

Water Resources of the Sierra National Forest

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Table of Contents

I. Acknowledgments.....3

II. Executive Summary.....3

III. Project Objectives.....3

IV. Project Approach.....3

V. Project Outcomes.....4

VI. Conclusion.....4

I. Acknowledgments

This project was supported by Hispanic-Serving Institution's Education Program Grant no. 2015-38422-24058 from the USDA National Institute of Food and Agriculture. I would also like to thank the CSUSB Water Resources Institute and the United States Forest Service for giving me this opportunity.

II. Executive Summary

This summer I was fortunate to work in the Engineering Department of the Sierra National Forest for the United States Forest Service. I was able to experience a lot of work today's engineers face. I was involved in several projects that emphasized the water resources aspect of civil engineering in the Sierra National Forest. Overall, the experience has helped prepare myself for the next phase of my life after college.

III. Project Objectives

For my career pathway, I am determined to couple engineering with the environment. Potentially having a career with the USDA does not sound far off track for myself, since I do want to find a career niche that is centered on both engineering and nature elements. My original goal for this entire project was to finalize a self-decision to aspire in water resources engineering.

The focus of my summer projects with the Forest Service emphasized water resources in civil engineering. I worked with a crew of three other college interns and together we worked on three different projects. The objective of the biggest project was to inventory culverts along the main mountain roads. The objective of the second project involved calculating the streamflow of specific waterways in the forest. The last objective was conducting land surveys with observable water paths.

IV. Project Approach

The approach to the culvert objective required a lot of driving down the roads in the mountains. My crew and I had to become familiar with visually reading the layout of the land to find all culverts along a road. We were the ones finding and inventorying the culverts. At every culvert, a picture, GPS coordinates, and small description of current condition was recorded. The aim of the project was to find out how many culverts were in use, what sizes, and how many were currently damaged. This information is necessary in knowing how the water is being routed down the mountains to prevent possible future water damages.

The second project involved being able to calculate streamflow of waterways both in-field and out-of-field of the forest. The in-field calculation required timing an object float between two markers and taking further measurements of water depth along several cross-sectional areas. The measurements were then inputted into an equation to find the streamflow. The out-of-field calculation was found using the TR-55 method. The TR-55 required collecting data from

websites like USGS' Stream Stats and NOAA's Precipitation Frequency Data Server to help fill out the worksheet to find the approximate runoff flow.

The approach to the third objective was comprised of land surveying. The two surveys I helped complete involved a bridge that had been severely damaged by a falling tree and a recreation area that had experienced much erosion due to the presence of several gully lines. The bridge was over a small stream and was no longer safe for cars to drive over, and the recreation area floor was too irregular for motor vehicles to travel on. My team and I surveyed the areas using a total station to produce hundreds of data points to map out the topography of the lands.

V. Project Outcomes

Due to our continuous efforts, my team and I produced excellent results in the three projects. We were able to add data on hundreds of culverts to the GIS map of the Sierra National Forest culvert inventory, so further maintenance and operations could be done. We produced volume flows for the mountain waterways asked for by our supervisors. Allowing them to adequately choose the diameter sizes necessary for the culverts. Lastly, my team and I produced two 3D computer models in Civil 3D based on our land surveys to present to contractors to help the infrastructures get fixed.

VI. Conclusion

My summer internship with the Forest Service exposed me to several projects all relevant to water resources engineering, and I would have to say that I learned an immense amount. The experiential learning environment really allowed me to be hands-on in the projects and be able to gain exposure to a multitude of different aspects of engineering in the Sierra National Forest. The work experience I gained was validating of the line of work I want to continue doing; making the whole opportunity invaluable to myself in helping me determine my career path that will be aligned with nature. Thanks to this experience, I now have a better idea of what I want to do in life.