Bellis perennis in different areas of light intensity

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Compare the concentration of Bellis Perennis in different areas of light intensity

Aim:

The aim of this study was to compare the concentration of Bellis Perennis (More commonly known as the English daisy) in different areas of light intensity.

Plan:

Hypothesis:

The concentration of Bellis Perennis will be greater when there is a greater light intensity.

Null hypothesis:

The growth pattern of the Bellis Perennis will not be affected by the light intensity it receives.

Variables:

- The area in which growth is taking place
- pH of soil
- Temperature of habitat
- Amount of nutrients available to aid with growth
- Time of day measurements taken
- Type of soil growth is taking place in

To have as much control over these variables as possible and make the results of the investigation as accurate as they can be, I will select a large

area with the soil being as similar as possible but there being different exposures of light intensity in different areas.

The investigation will have to take place at a certain time of day as the light exposure in all areas will change throughout the day with the sun rising and setting, the measurements will need to be taken at the same time of day to be completely fair and accurate in the measurements taken. However measurements could be taken throughout the day and then an average could be taken to determine the average light intensity in each area, this technique will be a more accurate way to come to the most accurate conclusion relative to the hypothesis.

The pH of the soil in each area can also be measured and taken note of as this is a variable that cannot be controlled but could still have an effect on the growth of the Bellis Perennis.

Other uncontrollable variables include the amount of oxygen and carbon dioxide available to be used by the plants; these too should be taken note of as these factors can directly affect the growth.

Note will also need to be taken of other plants growing in the area as these are potential competition for water and nutrients etc. thus affecting their growth.

In this experiment I will only include the flowers that have fully bloomed in my measurements to make the results as fair as possible. This is because flowers that have not bloomed may not be easy to identify and instead of causing discrepancies in the results it would be better to discount them

Apparatus:

- 2x metre tape measures
- 2x metre rulers
- Pencil
- Paper
- Calculator
- Light metre
- Grid square

Method:

Using random sampling method I will select ten areas within the chosen location where there are growths of Bellis Perennis. I will then in the first area measure out a ten by ten metre square. In each area I will identify the centre of the square and measure the light intensity within that area and the number of Bellis Perennis growing there. This method will be repeated in each of the ten areas.

Risk assessment:

Care will need to be taken so as not to destroy any other organisms growing or living in the area chosen. When carrying out the investigation it is also necessary to avoid disturbing or damaging the habitats of different animals within the area as this could damage the local ecosystem. There should also be an awareness of animals living in the area that could be a potential danger so caution should be executed. When it was conducted if any habitats were identifiable I made sure to remove myself from that area to limit the chances of harm occurring.

Hazard	Risk	Precautions
Weather extremes	Risk of hypothermia with extreme cold weather such as rain and snow, risk of sun stroke and dehydration on extremely hot and sunny day.	Precautions taken involve checking the weather forecast frequently in area of proposed study and monitoring it for changes. At the risk of extreme cold correct clothing should be taken such as coats, hats, gloves etc. so as to limit the risk as much as possible. In preparation for hot weather a substantial amount of water should be taken on the trip to prevent dehydration and the correct sun creams and clothing to cover the skin (Hat) should be taken.
Grass slippery when wet	Risk of falling over and experiencing serious injury	Shoes with the correct grip should be worn so as to limit the risk of injury and extra care should be

	when carrying out study on grass.	taken when walking on the grass surface.
Dust	There are dusty paths and roadways throughout the peak district which could cause breathing issues and perhaps get into eyes etc.	To protect against dust protective eye wear should be worn to limit the risk of dust getting into the eyes and if the dust does get into the eyes care should be taken not to rub them as this increases the chance of infection and medical assistance should be sought. Any asthmatics or other people at risk if they inhale dust should take the correct medications with them, a sufficient supply of water and seek medical assistance if necessary.
Waste disposa	Risks from waste people	Avoid any areas where it apparent there is waste

	have disposed in the area with it decomposing and the	
l	chemicals it may release; it may also be on the paths and area of study.	and take care when carrying out the rest of the study.
Workin g alone	Harm could come from animals, other people or other accidents and when working alone no help may be immediately available.	Try to take at least one other person with you and if unable to do so have the phone numbers of people to contact in emergencies, make sure people know where you are and stay vigilant.

Farming	Risk of trespassing on land that has been used for farming.	Research the land you are planning to use to ensure it is not being used already.

Introduction:

Hypothesis:

The concentration of Bellis Perennis will be greater when there is a greater light intensity.

Null hypothesis:

The growth pattern of the Bellis Perennis will not be affected by the light intensity it receives.

Rationale:

Bellis Perennis belong to the kingdom of Plantae which characteristically gets their energy for growth from sunlight so it would be logical to assume that the frequency of Bellis Perennis growing in that area would increase the higher the sunlight exposure. The plant also belongs to the phylum of Angiosperms which are flowering plants which in particular need light energy to bloom so we can also assume that as this is the case the plants will need sunlight to flower and the more sunlight in the area the more plants that will do so. As they also belong to the family Asteraceae these commonly grow in clusters and the flowers have disc shaped heads that follow the direction of the sunlight meaning they can get as much sunlight as possible for growth

and other important processes. As the Bellis Perennis can follow the sunlight the light intensity the flower is receiving will not change so dramatically throughout the day and during the investigation the direction the plants are facing can also be noted throughout the day to see if in fact the plants have moved to face the sunlight.

The hypothesis states growth is dependent on light intensity so the study will have to take place in an unkempt area so as to limit the effects of variables for example if this study took place in a garden where the grass was mowed and the people often walked over It many of the Bellis Perennis would be destroyed so the measurements taken would be inaccurate. However in regards to other possible variables it has been proven previously that plants belonging to this family can adapt easily so the effects of pH, temperature and the amount of nutrients available may be limited.

Method:

The investigation took place in the Peak District in Derbyshire which with an area of 555 square miles of land with much of this being open to the public I was able to find an area mostly unaffected by the human population and that seemed relatively unpopular to tourists.

Once I had found the area I surveyed it to find at least ten locations where there appeared to be growths of Bellis Perennis, many of these areas were exposed to significantly different light intensities; for example some areas were shaded by hedges growing within the vicinity whereas in the middle of the area there were plants completely exposed to sunlight.

In the first area a point was noted and marked out and then using the metre long tape measure 10 metres was measured parallel to the marker, another ten metres was measured so it would form a right angle with the first line measured thus creating a square leaving the area to study at 100 meters.

Using a light meter the light intensity in the middle of the area is measured and is noted down in a table marked out on a piece of paper brought for the investigation; Within the table the area is numbered and there is space for the light intensity to be recorded. To calculate the number of Bellis Perennis growing in the particular are a grid square was used so as to get an accurate figure as without this it may be easy to miscount. Also when obtaining this figure a key was used showing what the Bellis Perennis looked like so the correct plants were being counted.

The same method was then followed in each of the chosen areas to provide ten sets of data for analysis.

Pilot Study:

For this method a pilot study needs to be performed to find ways in which the study can be improved. For this study the original method was performed on a smaller scale in an area of local land which would be similar to what I would use in the Peak District. The aim of my study is to compare the growth of Bellis Perennis due to different light intensities and with this pilot study I will select five areas within the chosen location and measure out ten metre squared areas and tally the number of Bellis Perennis in the area and the light intensity in the centre of the area.

My results were as follows:

Number of samples taken	Total number of Bellis Perennis growing in the area	Light intensity (lux)
1	16	5770
2	29	7770
3	21	6000
4	46	13800
5	37	9100

My results show that the method of carrying out the research is an effective method of getting the results with a good control over extraneous variables that present themselves, however care needs to be taken to ensure the areas are measured out correctly and occasionally the Bellis Perennis are difficult to recognise and distinguish from other very similar plants so a picture for reference would be useful when carrying out the actual study. Note should also be taken of other plants growing within that area as it became apparent that this may be a contributing factor to the number of Bellis Perennis growing in that area as areas with low numbers tended to have a higher number of other plants growing in the immediate vicinity. I have also decided that in my actual study I will need to take multiple light intensity reading to get an accurate figure as it often changed between measurements.

Analysing evidence:

Number of samples taken	Total number of Bellis Perennis growing in the area
1	30
2	14
3	51
4	26
5	48
6	29
7	37
8	18
9	21
10	46

Number of samples taken	Light intensity Measurement 1 (lux)	Light intensity Measurement 2 (lux)	Light intensity Measurement 3 (lux)	arithmetical mean
1	8600	8300	8600	8500

2	8000	5600	5500	6366
3	15300	15700	15200	15400
4	7400	7350	7900	7550
5	13400	13900	13600	13633
6	7650	7800	7770	7740
7	9200	9000	9250	9150
8	5780	5770	5780	5776
9	6010	5900	5990	5966
10	12000	12300	11800	12033

Explanation of graph:

The graph significantly supports my original hypothesis with the figures showing that a higher light intensity is linked to a higher number of Bellis Perennis growing within that area. The repeat reading allowed me to identify any anomalies in my results and only one figure is clearly inaccurate with a result of 8000 lux when the other two repeat reading for this area showed results of around 5000, this anomaly could be due to a variety of reasons but one that may be most likely is if the light meter probe was not cleaned in between readings which could affect the accuracy of the reading presented.

Evaluation:

Limitations:

Despite doing everything to avoid their affects in my study some of the extraneous variables still had an effect on my study; for example some of the plants showed clear evidence of being eaten by animals that must live in the area which may have affected the accuracy of the results with the number of Bellis Perennis perhaps originally being higher than what I saw. When measuring the light intensity the reading sometimes fluctuated a significant amount due to clouds overhead making it sometimes difficult and time consuming to get an accurate reading from that area.

Modifications:

To increase the reliability of the study and remove any limitations found in my study I did get numerous light readings from each area and then find an average to eliminate any anomalous results caused by cloud cover etc. In regards to animals eating the plants it would be best to cordon off the area intended to be used for the study maybe a month before to prevent animals from getting inside and so the results of the study better reflect the natural growth of Bellis Perennis. The fencing used to cordon off the areas should be (or similar too) chicken wire as this will not disrupt the natural sunlight getting to the area and negatively affect the reliability of the results.

Conclusion:

In conclusion the results of the study directly support the hypothesis of the greater the light intensity the higher the number of Bellis Perennis growing in that area.

Bibliography:

Hind, N. (no date) Bellis Perennis (daisy) | Plants & Fungi At Kew, www. kew. org. Available at: http://www. kew. org/science-conservation/plants-fungi/bellis-perennis-daisy(Accessed: 12 March 2015).

This website was useful for this project as it provided a large amount of biological information into the growth patterns of Bellis Perennis and assisted me in making a hypothesis that is likely to be accurate a supported by the study.

Rowlands, G. (2012) WJEC A2 Biology Student Book. United Kingdom: Illuminate Publishing.

This source was useful as it showed methods on how to carry out studies similar to the one I performed and examples of the equipment I was likely to need and variables I needed to be wary of.

Wulfinghoff, D. R. (1999) Measuring Light Intensity, www. energybooks. com. Available at: http://www. energybooks. com/pdf/D1150. pdf(Accessed: 15 March 2015).

This source was particularly useful for the use of the light metre showing how it should be used correctly and likely reasons for any abnormalities for occurring and how best to avoid this and get more accurate results.