AIM:

To analyze a given piece of land for its distribution of plant life using Quadrat Sampling Method.

THEORY:

If we want to know what kind and types of plants/animals populate a particular habitat, one can sample the area of interest assuming it is a representative of the entire region.

The most frequently used sampling method is the Quadrat Method.

Quadrat sampling is based on the measurement of replicated sample units referred to as quadrats or plots. This method is appropriate for estimating the abundance of plants and other organisms that are sufficiently sedentary that we can usually sample plots faster than individuals move between the plots. This allows us to measure absolute densities.

To remove any bias :

An estimate would be biased if it consistently under-estimates or over-estimates the mean of the area.

Bias may arise by selection of sample plots which are non-random with respect to the target organism. A random sample is the one where every potential sample plot within the study area has an exactly equal chance of being chosen for sampling.

To increase precision:

More the area sampled, more is the precision but this comes at the cost of more effort involved in sampling.

Statistical description of the population:

1. Average density – to find the average number of individuals per plot. Add up all the numbers of each species
2. Variance to Mean Ratio - The test is founded on the property of the Poisson distribution that its mean equals its variance. If the plant species is *randomly* distributed, then the ratio is expected to be one. If the nature of distribution is *clustered,* the variance is expected to be higher than the mean while for a *uniform* distribution, variance is expected to be lower than the mean. Thus, the ratio of variance to mean will be greater than one for clustered while less than one for uniform.
3. T-test – one tailed t-test for independent samples of two different species.

MATERIALS:

A metre stick, a plastic ball, a rope and a record notebook.

PROCEDURE:

1. Stood at a place inside the area chosen. Chose a spot *randomly*.
   In order to choose a spot randomly, a person was made to stand with his/her eyes closed and asked to rotate. Another person completely unaware of this person's position was asked to stop him/her. The person then stopped and threw the ball wherever he wished to.
   This procedure is random since both the person's involved are not aware of their positions with respect to the piece of land to be sampled.
2. The metre (~1.25 m long) stick's center was kept at the position where the ball landed.
3. Keeping the stick as the diagonal, a square was marked by the rope.
4. Each species of plant found in the first few quadrats was labelled and their numbers counted in each quadrat.
5. Average densities were calculated, their kind of distribution inferred (whether it was random/clumped/uniform) and a t-test carried out.
6. Standard error was calculated for the variance to mean ratio.

DATA:

Quadrat no.	cannabis(sp 1)	grass (sp 2)	cactus(sp 3)	papaya(sp 4)	ugly(sp 5)	hydrilla(sp 6)	scratchy(sp 7)	yellow(sp 8)	black eyed(sp 9)
1	0	0	0	0	2	2	2	1	0
2	5	0	0	0	1	4	5	2	1
3	22	0	0	0	0	0	0	0	1
4	10	5	0	3	0	0	3	0	1
5	0	6	0	0	0	0	0	0	0
6	2	0	0	0	0	0	0	2	0
7	1	9	0	6	0	0	0	0	0
8	1	16	0	0	0	0	2	1	0
9	6	2	0	0	0	0	3	0	0
10	8	3	1	3	0	0	0	0	1
11	8	4	0	3	0	1	0	0	0
12	4	0	1	33	0	1	0	0	2
Mean(avg no of ind per plot)	5.6	3.8	0.2	4.0	0.3	0.7	1.3	0.5	0.5
Variance	38.3	23.5	0.2	87.3	0.4	1.5	2.9	0.6	0.5
variance/mean	6.853459973	6.260606061	0.909090909	21.81818182	1.545454545	2.272727273	2.345454545	1.272727273	0.909090909
distribution kind	clustered	clustered	uniform/random	clustered	uniform/random	clustered	clustered	clustered/random	uniform/random
std dev	6.185883245	4.845335151	0.389249472	9.34198733	0.621581561	1.23091491	1.712255291	0.797724035	0.674199862
std error	1.785710678	1.398727777	0.112366644	2.69679945	0.179435141	0.355334527	0.494285527	0.230283093	0.194624736
Confidence interval-									
upper limit	7.33	6.74	1.39	22.30	2.03	2.75	2.83	1.75	1.39
lower limit	6.37	5.78	0.43	21.34	1.06	1.79	1.86	0.79	0.43
			random		uniform/random			random	random

Note: The names mentioned are just for labelling different species of plants noted, and are not accurate.

OBSERVATIONS:

Data for nine species of plants was collected across twelve quadrats. The land area sampled was the bank of the Nala (small stream), behind the Faculty Housing.

Mean and variance was calculated for each species of plant.

By looking at the variance to mean ratio, one could easily point out whether the distribution is clustered (>1), random (=1) or uniform (<1).

However, the conclusions drawn might be misleading since the quantities might not be statistically different and may just be a consequence of experimental error.

To eliminate this possibility, t- test was carried out wherein standard error was calculated.

Null Hypothesis: The distribution of species 3, 5, 8 and 9 is random.

> Upon calculation of standard error, one could see that the value of the variance to mean ratio could not be very different from 1. Therefore, within experimental limits, species 3, 8 and 9 are randomly distributed. While for species 5, the interval does not overlap with 1, therefore distribution of species 5 is uniform and not random.

Distribution of other species is fairly clear, since the numbers clearly fall under the three different categories and the calculated confidence intervals depict the errors involved.

CONCLUSION:

For the chosen land area near the Nala, nine species were sampled using the Quadrat Sampling Method. Their distributions were predicted based on this sampling, and the statistical errors estimated.

AIM:

To index the diversity of a chosen region of land using Line Transect as the sampling method.

MATERIALS:

10 m rope, 1 m stick, a pair of scissors, a record notebook.

THEORY:

Line transect is a sampling method employed in regions where there are clear environmental gradients. It involves systematic sampling where samples are taken at fixed intervals along a line.

Different line transects can be employed in the given land area. The diversity in the plant species can be quantitatively or qualitatively established, once data is acquired.

PROCEDURE:

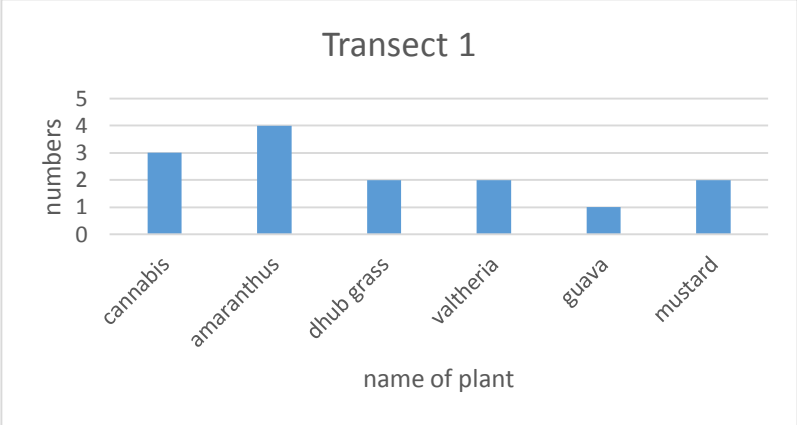
1. Chose a land area to be studied, and stretched the rope tying it to one end of a nearby tree.
2. Using the 1 m long stick, demarcated a metre long stretch and noted the different plants found just below it.
3. Took samples of all the species found for identification.
4. Repeated for the next nine metres.
5. Repeated for two more transects. In the same area.

DATA:

Transect 1	Transect 2	Transect 3
Cannabis	Lavender	Recinus
Cannabis	Mustard	Valtheria
Cannabis	Mustard	Dandelion
Amaranthus	Valtheria	Amaranthus
Dhub Grass	Valtheria	Bean family - Leguminous
Valtheria	Guava	Valtheria
Guava	Valtheria	Cannabis
Valtheria	Eucalyptus	Recinus
Amaranthus	Oxalus	Babool
Amaranthus	Amaranthus	Amaranthus
Amaranthus	Dhub Grass	Babool
Mustard	Dhatura	
Mustard		
Dhub Grass		

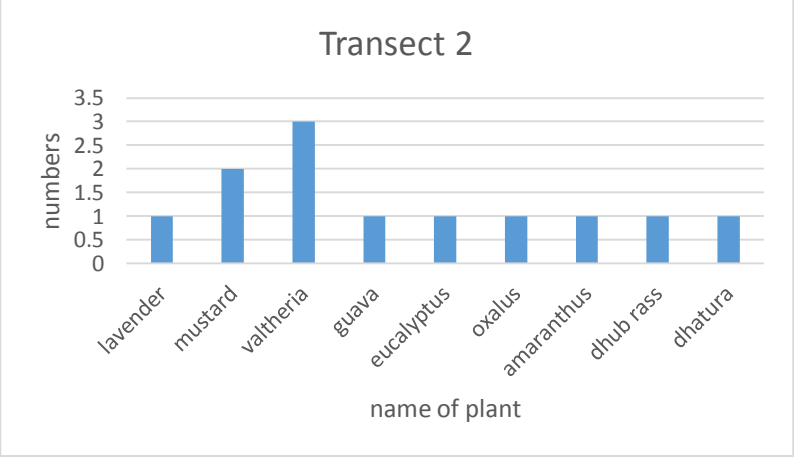
TRANSECT-1

cannabis	3
amaranthus	4
dhub grass	2
valtheria	2
guava	1
mustard	2



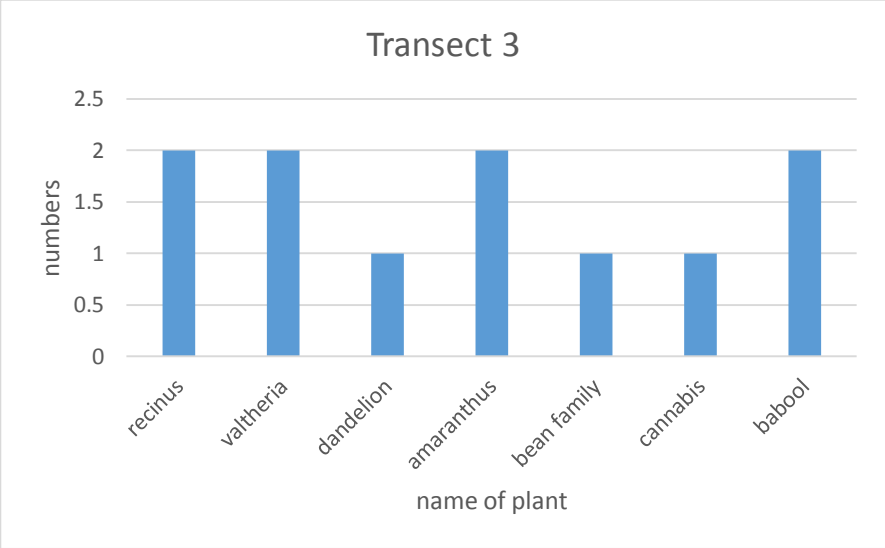
TRANSECT-2

lavender	1
mustard	2
valtheria	3
guava	1
eucalyptus	1
oxalus	1
amaranthus	1
dhub rass	1
dhatura	1



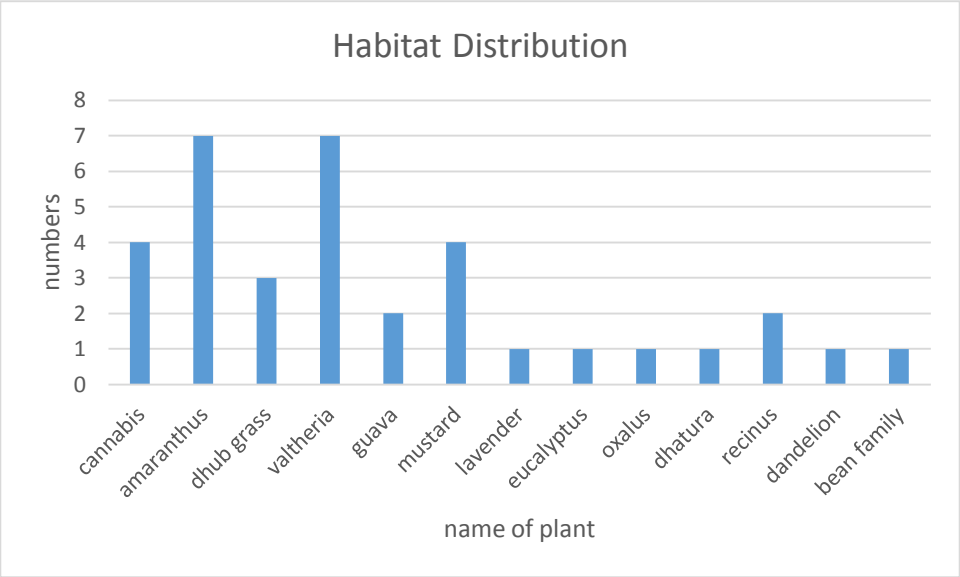
TRANSECT-3

Recinus	2
Valtheria	2
dandelion	1
amaranthus	2
bean family	1
cannabis	1
babool	2



Habitat Distribution

cannabis	4
amaranthus	7
dhub grass	3
valtheria	7
guava	2
mustard	4
lavender	1
eucalyptus	1
oxalus	1
dhatura	1
recinus	2
dandelion	1
bean family	1



CONCLUSION:

From the histograms plotted above, one can observe that in the chosen plot of land, Amaranthus and Valtheria are the most common plant species found, while Eucalyptus, Lavender, Oxalus, Dhatura, Dandelion and Bean are less commonly observed.

If the data for the numbers for each plant species is collected, then one can quantitatively establish the diversity of the land plot, by calculating Shanon-Wiener Index. The above plots however are successful in qualitatively establishing this.