

The University of Dundee
Campus biodiversity Survey
2010

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Introduction

“It would be a hollow victory if Scotland wins the carbon battle but lacks the richness in biodiversity to provide the natural resources we need.”

“We need to treat climate change and biodiversity, along with renewable energy, as part of the same challenge in our aim to achieve sustainability.”- Scottish ministers Roseanna Cunningham and Stewart Stevenson.

It is important that we protect the fundamental biological systems and processes that provide essential services from carbon and water cycling to soil stability and agricultural pollination. Universities and colleges have an important opportunity to make biodiversity an important part of their campus and can provide highly valuable resources for biodiversity. Many campuses already contain important habitats and there is always the opportunity to increase biodiversity through sensitive ground management.

The Green business partnership's environmental placement programme places students within businesses across Scotland to undertake varied environmental projects. Through this scheme the University of Dundee provided a placement for a student working with the estates and buildings department to carry out a comprehensive survey of the biodiversity on Campus and develop site-specific reports and action plans. The Survey follows on from a natural history survey of the university property completed in 2001 by members of the Dundee naturalists' society prior to extensive building work on campus. It aims to identify and document any changes to the diversity of organisms and habitats on campus over this time in order to highlight important habitats for protection or enhancement as well as possible creation. The majority of the project was carried out by one student working full time over 8 weeks with the assistance of local experts and enthusiasts. The areas were surveyed in summer from the 5th of July 2010 until the 27th of August 2010 to maximize the species present.

Acknowledgments

I would like to thank my supervisors on this project Trudy Cunningham and Alasdair Hood for an excellent summer and for their support in the planning and carrying out of this survey.

I would also like to say thank you to Anne Reid from the Dundee naturalist society for her time and knowledge as well as her good company whilst carrying out this placement.

I would also like to thank the accommodating staff in estates and buildings.

Outline survey

Habitat

The purpose of the survey is to assess the native species which have established in the campus without planting and via this the campus's ability to promote native biodiversity however in the campus the majority of habitat is planted artificial habitat and it can be of use for habitat diversity in encouraging biodiversity. The outline survey identifies important habitats within sites for a more detailed species survey.

The greatest area of green space on campus by far is the mown short lawns and this survey aimed to look at this habitat in more detail as a result.

The following gives information on the areas studied in detail as species surveys within the site as a physical description.

Site 1

Site 1 was the smallest of the 7 sampling areas.

The site has a small green space at the south end of the area and is locked so not used by staff or students. It contains a regularly mown lawn, with access to sunlight a large tree possibly providing some shade and a shrub area containing bramble bushes and Catoneaster bushes mainly. This area boundary was defined by a stonewall surrounding it on three sides.

There is a planted area behind a car park on the east side with a diversely planted bed of non-native species but has a diversity of native species established possibly due to lack of management because of its isolated location. The area is relatively isolated on campus from other green space and fairly shaded.

Site 2

Site two is a larger site with a greater diversity of habitat.

The site has one large green area on the south end with access to sunlight consisting mainly of a cut lawn with large trees offering some shade and a planted shrub area on the east side of this space. The area boundary is defined by stonewall. There are two further cut lawns on the site that were measured, one just behind the tower building with a small planted shrub area and the other within a planted garden. The first of the smaller lawns is as a contrast to the large one at the south end, much smaller and much more shaded and is fenced off similar to that in site one so has limited use. The second of the smaller lawns is within a diversely planted non-native garden and regularly used by members of the university relatively shaded and regularly walked on.

Site 3

In site 3 eight areas were studied in detail, the first of which the largest uninterrupted area of mown lawn on campus. It was exposed to sunlight with the exception of infrequent trees. This lawn was also defined by stonewall and contains some surrounding non planted vegetation.

In site three there were two wildflower gardens planted roughly one year ago both very shaded and with limited access. They have been left unmanaged. The one closest to the registry building is on a hill and the more isolated of the two areas. The other

between the micro computing centre and the health centre the majority of which has recently been dug up during the instillation of disabled access is more accessible and less shaded on a flat piece of grass.

Site three also contained two diversely planted non-native gardens that are well used. The first is the Geddes quadrangle with a highly maintained and relatively shaded lawn. The other is also relatively shaded and topographically more diverse. It runs adjacent to Airlie place towards the registry office.

A very shaded lawn beside the union on a hill runs behind the library and is separated from the path by a planted shrub area that stretches around to the side of the library.

Campus green was recorded despite likely lack of diversity, as it is a focal point of the university and a good comparison. A recently planted hedgerow defines the green and the union building shades parts of the lawn as well as a row of trees and shrubs beside the union overlooking the lawn.

The lawn surrounding the Queen mother building was recording since it was a new lawn. The building offers some shade to the area.

Site 4

Site 4 contained the Belmont residences and the Crawford building as well as part of the union. Semi-natural mixed woodland provided a corridor connecting the large green spaces across from Perth road to the centre of the campus. In the centre of this woodland a small lawn in a small garden was surveyed. It was very shaded surrounded by the old buildings of Airlie place and large stonewalls backing on to the woodland. Ivy and some shrubs provided a border of vegetation to the lawn.

There were three lawns surveyed between the tennis courts and Belmont residences. Lawn 'N' was used to store some building material and as a result areas went uncut for some time. The lawn was surveyed twice both without the material once with the uncut area and once without prior to the growth. Belmont residences contain low diversity of mainly planted species of non-native plants; dominant species include catoneaster, *Pachysandra terminalis* and an unrecorded *Rhubus* species.

Site 5

Site 5 contained four recorded areas including three maintained lawns and an unmaintained planted area left to grow behind the biological sciences institute.

Two of the lawns were behind the biomedical sciences building and highly maintained. They were relatively shaded by the building and had planted shrub vegetation on either side in a corridor running parallel to the Medical sciences institute.

The other area recorded was the isolated lawn behind the Mathew building building. It is a shaded maintained lawn shaded by buildings on both sides and a large row of trees with planted shrubs at the base although this shrub bed was relatively less frequently maintained. Gardens on either side of Springfield road provide a corridor of green space through the campus.

Site 6

Site 6 contained three recorded areas including three lawns and a semi-natural woodland area. Two of the lawns are on the edge of the woodland area. One behind the sports centre being shaded and the other beside the car park at the west end of Old Hawkhill. The third lawn 'T' is in the Dalhousie building and is a new lawn shaded by buildings on each side. Heathfield residences were also recorded containing mainly raised planted non-native beds including catoneaster predominantly.

Site 7

Seabraes buildings at site 7 were recorded for the species list but no lawns were surveyed. The grounds contain planted species and some native plants but overall highly maintained.

Species survey

Further information on species recorded and there locations can be found in the species list appended

Lichens

Sites 1, 2 and 3 seem to have the highest diversity and a majority were present on stone walls present on these sites in sunny areas. My knowledge of lichen is perhaps not sufficient to draw a conclusion however several species of note in the 2001 survey including *Leparia incana* and *Lecanora conizaeodites* were not recognised. The presence of the latter is indicative of low Ph and high sulphur levels in the atmosphere and so perhaps in the last 10 years atmospheric sulphur levels have decreased in the Dundee campus. This would be consistent with a trend noticed in the previous study. It is doubtful that this is a direct result of actions on the Dundee campus however there have been concerted efforts to reduce traffic levels and emissions on campus via various methods including Cycle to work schemes and the reduction of parking space in the campus. *Usnea sp* from the previous survey was not recognised however would be an indicator of cleaner air and present in the previous survey.

Fungi

A very small amount of fungus species were recorded and too few to draw any conclusions from this however further survey work in the autumn to be combined with work done over the summer would perhaps be useful.

Mosses and liverworts

No particular conclusions can be drawn from the bryophyte survey however as a repeat survey large sections of liverwort mentioned in the previous survey are still present and fertile in at least two areas.

The moss *Rhytidiadelphus squarrosus* was a large part of the of many of the lawns indexed.

Ferns and allies

Few pteridophytes were recorded. The common male fern and the common polypody were not recorded although present in the previous survey in 2001. The stands of

hearts tongue fern mentioned in the previous survey were recorded on two occasions and perhaps the most interesting.

Wall rue and black spleenwort are still present on old sandstone walls in the older parts of campus.

Flowering plants

The greatest time spent was on the angiosperms as perhaps the most useful measure of biodiversity on the University campus. Highly maintained lawns dominate the greatest areas of green space on campus and so this survey has aimed to characterise these lawns in terms of diversity and the possible opportunities to enhance these types of areas for an increased biodiversity.

The Shannon weaver index is a measure of diversity where abundance data is available incorporating species richness and evenness in abundance of species.

Shannon weaver diversity index

- $H = -\sum (p_i \ln p_i)$
- S = number of species
- N = Total number of individuals
- N_i = Number of individuals in a species
- $P_i = n_i/N$
- Takes into account species richness and evenness. Increases with new species and increased evenness of distribution.

This was used to calculate a diversity index for the lawns on campus and the results are shown in figure 2 where the Letters correspond to letter on the map (figure 1) representing the location of the surveyed area. A higher number represents a higher diversity in terms of species and evenness of distribution.

The most diverse areas were A,H,K,O,S and T. These were diverse in habitat quality either by the value of size but also topographical diversity or the fact that these areas were shaded. The areas provided mosaics of different patches of environmental conditions were different species were present of more abundant leading to a larger over all evenness of species and an increased diversity index.

Areas of Low diversity were recognised as being amenity lawns for instance D and F (Frankland gardens and the Geddes quad. Campus green (I) was higher than expected as a shaded area closer to the building where species evenness was much higher increased its diversity index.

Still present and considered locally uncommon or rare in the previous survey when recorded were:

Deadly Nightshade	(<i>Atropa belladonna</i>)
Oxford ragwort	(<i>Senecio squalidus</i>)

Barren fescue and eastern rocket however were not recognised on campus as previously in 2001. This relatively low number of rare or uncommon species is indicative of the campus' low native biodiversity.

Arthropods

Arthropod diversity was an area of the survey built upon from the previous using various methods with varying success. The insects are among the most diverse groups of animals on the planet and because of this there is a large number of species not recorded however by recording in particular habitats using a number of repeatable methods an idea of variation in diversity of arthropods across different areas of the campus could be obtained. Dry pitfall trapping gave a repeatable and comparable method of comparing diversity of leaf litter fauna in different habitats and areas.

Below are the results of the dry pitfall trapping including the Shannon weaver index in this case not representing the diversity of the area but of the sample.

1) Shannon weaver index (1.483694)

Ear wig - *Euborellia moesta* - 2
Ground beetle – *Pterostichus madidus* - 2
Spider – *Bathyphantes gracilis* - 1
Springtail – *Tomocerus vulgaris* - 9
Bristle tail – *Dilta hibernica?* - 2
Woodlouse - *Porcellio scaber* - 2

2) Shannon weaver index (1.399631)

Ground beetle – *Pterostichus madidus* - 1
Spider – *Bathyphantes gracilis* - 1
Springtail – *Tomocerus vulgaris* - 11
Bristle tail – *Dilta hibernica?* - 1
Woodlouse - *Porcellio scaber* - 4
Centipede – *Necrophloeophagus longicornis* - 1
Centipede - *Lithobius forficayus* - 1

3) Shannon weaver index (1.039721)

Common black ant - *Lasius niger* - 2
Common earthworm - *Lumbricus terrestris* - 1
Garden slug - *Arion hortensis* - 1

4) Shannon weaver index (1.039721)

Ground beetle – *Pterostichus madidus* - 1
Springtail – *Tomocerus vulgaris* - 2
Spider – *Bathyphantes gracilis* - 1

5) Shannon weaver index (2.059229)

Ear wig - *Euborellia moesta* - 4
Ground beetle - *Pterostichus madidus* - 3
Harvestmen - *Opiliones sp* - 3
Centipede - *Necrophloeophagus longicornis* - 1
Garden slug - *Arion hortensis* - 2
Brawn garden snail - *Helix aspera* – 1
White lipped snail - *Cepaea hortensis* - 1
Common earthworm - *Lumbricus terrestris* - 1
Common black ant - *Lasius niger* – 3

6) Shannon weaver index (1.332179)
Ground beetle - *Pterostichus madidus* - 1
Harvestmen - *Opiliones* sp – 2
Centipede - *Necrophloeophagus longicornis* - 1
Common earthworm - *Lumbricus terrestris* - 1

7) Shannon weaver index (1.294545)
Ear wig - *Euborellia moesta* - 1
Ground beetle - *Pterostichus madidus* - 2
Springtail - *Tomocerus vulgaris* - ~6
Bristle tail - *Dilta hibernica?* - 1
Centipede - *Lithobius forficayus* - 1

8) Shannon weaver index (1.427061)
Ground beetle - *Pterostichus madidus* - 1
Springtail - *Tomocerus vulgaris* - 4
Bristle tail - *Dilta hibernica?* - 1
Harvestmen - *Opiliones* sp – 2
Centipede - *Necrophloeophagus longicornis* - 1

9) Shannon weaver index (1.14906)
Woodlouse - *Porcellio scaber* - 5
Harvestman - *Nemostoma bimaculatum* - 2
Spider - *Bathyphantes gracilis* - 1
Ground beetle - *Pterostichus madidus* - 1

10) Shannon weaver index (1.666876)
Ear wig - *Euborellia moesta* - 3
Woodlouse - *Porcellio scaber* - 3
Ground beetle - *Pterostichus madidus* - 4
Springtail - *Tomocerus vulgaris* - 6
Centipede - *Necrophloeophagus longicornis* - 1
Centipede - *Lithobius forficayus* - 2

11) Shannon weaver index (1.86368)
Ear wig - *Euborellia moesta* - 1
Ground beetle – *Pterostichus madidus* - 2
Springtail – *Tomocerus vulgaris* - 8
Woodlouse - *Porcellio scaber* - 4
Bristle tail – *Dilta hibernica?* - 3
Centipede - *Necrophloeophagus longicornis* - 2
Centipede - *Lithobius forficayus* - 3
Spider - *Bathyphantes gracilis* - 1

12) Shannon weaver index (0)
Common black ant - *Lasius niger* – 1

13) Shannon weaver index (0)
Woodlouse - *Porcellio scaber* - 1

The information was collected over three days in variable weather conditions at different points in the 8 week survey period so have limited power to predict biodiversity of the area however each trap was set for the same length of time using the same method and a trap measuring 8cm in diameter so some conclusions can be drawn from the results. These results in many ways followed the expected results showing the highest diversity in semi natural areas. The highest diversity (trap 5) was found in the wildflower area although only recently introduced and designated. The high diversity of native plants in this area would suggest a possibly high diversity of fauna and this seems to be the case as measured by pitfall trapping. The unmanaged area behind the biological sciences institute building also had a diverse fauna suggested by the pitfall traps. Lack of management could create habitat by not removing dead organic material or allowing change in the habitat structure. The pitfall trapping suggested lowest diversity areas seemed to correlate with low diversity lawns or areas with a lack of native plants and weeds. Incidental finds such as the Antler moth and the 7 spot ladybirds near the union were found on the more diverse part of the lawn across from campus green nearest the cash machine and planted area.

Moth trapping had limited success and seemed to be sensitive to weather conditions and perhaps the point in time over the survey period. The trapping still led to some results and when comparing the catch at each of three locations indicated on the map as a black circle with the letter 'M' in white the highest diversity seemed to be in the Airlie place garden connected by a large green corridor to a semi natural wooded area.

Molluscs

The diversity of molluscs was similarly to the previous survey not recorded significantly to suggest a true representation of the group's diversity on campus however they were record in the pitfall traps and contributed to conclusions drawn from that. Cover boards were attempted and proved relatively unsuccessful in trial.

Birds

The sampling effort when recording birds was not carried out in a uniform way in order to compare results in the areas but rather recorded as incidental sightings whilst out on campus. The survey was carried out in the summer similar to the previous survey so did not encompass the early spring and the lack of expertise on my part meant that the opportunity to record the dawn chorus was missed.

Areas of interest from the 2001 survey for instance the Newport pier and the areas south of the Perth road buildings were not recorded in this survey.

Due to the range of birds a small campus can not count visiting birds as breeding on site having recorded a visit on campus however habitat for birds to feed on campus can be important in conservation in an urban environment to support a larger breeding population else where. Some evidence of breeding was recorded on the main campus however. An abandoned nest was found in the wooded area behind the sports centre as well as nesting blackbirds in a cotoneaster bush in front of Bonar hall.

Mammals

Rabbits are very common on campus recorded as incidental sightings and perhaps successful due to the large amount of lawns on campus.

No squirrels were seen on campus during the period but are likely to occur in the area.

Longworth traps were supplied by Camperdown country park but although show evidence of small mammal activity were unsuccessful in trapping anything to record.

Foxes were sighted in the evening around the Old Hawkhill area and were possibly partly responsible for the lack of success in Longworth trapping as they were often found moved or in fact lost in one case. I can't think of another explanation for the disturbance of the traps and if this is the case then it provides further evidence for foxes behind Airlie place.

A bat walk recorded some soprano pipistrelle bats around the union that correlates with a higher diversity and abundance of moths in that area and can possibly be put down to the green corridor running through that area of the campus connecting the campus with more naturalised areas across Perth road.

Management suggestions

Maintained lawns making up the largest part of the campus usually have high nutrient levels that encourage vigorous generalist species. Grazing although not possible on a university campus would naturally do the maintenance of a wildflower area.

Maintenance must be in order to mimic grazing by removing plant material preventing decomposing material adding nutrients back into the soil and vigorous species taking over. A cutting regime diversifying existing grassy area could prove cost effective without the need for planting. Implementing a 'wait and see' approach with a long view to naturally diverse lawns on campus.

It is important to maintain the recreational use of the green spaces and maintaining a cut lawn serves an important purpose in a university campus. For example an aerobics class being held on lawn 'M'

Managing wildflower meadows.

Newly planted areas cut more intensively over the first year every 6 – 8 weeks to help establishment.

Hand weeding of unwanted more vigorous species would be necessary to prevent the use of weed killers.

Ongoing management

Cutting to mimic grazing prevents nutrient leaching into the soil at winter due to decomposition and more vigorous plants taking over.

Set a cutting regime inline with when established flowers have set seed incorporating some annual variation into the regime to include later flowering species maintaining sward length at 5 – 10 cm. Ideally do not use mulching lawn mower so cuttings can be removed and a sward length can be maintained keeping nutrient levels low.

Some suggested lawns for development

Ideally we could create a mosaic of habitats on campus with a degree of connectivity, as this connectivity between habitats seems to increase diversity of the effected areas, creating habitat heterogeneity by shade or the provision of habitat for arthropods to breed. Bellow in figure 3 is a map with some suggested areas for habitat development on the lawns. The areas suggested were selected for their low diversity (figure 1 & 2), lack of use in terms of amenities on campus and also taking into account a possible preference for a maintained lawn in certain focal points on campus for aesthetic value.

The map in figure 3 shows two main suggested lawns for development beside Belmont residences these large areas could be of importance for biodiversity on campus eventually and by using a ‘wait and see’ approach could have some interesting species within a few years and hopefully within 10 years be an important part of the biodiversity on campus. To maintain a managed and tidy look a short border of lawn separating these areas from the path could be maintained and would prevent the path from being encroached on by the plant life.

Other areas suggested were the area of grass behind the sports centre that goes entirely unused and could be developed beneficially to the biodiversity as well as the time of the campus staff. Smaller areas of less intensely managed grass could enhance the biodiversity of some of the less diverse lawns whilst still maintaining the aesthetics of the lawn by creating small beds of less intensely managed grass in the larger managed lawns on campus perhaps in a circle around trees.

Other suggestions

Many of the native plants on campus are reduced by the use of chemicals on campus and ideally this would be reduced or eliminated from campus management. Mulch beds with wood chips produced from your own waste materials or from another sustainable source could reduce the use of herbicides to control weeds as is used in Sea braes residences and can increase the arthropod diversity.

Compost as organic fertilisers on campus could reduce the use of chemicals. This could possibly be facilitated by the creation of a compost heap in the halls of residence grounds and hopefully highlight the students responsibility for not only sustainability on campus but get them involved in habitat creation as compost heaps can be an important habitat for certain animal communities although I am unsure of the usage of fertiliser on campus.

Encouraging natural predators like ladybirds and lacewings via food plants and hibernation habitats will reduce any insecticide use presently on campus and ladybird boxes could be a useful addition to the student allotments on campus.

I would suggest further designation of wildlife areas on campus similarly to what has been achieved with the current wildflower gardens to increase student involvement and awareness at least if not to protect and ensure further study of these areas. I would like to see the whole green space from behind Airlie place to the tennis courts to be recognised as a wildlife corridor potentially home to Pipestrelle bats if not they are feeding on the wider diversity of moths found in this part of the campus. It would also be important to designate any new wildflower areas for people's awareness and hopefully acceptance.

Summary

Non native gardens have their place in a university this is highlighted simply by the volume of it's use. However ideally the opportunity to make use of this frequent visitation to highlight native flora and fauna to people on campus in an attempt to foster an interest in local biodiversity would be taken advantage of.

Biodiversity can be an important marketing tool for a university and its development can be a saving for the university in terms of time spend in management of the campus grounds or the ability for management effort to be focused elsewhere.

I would hope to see this survey used in future planning for the campus and estates including future planting programmes and sites for further development. Green space can not simply be substituted and gains value over time which should be conserved and allowed to improve.

I would hope it could be used to help generate an enthusiasm for biodiversity issues on campus and further improve the reputation of what I as a visitor think is an excellent university and campus.

Maps

Figure 1.

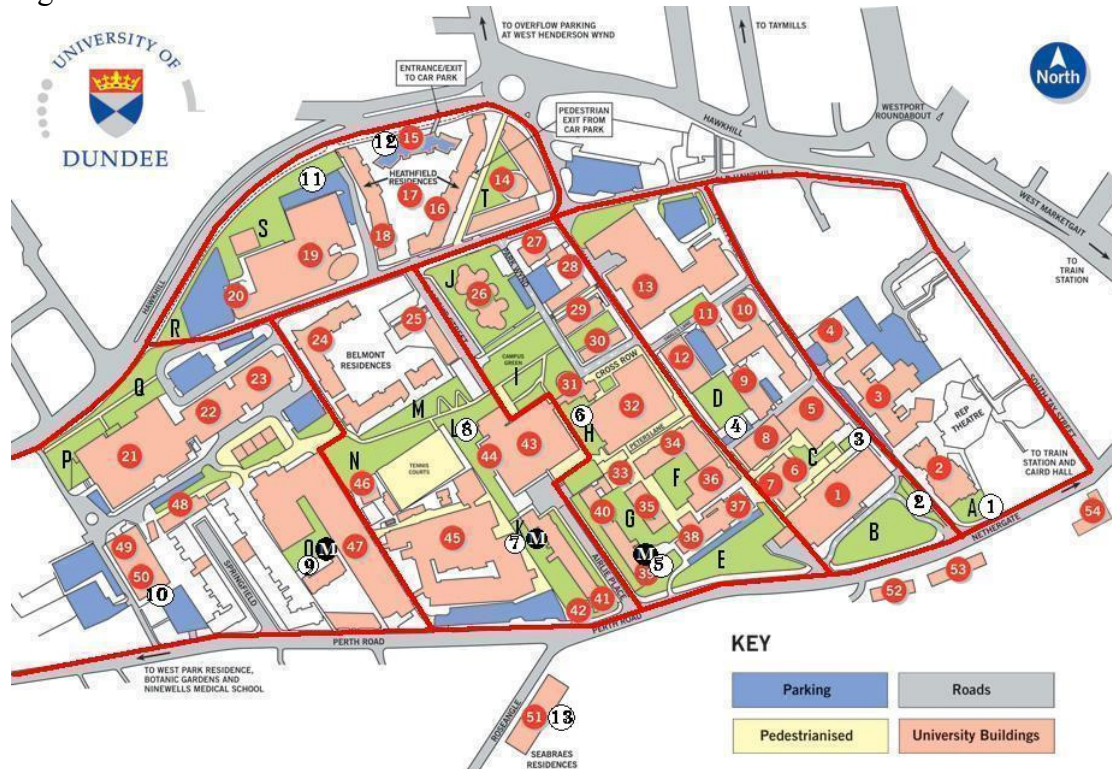
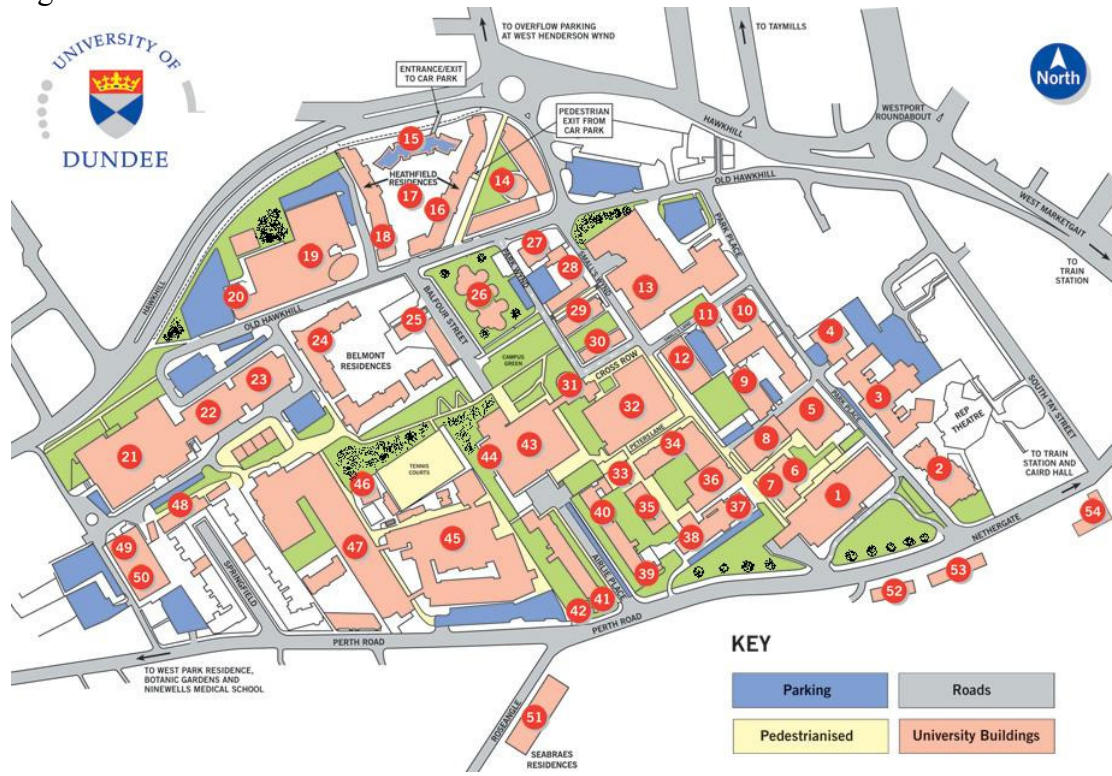


Figure 2.

Area	Shannon weaver diversity index
A	0.53
B	0.3
C	0.25
D	0.19
E	0.25
F	0.17
G	0.28
H	0.36
I	0.27
J	0.19
K	0.49
L	0.22
M	0.2
N	0.19 (0.24 with uncut patch)
O	0.61
P	0.26
Q	0.21
R	0.19
S	0.34
T	0.31

Fig 2. Where the letter correspond to a location on the map indicated in figure one

Figure 3.



List of species recorded

The university property localities used in the recording scheme are indicated as follows and on the map (appendix 1).

The area between South Tay Street and Park Place	1
The area between Park Place and Smalls Wynd	2
The area between Balfour Street/Airlie Place and Smalls Wynd	3
The area including Belmont residences, The student Association and the Crawford Building.	4
Area including the Sir James Black Centre and Medical Sciences Institute	5
Hawkhill area separated by Hawkhill and Old Hawkhill	6
Seabraes residences	7

Lichens

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
	<i>Cladonia spp.</i>							
	<i>Evernia Prunastri</i>	X					X	
	<i>Hypogymnia physodes</i>	X		X		X		
	<i>Lecanora chlarotera</i>						X	
	<i>Lepraria incana</i>							
	<i>Leconora conizaeoides</i>							
	<i>Parmelia glabratula</i>		X	X				
	<i>P. Saxatilis</i>	X	X					X
	<i>P. Sulcata</i>	X	X	X	X			
	<i>Physcia spp.</i>		X		X		X	
	<i>Usnea</i>							
	<i>Xanthoria candelariella</i>	X	X	X		X		X
	<i>X. parietina</i>	X	X	X			X	

Fungi

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
	<i>Botelus spp.</i>							
	<i>Conocybe</i>							
Wax cap	<i>Hygrocybe spp.</i>				X		X	
Coral spot	<i>Nectria Cinnabarina</i>							
Dryad's saddle	<i>Polyporus squamosus</i>							
	<i>Russula curtipes</i>					X		
Common earth ball	<i>Scleroderma citrinum</i>							
Witches' broom	<i>Taphrina betulina</i>						X	

Mosses and Liverworts

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
Liverwort	<i>Marchantia polymorpha</i>	X	X	X		X	X	
Hair-moss	<i>Brachythecium rutabulum</i>							
	<i>Bryum capillare</i>		X	X	X			
	<i>Eurhynchium praelongum</i>		X				X	
	<i>Funaria hygrometrica</i>							
	<i>Grimmia pulvinata</i>		X	X	X			
	<i>Hypnum cupressiforme</i>							
	<i>Mnium hornum</i>							
	<i>Pohlia nutans</i>			X				
	<i>Polytrichum juniperum</i>	X	X	X			X	
	<i>Rhytidiadelphus squarrosus</i>	X	X	X	X	X	X	X
	<i>R. triquetris</i>			X				

Ferns and allies

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
Black spleenwort	<i>Asplenium adiantum-nigrum</i>		X	X				
Wall rue	<i>A. ruta-muraria</i>	X	X	X		X		
Maidenhair spleenwort	<i>A. trichomanes</i>	X	X	X	X	X		
Broad buckler fern	<i>Dryopteris dilatata</i>			X				
Common male fern	<i>D. filix-mas</i>							
Hart's-tongue fern	<i>Phyllitis scolopendrium</i>			X				
Common polypody	<i>Polypodium vulgare</i>							
Common Horsetail	<i>Equisetum arvense</i>				X			

Conifers

No self grown conifers were recorded

Angiosperms

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
Field maple	<i>Acer campestre</i>					X	X	
Norway maple	<i>A. plantanoides</i>	X	X					
Sycamore	<i>A. pseudoplatanus</i>	X	X					
Yarrow	<i>Achillea millefolia</i>	X	X	X		X		
Ground elder	<i>Aegopodium podagraria</i>	X		X				
Common bent grass	<i>Agrostis capillaris</i>							
Brown bent grass	<i>A. canina</i>							
Creeping bend grass	<i>A.stolonifera</i>							
Silvery hair grass	<i>Aira caryophyllea</i>				X			X
Common lady's-mantle	<i>Alchemilla glabra</i>	X	X					X
Parsley piert	<i>Aphanes arvenis</i>	X						
Thale cress	<i>Arabidopsis thaliana</i>		X	X	X	X	X	
Mugwort	<i>Artemisia vulgaris</i>				X			X
Common Orache	<i>Artiplex patula</i>		X	X		X		X
Deadly night shade	<i>Atropa belladonna</i>	X		X				
Bittercress	<i>Barbarea vulgaris</i>		X					
Daisy	<i>Bellis perennis</i>	X	X	X	X	X	X	X
Silver birch	<i>Betula pendula</i>			X	X			
Lop grass	<i>Bromus mollis</i>							
Barren brome	<i>B. sterilis</i>							
Buddlea	<i>Buddleya davidii</i>	X	X	X	X	X	X	X
Shepherds's purse	<i>Capsella bursa-pastoris</i>		X					
Hairy bitter cress	<i>Cardamine hirsute</i>	X	X	X		X	X	
Wood sedge	<i>Carex sylvatica</i>							
Knapweed	<i>Centaurea nigra</i>							
Sticky mouse ear chickweed	<i>Cerastium glomeratum</i>		X	X	X	X		X
Common mouse ear chickweed	<i>C. fontanum</i>	X	X	X	X	X	X	
Fat hen	<i>Chenopodium album</i>		X					
Fever few	<i>Chrysanthemum parthenium</i>			X	X			
Creeping thistle	<i>Cirsium arvense</i>	X	X	X	X			X
Spear thistle	<i>C. vulgare</i>			X	X			X
Common bindweed	<i>Convovulus arvensis</i>				X			
Cotoneaster spp.	<i>Cotoneaster spp.</i>	X	X					X
	<i>Cotula squalida</i>							
Smooth hawks-beard	<i>Crepsis capillaries</i>	X	X					X
Hawthorn	<i>Crataegus monogyna</i>							
Ivy leaved toadflax	<i>Cymbalaria muralis</i>							

Crested dog's-tail	<i>Cynosurus cristatus</i>				X			
Cock's-foot grass	<i>Dactylis glomerata</i>							X
Foxglove	<i>Digitalis purpurea</i>			X	X	X		
Rose-bay willow-herb	<i>Epilobium augustifolium</i>	X	X				X	X
Broad leaved willow-herb	<i>E. montanum</i>	X	X				X	X
Lesser hairy willow-herb	<i>E. parviflora</i>							
Square-stemmed Willow-herb	<i>E. tetragonum</i>							
Couch grass	<i>Elymus repens</i>							X
Spring whitlow-grass	<i>Erophila verna</i>							
Sun spurge	<i>Euphorbia helioscopia</i>					X		
Black Bindweed	<i>Fallopia</i>	X						
Red fescue	<i>Festuca rubra</i>							
Chewing's fescue	<i>F. ovina spp. commutata</i>							
Meadowsweet	<i>Filipendula ulmaria</i>							
Common fumitory	<i>Fumaria officinalis</i>							
Fumitory	<i>F. muralis</i>			X				
Sticky willy	<i>Galium aparine</i>	X	X	X			X	X
Dove's foot crane's-bill	<i>Geranium molle</i>			X	X			
Herb Robert	<i>G. robertianum</i>							
Herb bennet	<i>Geum urbanum</i>			X				X
Ivy	<i>Hedera helix</i>	X			X		X	X
Yorkshire fog grass	<i>Holcus lanatus</i>							
Spanish bluebell	<i>Hyacinthoides hispanicus</i>							
Tutsan	<i>Hypericum androsaemum</i>							
Common St John's wort	<i>H. Perforatum</i>							X
Common cat's ear	<i>Hypochaeris radicata</i>	X						X
Holly	<i>Ilex aquifolia</i>			X		X		
Field scabious	<i>Knautia arvensis</i>							
Red dead-nettle	<i>Lamium purpureum</i>	X	X	X				X
Nipplewort	<i>Lapsana cummunis</i>			X	X			X
Oxe-eye daisy	<i>Leucanthemum vulgare</i>			X				
Purple toadflax	<i>Linaria purpurea</i>	X	X	X	X	X	X	X
Rye-grass	<i>Lolium perenne</i>							
Honeysuckle	<i>Lonicera periclymenum</i>							
Field woodrush	<i>Luzula campestris</i>							
Many-headed woodrush	<i>L. multiflora</i>							
High mallow	<i>Malva sylvestris</i>							

Black medick	<i>Medicago lupulina</i>	X	X	X	X	X	X	X
Pineapple weed	<i>Matricaria matricarioides</i>	X	X					
Wall lettuce	<i>Mycelis muralis</i>							
Common forget me knot	<i>Mysotis arvensis</i>							
Changing forget me knot	<i>M. discolor</i>							
Narrow-headed poppy	<i>Papaver dubium</i>		X		X			
Opium poppy	<i>P. somniferum</i>	X						
Colt's-foot	<i>Petasites hybridus</i>							
Ribwort plantain	<i>Plantago lanceolata</i>	X						
Broadleaved plantain	<i>P. major</i>	X	X	X	X	X	X	X
Annual meadow grass	<i>Poa annua</i>		X					
Smooth stalked meadow grass	<i>P. pratensis</i>							
Rough stalked meadow grass	<i>P. trivialis</i>							
Knotgrass	<i>Polygonum aviculare</i>	X		X				X
	<i>P. persicaria</i>					X		
Barren strawberry	<i>Potentilla sterilis</i>					X		
Self heal	<i>Prunella vulgaris</i>	X	X	X	X	X	X	
Creeping buttercup	<i>Ranunculus repens</i>	X	X	X	X	X	X	X
Gooseberry	<i>Ribes uva-crispa</i>							
Downy Rose	<i>Rosa villosa</i>							
One-rowed water- cress	<i>Rorippa microphylla</i>							
Sorrel	<i>Rumex acetosa</i>		X	X				
Sheep's sorrel	<i>R. acetosella</i>							
Broad-leaved dock	<i>R. obtusifolius</i>	X		X			X	
Bramble	<i>Rubus fruticosus</i>	X						
Raspberry	<i>R. idaeus</i>					X		
Annual pearlwort	<i>Sagina apetala</i>							
Knotted pearlwort	<i>S. procumbens</i>		X	X	X	X	X	
Heath pearlwort	<i>S. subulata</i>	X					X	
Biting stonecrop	<i>Sedum acre</i>							
Ragwort	<i>Senecio jacobea</i>	X	X	X	X	X	X	
Oxford ragwort	<i>S. squalidus</i>			X			X	
Sticky groundsel	<i>S. viscosa</i>	X			X			
Common groundsel	<i>S. vulgaris</i>	X	X	X	X	X	X	X
Red Campion	<i>Silene dioica</i>			X				
Charlock	<i>Sinapsis arvensis</i>							
Hedge mustard	<i>Sisymbrium officinale</i>			X			X	
Eastern rocket	<i>S. orientale</i>							
Field sowthistle	<i>Sonchus arvensis</i>	X	X	X	X	X	X	X
Prickly sowthistle	<i>S. asper</i>			X	X			
Grey sowthistle	<i>S. oleracea</i>	X			X			X
Rowan	<i>Sorbus aucuparia</i>			X				
Lesser stitchwort	<i>Stellaria graminea</i>							
Common chickweed	<i>Stellaria media</i>		X	X			X	

Comfrey	<i>Symphytum x uplandicum</i>		X						
Dandelion	<i>Taraxacum officinale</i>	X	X	X	X	X	X		
Upright hedge-parsley	<i>Torilis japonica</i>			X					
Lesser hop trefoil	<i>Trifolium dubium</i>		X	X	X	X	X		
White clover	<i>T. repens</i>	X	X	X	X	X	X		
Scentless mayweed	<i>Tripleurospermum inodorum</i>			X	X				
Coltsfoot	<i>Tussilago farfara</i>		X	X	X	X			X
Stinging nettle	<i>Urtica dioica</i>	X	X	X	X	X	X		X
Small nettle	<i>U. urens</i>	X							
Wall speedwell	<i>Veronica arvensis</i>								X
Germander speedwell	<i>V. chamaedrys</i>	X						X	
Slender speedwell	<i>V. filiformis</i>							X	
Common speedwell	<i>V. officinalis</i>	X						X	
Large field speedwell	<i>V. persica</i>								
Grey speedwell	<i>V. polita</i>								
Tufted vetch	<i>Vicia cracca</i>								
Hairy tare	<i>V. hirsuta</i>								
Common vetch	<i>V. sativa</i>		X						
Bush vetch	<i>V. sepium</i>			X					
Field pansy	<i>Viola arvensis</i>								
Barren fescue	<i>Vulpia bromoides</i>								

Annelid worms

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
Common earthworm	<i>Lumbricus terrestris</i>		X	X	X			

Arthropods

insects

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
2 spot ladybird	<i>Adalia 2- punctata</i>	X						
Dark arches moth	<i>Apamea monoglypha</i>			X	X	X		
Red tailed bumble bee	<i>Bombus lepidarius</i>			X				
White tailed bumble bee	<i>Bombus terrestris/ lucorum</i>			X	X	X		
Common carder bee	<i>Bombus pascuorum</i>	X		X	X			
Antler moth	<i>Cerapteryx graminis</i>			X				
7 spot ladybird	<i>Coccinellia septempunctata</i>			X				
Marbled beauty	<i>Cryphia domestica</i>				X			
Painted lady butterfly	<i>Cynthia cardui</i>	X						

Bristle tail	<i>Dilta hibernica?</i>	X	X		X	X	X
Tree wasp	<i>Dolichovespula sylvestris</i>				X		
Earwig	<i>Euborellia moesta</i>	X			X	X	X
Hover fly	<i>Episyrphus balteatus</i>				X	X	X
Drone fly	<i>Eristalis tenax</i>						
Common black ant	<i>Lasius niger</i>		X	X			X
Green bottle fly	<i>Lucilia caesar</i>					X	
Common rustic	<i>Mesapamea secalis</i>					X	
Lesser yellow underwings	<i>Noctua comes</i>				X	X	
Lesser broad bordered yellow underwing	<i>Noctua Janthe</i>				X	X	X
Large yellow underwing	<i>Noctua pronuba</i>				X	X	X
Willow beauty	<i>Peribatodes rhomboidaria</i>					X	
Large white butterfly	<i>Pieris brassicae</i>					X	
Hoverfly	<i>Platycheirus sp</i>					X	
Ground beetle –	<i>Pterostichus madidus</i>	X	X		X	X	X
Spring tail	<i>Tomocerus vulgaris</i>	X	X		X	X	X
Common wasp	<i>Vespula vulgaris</i>				X		
Hoverfly	<i>Volucella pellucens</i>				X		X
Dotted clay	<i>Xestia baja</i>					X	
Double square-spot	<i>Xestia triangulum</i>					X	

Arachnids

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
Garden spider	<i>Aranea diadema</i>				X			
	<i>Bathyphantes gracilis</i>	X	X				X	
Comb footed spider	<i>Enoplognatha ovata</i>				X			
Harvest man	<i>opiliones</i>				X	X	X	

Centipedes & millipedes

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
Centipedes	<i>Lithobius forficayus</i>		X		X		X	
	<i>Necrophloepagus longicornis</i>		X	X	X	X	X	
Millipede	<i>Cylindrioulus puntatus</i>		X			X		
	<i>Glomerus marginata</i>					X		

Crustaceans

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
Shinny woodlouse	<i>Oniscus asellus</i>		X					
Rough woodlouse	<i>Porcellio scaber</i>	X	X	X		X	X	X

Molluscs

<u>Common name</u>	<u>Scientific name</u>	1	2	3	4	5	6	7
Garden slug	<i>Arion hortensis</i>		X	X				
White lipped snail	<i>Cepaea hortensis</i>			X				
Brown garden snail	<i>Helix aspera</i>			X				