Engineering Internship with Modoc National Forest

Alicia Nam

California State University, Fresno

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Supervisors:

Chris Bielecki, PE, Forest Engineer

Alvin Sarmiento, EIT, Roads Engineer

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Executive Summary

My expectations during my internship in the summer of 2019 were to explore civil engineering opportunities while working for one of the beautiful national forests within California. Since I am partial to water resources within civil engineering, I thought that an internship with the US Forest Service, sponsored by WRPI, would be a great learning experience. Through this internship experience, I learned about the job opportunities for a civil engineer graduate within the federal government, specifically in the US Forest Service (FS), Bureau of Land Management (BLM) and Natural Resources Conservation Service (NRCS). During my time assisting the forest engineer and roads engineer in the engineering department of the Modoc National Forest, I've realized that a federal civil engineer can encompasses a broad range of work. During my two months of stay in Alturas, where the Modoc National Forest Supervisor's Office is located, I became familiar with some of the work done for a national forest, including: watershed management, roads management, bridge inspections, project planning and NEPA (National Environmental Policy Act) discussions, BMP (Best Management Practices) monitoring, recreational activities and management, and drinking water management.

Project Objectives

To achieve my goal of learning about the civil engineering opportunities for the national forest, my two supervisors, Chris Bielecki and Alvin Sarmiento, were really helpful in giving suggestions and assigning me and another engineering intern a variety of engineering tasks.

During the first half of my internship, we were tasked with surveying roads for drainage issues and general road improvements, assisting with cost estimations for road construction, assisting the roads engineer with staking for road alignment and avoiding unnecessary stream crossings, assisting with hydrology surveys for streams near roads before and after construction work, and accompanying an inspector from the California DWR (Department of Water Resources) in checking the quality of the operations of the water distribution systems that provide potable water to the forest campgrounds.

During the second half of my internship, we were tasked with assisting the forest engineer, a certified bridge inspector, in inspecting fourteen bridges in the Modoc National Forest. Bridge inspections involve documenting the current bridge conditions, scour potential, and needed work item tasks. In addition, I had the opportunity to be involved in various engineering tasks including: using ArcGIS to update and suggest improvements for road conditions using field assessment data collected through the Avenza mobile application; assessing roads for maintenance, including realigned roads that avoid a stream crossing; and assisting with a timber sale road package that included timber volume and road length calculations using anticipated landings (log processing and loading locations).

Project Approach

During the beginning of my internship, we were made aware that miles of NFS (National Forest System) roads on the Modoc National Forest needed field work done, including: road surveying, road drainage assessments, and road staking during the summer to ensure transportation efficiency and proper runoff drainage to minimize effects to the watershed. Most of the work that we did was field work, since summertime is the ideal time to get all the work done.

To accomplish the work, we were given oral and written guidance, and received training for Avenza, a powerful GPS application, to help locate and assess project roads and drainage features. We surveyed road maintenance level, road surface type, surface blading assessment, vegetation clearing assessment, drainage type and cleaning assessment. The surface cross drains types that we came across included culverts, rolling dips, and water bars. Certain culverts, structures that allow water to flow under a road, were measured for their diameter to determine adequacy for carrying flow using Manning's equation, since there was evidence of sedimentation and erosion in stream banks from heavy rainfall and runoff. We also assisted the roads engineer with staking a road realignment to avoid a stream crossing for the protection of a potential fish-bearing stream. Much of the field work that we've done was to maintain a safe and efficient forest transportation system, with consideration of the watershed.

Part of our internship duties included staying indoors and doing office work as well. This entailed doing cost estimation analysis for construction work that accounted for labor wage and inflation, materials costs, loading and hauling costs. Also, I worked on timber sale road

packages that included timber volume and road length calculations based on anticipated landings.

For the majority of the second half of my internship, we helped with bridge inspections and also assessed conditions of roads that were staked for realignment to check if more construction work needs to be done. For the bridge inspections, we accompanied the forest engineer, a certified bridge inspector, to inspect fourteen bridges within the Modoc National Forest. We assisted him with writing reports, taking pictures, assessing the bridge for potential scouring, and then digitizing the data. Through my experiences with both engineers, I had the opportunity to learn about how the whole transportation system functions within a national forest, and how it helps facilitate the management of various resources including watershed, sensitive plant species, and cultural sites.

Project Outcomes

Through my experience at Modoc National Forest, I've learned a lot about the civil engineer duties within the Forest Service. I'm glad that I was able to help the engineers with completing work on multiple projects.

During my stay at Modoc National Forest, I helped the engineers with assessing NFS roads on the Bald Mountain Restoration, Stone Fire, Fandango, and Kresge projects for evidence of erosion, drainage issues, and overall road conditions. I also helped with assessing roads on the Lassen Restoration Project for road maintenance, road decommissioning, and staked roads for road realignment to avoid streams and unnecessary low water crossings. During our work, we collected and analyzed data for NFS roads using ArcGIS and Avenza, including calculating mileage and revising data to meet resource needs. We also assisted with other projects, including Lassen Restoration hydrology surveys (pebble counts). Lastly, we assisted engineering with bridge inspections including writing reports, taking pictures, and assessing the bridge for potential scouring.

Conclusions

My experience with the USDA Modoc National Forest was a great and truly unforgettable one. Not only was my job experience eye-opening to my field of work, the people at the Modoc National Forest were super friendly and contributed to my time working there being an overall great experience. The projects that I got to be involved in will always stay with me and the perspectives that I've gained will be carried on with me over to my future work and career in civil engineering. I believe that my experience with the Forest Service helped me grow in the direction that I want to. I look forward to working for the Forest Service again someday if the chance arises, and also other federal agencies that I've learned about during this summer.

Appendix

Picture that shows a level 2 maintenance road needing medium vegetation clearing and surface blading.

Picture that shows a stream crossing that needs a culvert or vented Ford installation to protect potential fish-bearing stream.

Picture showing engineering interns assisting bridge inspector with measuring potential scouring and writing report. On the left is intern David Phanthavady, and on the right is Alicia Nam.