Plan an investigation to find out the distribution and abundance of two named species of plant in a specific habitat and to determine if this is affected by the water content of the soil.

The two species I have decided to carry this investigation out on is Ranunculus repens and Ranunculus bulbosus, both are different species of buttercups. I have chosen these species as they are known to grow in different conditions and therefore results will be very contrasting so that results are easily obtained and conclusions can clearly be drawn.

- *R.bolbosus*
  The name *bolbosus* refers to a bulb- like swelling found at the base of the stem. It has back turned sepals touching the penducle that contributes in supporting the flower; therefore it never needs to throw runners. These distinct facts make the R.bolbosus easily distinguished amongst other buttercups. It is also known that it is most adapted to dry soil conditions.

- *R. repens*
  This species is also easily distinguished as it is a low growing plant with creeping runners, it is most adapted to wet soil conditions.

As both species are physically rather different I will easily be able to distinguish which is which and record accurate results.

Interspecific competition takes place between organisms of different species when their niches overlap. I believe this will be taking place during this investigation and will effect the distribution of the species. The soil must have adequate water, as osmosis needs to be constantly taking place. Osmosis is the movement of water molecules from a high water potential gradient to a low water potential gradient through a partially permeable membrane. If there is not a suitable concentration gradient then plants will begin to wilt an eventually may die. As the water content will vary at different areas of the bank, the percentage of water present will need to be calculated for each interval. The different species of plants will have adapted to living in the certain conditions that they are found to be most abundant this will be achieved by genetic variation. Several different reasons but most commonly independent assortment cause genetic variation.

Throughout this investigation there will be many factors effecting the distribution and abundance of the chosen species. However I will try my best to control the fixed variables as much as possible.

Independent variable – distance (intentionally changed.)
Dependent variable - number of each species present (measured variable.)
Fixed/confounding variable/s: (variables that must maintain as constant as possible.)

Location - all results recorded from same pond area
Air, pressure, temperature - all experiments carried out at the same time keeping the variables as similar to each other as possible.
Time - experiments carried out at the SAME time, to avoid disruption of results from the changes in weather e.g. rain.
H- both species allowed to grow under same pH.

HYPOTHESIS

I predict that the most abundant species nearest the pond (high water content) will be R. repens and this will gradually decrease up the bank. In contrast to this, I expect to find the number of R. bulbosus low near the pond and gradually increase up the bank. Interspecific competition will be taking place, the R. bulbosus will out compete the R. repens at low water content as it is better adapted to dry soil. There will be variations of individuals, which can either increase chances of survival or oppose this. I will expect a region, around the middle of the bank that there will be a similar number of each species present.

PRELIMINARY

The preliminary experiment I carried out was 'How the distance from the sea affected the succession on sand dunes'.

From this experiment I was able to understand the techniques of using a belt transect and quadrats. I also understood how environmental factors could effect the distribution of organisms. The results obtained for my preliminary experiment were very large and several anomalies were recorded, as the quadrat used was large Therefore for this investigation I have decided to use a smaller (50cm) quadarat so that more reliable results are recorded. My results may have been bias so I have decided to randomly select a point where to carry out this experiment and repeat this again to be more accurate. I will use graph paper to represent the whole pond area and then randomly select 2 number and use them as x and y co ordinates.

APPARATUS

Rocks – secure tape to ground
10m measuring tape –measure the distance intervals
Marker pen – clearly mark intervals
50cm2 quadrat – quantitatively record number of species present

Small spade – dig sample soil
Bowl – contain soil
Top pan balance – weigh mass of soil
Oven – heat soil
Dessicator – cool soil

METHOD

1. Choose a point at random using a random number generator to prevent an unbiased decision (explained above)
2. Mark the spot just above the highest point to which the water is with a large rock.
3. Slot the measuring tape under the rock, this will securely hold the tape end.
4. Roll the tape up the bank of the pond. (perpendicular to pond)
5. At the other end, once again use a rock to secure the tape down to the ground
6. At every 50cm interval, mark the measuring tape using a black marker pen.
7. Place a 50cm^2 quadrat at 0m so that it spans the 0-50m on the measuring tape.
8. Starting from 0m, record the results of each species (definition given in introduction) up to 50m in table.
9. Repeat this from 50cm to 100cm, and so on until you reach 10m. A total of 20 intervals should be investigated.
10. Record all results in the table.
11. Once again choose a point at random. Repeats steps 2-10 at this new location.

Interval (cm)	Number of R. repens	Number of R. bolbosus	Water content
0-50			
50-100			
100-150			
150-200			
250-300			
350-400			
400-450			
450-500			
500-550			
550-600			
600-650			
650-700			
700-750			
750-800			
850-900			
950-1000			

METHOD 2

- Take a sample of soil from each distance interval and place in a bowl.
- Weigh the soil as it is using top pan balance and record results. (a)
- Heat in an oven.
- Allow to cool is a dessicator.
- Re-weigh the soil and record mass (b).
- Calculate the 'mass' of water by subtracting (b) the mass of dry soil from (a) mass of wet soil. This is the mass of water that was initially present (c)
- Divide mass of water into mass of wet soil and multiply by 100 to determine the percentage of water that was present.

Mass of wet soil (g) - Mass of dry soil (g) = Mass of Water present (g)

Mass of Water/ Mass of wet soil X 100 = Percentage of water that was present.

Interval (cm)	Mass of wet soil (g)	Mass of dry soil (g)	Mass of water (g)	Percentage of water
0-50				
50-100				
100-150				
150-200				
250-300				
350-400				
400-450				
450-500				
500-550				
550-600				
600-650				
650-700				
700-750				
750-800				
850-900				
950-1000				

After collecting all the data I will plot several graphs to mathematical understand the investigation. I will plot interval (x) against number of species present (y) for both species. I will also plot the interval (x) against the water content (y) to see the distribution of water content up the bank. I will use the data to calculate the PMCC to understand the degree of correlation.

$$PMCC = r = \frac{S_{xy}}{(S_{xx}S_{yy})}$$

SAFETY

- No running, this can lead to an accident.
- Taking care using equipment, gently placing materials rather than throwing.
- Wear safety goggles, this prevents debris blowing into eyes.

REFERENCE

Biology 1 & 2
www.soils.wsc

Word count- 1094 words