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The Types and Amount of Mosses Found on Big Leaf Maple Trees Bordering the Elwha River

Introduction

Moss is the misunderstood plant of the forest. It is very unique compared to all of the other forest plants. First of all, moss does not have a circulatory system unlike you, me and most plants. This is an important fact to consider when taking on an experiment such as ours. Circulatory systems are important because they are the method through which nutrients and water are moved from one part of a plant or animal to another part. Knowing this, then one could conclude that moss has a difficult task of staying alive. Rather than circulating nutrients, it absorbs anything that lands on it or what it can absorb through the air. Water droplets are also very important to the moss life cycle. Moss reproduction is able to take place when there is a water droplet resting on the female and male reproductive organs of moss. The male organ releases sperm that must swim through the water droplet thus fertilizing the egg.

To better understand how mosses survive, one must understand that the warmer the air is, the more water it can hold. Therefore in a lower elevation, where it is warmer, there is more moisture in the air and vice versa. Also, what needs to be understood are the basic principles of the water cycle. As vapor in the air raises to higher elevations, it cools and condenses forming rain. Therefore, generally, at higher elevations, there is more rain and at lower elevations there is less rain.

For our experiment, the locations are included in the procedure, the date was 10/25-26/06, season was in autumn, and timing was around 11:00 a.m. – 2:00 p.m. Our sites looked pretty much the same except for when the higher we went in elevation levels there were less big leaf maple trees. That is why we stopped at 1700 ft; from where we were it looked like there were no more maple trees.

Research Question

What effect does elevation have on the amount and variety of mosses that grows on big leaf maple trees in the Olympic National Park bordering the Elwha River?

Hypothesis

Our hypothesis was that if a big leaf maple tree is growing at a lower elevation, then it will have a greater variety of moss species growing on it and the percent of the trunk covered in moss will be greater compared to a tree at a higher elevation. We think this is true because there is moister in the air compared to a maple tree found growing at lower elevations and mosses need high levels of moisture to live.

Materials

Hand Lens- used for a tool to help us see little things in the moss in order to classify the moss.
Car- used for to take us to the different elevations.
Plastic Bag- used for putting our moss samples from the big leaf maple tree for further examination.
Marker- used to mark the little baggy samples, so we could tell which sample came from which tree.
Plant Identification Book- used to help us classify the different moss samples we picked from the big leaf maple tree.
Topographical Map- used to determine what elevation the trees were at.

Procedure

1. Go to first site: Happy Trail Trailhead with the elevation level at 1700 ft.
2. Select 1 big and 1 small big leaf maple trees and assign # to each tree.
3. Record data and elevation of each tree.
4. Take samples of different mosses on the tree.

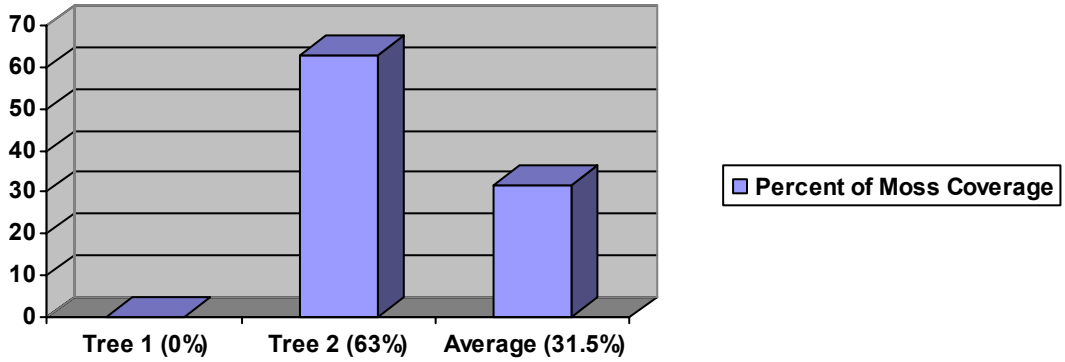
5. Bag samples and label the bag with the tree #.
6. Estimate percentage of tree trunk covered in moss.
7. Go to the next site: The Ranger Station with the elevation level at 300 ft.
8. Repeat steps 2-3.
9. Go to next site: Lower Elwha River with the elevation level at 30 ft.
10. Pick our last 1 big and 1 small Big Leaf Maple trees.
11. Repeat steps 2-3.
12. Go through each bag and identify each moss and record on data table.

Results

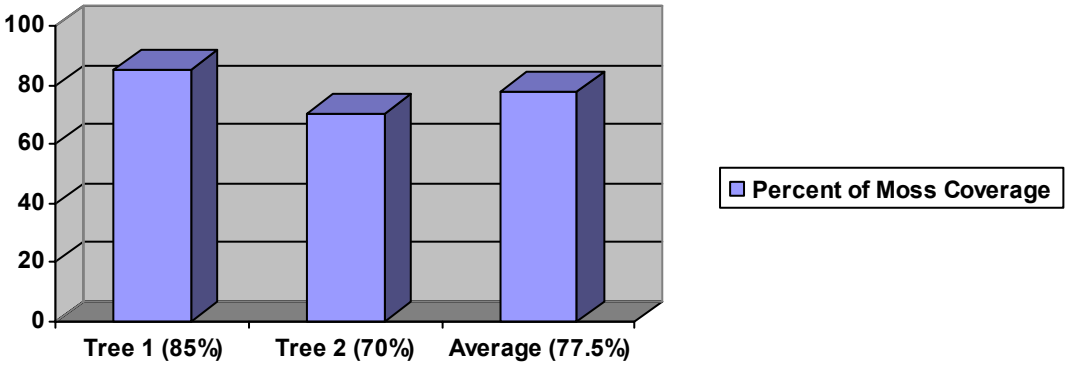
Chart 1 - Types and Quantity of Moss on Big Leaf Maples at Different Elevations Along The Elwha River

Big Leaf Maple Tree Number	Location	Elevation	Number of Moss Species	Types of Moss Species
1	Happy Trail Trailhead	1700 feet above sea level	0	• None
2	Happy Trail Trailhead	1700 feet above sea level	4	• Douglas' Neckera • Lanky Moss • Spear Moss • Magnificent Moss
3	Ranger Station	300 feet above sea level	5	• Douglas' Neckera • Cattail Moss • Small Flat Moss • Goosenecked Moss • Magnificent Moss
4	Ranger Station	300 feet above sea level	5	• Douglas' Neckera • Menzie's Neckera • Clear Moss • Tree Moss • Curly Hypnum
5	Lower Elwha	30 feet above sea level	3	• False Polyrichum • Menzie's Neckera • Bottle Moss
6	Lower Elwha	30 feet above sea level	2	• Clear Moss • Yellow Moss

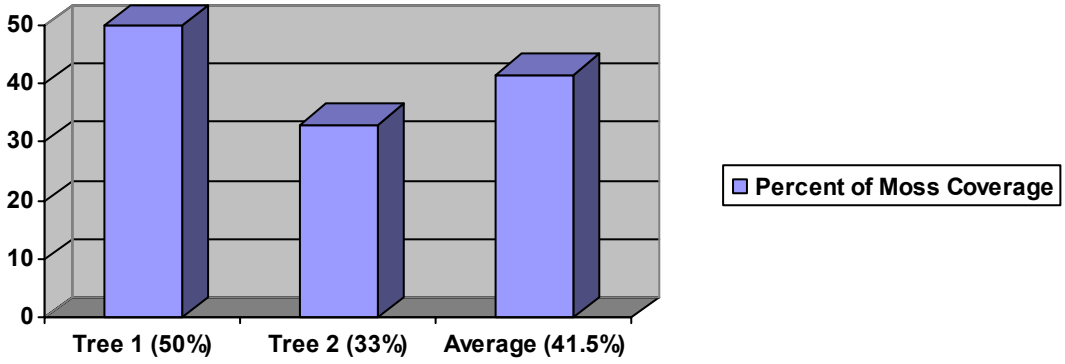
Graph 1 - Percent of Moss Coverage on Big Leaf Maples at 1700 feet above sea level



Graph 2 - Percent of Moss Coverage on Big Leaf Maples at 300 feet above sea level



Graph 3 - Percent of Moss Coverage on Big Leaf Maples at 30 feet above sea level



Analysis

Our results are numerous and interwoven. In chart one, there is information about the species of mosses and how many species of moss there are at each of the different elevations on each of the trees. The first location is the Happy Trail Trailhead at 1700 feet above sea level. The first tree there had no moss on it. The second tree there had four species on it: Douglas' Neckera, Lanky Moss, Spear Moss, and Magnificent Moss.

Tree number three and four were located at the Ranger Station, at 300 feet above sea level. Tree three had five different varieties of moss: Douglas' Neckera, Cattail Moss, Small Flat Moss, Goosenecked Moss, and Magnificent Moss. Tree four also had five different types of moss: Douglas' Neckera, Menzie's Neckera, Clear Moss, Tree Moss, and Curly Hypnum.

The last two trees, trees five and six, were found in the Lower Elwha, at 30 feet above sea level. Tree number five had only three types of moss: False Polyrichum, Menzie's Neckera, and Bottle Moss. Lastly, tree six had two species: Clear Moss and Yellow Moss.

The order of most variety is as follows: trees three and four, at the Ranger Station (300 feet above sea level), both had five varieties of moss on them, which was the most variety, followed by tree two (1700 feet above sea level), with four varieties, then trees five and six (30 feet above sea level) with three and two varieties, respectively. The last tree was tree one, with no moss varieties.

In graph one, it is shown that at 1700 feet above sea level, at the Happy Trail Trailhead, there is no moss on the first tree, and on the second tree, 63% of the entire organism is covered with moss. This is an average of 31.5% moss coverage.

In graph two, the elevation and location are changed to 300 feet above sea level at the Ranger Station. Here, the first tree is 85% covered with moss, and the second is 70% covered, creating an average of 77.5% coverage.

The last graph, graph three, shows the percent of moss coverage in the Lower Elwha, which is 30 feet above sea level. The first tree in this area has 50% of its trunk and branches covered, and the second has 33% coverage, making an average of 41.5% covered.

If the averages are compared, the elevation of 300 feet above sea level at the Ranger Station has 36% more moss coverage than the Lower Elwha at 30 feet above sea level, and 46% more moss than the Happy Trail Trailhead, at 1700 feet above sea level.

Conclusion

To begin we must state that our conclusion is solely based on our observations and the samples we took over two days. This should not be taken as a comprehensive study.

Our hypothesis was not supported by our results. We believed that there would be more moss at lower elevations because there is more moisture in the air. We made this hypothesis on the assumption that moss would grow better with more moisture in the air and less rainfall. However, we found that many of our predictions about moss were incorrect. From our data, we can conclude that moss needs neither mass amounts of moisture in the air, nor mass amounts of rain. We can conclude from our data that moss needs a "happy medium" with more equal amounts of moisture in the air and rain. Our data illustrated this in numerous ways. The Happy Trail Trailhead was our highest elevation of sites. This means that there was less moisture in the air and less rainfall there. The result of this elevation and these conditions resulted in a 31.5% average of moss coverage and only four species of moss. The Lower Elwha was only thirty feet above sea level. This, in theory, should have had less rainfall and more moisture in the air. This location and conditions resulted in a 41.5% average in moss coverage and a total of five different species of moss. The Ranger Station had much more promising results. At an elevation of 300 ft above sea level the average coverage was 77.5%, much more than the other two areas. It also had nine species of moss. From this data we can conclude that moss grows and proliferates best at a medium elevation where there are equal amounts of rain and moisture in the air.

Discussion

Our research applies to how the interaction of organisms changes in varying conditions, such as elevation, as it relates to rainfall and water levels in the air. Several factors may have affected this research and, therefore, the conclusion to the research. One item is that mosses are finicky plants and are difficult to identify. One species may look completely different on one tree as on another; and yet still be the same plant. Mosses are also similar looking in most aspects, so a certain amount of error in identifying them is expected. We also did not repeat trials due to time restrictions. As well as this, our method of measuring the percent of the tree covered by moss was simply a look-and-estimate method, and so should be taken as a guess, not a definite amount. Lastly, there were many big leaf maples at each elevation, and our group only took samples from two at each location. For a more comprehensive study, many more maples would have to be examined and have the information recorded and analyzed, as well as examining maples in different areas at the same elevation. Further research, as well, would have to go into deciding whether or not the age of the big leaf maples had anything to do with our results, and whether that would alter any of our data.

Two possible experiments to complement this one would be to examine a different symbiotic relationship at varying elevations. An example of this would be the relationship of ferns growing out of moss. One could then compare the data to see the similarities and differences to the interaction of moss on big leaf maple trees. This would examine the relationships between organisms at different elevations. The other experiment that could be done would be to see the difference in moss coverage on varying ages of big leaf maples at different elevations. This data could be compared to ours to see if there is any correlation between age and elevation in relation to moss growth.