are also small areas of heath and a few limited areas of wetland habitat, including natural features as well as man-made ponds.

Due to the Bison's ecology and behaviour, the project is hoping to create more open areas and structural diversity and provide a nature-based, natural process led, and sustainable solution to woodland management in southeast England.

2 Survey aims

The aim of this survey is to identify and evaluate the changes in vegetation structure, community, and compositional dynamics, as a result of the naturalistic grazing regime by providing grid based, spatially referenced fixed quadrat mapping of plant communities.

3 Survey methodology

3.1 Logistics

3.1.1 Spatially referenced grid

A 200m grid was selected to give 142 sample points across the site, which can be seen in **Figure 1** Map showing vegetation monitoring plots across all three treatmentsInitially, the grid provided 145 monitoring points, however upon commencement of fieldwork it became obvious that three points lay outside of the project boundary and were therefore removed. Some of the monitoring points were repositioned slightly in case they fell on fence lines. Plots were labelled 001 to 145.

19 points were not sampled due to being impossible to access safely without damaging the nature of the plot so much as to render surveying meaningless. This was either due to dense, impenetrable, young native regen habitat (comprising heather, birch, broom, bracken) or dense, chest-high bramble.

40 plots were sampled in the bison treatment, 56 in the proxy treatment and 27 in the control treatment. As each plot is 300m², 123 plots cover an area of 3.69ha. This means that only 0.66% of the 560ha rewilding project area was sampled.

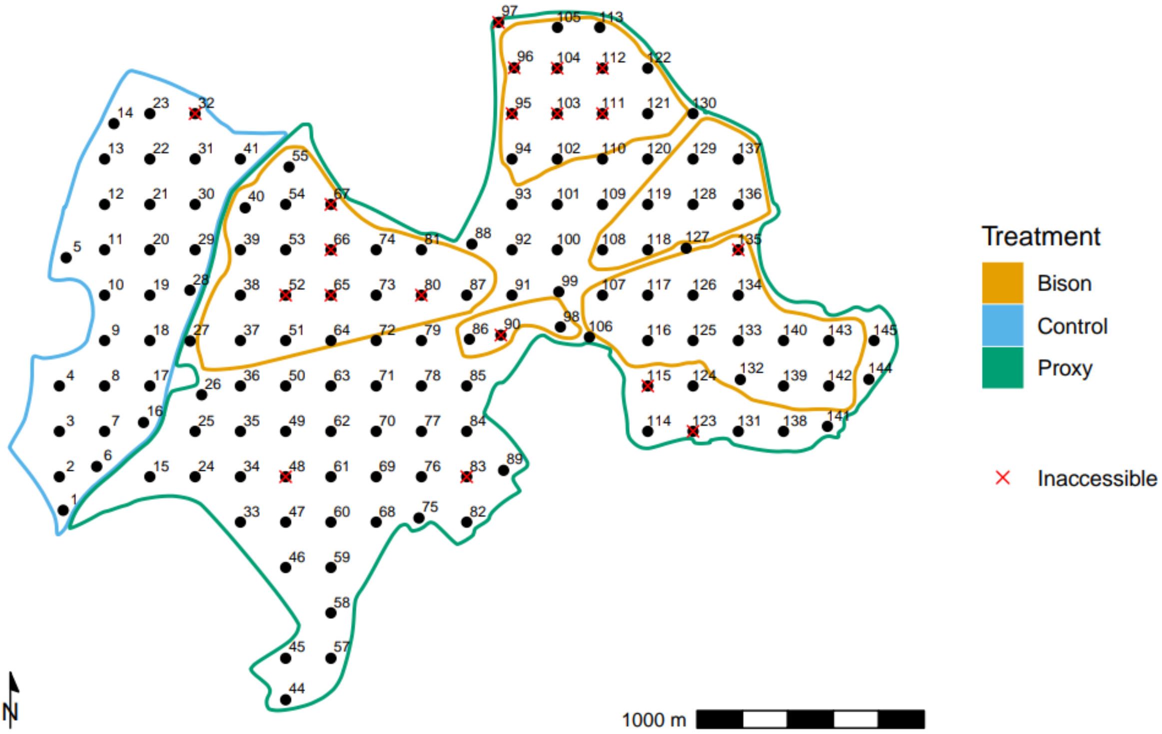

Figure 1 Map showing vegetation monitoring plots across all three treatments

3.1.2 Locating grid points

A high-powered GPS (Emlid Reach RS2) was used to carry out the survey in June, July and August 2021. This allowed the surveyor to get within sub-centimetre accuracy 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; inquisitive livestock would likely destroy any markers as would any mechanical intervention.

3.2 Survey plots

The basic methodology of the plots follows that of Swift (2006). 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 9.77m. This would delineate a circle of exactly 300m².

3.2.1 Species-richness of all plants

The following DAFOR scale was employed to record all species of plant: D (dominant) >75% cover, A (abundant) 51-75% cover, F (frequent) 26-50% cover, O (occasional) 11-25% cover, R (rare) 1-10% cover.

Plants were recorded to species where possible but in some instances were only recorded to genus or family. Birch and oak species particularly were recorded to just genus due to difficulty differentiating between downy birch (*Betula pubescens*) and silver birch (*Betula pendula*), as well as pedunculate oak (*Quercus robur)*, sessile oak (*Quercus petraea*) and any hybrids. Spruce (*Picea spp.),* larch (*Larix spp*.) and fir (*Abies spp.*) were recorded as conifers.

3.2.2 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 woody plant under 1.3m in height. It was decided to remove bramble and honeysuckle from the seedling count as it was not possible to accurately count them.

3.2.3 Sapling layer

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

3.2.4 Canopy layer

All trees with a GBH of over 20cm were classed in this category. Distance and direction from the central point were recorded as well as the tree's circumference at breast height. This allowed for a total basal area per ha to be calculated.

3.2.5 Vegetation structure

Each of the following structural layers was assessed using the same DAFOR scale as mentioned above. There are a maximum of nine structural layers:

1. Bare ground
2. Short grass
3. Medium grass

4. Rank grass
5. Tall herb
6. Low scrub
7. Medium scrub
8. Established scrub
9. Established trees/woodland

3.2.6 Nectar sources

Nectar sources were assessed in two ways; abundance and diversity. Each was assessed on a scale of 0 to 3. A nectar index was then calculated, multiplying abundance with diversity, allowing for scores between 0 and 9.

3.2.7 Deadwood

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

4 Results and analysis

This report represents a baseline of the vegetation data in the project area ahead of the release of any grazing animals and its intent is to reflect the vegetation composition and structure in 2021. The surveyors have collected a large amount of data that could be analysed in more ways than presented in this report. It is likely that future reports go into more detail or that this report becomes extended in the future as it currently only gives an overview of vegetation dynamics and composition.

4.1 Species-richness of all plants

A total of 137 plants were recorded to species level, an additional seven were recorded to only genus or family. A map of overall species richness across the project area can be seen in **Figure 2**. No Lower Plants (bryophytes, lichens and fungi) were recorded as part of this survey. There was a great variety of species numbers per plots; from only five in plot 8 to 39 in plot 72. Plot 8 is dominated by bracken which allows very few other plants to grow whilst plot 72 is in high forest habitat but located close to a public footpath and therefore benefits from ride management which allows sunlight onto the woodland floor in a large area of the plot which in turn aids a range of different species to grow. Generally, there were fewer species found in dense sweet chestnut (*Castanea sativa*) coppice habitat where the ground flora is very sparce as well as in dense conifer plantation areas where bramble (*Rubus fruticosus*) or bracken (*Pteridium aquilinum*) usually dominate the ground flora. A higher amount of species was generally found in areas that contain more open pockets allowing sunlight to filter through to the ground flora. The mean species richness across all plots was 15.24.

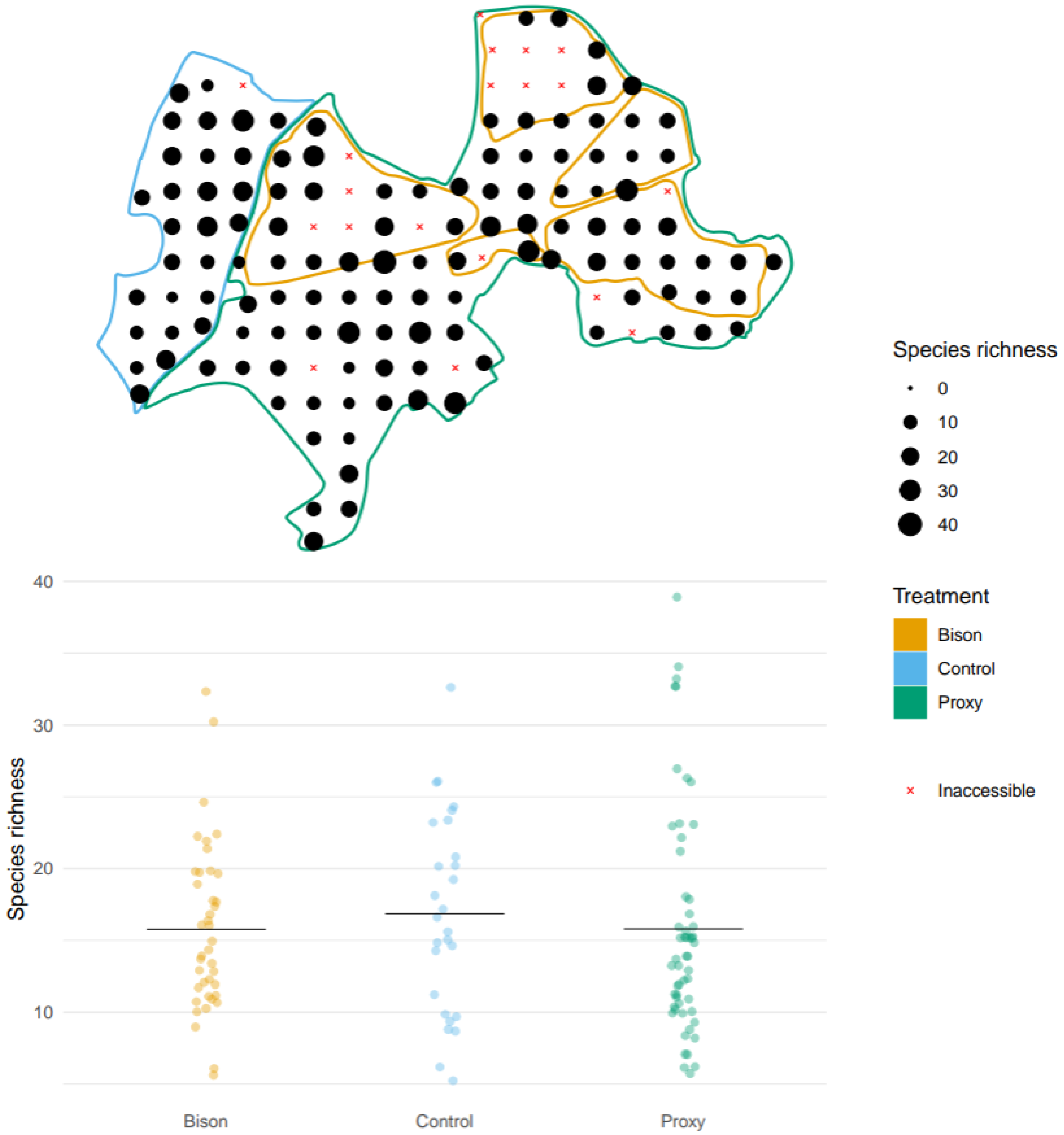

Figure 2 Map showing species richness as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

Bramble was the most frequent plant across all monitoring points, closely followed by oak (*Quercus spp*.). Birch (*Betula spp*.), bracken, honeysuckle (*Lonicera periclymenum*), sweet chestnut, holly (*Ilex aquifolium*) and hazel (*Corylus avellana)* were also all found in more than half of the plots, see **Table 1.**

Table 1 The most frequent species across all 142 plots

Rank	Species	Number of plots	Percentage of plots
1	Bramble	116	92.1
2	Oak spp.	115	91.3
3	Birch spp.	101	80.2
4	Bracken	95	75.4
5	Honeysuckle	93	73.8
6	Sweet Chestnut	88	69.8
7	Holly	87	69
8	Hazel	83	65.9
9	Wood Sage	62	49.2
10	Creeping Soft-grass	57	45.2

Table 2 The most frequent species scoring as 'dominant'

Rank	Species	Number of plots where 'dominant'	Percentage of plots where 'dominant'
1	Bramble	5	4
2	Birch spp.	2	1.6
3	Bracken	1	0.8
4	Lesser Periwinkle	1	0.8

Only four species scored 'dominant' (see 3.2.1 Species-richness of all plants) across all 142 plots with bramble being the most frequent again and scoring as 'dominant' in five plots. Birch was recorded as 'dominant' in two plots and bracken and lesser periwinkle (*Vinca minor*) in one plot each.

Figure 3 Circular bar plot showing the abundance (DAFORX) of each species within the bison treatment area, **Figure 4** and **Figure 5** show circular bar plots containing all plants found in each treatment and their abundance (DAFORX). 87 different plants were found in the bison area, 124 plants in the proxy area and 79 plants in the control area. The high number of species in the proxy area compared to both other treatments can be explained due to more monitoring points located in open areas, along rides and footpaths but also due to the fact that a higher number of plots was monitored in the proxy area compared to both other treatments.

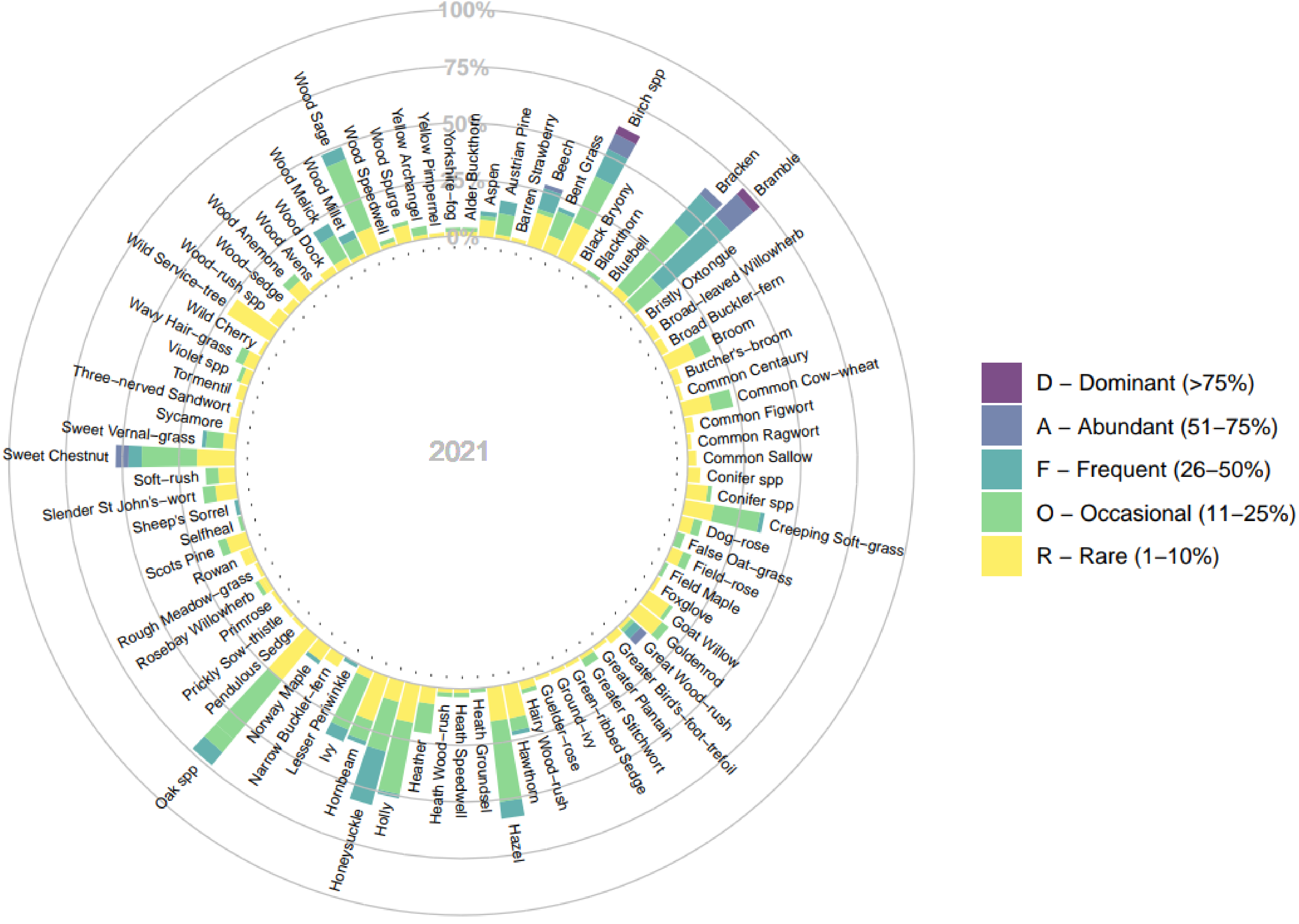

Figure 3 Circular bar plot showing the abundance (DAFORX) of each species within the bison treatment area

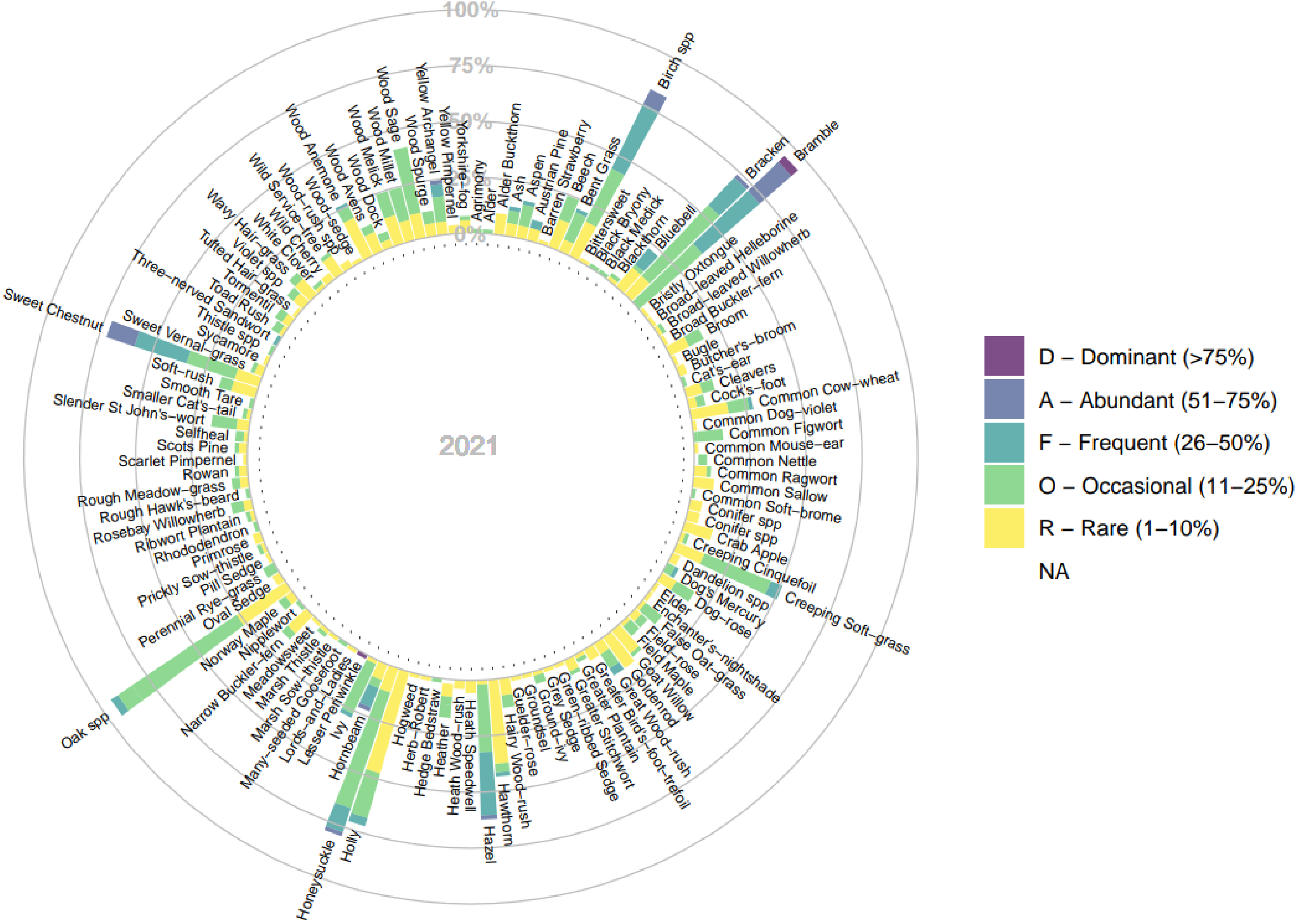

Figure 4 Circular bar plot showing the abundance (DAFORX) of each species within the proxy treatment area

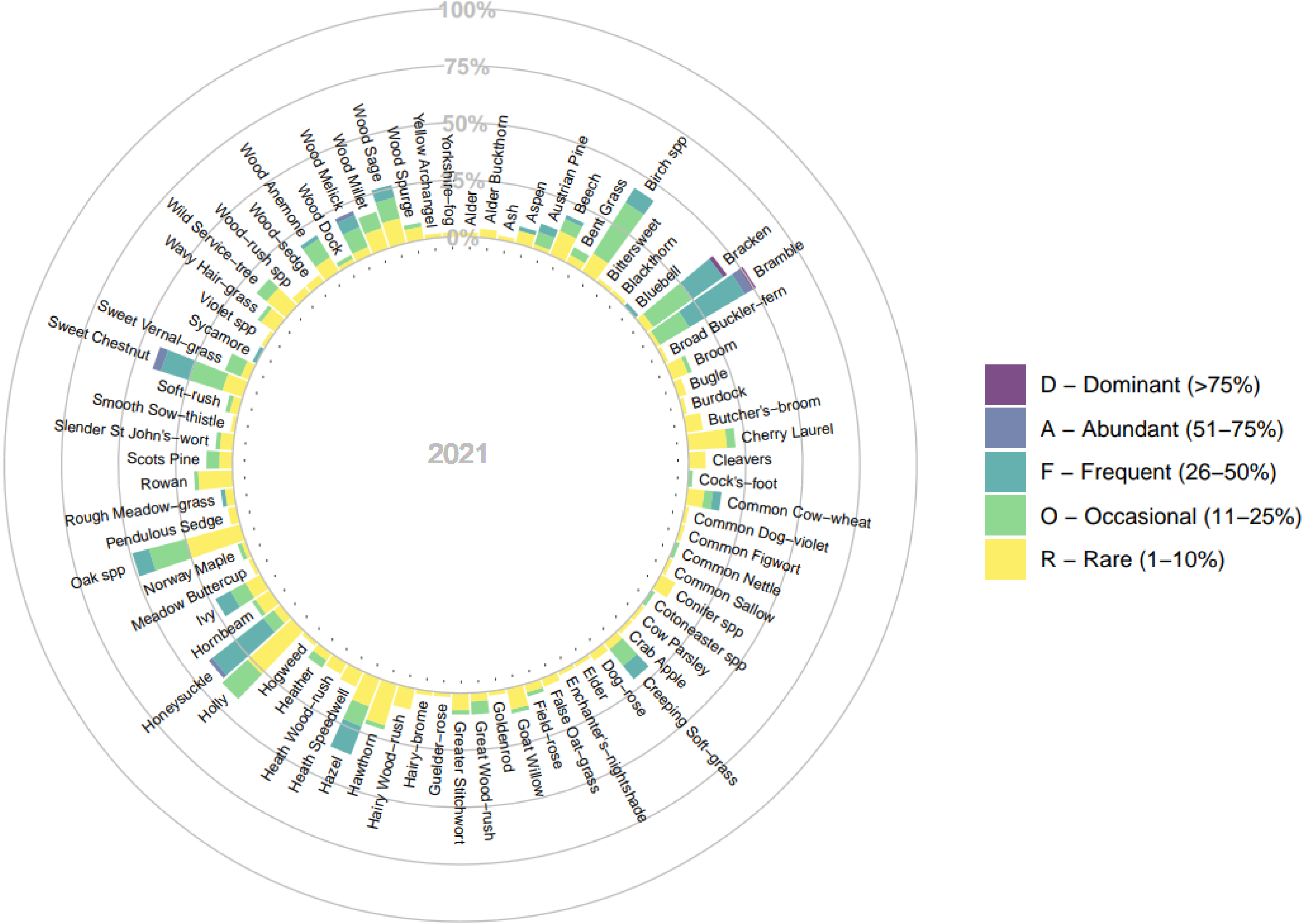

Figure 5 Circular bar plot showing the abundance (DAFORX) of each species within the control treatment area

4.1.1 Species with conservation status

Six species with conservation status were recorded in the plots:

Common Cow-Wheat (*Melampyrum pratense*) - Red List, Near Threatened

Common Cow-Wheat was the most widespread species with conservation status and was recorded in 35 plots. It was recorded as rare in 20 plots, in ten plots as occasional and in three plots as frequent. Common Cow-Wheat is also surveyed separately to this vegetation monitoring method across the entire site as part of a heath fritillary (*Melitaea athalia*) foodplant survey.

Goldenrod (*Solidago vergaurea*) - Red List, Near Threatened

Goldenrod was found in 19 plots and recorded as rare in 17 of these. It was only recorded as occasional in two plots.

Heath Speedwell (*Veronica officinalis*) - Red List, Near Threatened

This species was only found in nine plots and was recorded as rare in all but one where it was recorded as occasional.

Heather (*Calluna vulgaris*) - Red List, Near Threatened

Heather was found in 24 plots and was recorded as rare in 9 plots, as occasional in 14 plots and as abundant in two plots.

Tormentil (*Potentilla erecta*) - Red List, Near Threatened

Another species that was recorded in very low levels and only found in six plots, four times recorded as rare and twice as occasional.

Yellow Archangel (*Lamium galeobdolon*) Red List, Vulnerable

This species was found in 17 plots and was recorded as rare in five of them, as occasional in seven plots, as frequent in three plots and as abundant in one plot.

4.1.2 Non-native species

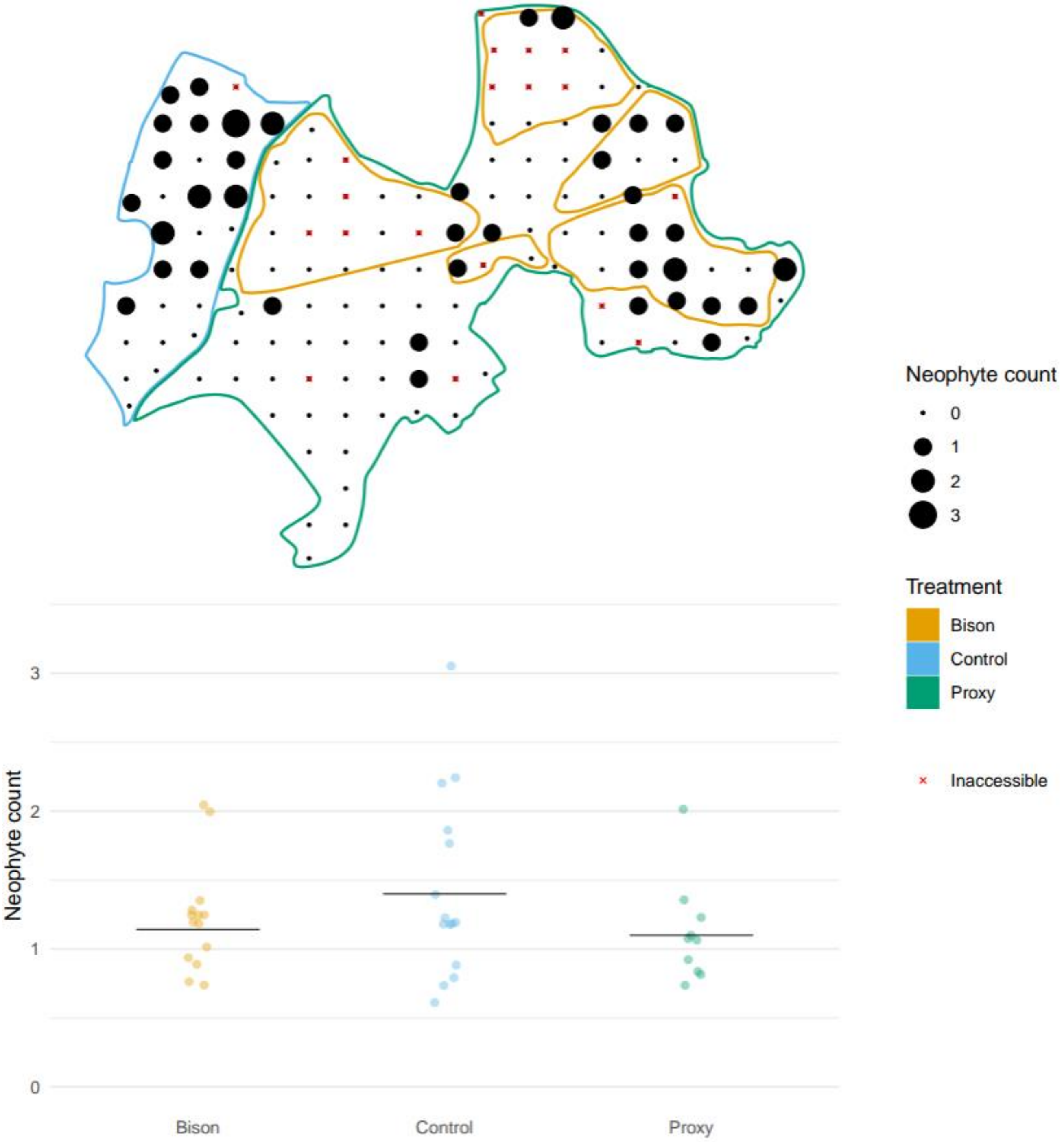

Figure 6 Map showing neophyte counts as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

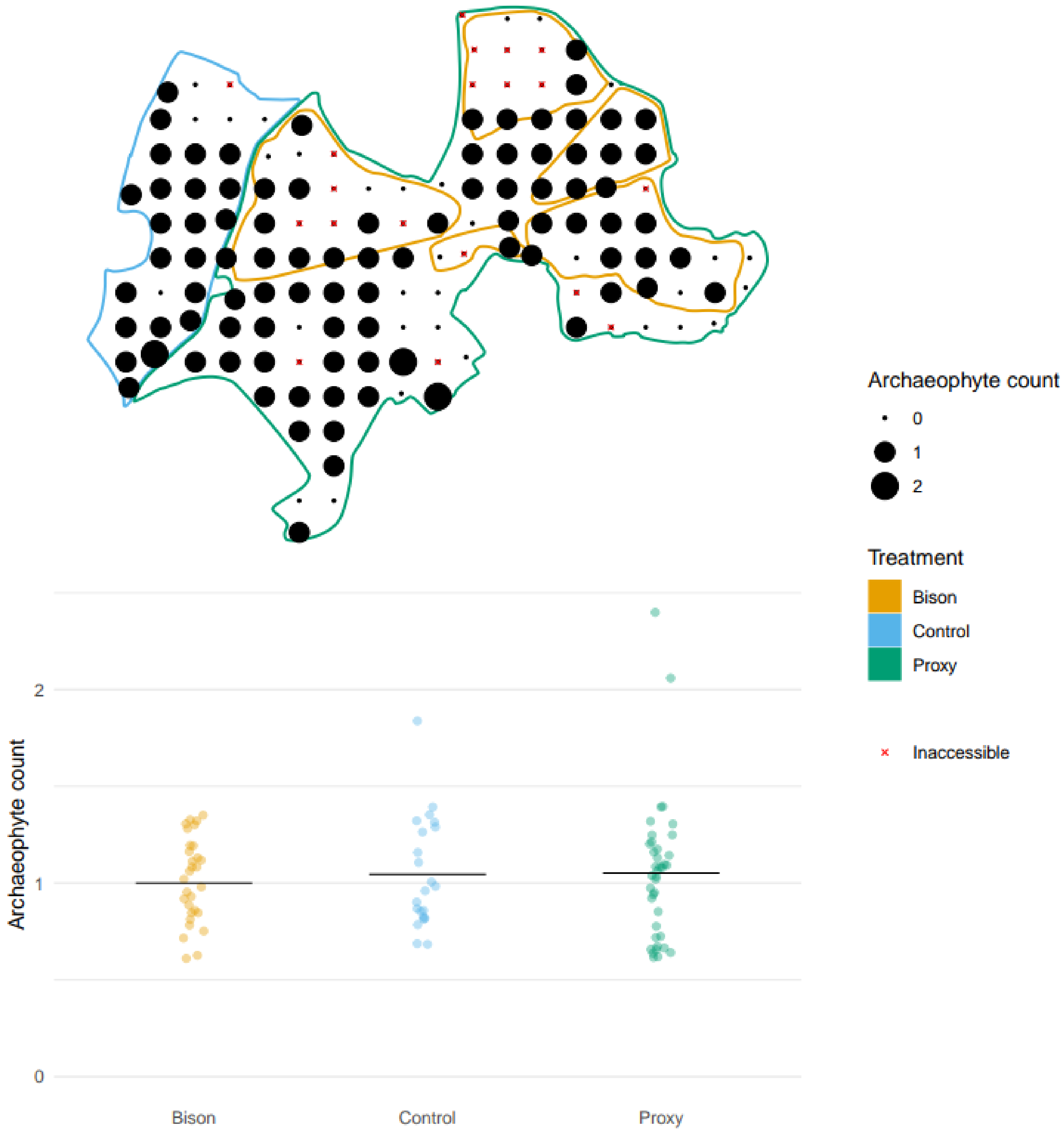

Figure 7 Map showing archaeophyte counts as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

Figure Figure *6* and **Figure** *7* show neophyte and archaeophyte counts respectively. Neophytes are non-native species which have been introduced to the UK in recent history whilst archaeophytes are considered to have become established AD 1500. Neophytes in the project area include sycamore (*Acer pseudoplatanus*), rhododendron (*Rhododendron spp.*), norway maple (*Acer platanoides*), cotoneaster (*Cotoneaster spp.*), cherry laurel (*Prunus laurocerasus*) and corsican pine (Pinus nigra). Archaeophytes in the project area include bristly oxtongue (*Helminthotheca echioides*), burdock (*Arctium spp*.), lesser periwinkle, many-seeded goosefoot (*Lipandra polysperma*), and sweet chestnut. It should be noted that even though scots pine (Pinus sylvestris) is native to the UK, it does not naturally grow in England and all the Scots Pine found in the project area has previously been planted for timber.

4.2 Seedling layer

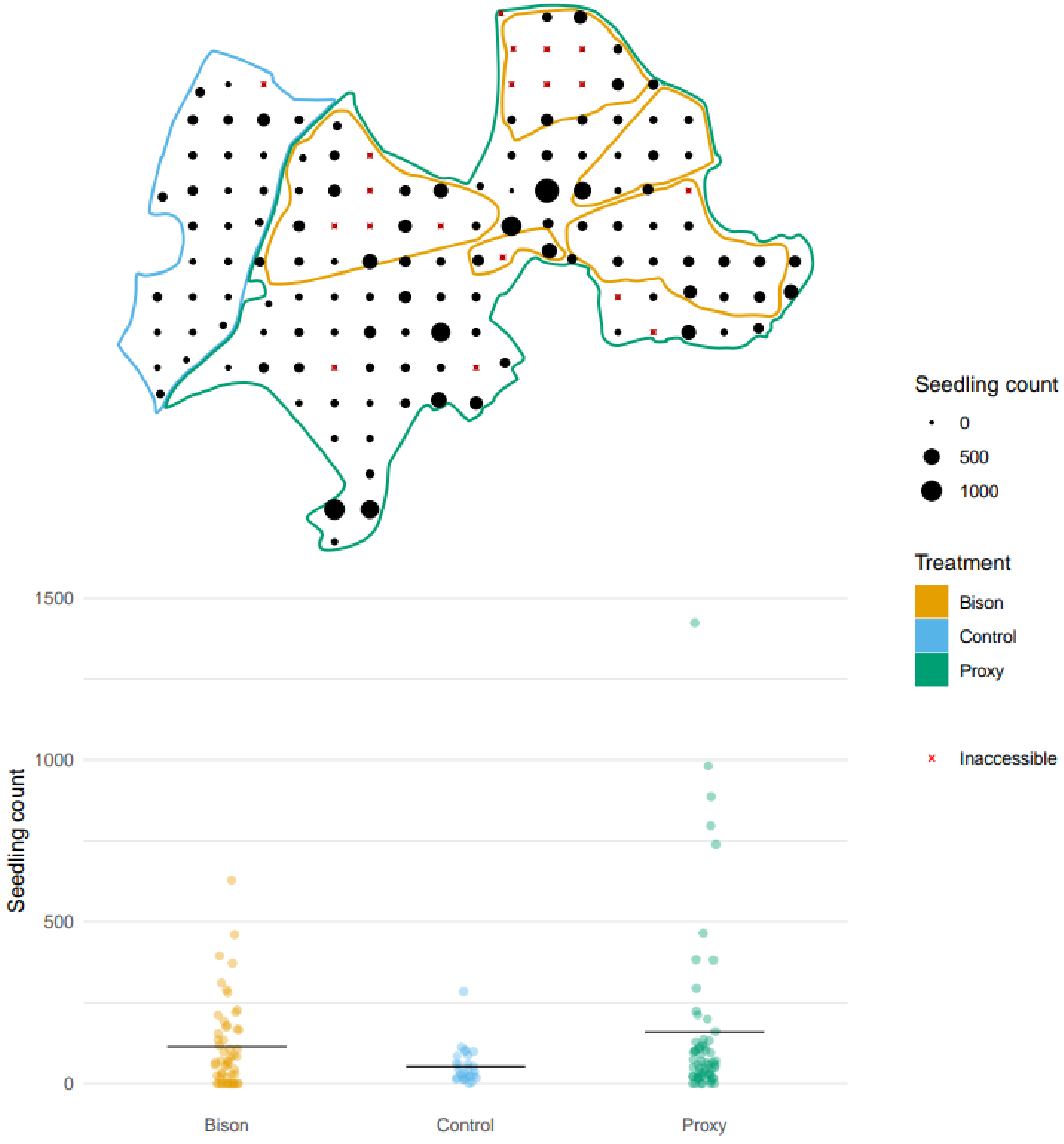

Figure 8 Map showing seedling count as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

Woody seedlings were recorded in all surveyed 123 plots and were considerably more numerous in woodland plots compared to more open habitat. A total of 17284 seedlings was counted during the survey. The highest seedling numbers were recorded in the proxy treatment with 9723 seedlings, followed by the bison area with 6061 and the control area with 1500 seedlings, see **Figure 8**. The most numerous seedling across all three treatments was birch with 4280 plants counted, followed by holly with 2472 seedlings, oak with 2168 and sweet chestnut with 1409 seedlings. The relative abundance of seedling species per treatment can be seen in **Figure 9**.

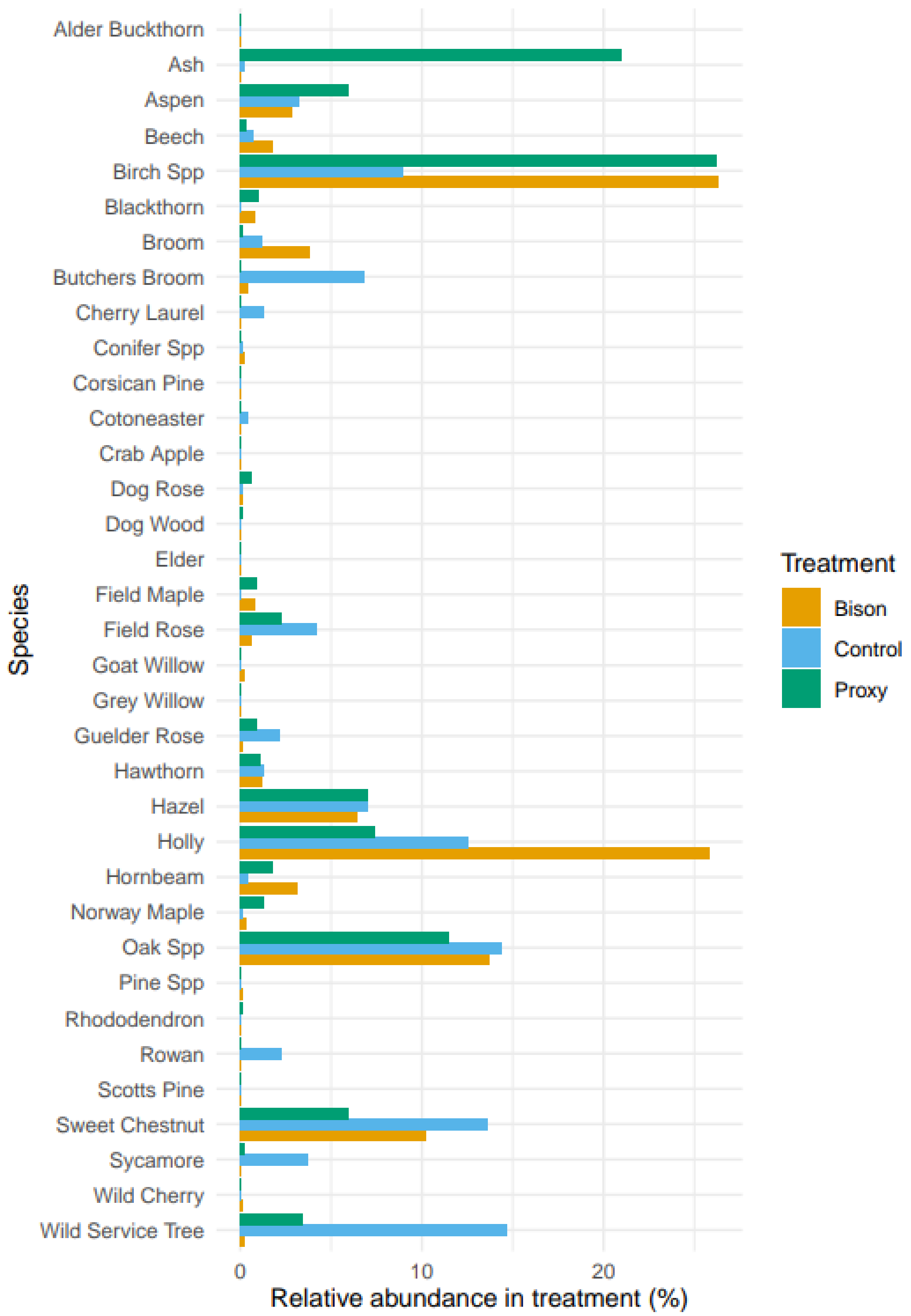

Figure 9 A bar plot showing the relative abundance of seedling species in each treatment area

4.3 Sapling layer

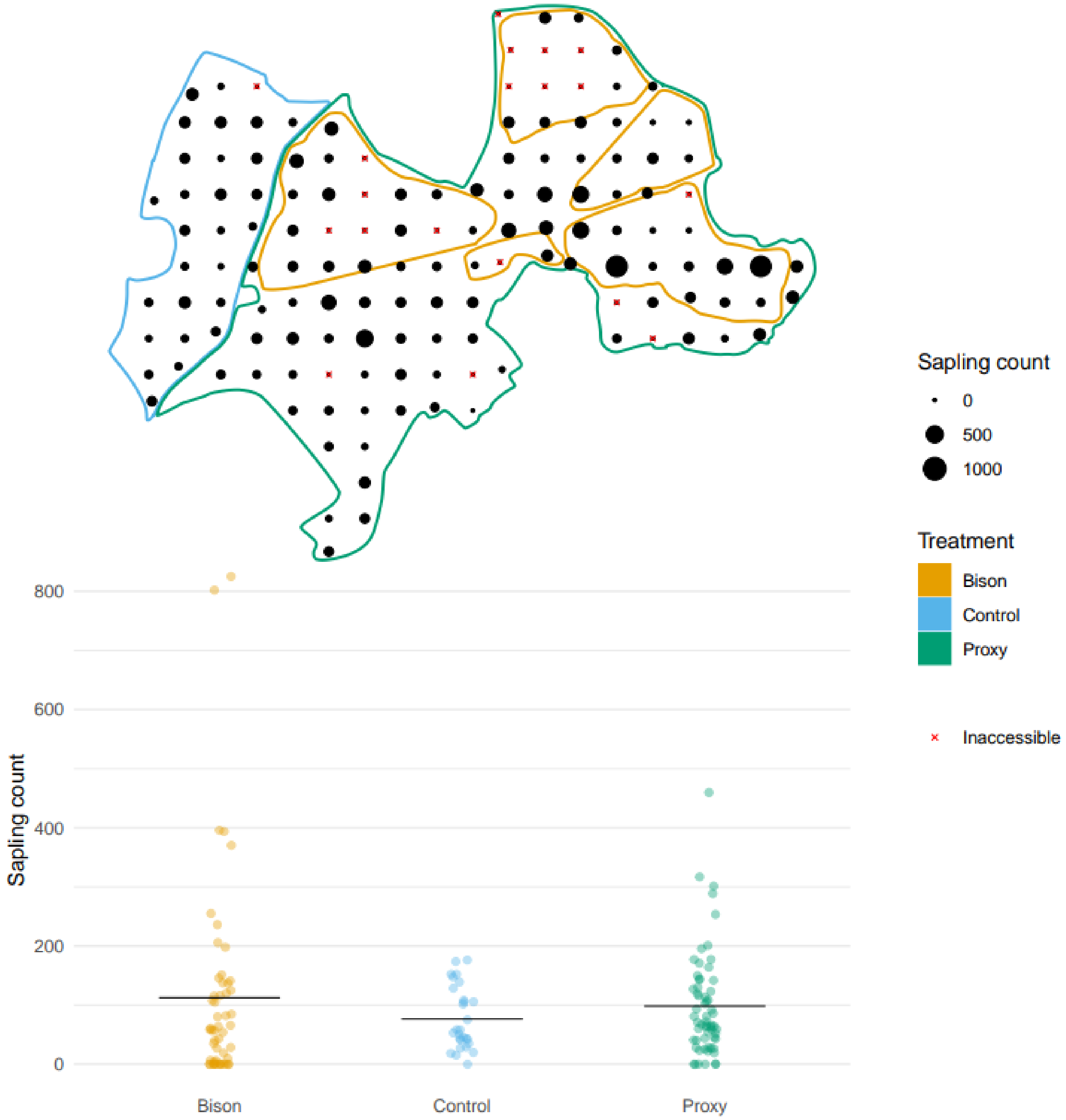

Figure 10 Map showing sapling count as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

Woody saplings were recorded in all surveyed 123 plots and were considerably more numerous in woodland plots compared to more open habitat. A total of 14099 saplings was counted during the survey. The highest sapling counts were recorded in the proxy treatment with 5991 saplings, closely followed by the bison treatment with 5967 and then the control treatment with 2141 saplings, see **Figure 10**. The most numerous sapling was birch with 5102 plants counted, followed by hazel with 4419 saplings, sweet chestnut with 1711 and oak with 605, see **Figure 11**.

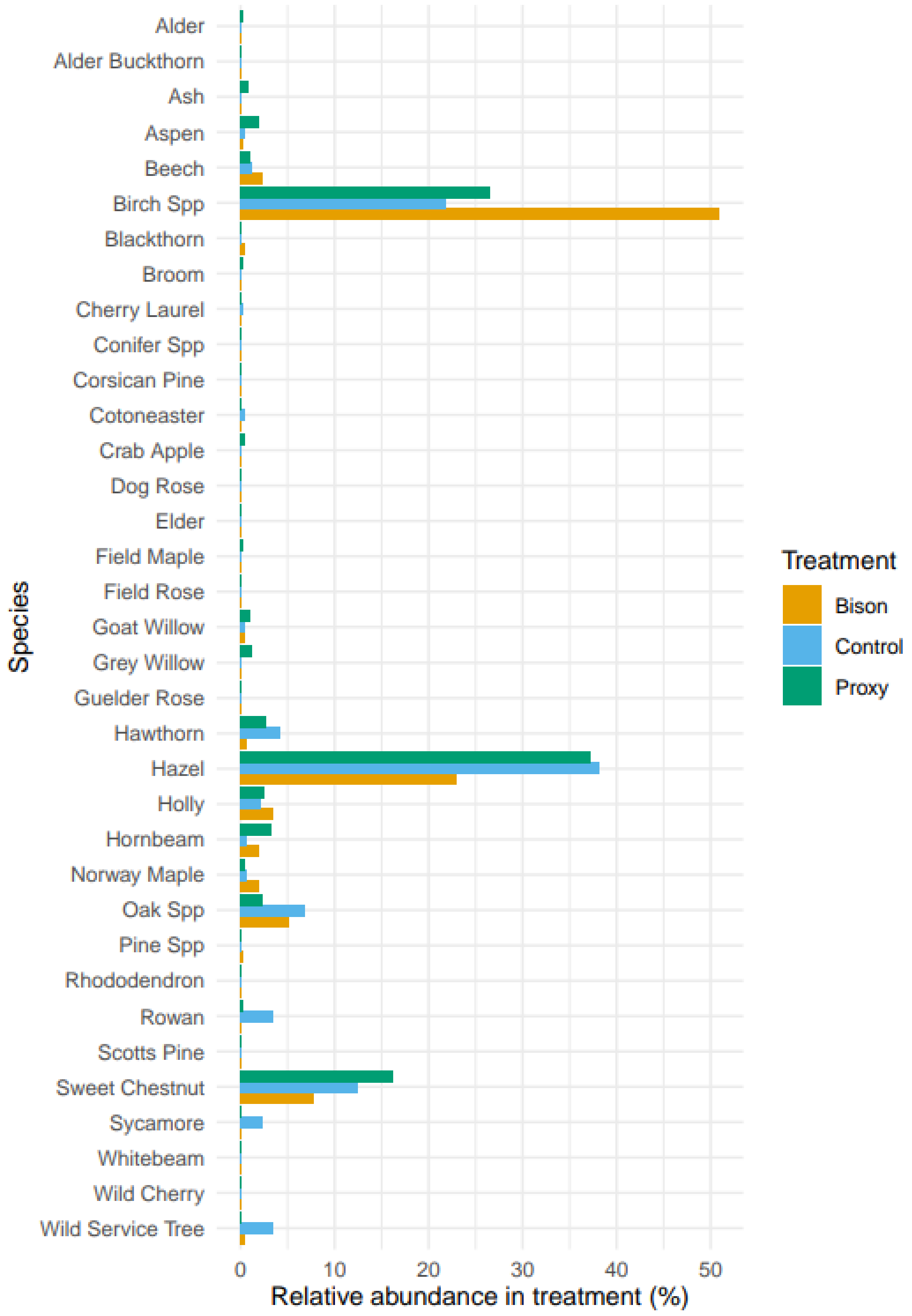

Figure 11 A bar plot showing the relative abundance of seedling species in each treatment area

4.4 Bramble cover

Bramble was not recorded as part of seedling or sapling data and is instead illustrated separately as a percentage in **Figure 12** below. It should be noted that bramble growth and therefore bramble cover increased over the course of this survey and is therefore generally higher in any plots surveyed in July/August rather than June.

Figure 12 Map showing bramble cover as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

4.5 Canopy layer

A total of 3875 qualifying stems (stems with a GBH grater than 20cm) had their GBH measured, occurring in 122 out of the 123 plots. 1113 qualifying stems were measured in the bison treatment, 1856 in the proxy treatment and 906 in the control treatment. Sweet Chestnut was the most abundant with 1304 trees measured, followed by birch with 1080 trees and oak with 518 trees, as can be seen in **Figure 15**.

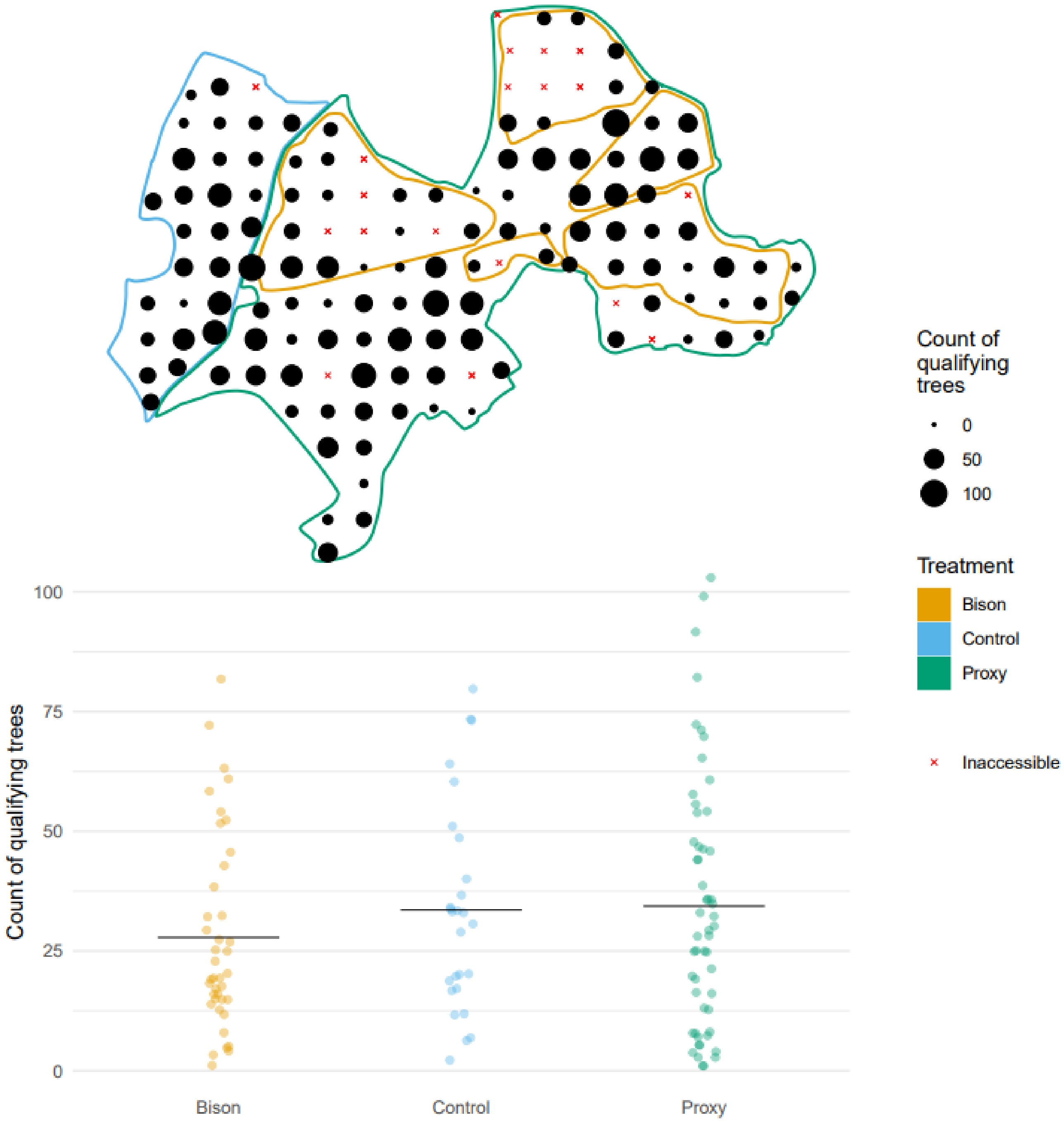

Figure 13 Map showing the count of qualifying canopy trees as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

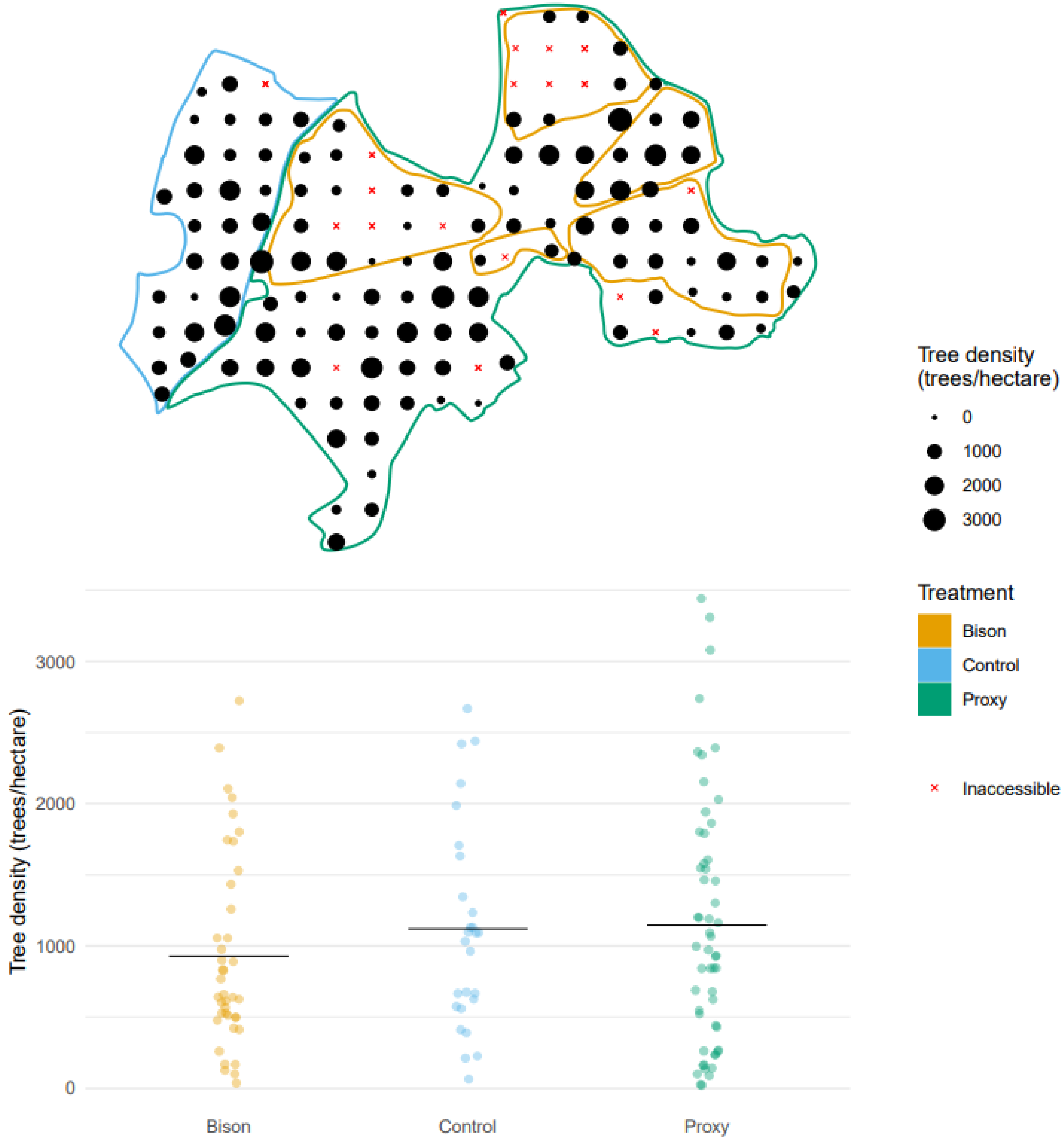

Figure 14 Map showing canopy stems per hectare as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

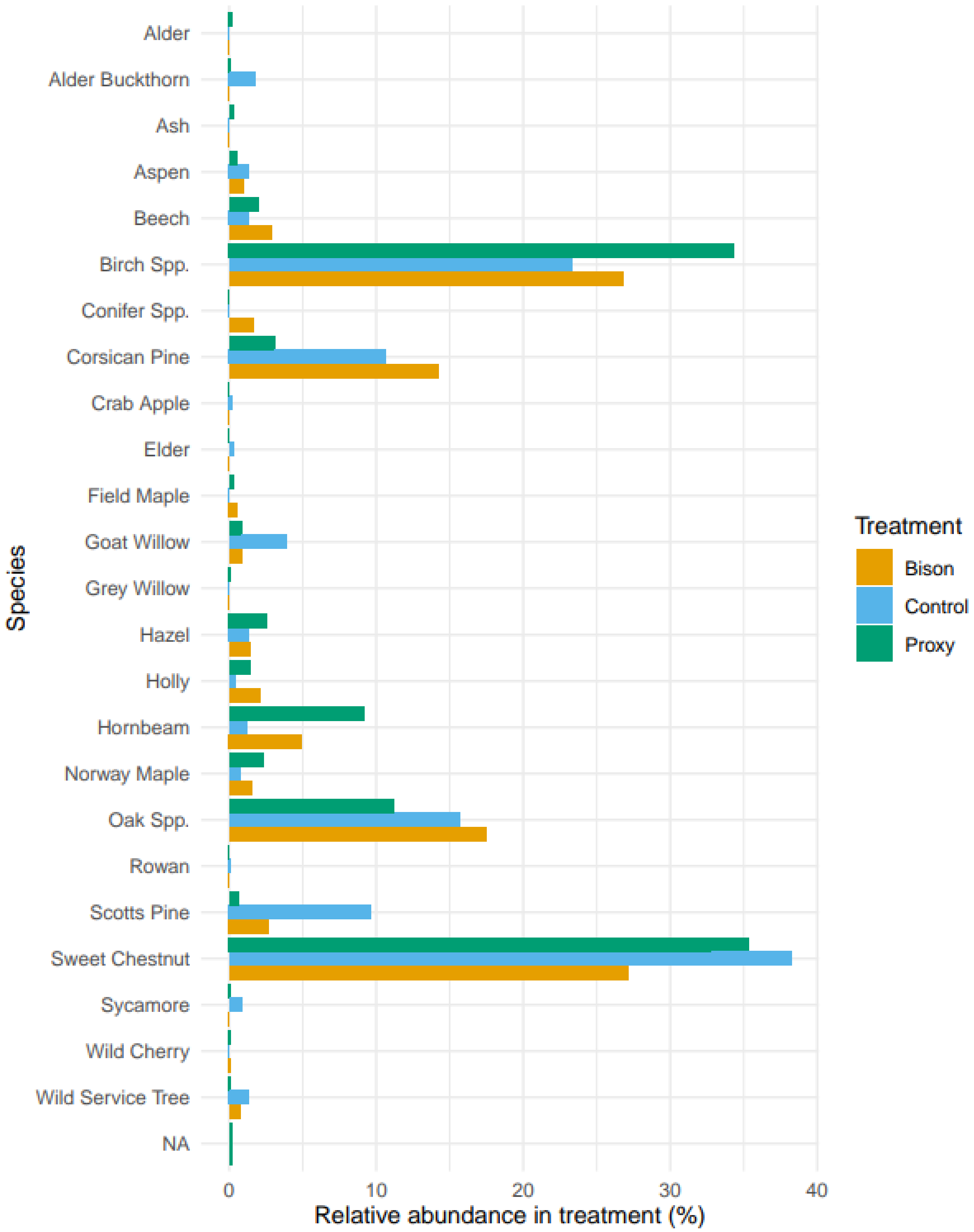

Figure 15 A bar plot showing the relative abundance of canopy species in each treatment area

A total of 9473.8m^2 of basal areas were measured. The greatest amount in any one plot was plot 138 with 188m^2, followed by plot 137 with 165.2m^2 and then plot 41 with 164.8m^2. As can be seen in **Table 3** below, out of all qualifying canopy trees, ten had a girth at breast height (GBH) greater than

2m. All of these were oak, with the exemption of one beech (*Fagus sylvatica*). The largest tree was an oak with a GBH of 2.6m.

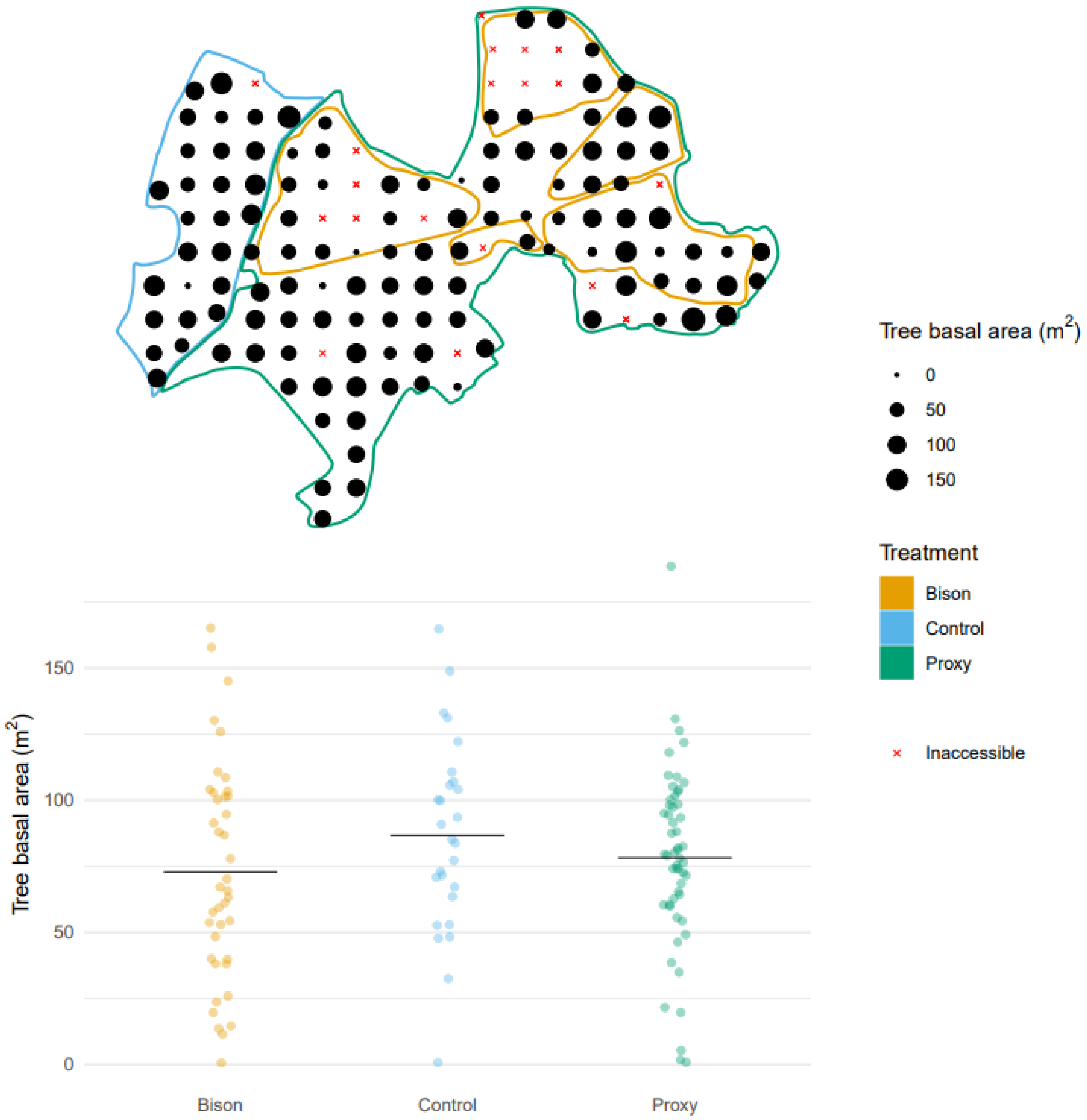

Figure 16 Map showing tree basal area (m²) as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

Table 3 All trees with a GBH over 2m

Species	Point	Treatment	Girth (cm)	Basal area (cm^2)
Oak Spp.	75	Proxy	260	5379.4
Oak Spp.	74	Bison	257	5256
Oak Spp.	141	Proxy	248	4894.3
Oak Spp.	142	Bison	242	4660.4
Oak Spp.	113	Bison	215	3678.5
Oak Spp.	62	Proxy	211	3542.9
Oak Spp.	1	Control	210	3509.4
Oak Spp.	114	Proxy	207	3409.8
Oak Spp.	139	Bison	203	3279.3
Beech	102	Bison	201	3215

4.6 Vegetation structure

As can be seen from **Figure 17** below, the frequency distribution is skewed strongly to the right. Plots with seven structural layers were the most abundant type with the ‘established trees’ and ‘tall herb’ layers most commonly present. ‘Established scrub’ and ‘rank grass’ were the least represented structural layers across all monitoring points. The mean number of structural layers was slightly higher in the wooded plots than the open plots. The nine structural layers are displayed sequentially in **Figure 18** to **Figure** *26*. It should be noted that bare ground under closed canopy trees has very little value compared to open and sunny bare ground.

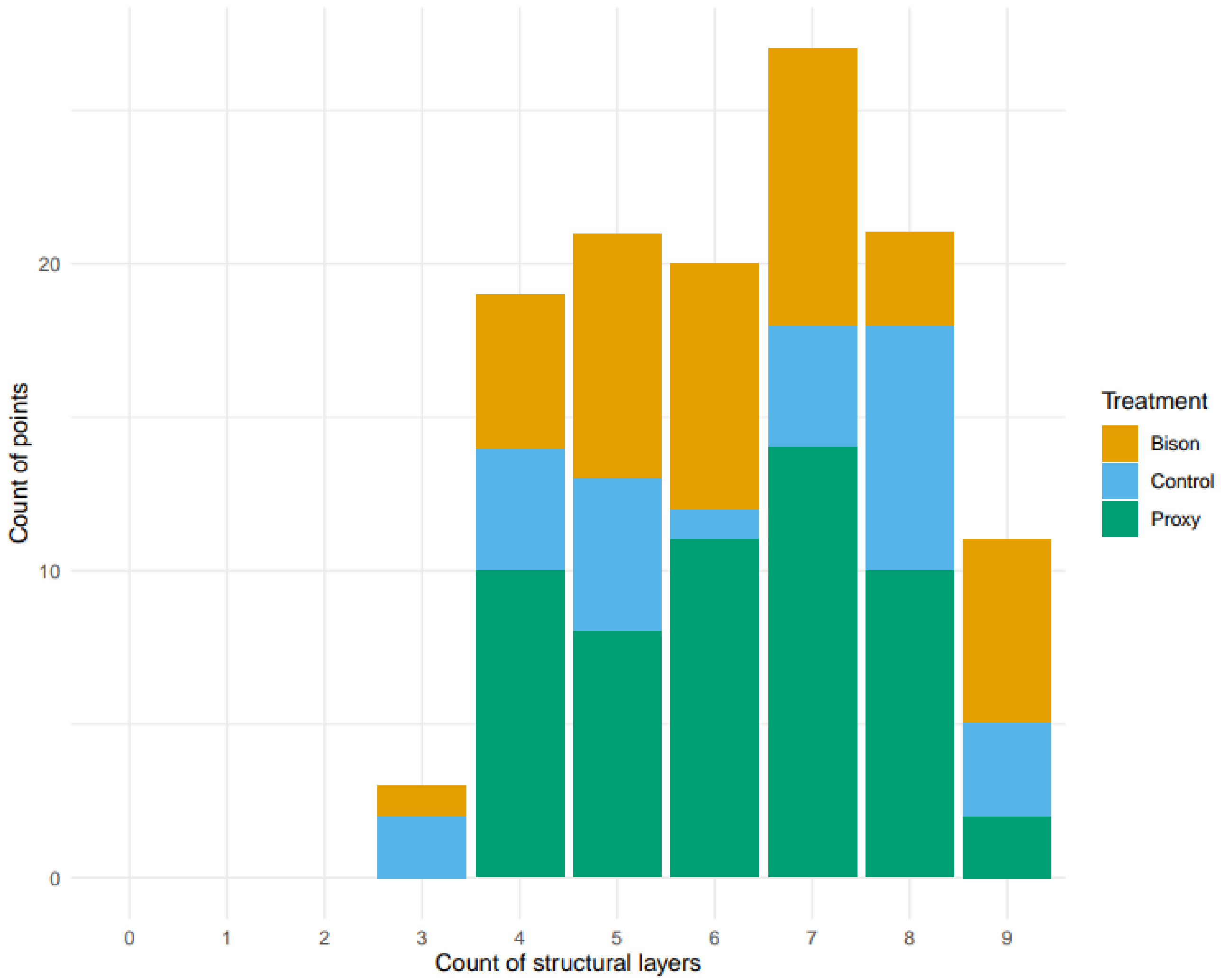

Figure 17 Bar plot showing the count of points with each number of structural layers in each treatment type

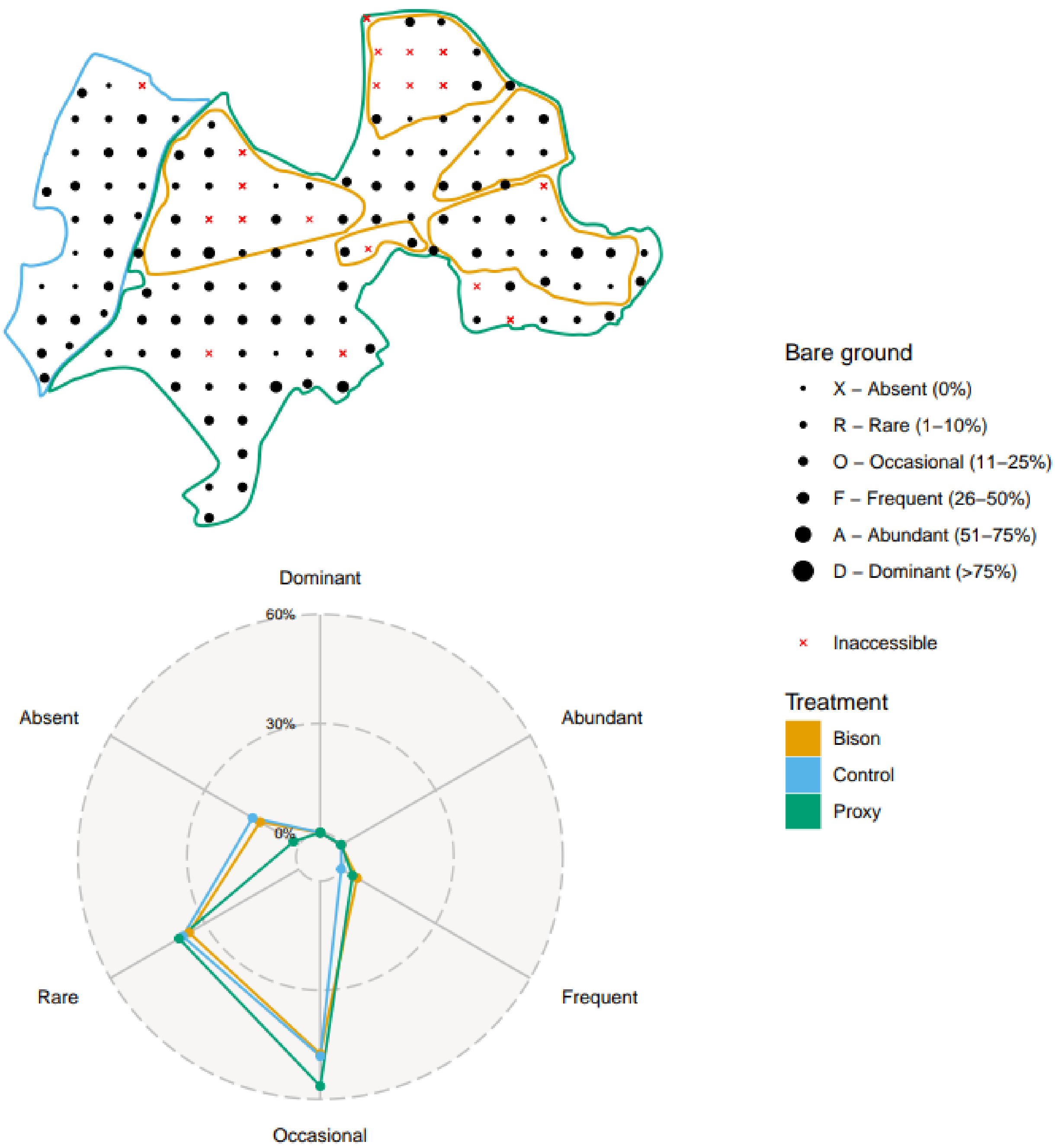

Figure 18 Map showing bare ground abundance (DAFORX) as scaled dots at each sampling point, with radar plots showing the proportion (%) of points in each DAFORX category in each treatment type

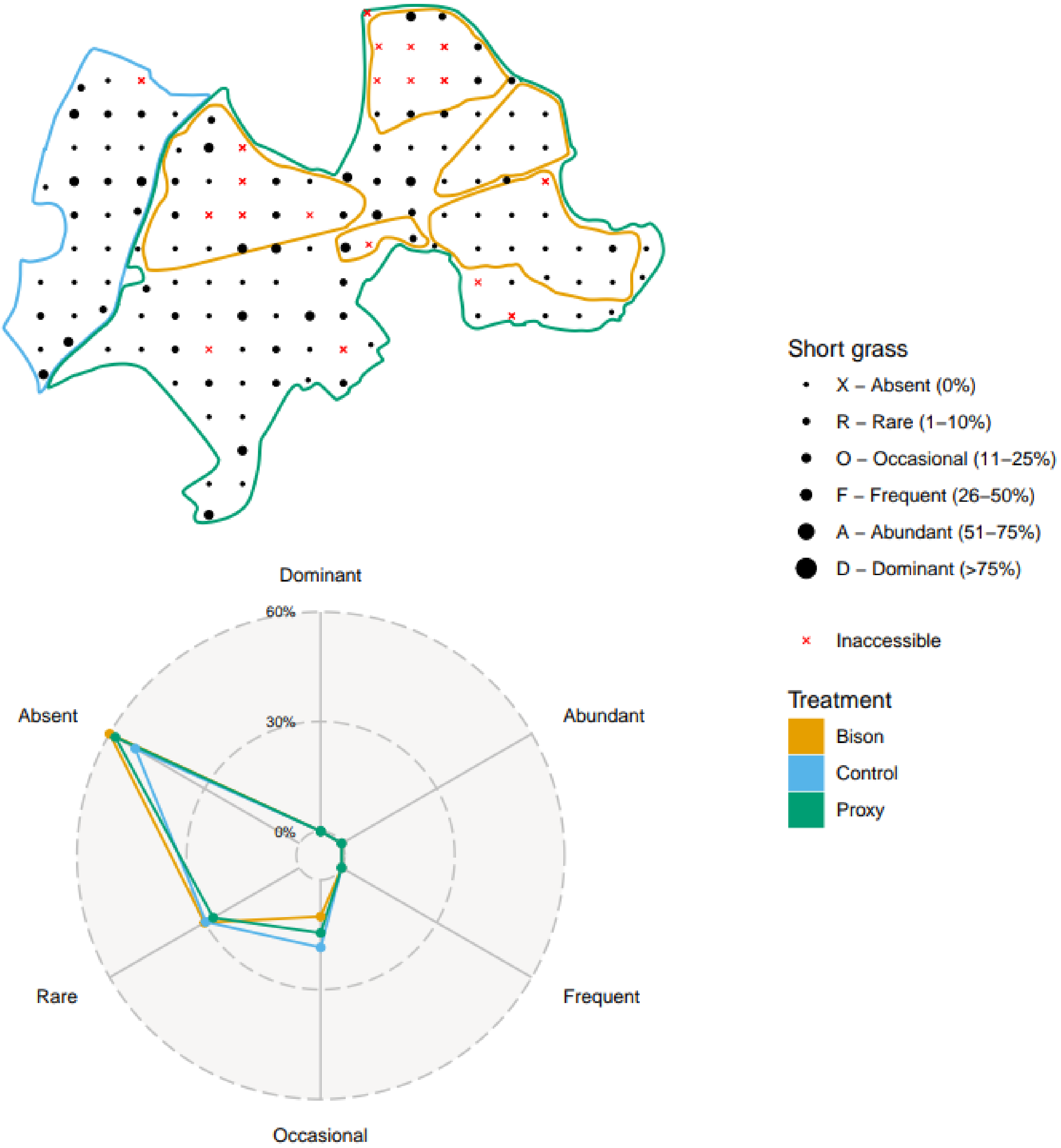

Figure 19 Map showing short grass abundance (DAFORX) as scaled dots at each sampling point, with radar plots showing the proportion (%) of points in each DAFORX category in each treatment type

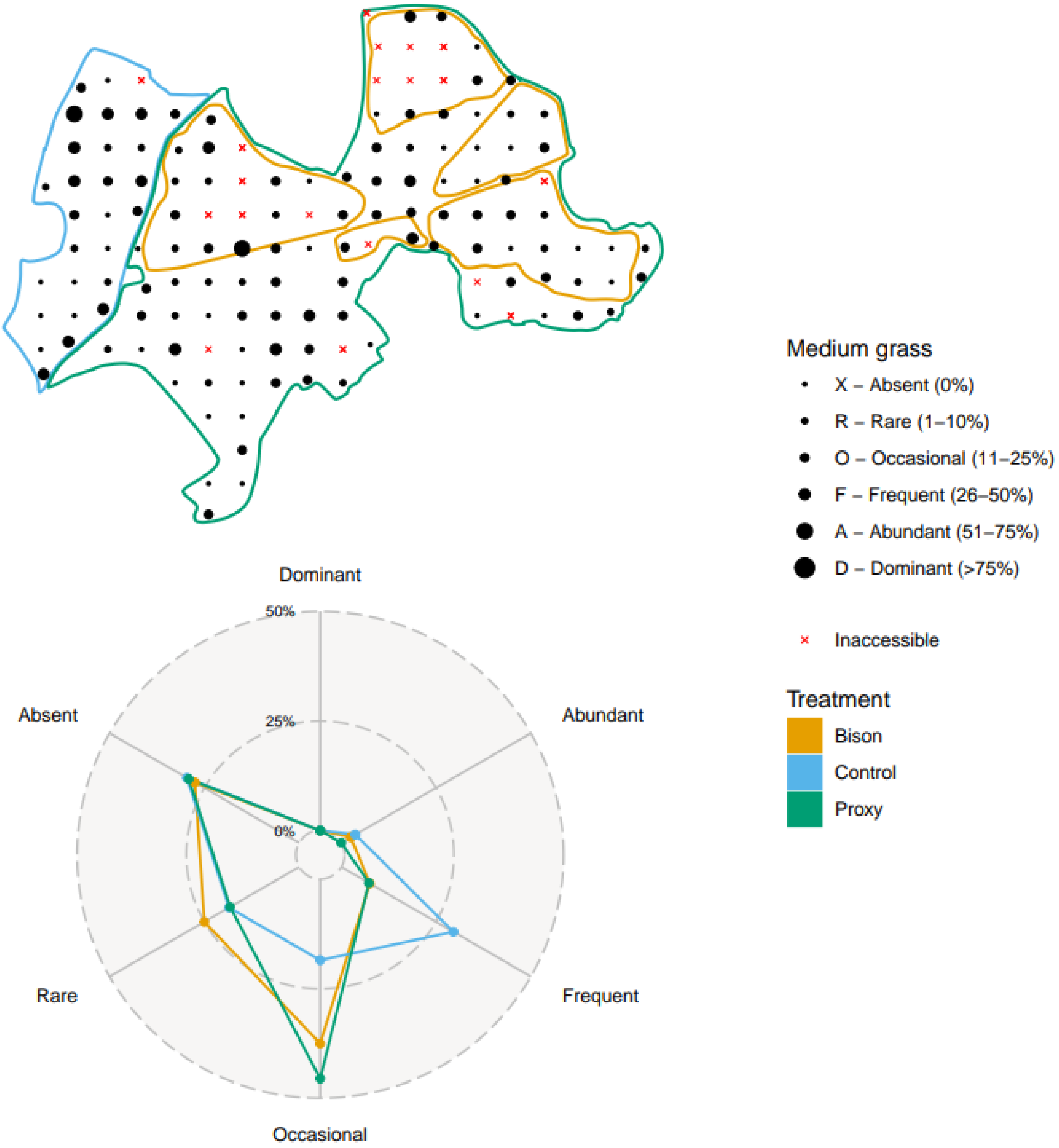

Figure 20 Map showing medium grass abundance (DAFORX) as scaled dots at each sampling point, with radar plots showing the proportion (%) of points in each DAFORX category in each treatment type

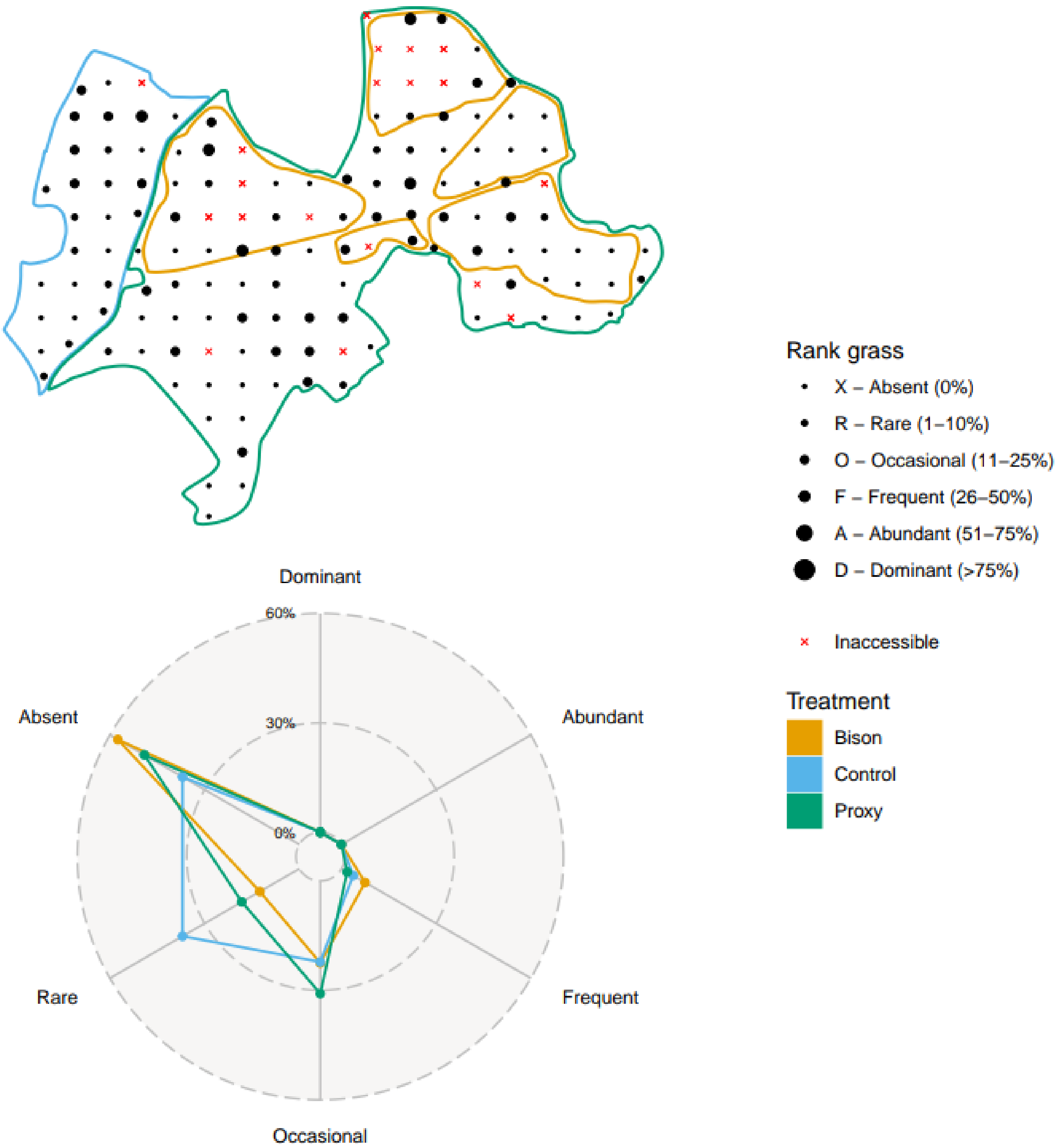

Figure 21 Map showing rank grass abundance (DAFORX) as scaled dots at each sampling point, with radar plots showing the proportion (%) of points in each DAFORX category in each treatment type

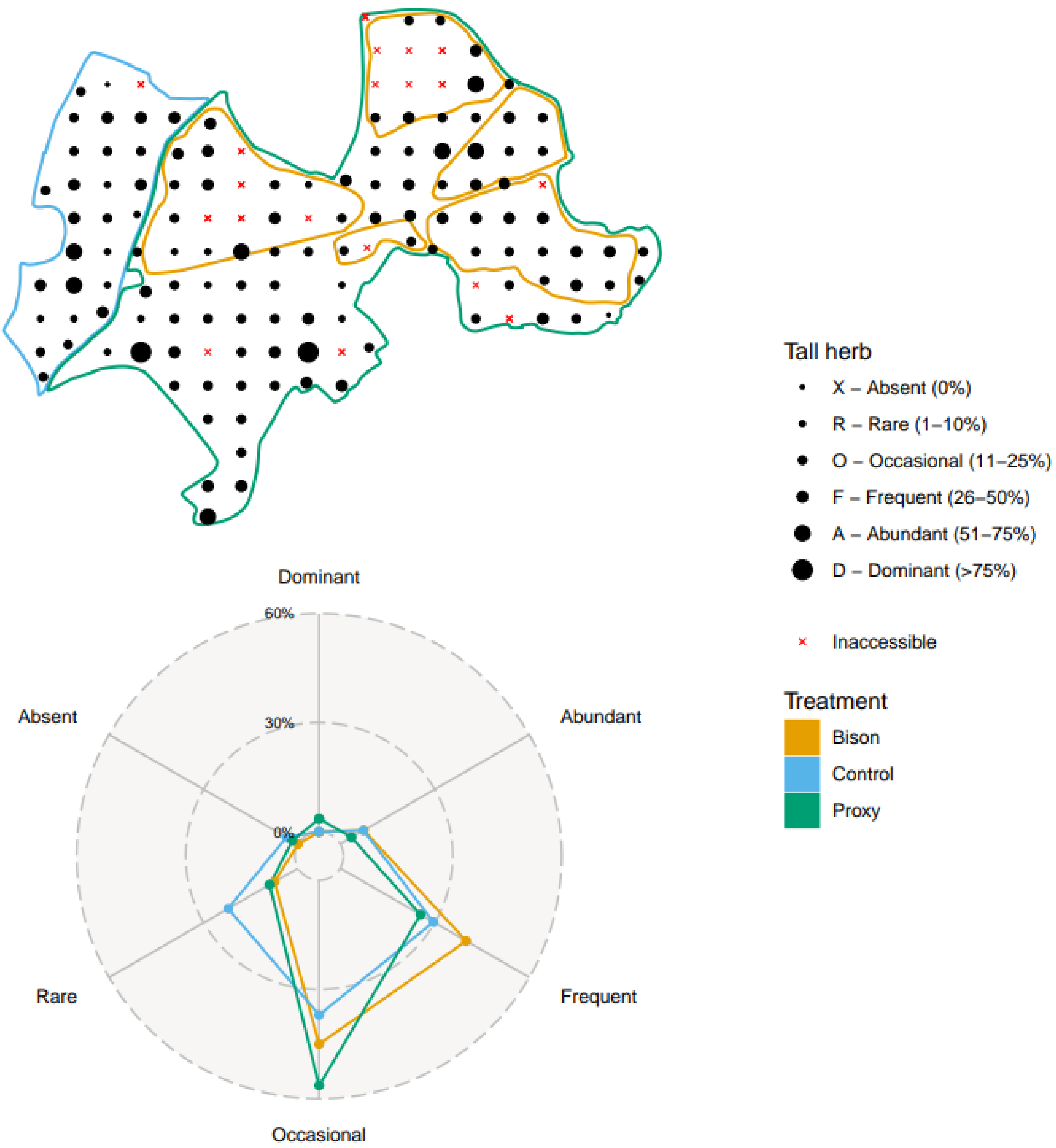

Figure 22 Map showing tall herb abundance (DAFORX) as scaled dots at each sampling point, with radar plots showing the proportion (%) of points in each DAFORX category in each treatment type

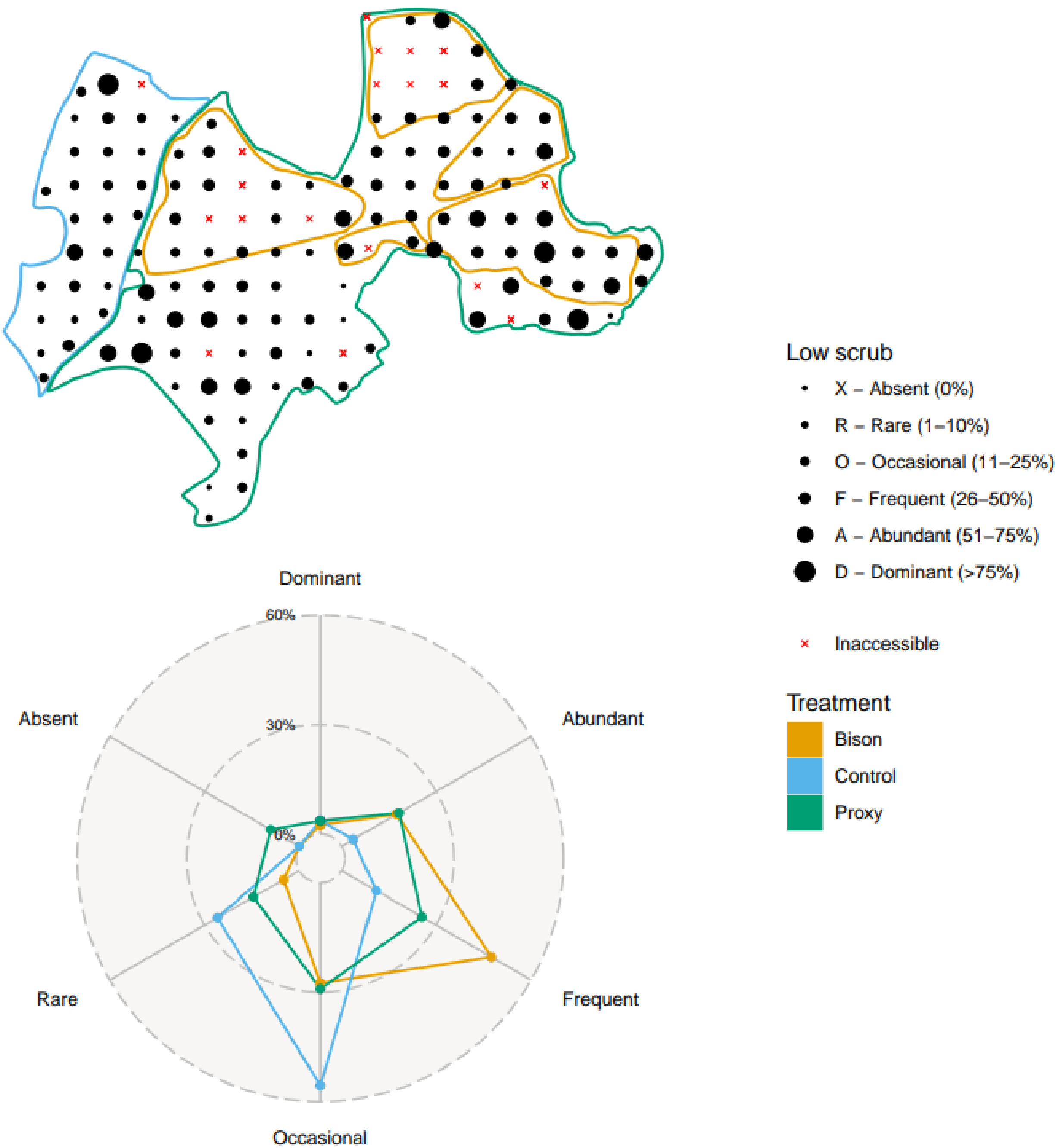

Figure 23 Map showing low scrub abundance (DAFORX) as scaled dots at each sampling point, with radar plots showing the proportion (%) of points in each DAFORX category in each treatment type

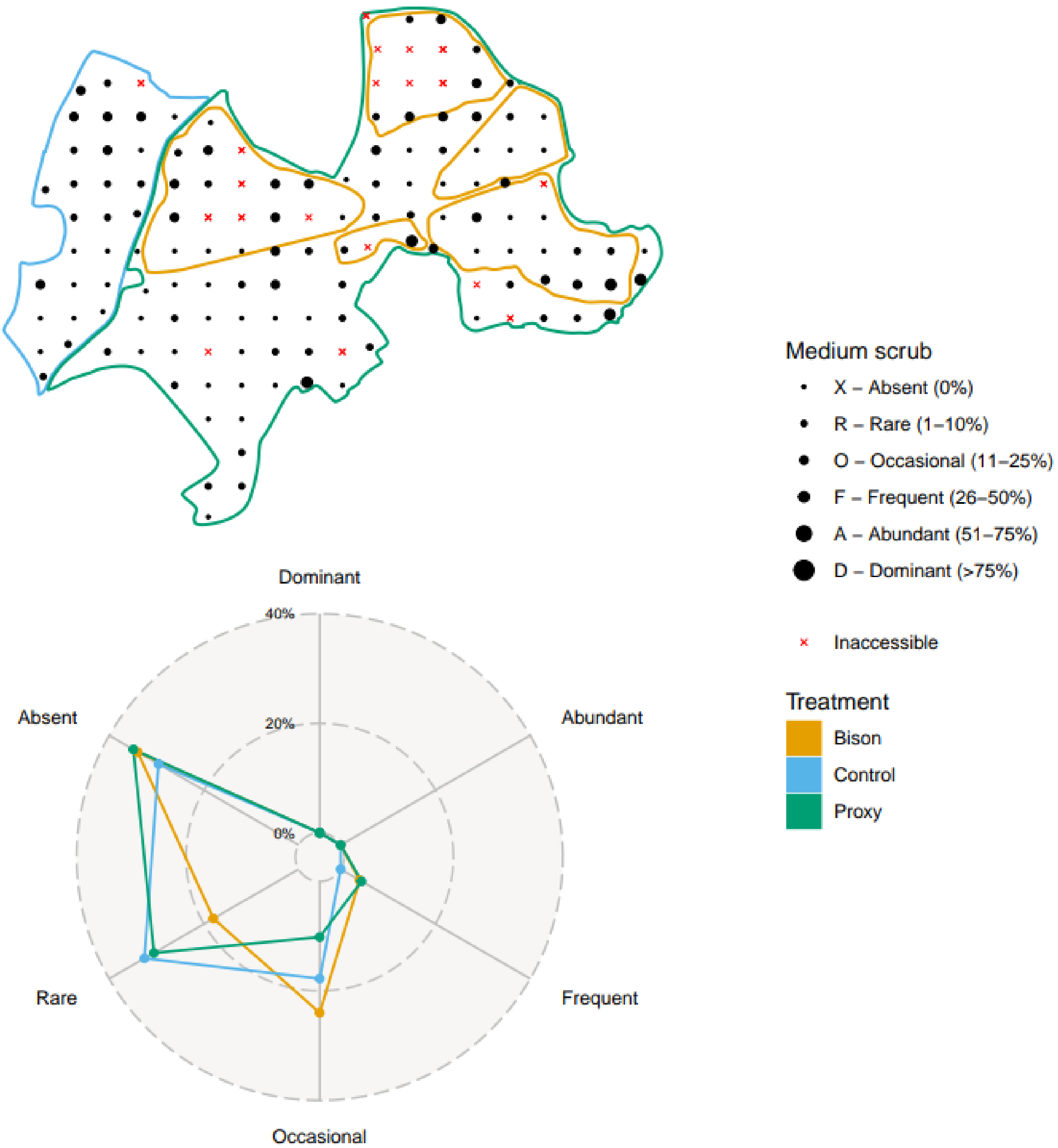

Figure 24 Map showing medium scrub abundance (DAFORX) as scaled dots at each sampling point, with radar plots showing the proportion (%) of points in each DAFORX category in each treatment type

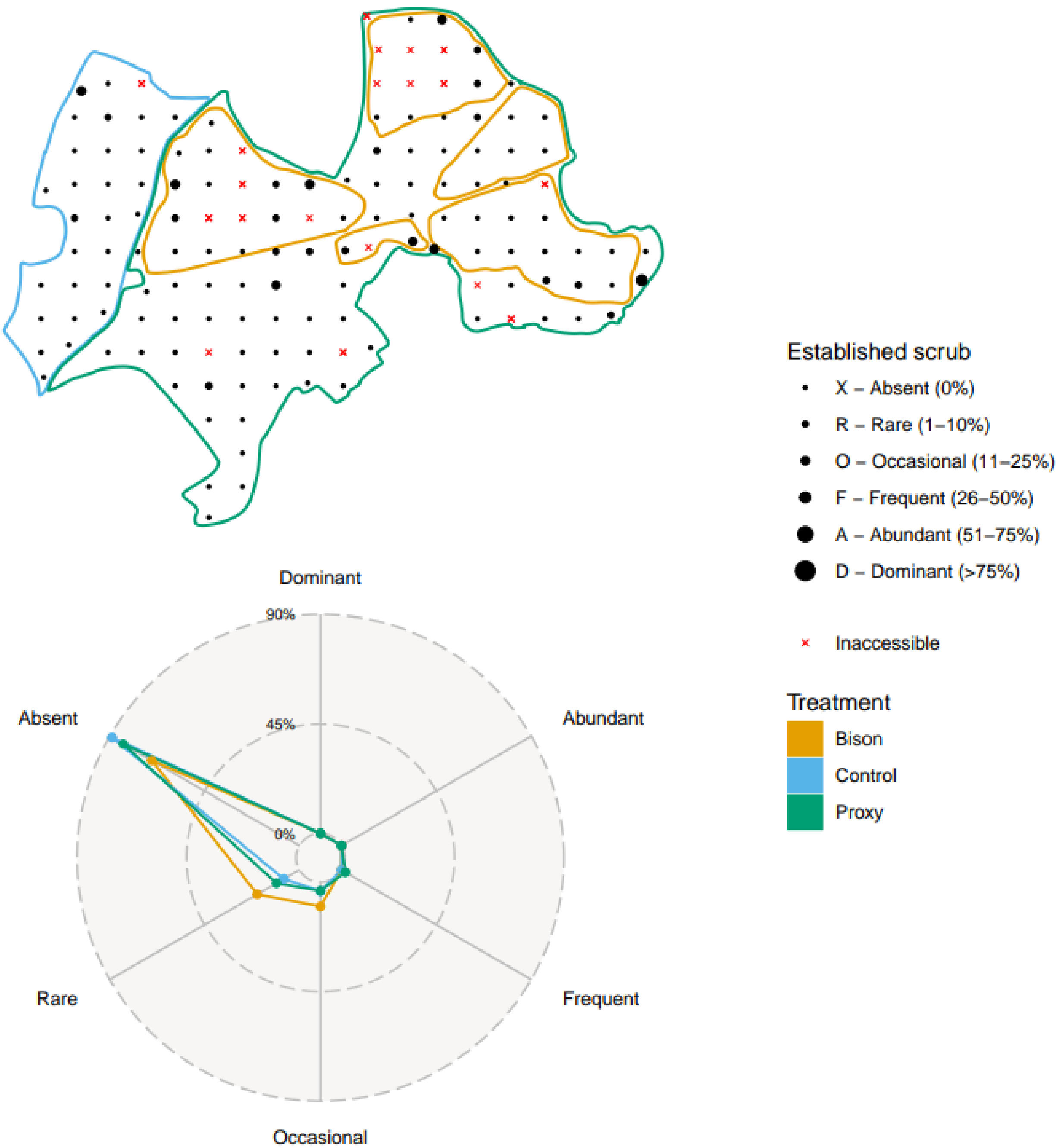

Figure 25 Map showing established scrub abundance (DAFORX) as scaled dots at each sampling point, with radar plots showing the proportion (%) of points in each DAFORX category in each treatment type

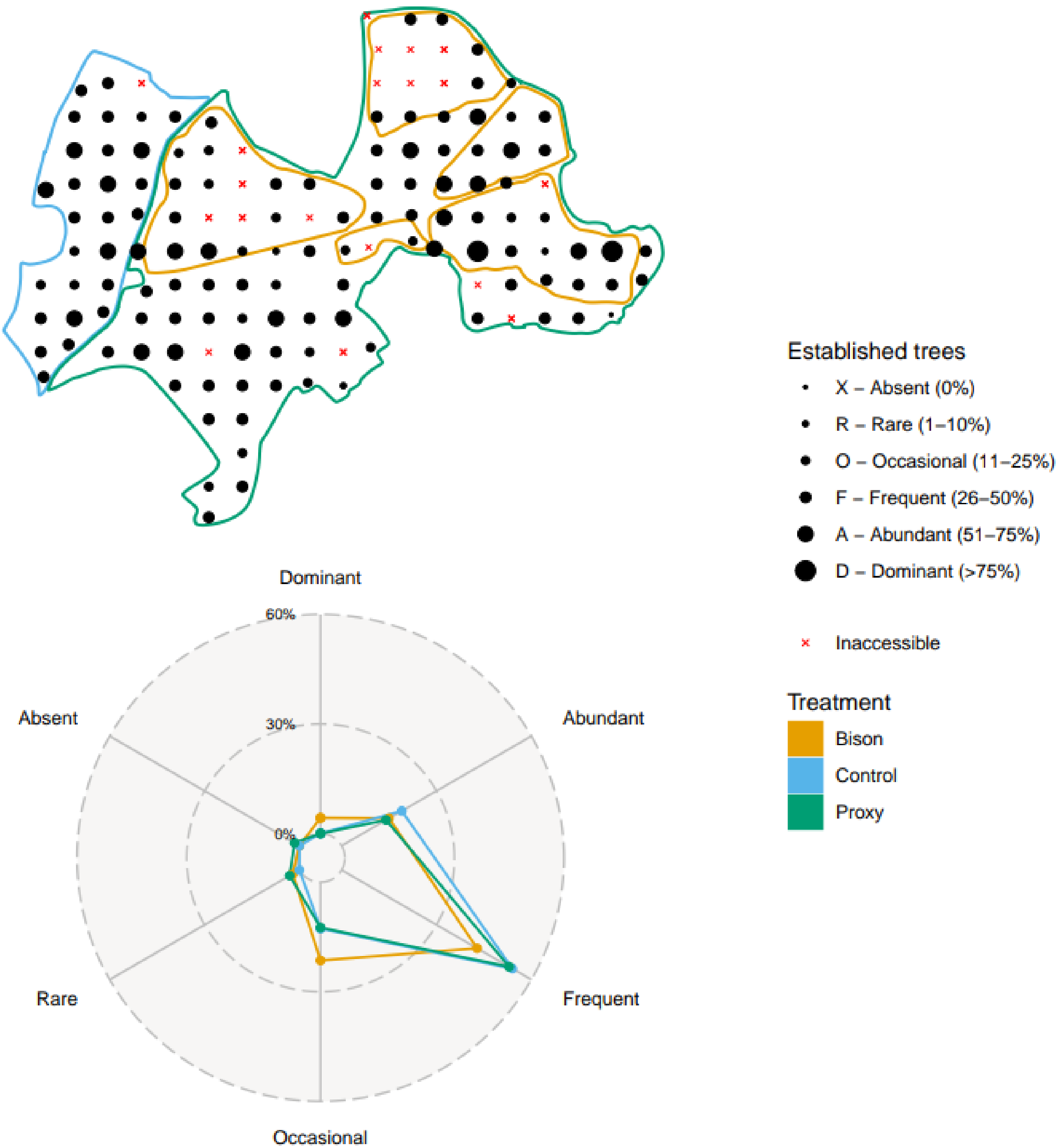

Figure 26 Map showing established tree abundance (DAFORX) as scaled dots at each sampling point, with radar plots showing the proportion (%) of points in each DAFORX category in each treatment type

4.7 Nectar sources

The most frequent nectar index score was 1, with 52 plots (42.3%) having this nectar index which was to be expected as much of the project area is under dense canopy. 32 plots had a nectar index of 2 and three plots had a nectar index of 3. The next highest score was 4, with 35 plots (28.5%) scoring this index. It was frequently recorded in more open habitat, along rides and close to footpaths, as well as under electricity lines. Only one plot scored a nectar index of 6 which was in open habitat that had recently been felled in xxxx in the bison treatment.

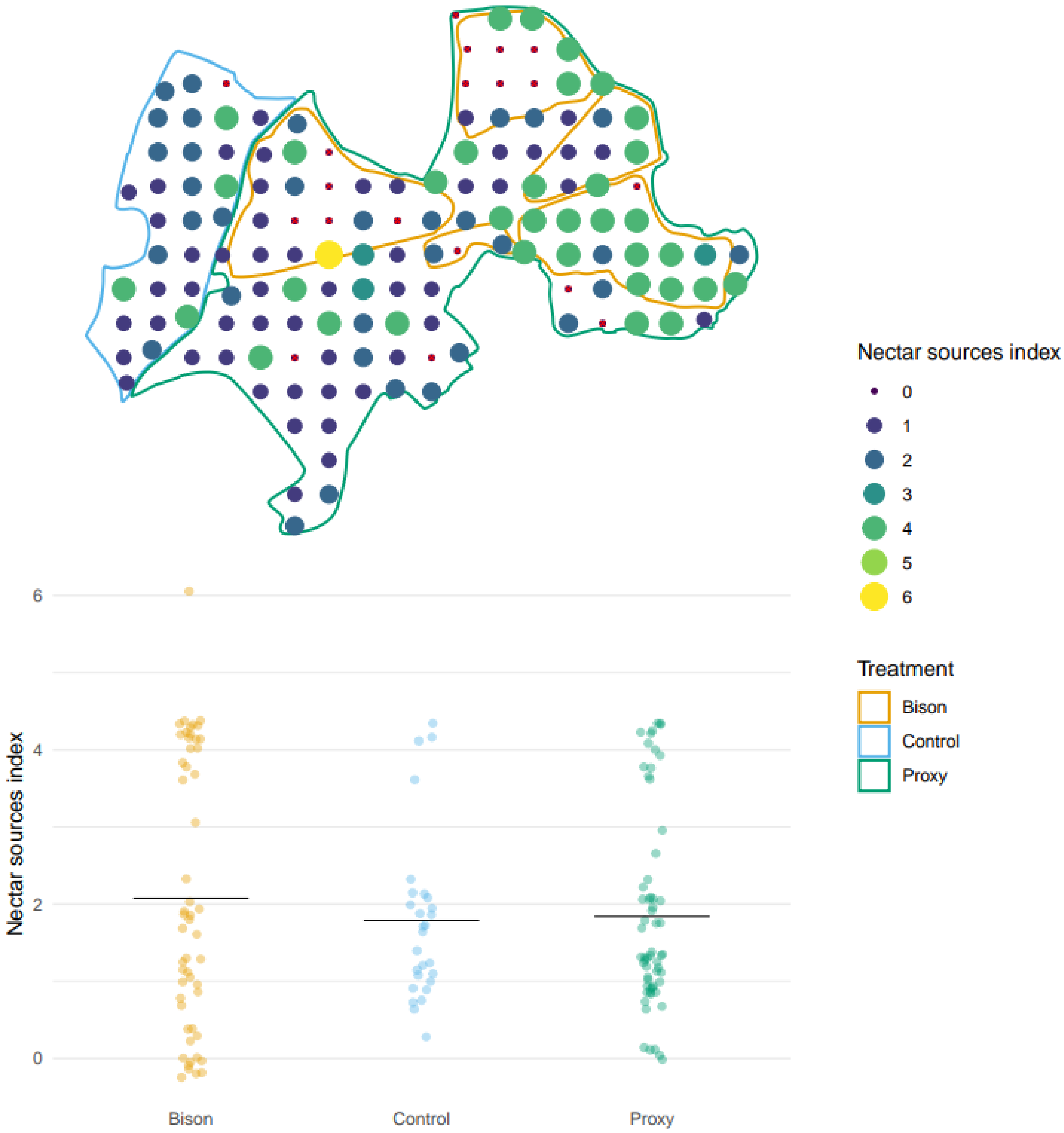

Figure 27 Map showing nectar source indices as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

4.8 Deadwood

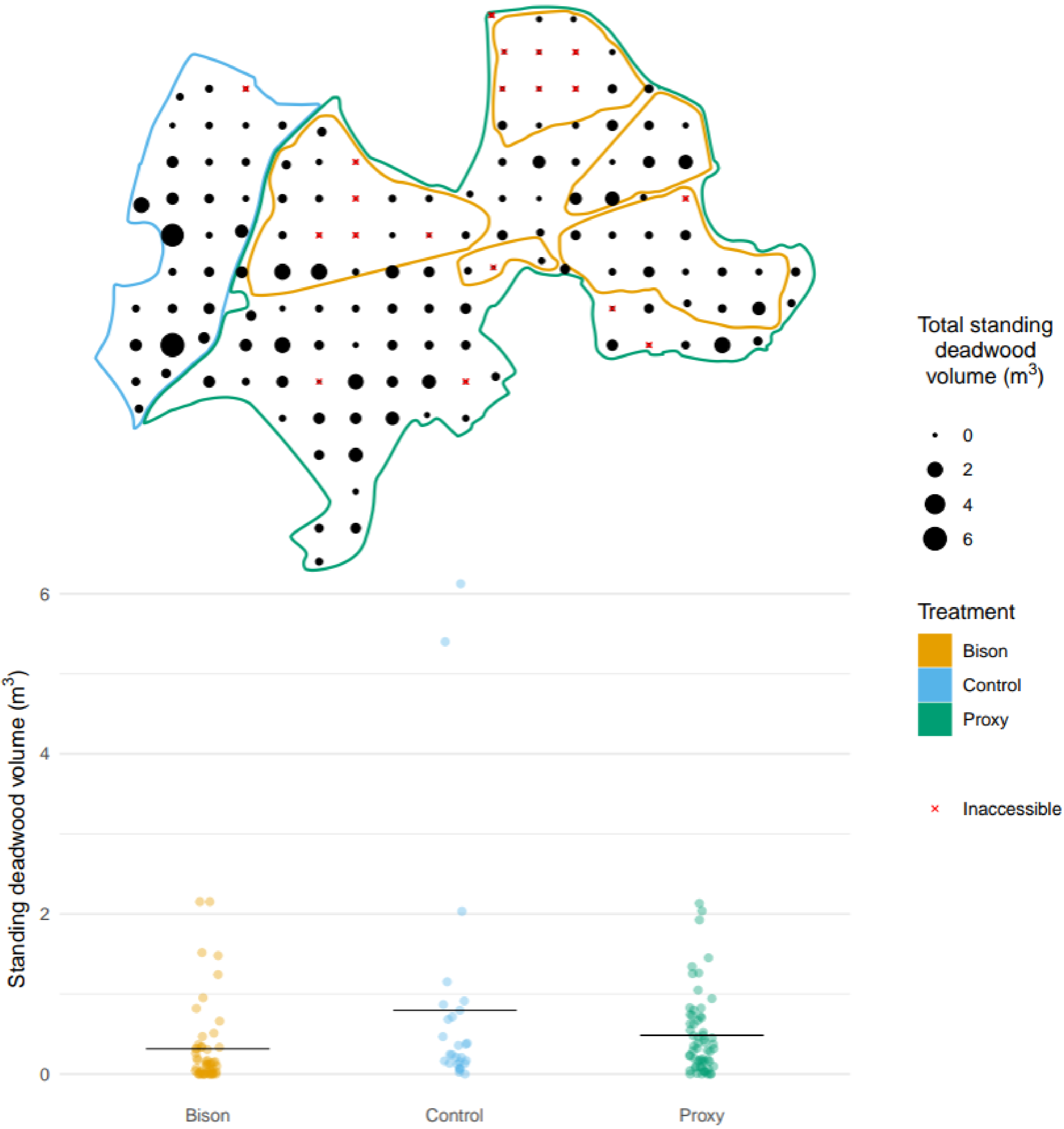

Figure 28 Map showing standing deadwood as scaled dots at each sampling point, with jitter plots showing the data values in each treatment type and a horizontal line at the mean

Figure 28 shows the standing deadwood volume (m^3) in the project area. The plots with the highest volume of standing deadwood have been found in the control treatment. It would be expected for that to change and for deadwood volume to grow in the bison area due to the animals' unique behaviour and ecology.

5 Assumptions and Limitations

A significant amount of the survey methodology is subjective (e.g., percentage cover of bramble, DAFOR categories for structural layer abundance) and could get recorded differently by varying surveyors. Seedling, sapling and canopy tree heights are all estimated as measuring seedlings and saplings would have taken too much time due to tree density whereas measuring canopy height would have been physically impossible. In very densely vegetated areas, particularly native regen habitat, tree numbers in all age categories were often estimated as counting would not have been feasible in the field. Deadwood length and diameter were generally estimated rather than measured.

6 Conclusion/Discussion

The findings of this survey were very much expected and present the baseline of the Wilder Blean vegetation monitoring which will provide a canvas against which any future changes can be measured, quantified, and visualised. This survey is going to be repeated on an annual basis and will in the future provide the data to analyse any impacts of the naturalistic grazing regime on the vegetation structure and dynamics. There are currently some interesting differences between the three treatment areas (e.g. tree densities, count of structural layers) which will be monitored closely and are likely to fluctuate over the next few years due to the impact of the grazing animals. The range of vegetation structures, and their relative abundance on site in particular, gives a suite of options against which to detect change.

In future surveys and reports, we will know more about the animals' preferences through observations, GPS collar and vegetation data analysis and can use other datasets in conjugation with habitat structure and vegetation composition analysis to go into more detail as to how the grazers all make an impact, in what areas and what exactly this change looks like depending on species and habitat.

7 References

Swift, A.L. (2006). *Long-term Structural Changes, and Their Causes, in the Canopy Tree Layer of a Non-intervention Mixed Deciduous Ancient Woodland in West Sussex, UK*. Unpublished Master's thesis.