An Increase of Hikers in the Adirondack High Peaks is Damaging Alpine Vegetation at High Elevations

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Introduction/Background:

Within the High Peaks region of the Adirondack mountains in upstate New York holds rare alpine tundra, which is found at high altitudes with low temperature and energy, and only covers 3% of land outside of antarctica.[6] In the past decade, there has been an increase in use of the High Peaks region. This rapidly led to overuse and there has been evidence of trail erosion increasing coincidingly. The increased number of hikers going off the trail could result in a threat to the rare and fragile alpine tundra vegetation from trampling and widening of trails.[3] Short term effects of trampling consists of degradation of the plant material and long-term effects could cause disruption in the total system of vegetation and soil.[5]

Thus, our **objective** was:
To measure the impacts of increased hiking on alpine vegetation in the High Peaks region in order to assess the need for mediation.

Study Design: Observational Study

Site Selection:

We will be replicating data using sites that have been measured for their alpine percentage frequency in the past to compare our new data set to. The MacIntyre Range, consisting of Wright, Algonquin, Boundary, and Iroquois peaks, was measured in 1984, 1994, 2002, and 2007. The location and topographic map can be seen in Figure 3. The data from 2007, as seen in Figure 2, will be compared to the data we obtain.[2] We are using more than one peak assuming each peak will have different levels of traffic. Due to previous data already being collected in this range, we cannot utilize randomization and random selection in this study design.

Data Collection:

There are currently 11 30m transects placed within this range: 3 on Wright, Iroquois, and Algonquin, and 2 on Boundary.[2] For each transect we will replicate measurements along the transect with steel tape at 5cm intervals, using the point-intercept method to read each line.[2] At each interval, we will record the presence or absence of alpine vegetation.[2] To determine the average frequency, we will take the number of times alpine plants were present at each interval divided by the total number of intervals x 100 on each peak. This process will also be done on a control transect which hikers do not encounter to see the effect without hiker trampling.

To determine the number of hikers, we will contact the New York DEC to access the trail registry for each peak being tested to determine the change in hiker traffic from 2007 and present date.

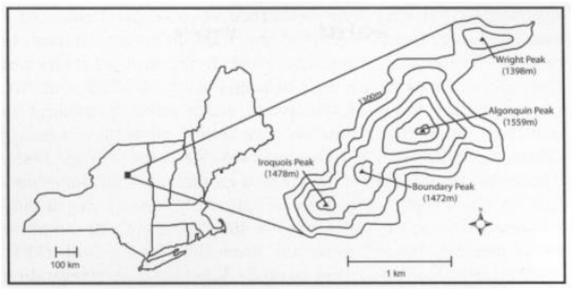

Figure 3: Location and topography of 4 major alpine summits in the MacIntyre Range, Adirondack High Peaks Region, New York State. Contour interval 50m.[2]

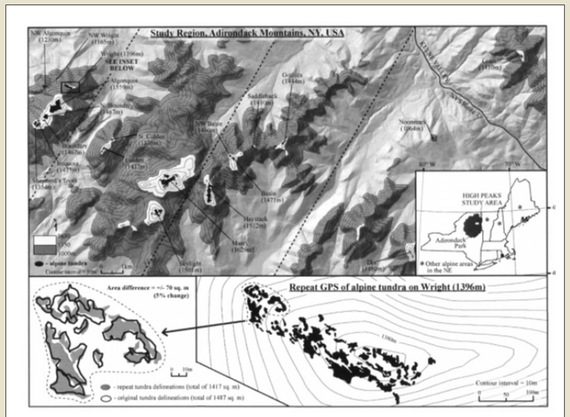

Figure 1: Inset: Location map of the High Peaks Region in northeastern New York. Stars mark major concentrations of alpine tundra. Large map: alpine tundra polygons are shown in black. Inset lower right: example of alpine tundra polygons on Wright. [4]

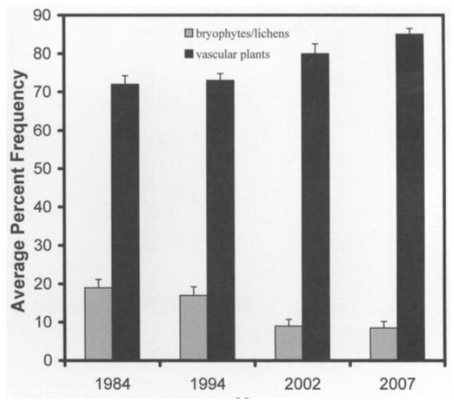

Figure 2: Change in mean frequency of bryophytes/lichens and vascular plants across all four years in the alpine zone, MacIntyre Range, High Peaks Region.[2] This figure attributes both bryophytes/lichens and vascular plants, which are both alpine plants. However, we will be looking at both types wholistically in our study.

Hypothesis: There is a relationship between an increased number of hikers in the Adirondack High Peaks and decreased alpine vegetation.

Intended Analysis:

With the data collected from the DEC registry for each of the peaks, we will determine the increase of hikers from 2007 to 2021 per peak by subtracting the 2007 data from the 2021 data. An example of this data can be seen in Figure 4.

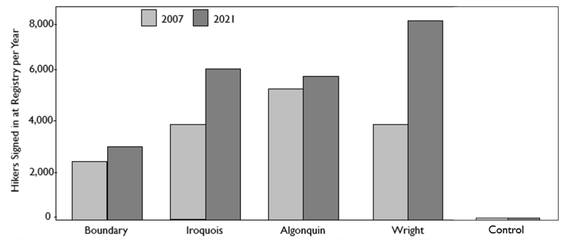

Figure 4: Hypothetical data collected from the New York Department of Conservation from the trail registry for Boundary, Iroquois, Algonquin, and Wright peaks in 2007 and 2021. The control set had no trail registry and did not have any hikers.[1]

With the data obtained on the average percentage frequency of alpine plants on each peak, we will take the difference between 2007 and 2021 to find the % change of alpine plants per peak. An example of this data can be seen in Figure 5.

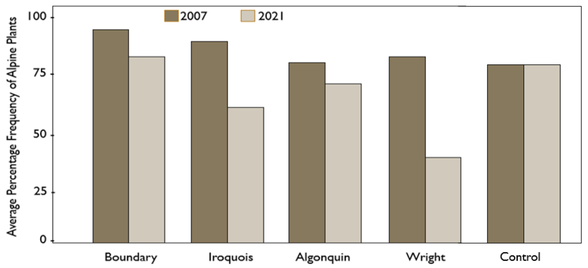

Figure 5: Hypothetical data obtained from the transect measurements at Boundary, Iroquois, Algonquin, and Wright peaks and the control transect in 2007 and 2021. The average percent frequency of alpine plants is measured in a percentage using the technique described in the Data Collection. [1]

With both data sets, our hypothesis will be tested through a regression test for statistical analysis. In this test, the change in average percent frequency of alpine plants per peak will be the dependent variable and the number of additional hikers per peak will be the independent variable, both variables being continuous. By seeing if there is a linear relationship between increase of hikers and decrease of the average percentage frequency of alpine plants, we can infer a significant causative relationship between the two variables. Using the r^2 value, the regression will tell us what percent of vegetation loss is attributable to increase of hikers. This information will be useful when looking at our scope of inference: all the Adirondack High Peaks. An example of this regression test can be seen in Figure 6.

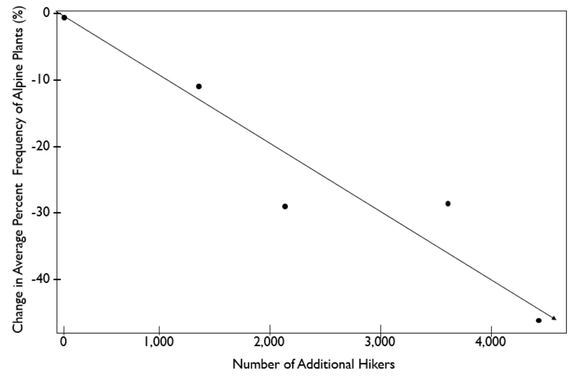

Figure 6: Hypothetical regression test between the two variables obtained: change in average percent frequency of alpine plants and number of additional hikers. The negative slope would represent a linear relationship between the increase of hikers and decrease of alpine vegetation. Each point on the graph would be data collected from the study, with the 0 point being the control. [1]

Conclusions and Future Research:

If the study is conducted in this manner and results in our expected data, there would be compelling evidence to suggest hikers are negatively influencing alpine vegetation in the High Peaks region of the Adirondack mountains. This could prompt conservation managers to act in order to preserve the rare alpine vegetation. Their action would depend on the nature of the managed site, the plant communities contained within, and the type of access in use.[5] Adequate research and the spread of information could also influence visitor attitudes toward this region and make them more likely to practice caution when hiking.[5]

An additional study could be done to see if regulations helped the decrease of alpine vegetation. With the available funding and pre-existing data for reference, we were limited in variability for data collection. Ideally, we would have implemented randomization and random selection in our study design, but due to the forementioned aspects of the study we were not able to. If future studies could be done in sequence, we would set up more transects and get a larger range of data in the Adirondacks with the intention to incorporate randomization and random selection.

Literature Cited:

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