**Sampling Strategies**

Today we're going to be exploring various sampling strategies including the use of quadrats. It's usually not possible to look at every single individual of a species within a given area. It's also pretty rare that you'll be able to look at every single square metre within that area too. For that reason, field ecologists try and obtain something called a representative sample. This is when you look at a smaller area that represents patterns that are happening on a bigger scale.

You might want to use a quadrat to do that, such as the ones down here. Quadrats are really useful because they can quantify that smaller area that we'll be looking within. They do come in all shapes and sizes, small and big depending on how many you're going to place and the species that you're looking at. Often they're square shaped like these ones. They can be made of metal or plastic. This one is an open-framed quadrat, there's no grids inside this one you can see; whereas this one is divided into many more grids, and that's what we call a gridded quadrat.

You can have lots of different numbers of grids; sometimes they have five squares by five squares giving you twenty-five in total. This one has ten along the top and ten down the side, giving us a hundred in total, which can be really useful if we're working out things like percentage.

When you place your quadrat on the ground, there's a number of things that you might want to do. Firstly, you might want to identify the species that you're looking at, either one that's particularly interesting or all of them if you're looking more generally at biodiversity. In my example here, I'm just going to look at this small flower here, which is known as *Bellis Perennis* or otherwise known as daisy. I can see three individual plants here: one of which has a flower; two of which just have the leaves. If I want to assess the abundance of that daisy, I could just count the fact there are three plants within the quadrat. This gives me what's known as species density: the number of plants or other species in a given area.

If you think of other species though, such as mosses or lichens or even corals that grow under the sea, they don't grow as individual entities. For that reason, we might need a different technique. I'm going to pop my gridded quadrat over the top now and try a technique that involves percentage cover. In this technique, I look at each square and if my species is present I count it, and if it's not I don't. So in this case I've got *Bellis Perennis* present in 1,2,3,4,5,6 of my squares. This gives me a percentage cover of 6%.

You may also want to use a pointer, and these pointers can be used to place in a number of locations around your quadrat and see if the species touches, or doesn't touch, your point.

That can be quite useful because it's not based on opinion: the plant either touches that pin or it doesn't, but you can miss some species, particularly if they're small or if they're quite rare.

It's not always appropriate just to place one quadrat within a given area. If you want to gain valid conclusions, by improving your accuracy and precision, you might want to place a number of these and take a mean or other averages. In my example behind me, I may want to be assessing the biodiversity in this small area of unmown grassland here. I may then want to compare that abundance to the area behind the fence in that grazed farmland there.

So it’s not possible for me in this example to look at every single individual within this area and then compare it to every single individual in this grazed farmland just over the fence here. So I'm going to be placing some of these quadrats, but I'm going to do so in a random manner. That means that every area within this area has an equal chance of being sampled. Now I'm not just going to throw this quadrat down, I'm going to use this random number table here - you can get these or generate them online - and I'm going to be selecting one random number for my x-axis and one random number for my y-axis with my two tape measures, and that will help me locate one location within this area. Let's have a go. So I'm going to close my eyes or look away and I'm going to point to my first random number. In this case it's 2.2m, and I'm just going to mark that out with a small stick here - 2.2 metres, just so I can see where that is. And I'm going to go down the same column until I find a random number that's below four metres, which is the length of my y-axis; in this case that's 1.8 metres. So 1.8m is exactly here. Now I've got my coordinates, I can find that exact one location, so I'm going to pace out from my marker here until I get to the point on my x-axis, and I'm going to place my quadrat down so that the bottom left-hand corner is exactly at that coordinate. And I'm now ready to identify and assess the abundance of species within this area.

If course, I'd want to do this again: a number of times in this area; and then do exactly the same thing on the other side to make my comparison.

Sometimes it isn't appropriate to use a random sample such as this - there are other techniques. Sometimes people place quadrats along a line known as a transect, and that can be really handy when you're trying to find out the influence of something that changes gradually. For example: the tree in front of me is casting shade on the ground, and I might be interested in how that shade effects plants moving away from the tree, assuming that light will increase as you get further away from the tree. In this case, I might want to place my quadrat every, maybe, 2m as you go away from that tree. In this way, we're placing our quadrat at equal intervals along that line, and this is known as a systematic sample.

Systematic samples can be quite useful, especially when you've identified a gradual change within the environment, such as changing light such as under this tree; or it could be something like increasing soil moisture as you get closer to a pond too.

Sampling techniques like this are pretty essential if you do want to get valid results within your investigation and to ensure accuracy and reliability.