Comparison of Plant Vegetation Communities

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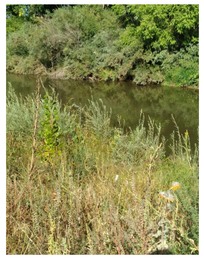
ABSTRACT

This study examines plant diversity across two different riverbank environments along the Poudre River. One site is eroded away due to river meandering and the other has been restored after thousands of dollars were spent to replant and reinstitute the riverbank. Originally, we thought that the restored site would exhibit the greatest amount of diversity. After examining both species richness and individual plant number, our results showed the hypothesis must be rejected. The restored site holds more species, but the unrestored site has a greater number of plants.

Non-restored Site



Restored Site

PURPOSE

Determine if riverbank restoration is worthwhile

INTRODUCTION

Plants serve as an important role to biotic environments and ecology. Specifically, the biodiversity of plants increases the types of interactions which balance and regulate the surrounding environment. The restored site is a result of human effort to reverse the erosion of river meandering with an expensive reconstruction of the riverbank as the non-restored site is untouched and quite eroded. In this study, we aim to highlight the differences of biodiversity between two areas of vegetation on a riverside.

By looking at previous research related to our own project, we can see how the environment is affected by plants. One study examining the plant species richness found that, “selecting the appropriate scale of resolution is crucial when evaluating the distribution and abundance of alien plant invasions, understanding ecological processes, and operationalizing management applications and monitoring strategies” (Foxcroft et al. 2009). Another study examined the exact bio-interactions that plants participate in. That study determined that “changes in global climate as well as plant–animal interactions determine the diversity and potential sp atial distribution of plants” (Buchmann 2002).

Other studies examined water flow and its impact on plant diversity, showing how tolerant plants are to an ever-changing environment, “The plant community at a site therefore reflects the balance achieved between the physicochemical environment and the plants tolerance, adaptation to or their modification of these conditions by their presence” (Dawson 1988). It determined that “changes in global climate as well as plant–animal interactions determine the diversity and potential spatial distribution of plants” (Buchmann 2002). Other studies examined water flow and its impact on plant diversity, showing how tolerant plants are to an ever-changing environment, “The plant community at a site therefore reflects the balance achieved between the physicochemical environment and the plants tolerance, adaptation to or their modification of these conditions by their presence” (Dawson 1988). Regarding water flow, there has been a similar study done that investigates the effect of river hydrology on the vegetation. This study observes how river channels can change direction due to the amount of vegetation present (Camporeale and Ridolfi 2006). To evaluate the relationship between the non-restored and the restored site, we collected data from both sites that range from different distances from the river. It is predicted that the restored site will have a higher plant population as well as diversity of plant species than the non-restored site.

HYPOTHESIS

The restored site will have a higher plant population and species diversity.

METHODS

From each site, sixteen different 50*20cm quadrants were sectioned off using a tape measure. They were marked with flags. The distance covered was 104.8 feet. This was divided by four to make each sample area 26.2 feet. Four quadrants were taken in each area. The first quadrant was spaced about two feet away from the river. Quadrants were kept 1 meter apart from each other and continued up the side of the riverbank in increasing distance from the river itself. Individual plant numbers, as well as the number of species in each quadrant, were both counted. This data was recorded into field journals and later compiled onto a google sheet. Pictures of each quadrant were taken for identification of plant species. To identify present species, a plant species key provided by the University of Northern Colorado was used. Two t-tests were run using Microsoft Excel and the data between the restored and unrestored sites. One t-test was conducted for species richness, and another for individual plant number. The results of each t-test are as follows.

RESULTS

Looking at figures 1 and 2, there are overall trends that the non-restored site has a greater number of plants when measured from four distances from the river.

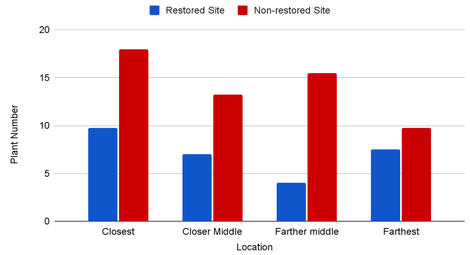


Figure 1: (Left) Average Number of Plants Across Quadrants

Figure 2: (Right) Average Number of Plants Restored vs Non-restored

Looking at figures 3 and 4 there are overall trends that the rstored site has a greater species richness of plants when measured 4 distances from the river as compared to the non-restored site

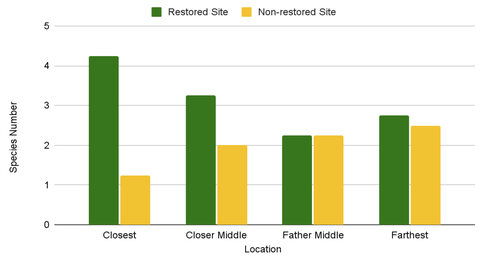


Figure 3: (Left) Average Number of Species Across Quadrants

Figure 4 (Right): Average Number of Species Restored vs Non-restored

DISCUSSION

Our hypothesis stated that the restored site would have more individual plant count and higher species diversity than the non-restored site. In addition, our t-test p-values are both greater than 0.05 which means our data is not statistically significant. This means we cannot say that our data supports that the non-restored site has more individual plant count or higher species diversity than the restored site. However, our hypothesis was not fully supported by the data we collected. Our original sites of comparison were the restored site and a rip rap site. Construction began on the rip rap site we intended to collect data from originally. As a result, we were unable to collect data there and had to revise our experiment, so the non-restored site replaced the rip rap site. The restored site had a higher average number of individual plants than the non-restored site. The restored site had an average of 3 species per quadrant as opposed to the non-restored site which had an average of only 2 species per quadrant. However, the non-restored site had a higher number of plants per quadrant than the restored site with the restored site having an average of about 7 plants per quadrant and the non-restored site having around 15 plants per quadrant. We believe the reason there are more plants in the non-restored site is because it had more time to grow. We also believe that due to environmental changes, only certain plants from the area can grow as they are the only ones that could survive that environment (Hasselquist et al. 2015). These plants could also have a monopoly on the area, as they are the most likely to survive. They compete with other plants and force them out so that there is no competition for resources (Wallace et al. 2017). Even though the two different environments are relatively close to each other, they still have a completely different landscape scene. This can lead to different types of species living there and different conditions that they must survive (Bourgeois et al. 2012). The species richness shows that the restored site has a much higher diversity than the non-restored site. This is because a larger diversity of plants were planted there during the restoration. This is in direct correlation with what Foxcroft states that you need to consider alien and foreign species recently added when taking measurements. As a final conclusion, our hypothesis was supported in the fact that the restored site had a higher richness than the non-restored site. However, the restored site had a lower number of plants than the non-restored site, and it must be rejected as a whole.

ACKNOWLEDGEMENTS

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See References Below