# Final Report:

# My Internship with the Forest Service and

# A Watershed Analysis of Roads in the Tahoe National Forest

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June 16 to August 11, 2014

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August 11, 2014

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## Acknowledgements

This project was supported by Agriculture and Food Research Initiative Competitive Grant no. 2011-38422-31204 from the USDA National Institute of Food and Agriculture. I would like to thank my supervisors, Carol Purchase and Luke Rutten for their guidance and knowledge of watershed and forest roads without which I would not have been able to complete the tasks I was assigned.

## Executive Summary

Dirt and unpaved roads make up a majority of the roads seen throughout the Tahoe National Forest. There are hundreds of roads to date and many roads, both authorized and unauthorized, are being added to the list. As these roads experience more use, their overall condition diminishes. As road conditions diminish, a potential for nonpoint source pollution, or NPS occurs. Nonpoint source pollution can be caused by certain forestry activities. One forestry activity in particular is considered the primary source of NPS: road construction and road use (EPA, 2012). This activity can contribute up to 90 percent of total sediment runoff affecting watersheds, or areas of land that drain water into waterways such as lakes, rivers and streams. This causes problems for both humans and wildlife. According to a Forest Service report on best management practices for water quality, more than 124 million people rely on National Forest land for their primary source of drinking water (Forest Service, 2012). Additionally, water on National Forest land also provides fish and wildlife a sustainable environment.

For this reason, it is important for the Forest Service to maintain or eliminate any roads on National Forest land that could be causing a problem for these bodies of water. While it is difficult to keep track of every road, the Tahoe National Forest has implemented Best Management Practices and the Soil and Water Road Condition Index (see Appendix I) to improve water quality as well as road quality. With this knowledge, I was assigned to the Western Nevada County Community Defense Project in the Deer Creek region of the Tahoe National Forest (see Appendix II). In this region I conducted an analysis of unauthorized and authorized forest roads to determine their condition as well as any potential nonpoint source pollution the roads may produce as a result of their creation and their use.

## Project Objectives

According to an EPA-sponsored manual, explaining the importance of dirt and gravel road maintenance, more than 1.6 million miles of dirt and unpaved roads cut through rural areas of the United States (Anderson, Gesford, 2007). Roads play an integral role in the transportation and travel of many people in the forest. As these roads experience more use, the conditions of these roads diminishes which, creates a potential for nonpoint source pollution. Road construction and road use is the primary source of nonpoint source pollution in a forest setting.

To prevent further nonpoint source pollution caused by forest roads, the National Forest Service has implemented Best Management Practices (BMPs). This program was developed to manage water quality and improve watershed conditions all while complying with the Federal Clean Water Act. In addition to the use of BMPs, the Soil and Water Road Condition Index (SWRCI) is also used. This index was developed by the National Forest Service to determine the impact of road conditions on soil and water quality.

I was assigned the project of conducting a watershed analysis on unauthorized and authorized roads within the specified Deer Creek region of the Tahoe National Forest. With the use of the SWRCI, the other intern and I were to evaluate these forest roads based on what we saw and what was on the Index. From the data collected, we were to determine what should be done with the roads, what maintenance was required of the roads, and how important the roads were overall for the Forest Service as well as for the public. Once the data was compiled, we were asked to have it input into a forest roads database so that the Forest Service could use it as a guideline for what to do with the roads. The primary goal of this project was to determine the condition of these forest roads and what should be done about them.

In terms of a potential career pathway pertaining to the USDA, I identified a career in the Agricultural Marketing Service. The agency appealed to me because of my educational background and my interest in food marketing. I have the education for it but I also have a passion for agriculture. To have the opportunity to help promote and sustain agriculture through the efforts of the Agricultural Marketing Service is something I would find really rewarding in a career.

## Project Approach

For the first week of the internship, my supervisors helped the other intern and I get situated with the project. The first step was to provide us with the information needed to understand the Soil and Water Road Condition Index (SWRCI). We were given several documents that went into detail about road conditions and what to look out for when out on forest roads. We were also given instructions on how to use a GPS unit. Once we became more familiar with the project and the GPS, we were taken to a district office to obtain defensive driving lessons. This was necessary for us to have clearance to use the government vehicle assigned to us as well as to inform us on how to drive safely through forest land.

By the third week we were able to efficiently navigate the forest with the help of a GPS unit and a set of hard copy maps. The GPS helped us find specific roads as well as track our progress. It provided a map of the region we were to be working on to help us find the location and length of each road segment. It also gave us the option to input data from the SWRCI directly onto the map. We could also map new road segments onto the GPS that had not been previously mapped. In addition to that, we also took pictures of the beginning and end of the roads as well as any site specific concerns along each road. Site specific concerns included signs of erosion or stream crossings along the roads.

After road assessments were completed, the data was scanned and filed in electronic form onto an SD card for future use. The photos that were taken were then uploaded and placed onto photo log sheets (see Appendix III). Once the roads were assessed and forms were completed, we input the data onto a forest road database. On the database, we 1) determined whether to keep or eliminate the road segment, 2) what maintenance, if any, was needed, and 3) wrote any comments pertaining to the road such as how difficult it would be to maintain or close down, the level of use, and whether it was overgrown or not.

## Project Outcomes

The Tahoe National Forest has a system of hundreds of roads with new roads being created, intentionally or unintentionally, which makes it difficult for the Forest Service to analyze soil and water conditions on all forest roads. Since it is difficult to keep track of every road and its condition, our road project was important to the Tahoe National Forest. We were able to assess more than 80 roads while providing critical information in regards to their current state and how these roads were affecting watersheds in the Deer Creek area. Based on the Soil and Water Road Condition Index, some of these roads were considered impaired or at-risk and by identifying these roads, the Tahoe National Forest would be aware of which roads were in need of road maintenance in order to prevent further nonpoint source pollution.

Additionally, by conducting these road assessments we were able to identify which roads were overgrown, which were mapped wrong, and which were recently created. This information is also important to the Forest Service because new maps could be created based on the changes we made. The maps would be more accurate than they previously were and this will be helpful to the Forest Service employees using them.

## Conclusion

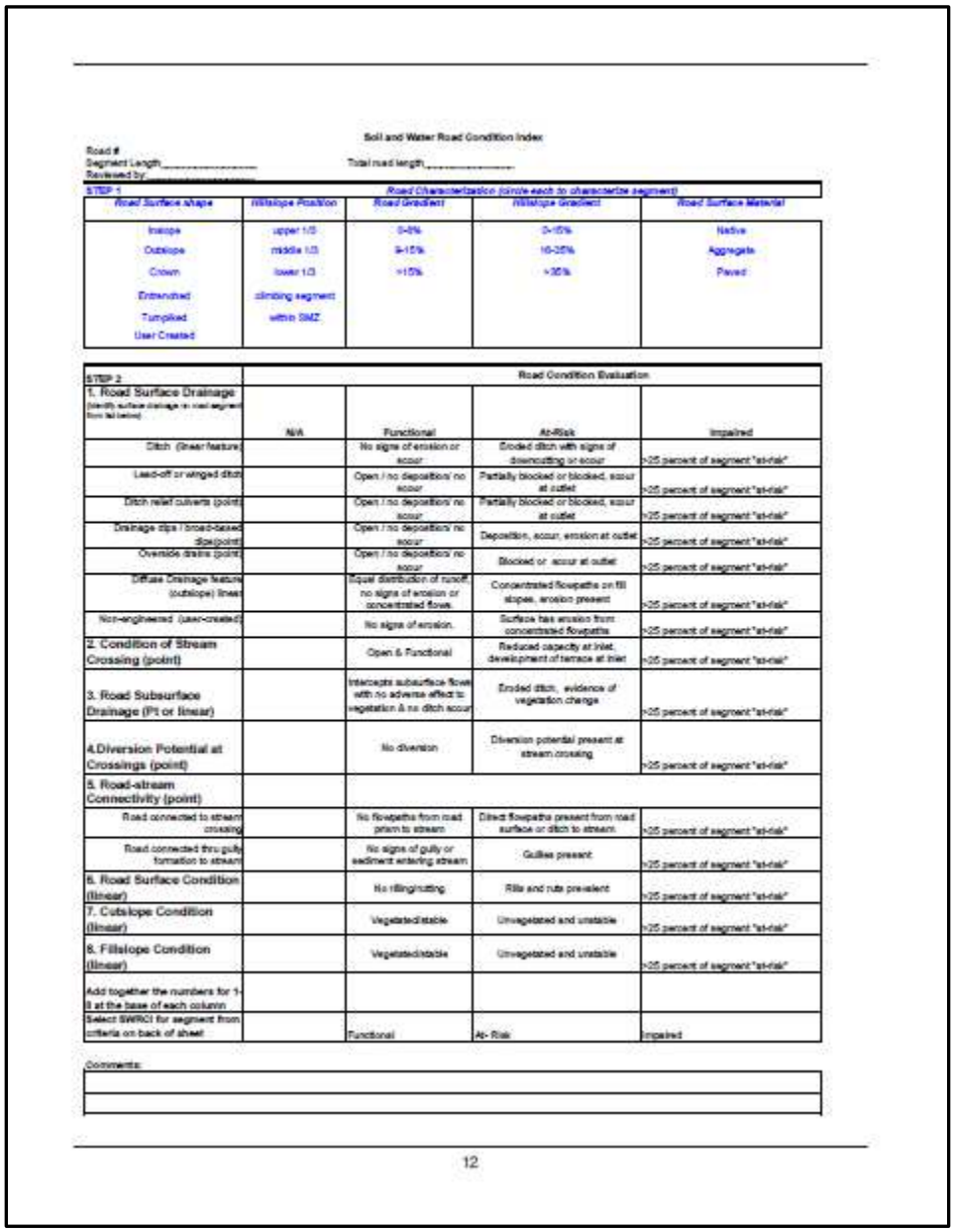
The Tahoe National Forest has hundreds of roads within its region. Oftentimes roads cannot be checked on a regular basis for the state of their condition. Neglected roads can lead to serious problems involving nonpoint source pollution that can impact watersheds in the area. Bodies of water on national forest land have many uses. They provide drinking water to some people, recreational use for others and create ecosystems for wildlife. That is why it is important for road assessments to be made. Through the completion of our project, we provided the Forest Service with valuable information about the roads in the Deer Creek area of the Tahoe National Forest. We conducted watershed analyses for the roads in this region. We identified the impaired and at-risk roads and made decisions on what could be done to improve their condition. By the end of the project, a forest road database was updated and changes could be made to a forest road map based on the work we did.

Something to take this project to the next level would be to apply the recommendations we made for these forest roads so that the roads receive the maintenance and attention they need in order to prevent any further nonpoint source pollution. The project supervisor is already at work to rehabilitate these roads and decommission the roads that are not needed for the Forest Service. Additionally, the changes made on the map on the GPS could be transferred onto an official Forest Service roads map.

The watershed internship I took on with the Forest Service was not exactly related to my career path with the Agricultural Marketing Service but I did learn a lot that I feel I could apply to my future career goals. I learned to adapt to a new environment. Before this internship, I had never even been to a forest. I stepped out of my comfort zone and I also grew as an individual because of it. The Tahoe National Forest was a different environment and workload than I was used to but it challenged me in positive ways.

# Appendices

Appendix I—Soil and water road condition index form used to determine the road condition and its potential effect to soil and water resources. (Source: Soil and Water Road-Condition Index Field Guide)



Soil and Water Road Condition Index

Road #
Segment Length:_____ Total road length:_____
Reviewed by:_____

| STEP 1 | Road Characterization (circle each to characterize segment) | | | |
|---|---|---|---|---|
| Road Surface shape | Hillslope Position | Road Gradient | Hillslope Gradient | Road Surface Material |
| Inslope | upper 1/3 | 0-4% | 0-15% | Native |
| Outslope | middle 1/3 | 4-15% | 16-35% | Aggregate |
| Crown | lower 1/3 | >15% | >35% | Paved |
| Entrenched | climbing segment | | | |
| Turnpiked | within SMZ | | | |
| User Created | | | | |

| STEP 2 | Road Condition Evaluation | | | |
|---|---|---|---|---|
| 1. Road Surface Drainage (identify surface drainage on road segment from list below) | N/A | Functional | At-Risk | Impaired |
| Ditch (linear feature) | | No signs of erosion or scour | Eroded ditch with signs of downcutting or scour | >25 percent of segment "at-risk" |
| Lead-off or winged ditch | | Open / no deposition/ no scour | Partially blocked or blocked, scour at outlet | >25 percent of segment "at-risk" |
| Ditch relief culverts (point) | | Open / no deposition/ no scour | Partially blocked or blocked, scour at outlet | >25 percent of segment "at-risk" |
| Drainage dips / broad-based dips(point) | | Open / no deposition/ no scour | Deposition, scour, erosion at outlet | >25 percent of segment "at-risk" |
| Overside drains (point) | | Open / no deposition/ no scour | Blocked or scour at outlet | >25 percent of segment "at-risk" |
| Diffuse Drainage feature (cutslope) linear | | Equal distribution of runoff, no signs of erosion or concentrated flows | Concentrated flowpaths on fill slopes, erosion present | >25 percent of segment "at-risk" |
| Non-engineered (user-created) | | No signs of erosion. | Surface has erosion from concentrated flowpaths | >25 percent of segment "at-risk" |
| 2. Condition of Stream Crossing (point) | | Open & Functional | Reduced capacity at inlet, development of terrace at inlet | >25 percent of segment "at-risk" |
| 3. Road Subsurface Drainage (Pt or linear) | | Intercepts subsurface flows with no adverse effect to vegetation & no ditch scour | Eroded ditch, evidence of vegetation change | >25 percent of segment "at-risk" |
| 4.Diversion Potential at Crossings (point) | | No diversion | Diversion potential present at stream crossing | >25 percent of segment "at-risk" |
| 5. Road-stream Connectivity (point) | | | | |
| Road connected to stream crossing | | No flowpaths from road prism to stream | Direct flowpaths present from road surface or ditch to stream | >25 percent of segment "at-risk" |
| Road connected thru gully formation to stream | | No signs of gully or sediment entering stream | Gullies present | >25 percent of segment "at-risk" |
| 6. Road Surface Condition (linear) | | No rilling/rutting | Rills and ruts prevalent | >25 percent of segment "at-risk" |
| 7. Cutslope Condition (linear) | | Vegetated/stable | Unvegetated and unstable | >25 percent of segment "at-risk" |
| 8. Fillslope Condition (linear) | | Vegetated/stable | Unvegetated and unstable | >25 percent of segment "at-risk" |
| Add together the numbers for 1-8 at the base of each column | | | | |
| Select SWRCI for segment from criteria on back of sheet | | Functional | At- Risk | Impaired |

Comments:

12

| STEP 3 |
|---|
| Maintenance or Improvement Considerations |

Operational Maintenance Level (Level 1-5)

| Season of Use for road | | Seasonal | Year long | |
|---|---|---|---|---|
| Traffic Level | | High | Low | Closed |

| Design Storm (Circle dominant storm type for which road and structures are designed) | Snow | Short duration/high intensity | Rain | Rain on Snow |
|---|---|---|---|---|

| Dominant Soil Texture | | Sandy loam | Silt Loam | Clay loam |
|---|---|---|---|---|

If sediment transport is occurring what is the cause?

| Inappropriate time of use of road with respect to soil and weather conditions. |
|---|
| Inappropriate location/design of road. |
| No maintenance of structures or road prism |
| Inadequate drainage features |
| Natural events (large storm event) |
| Unknown |
| |

| Will sedimentation continue? | Yes | No |
|---|---|---|
| Are downstream beneficial uses at risk? | Yes | No |

Site specific concern on road requiring immediate attention?

| GPS location: |
|---|
| Photo numbers: |
| Describe problem: |

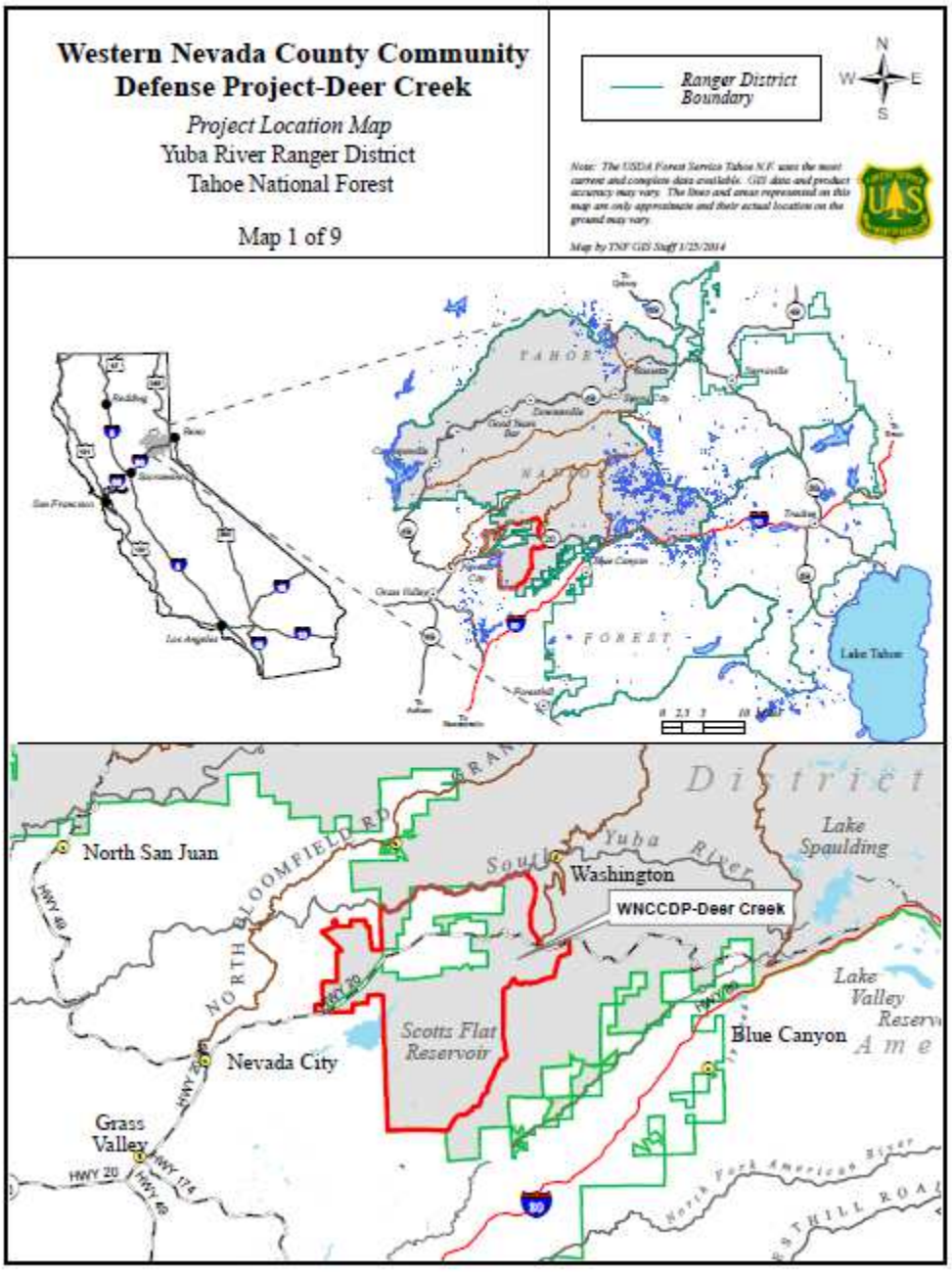
Additional comments

Definitions:
Functional: To operate in the proper or expected manner.
At-risk:The chance of damage to resources (water or soil quality) are present in the current condition.
Impaired: Not functioning as designed or maintained.

Rule set for determining an overall at- risk condition rating for the segment any of the following must be true:
1. Any road surface drainage is evaluated as at-risk.
2. Diversion potential is identified at road stream crossings.
3. If road stream connectivity is present.
4. The combination of road stream connectivity and unvegetated or unstable cutslopes.
5. A road segment with ONLY an-at risk surface condition rating and no other indicators even if >25% is still at-risk.

Rule set for determining an overall Impaired condition rating for the segment any of the following must be true:
1. A road segment with greater than 25% of the surface drainage structures at risk.
2. A road segment with greater than 25% of the stream crossing structures at risk.
3. A road segment with greater than 25% with at subsurface drainage at risk.
4. A road segment with greater than 25% of the crossings with diversion potential
5. A road segment with greater than 25% road stream connectivity.
6. A road segment with a combination of at-risk ratings for road surface drainage, diversion potential, road-stream connectivity, road surface condition, and cutslope or fillslope condition.

Appendix II—Deer Creek Project Map



Appendix III—Watershed Photo Log

Tahoe National Forest Watershed
Photo Log

| | |
|---|---|
| Project: WNCCDP-Deer Creek- | |
| Watershed name: Headwaters Deer Creek, 18020125060101 | |
| 5th or 6th Hydrologic Unit Code (HUC): | |
| Name: K. Ortega, L. Duran | Date: |

| No. | Digital # | Description |
|---|---|---|
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Digital Picture number is the number assigned by the camera/computer when pictures are downloaded/filed.

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## References

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