Does distance from shore affect the degree of plant cover? : Silver Creek Preserve vs. Silver Creek West.

Population and Environment Biology 221
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December 14, 2001

Introduction

Riparian areas are essential to the health of streams, providing hiding cover for fish and wildlife, nesting areas, forage, and migration corridors (BLM 2001). Riparian shrubs reinforce stream banks, preventing the erosion and clogging of gravel beds where fish spawn and insects live, while also keeps water cool and more oxygenated (The Nature Conservancy: Silver Creek Preserve). Even though riparian areas cover less than 1 percent of the land in the arid west, they are essential to maintaining healthy streams (The Nature Conservancy: Silver Creek Preserve). Riparian areas also provide aquifer recharge through water storage and release (BLM 2001).

The Silver Creek Preserve is an optimal place to study the varying degree of plant cover between rehabilitated, protected grazed sites while comparing them to less protected sites located off the preserve at Silver Creek West. The diversity and uniqueness of the Silver Creek Preserve allows us to witness the importance of riparian areas by providing a stable and sound setting for our research. By focusing our research on plant coverage alongside stream banks at the two sites, we will record noted plant types and degrees of coverage, enabling us to assess if their mean plant cover vary to a significant degree. If the two sites do not vary significantly, then we will accept our null hypothesis that streamside riparian vegetation does not differ between the Silver Creek Preserve and Silver Creek West. If the null hypothesis is proven false, then we will accept our alternate hypothesis that there is a difference in plant cover between the Silver Creek Preserve and Silver Creek West.

Not only will we assess the plant cover between the two sites, but also we found the opportunity to correlate our findings with previously collected fish data. The sites

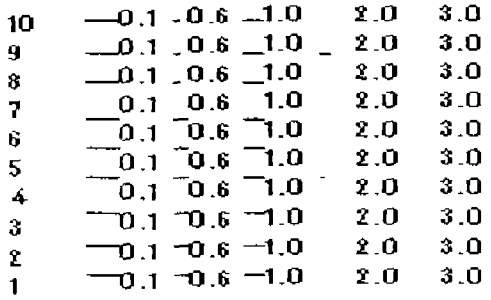
where we chose to measure plant cover were previously chosen by the United States Geological Service, Idaho Fish and Game and the Nature Conservancy for their apparent similarity in plant cover as places to perform fish counts. They wanted to obtain fish numbers from matching sites from an area on the Preserve and one off the Preserve to verify the accuracy of their count. By assessing the vegetation at the two sites we will be able to confirm their fish counts if the two sites are similar in vegetation. If the data shows that vegetation is not similar in the two sites, then they may want to find another site that is more similar in vegetation cover in order to verify the accuracy of their count.

Methods and Materials

In the fall of 2001, we surveyed overhanging vegetation cover at two sites, one on the Silver Creek Preserve and one to the west. Both sites were 200m in length and averaged from ten to twenty four meters in width.

First we chose ten random numbers for each of the two sites, and then we measured out the sites and marked our points with flags. Before continuing, we measured the temperature and dissolved oxygen of the water at the points with a dissolved oxygen meter with a built in thermometer and also measured the width of the stream with a meter tape. After distinguishing our areas of measure we then preceded to carry out the point transect method (Fig. 1) of measuring the overhanging vegetation by wading in the stream in fishing waders and boots.

Fig. 1. Point Transect Method.



At each of our ten random points at each site we measured ten meter down with the meter tape and at each meter recorded which plants overhung the bank at the transects of 0.1, 0.6, 1.0, 2.0, and 3.0. We then took samples of the plants that we encountered at these transects and bagged them for later identification in Ziploc bags while recording them on our data sheets which were clipped to a clipboard.

We then identified our plant species and proceeded to perform statistical test on our hypothesis. We plan to assess the plant cover between the two sites and later compare them to the fish counts previously obtained by the USGS, IDFG, and TNC. We may find that there is not enough replication of the fish data to make a conclusive statement of the relationship between plant cover and fish densities.

Results

The plant cover between 0.1 and 3.0 meters from stream edge was lower (0.59 ± 1.15 plants per point) along Silver Creek on the preserve than off the preserve (1.15 ± 0.96). A T-test shows this difference was statistically significant ($p < 0.05$) (Fig. 3). Plant cover decreases on the Silver Creek Preserve after 0.1 meter (Fig. 2). The difference between plant cover on and off the preserve at 0.1 meter was not statistically significant (Fig. 3). There is no plant cover on the preserve after 1.0 meter. The change in plant cover on Silver Creek West is more gradual (Fig. 2). Plant cover on Silver Creek West continues to 3.0 meters (Fig. 3). From the 0.6 meters to 3.0 meters difference in plant cover becomes statistically significant between the Silver Creek Preserve and Silver Creek West as determined by the T-test (Fig. 3). Plant diversity and cover increases greatly on Silver Creek West (Fig. 4, Fig. 5).

Fish census data collected by USGS, IDFG and TNC show that some species appear more abundant on the preserve than off, such as Rainbow Trout and possibly Paiute Sculpin (Fig.6). Yet other species, such as Bridgelip Sucker, Longnose Dace and Speckled Dace appear to be more abundant off the preserve (Fig.6). In both cases Brown Trout are clearly the most abundant species (Fig. 6).

Discussion

Through our comparison of the plant cover on the Silver Creek Preserve and Silver Creek West, we rejected our null hypothesis that streamside riparian vegetation does not differ between Silver Creek Preserve and Silver Creek West. Plant cover was similar at the two sites up to 0.1 meter. Beyond 0.1 meter there was a significant difference in plant cover between the two sites, as determined by our T-test (Fig. 3).

By looking at figure 2 we see that as the plant area index increases off the preserve at Silver Creek West, so does the degree of plant cover. On the preserve the plant area index decreases, resulting in less plant cover. Therefore plant cover does vary significantly between the two sites, allowing us to accept our alternate hypothesis.

When our data is compared to fish density numbers previously collected by the USGS, IDFG and TNC, we see that fish populations appear to have more variance and greater numbers off the preserve where we found significantly more plant cover and diversity than on the preserve (Fig. 2, Fig. 6). We were unable to conclusively determine whether greater fish densities and biomass off the preserve were due to an increase in plant cover on Silver Creek West because of lack of replication in the performed fish counts. We did come to the conclusion that the fish densities cannot be compared

accurately due to the differences found in plant cover between the two sites that were chosen because of their apparent similarity.

Conclusion

Studies of the relationship between overhanging riparian vegetation and fish densities can be valuable in evaluating the association between these two factors in terms of conservation. Healthy riparian areas are essential for providing hiding cover for fish and for stabilizing the banks to prevent erosion and to oxygenate the water. All of these factors contribute to a healthy fish population.

Although we were able to determine that plant cover varies significantly between Silver Creek Preserve and Silver Creek West, we were unable to relate this directly to fish counts. If there had been more replication of the fish counts, we would have been able to more accurately assess the relationship between fish density and plant cover. This could lead to further investigations that focus more directly on factors that affect fish densities between the two sites. It also needs to be determined if the fish densities differ significantly between the two sites using a T-test after more replication of the data. A T-test should also be conducted comparing the different plant species between the two sites, not only the mean plant cover.

Our study raises several questions, for example, why are fish densities greater off the preserve? The assumption is that the preserve would have greater plant cover and higher fish densities because it is a more protected area than Silver Creek West. Perhaps more factors influence fish densities than just plant cover. Our study would not have picked up on these other factors, which could include in-stream vegetation or substrate structure, because we focused solely on overhanging streamside vegetation. Future

studies should detail the relationships between fish densities and the factors that influence their occurrence. These questions are of great significance, because even though riparian areas make up only one percent of wildlife habitat types, their destruction could precede dramatic losses in fish diversity and density.

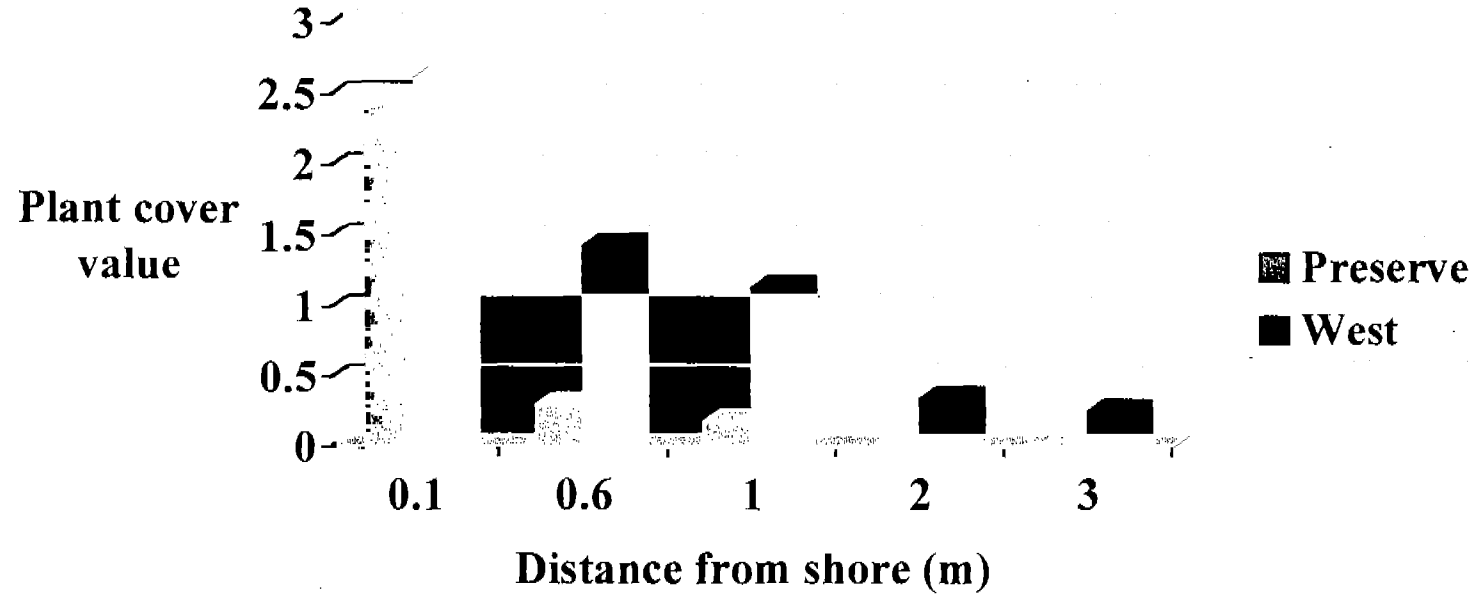


Fig. 2. Plant Area Index: Preserve vs. West. Note that plant cover decreases significantly on the Silver Creek Preserve after 0.1 meter. There is no plant cover on the preserve after 1.0 meter. The change in plant cover on Silver Creek West is more gradual. Plant cover on Silver Creek West continues to 3.0 meters.

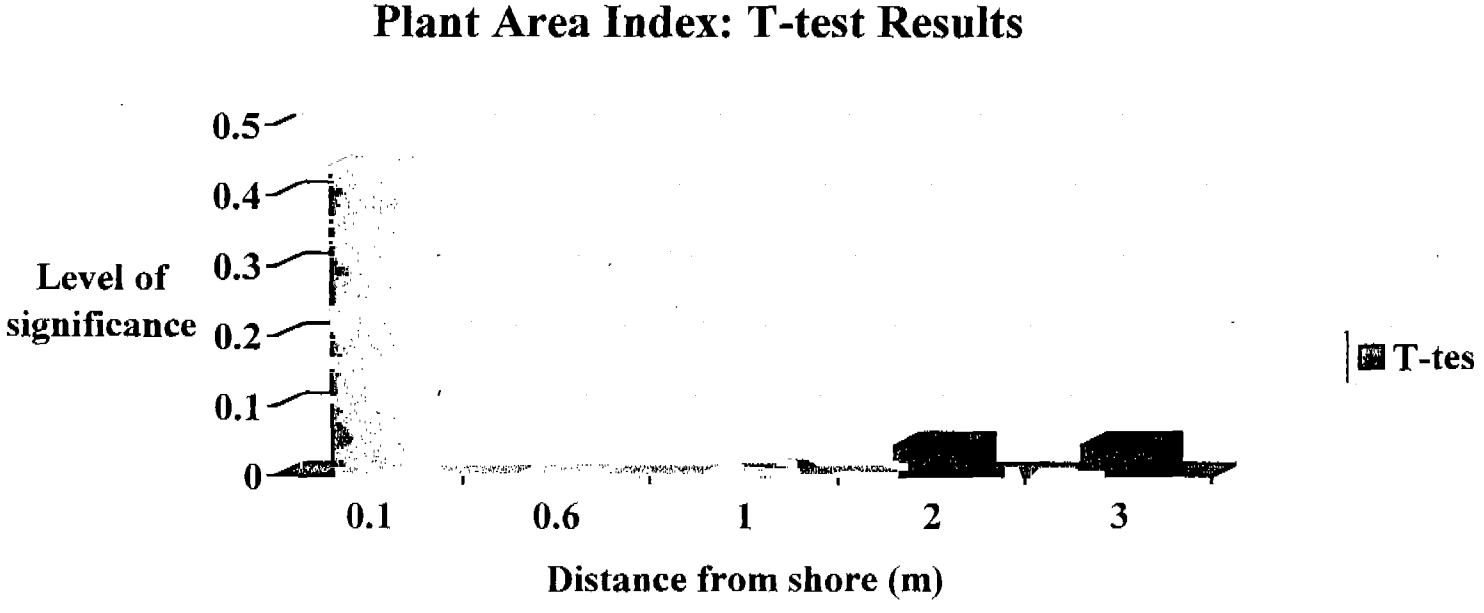


Fig. 3. Plant Area Index: T-test Results. At 0.1 meter the difference in plant cover is not statistically significant as determined by a T-test ($p < 0.05$). From 0.6 meters to 3 meters plant cover becomes significantly different between the Silver Creek Preserve and Silver Creek West.

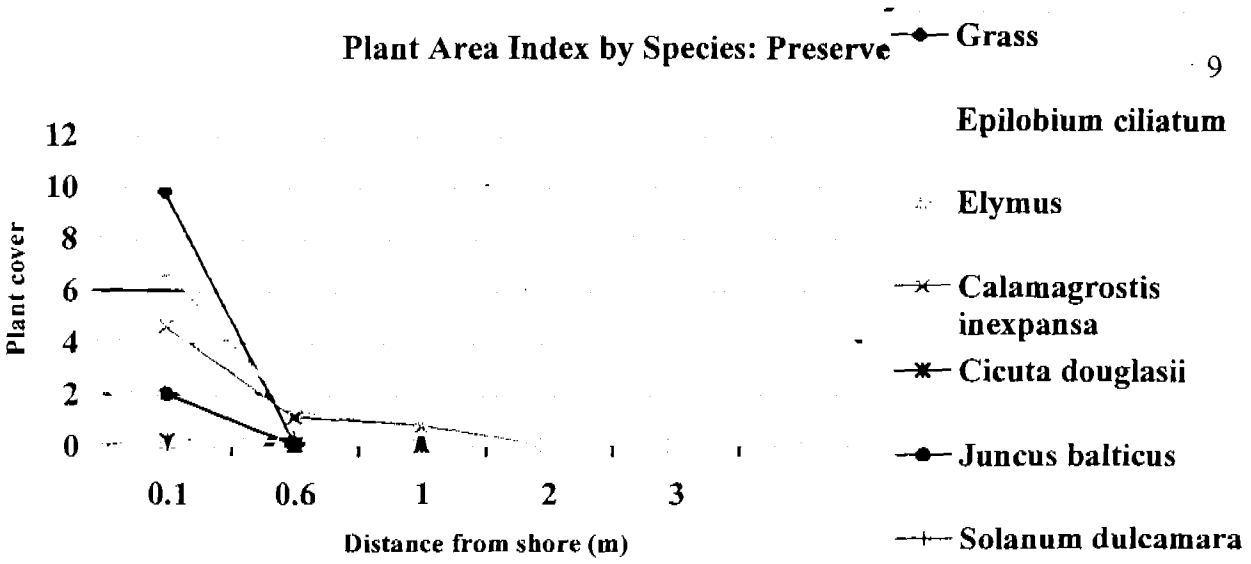


Fig. 4. Plant Area Index by Species: Preserve. Note that grass is the most abundant species on the preserve at 0.1 but declines drastically at 0.6 meters. Species Calmangrostis inexpansa has the most enduring plant cover. After 1.0 meter there is no overhanging vegetation.

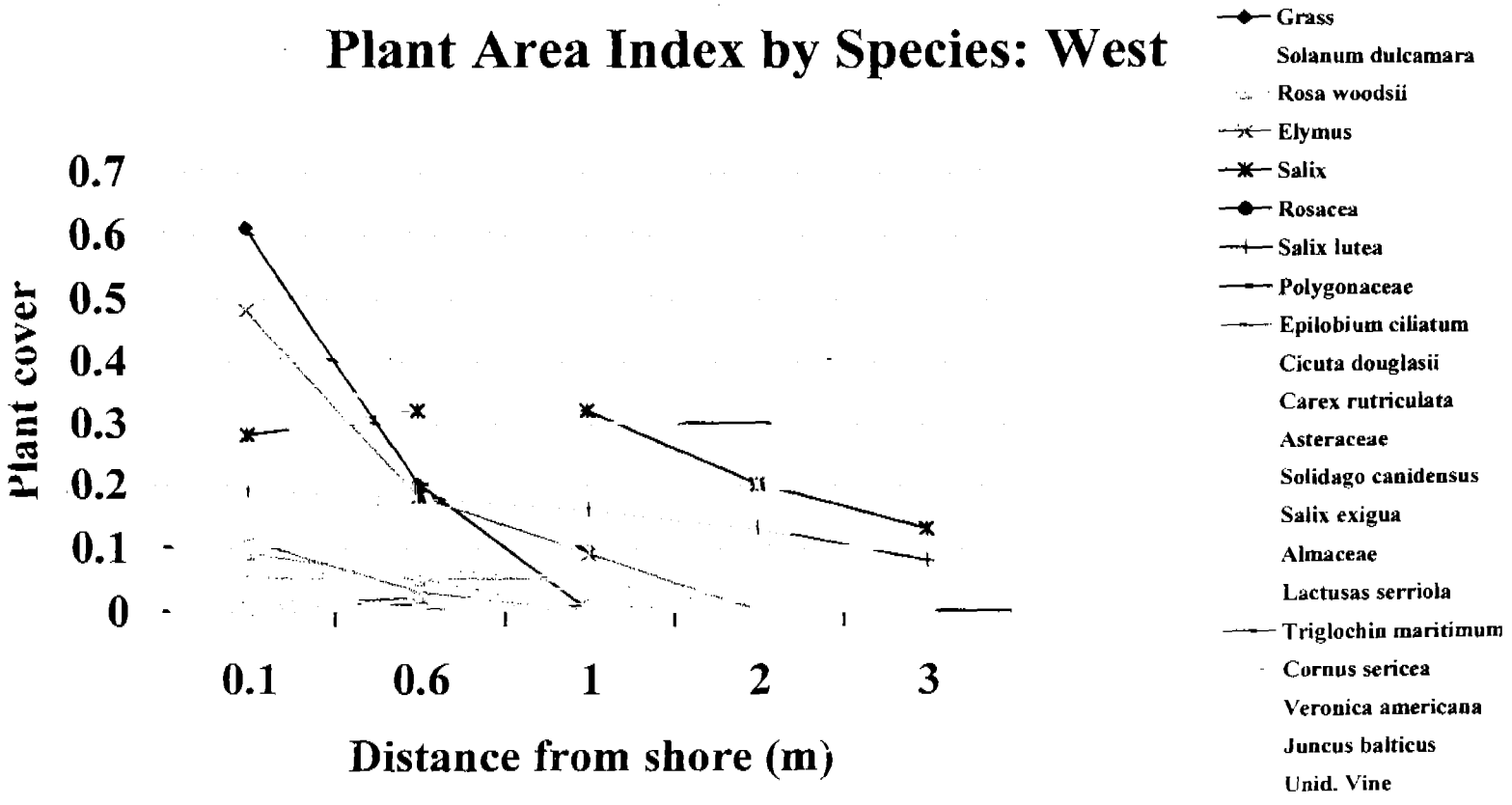
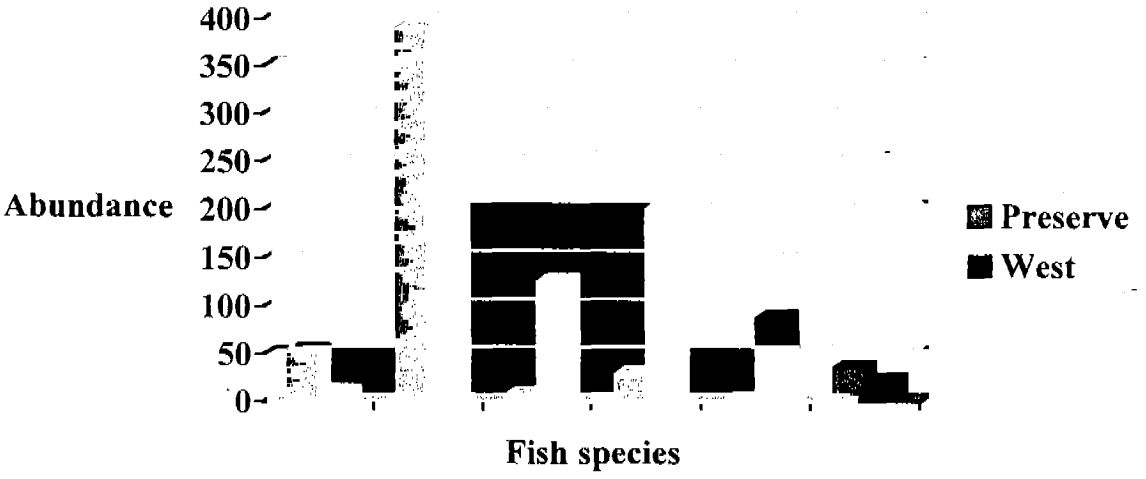


Fig. 5. Plant Area Index by Species: West. Note that plant cover and diversity increases greatly off the preserve. Overhanging vegetation continues to 3.0 meters. Grass is most abundant species at 0.1 meters and continues to 0.6 meters.

Fish Abundance: Preserve vs. West



Fish Species	Abundance Preserve	Abundance West	Avg. Mass/ Fish (g) Preserve	Avg. Mass/Fish (g) West
Rainbow Trout	53	10	48.2	206.8
Brown Trout	389	359	33.7	48.6
Bridgelip Sucker	7	125	8.7	24.6
Longnose Dace	29	201	5.5	2.6
Speckled Dace	2	88	2	2.7
Paiute Sculpin	36	22	7	6.5

Fig. 6. Fish Census data collected by the USGS, IDFG and TNC show that Rainbow Trout and Paiute Sculpin are more abundant on the Preserve than off. Other species such as Bridgelip Sucker, Longnose Dace and Speckled Dace appear to be more abundant on Silver Creek West. Brown Trout are the most abundant at both sites.

Acknowledgements

We would like to thank Mark and Jenny Davidson of the Silver Creek Preserve, Dr. Don Mansfield, Dr. Chris Walser, The Nature Conservancy, Idaho Fish and Game and the United States Geological Survey for their help with our research.

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