

Tahoe West Restoration Project

Water Quality Module

Scope of Work for FY 19

W. Elliot, RMRS

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Background

Stakeholders in the Tahoe Basin have determined that the forested areas on the West Shore of the Lake Tahoe Basin are in need of restoration. Much of the area has an overabundance of fuel accumulation due to past suppression and minimal fuel management activities. Interagency teams are formulating plans to identify critical areas for treatment, and are using a forest growth model, LANDIS, and a hydrology and erosion model, WEPP, to support these plans. The University of Idaho (U ID) has developed the application of the Random Forests R package to predict potential wildfire severity based on the observed wildfire burn severity from the King, Angora and Emerald fires and local conditions such as climate, topography and fuel load. The burn severity maps, by pixel, were used with a WEPP Watershed interface to estimate erosion by hillslope polygon and sediment delivery by channel segment for all the major watersheds on the West Shore for current conditions, following wildfire for current fuel loads and reduced fuel loads, and for treatment activities.

In order to carry out fuel treatment activities such as logging or thinning, a road network is needed. Numerous studies have suggested that sediment from the road network could exceed sediment from the upland treated hillslopes (Elliot, 2013). To aid in fuel management and sediment management, stakeholders need to know the sedimentation risks associated with opening up disused roads, or increasing traffic on current roads. A workshop was organized on road erosion in September, 2018 in South Lake Tahoe. One of the requests that came up on several of the course evaluation questionnaires following the workshop was to spend more time discussing methods to mitigate road sedimentation, and describe how to model such practices.

An initial analysis of the impacts of opening up closed roads was started with funding received in FY17 to evaluate the impact of reopening ghost roads on surface hydrology and upland erosion processes, with an emphasis on the Blackwood Creek watershed. The reopened roads were assumed to be insloped in the initial study. The study needs to be expanded to consider outsloping roads as well. The analysis also needs to be expanded to evaluate sediment risks from all existing roads on the West Shore for current conditions, for logging traffic impacts, and to evaluate the benefits of traffic exclusion. We propose to provide such information to the stakeholders with the FY19 proposed activities in two phases to suit funding availability and personnel changes.

A scope of work was submitted in April, 2018 to describe the next steps in providing water quality support to the West Shore Restoration stakeholders. The proposed U ID activities were funded in FY18, but not yet complete. Funding is still available to complete them. The proposed Rocky Mountain Research Station (RMRS) activities were not funded, in particular the road network sedimentation analysis. One new activity is proposed for FY19, and that is for RMRS and the U ID to add to the

Table 1. Status of recent, current, and proposed West Shore Water Quality activities

Activity	Status	Funding
Distribution of soil erosion on the West Shore for Current conditions, wildfire and treatment by U ID	Results online Report Pending	Funded in FY17
Report from RMRS on post fire erosion predictions for the Emerald Fire (Elliot et al., 2018b)	Report submitted	Funded in FY17
Report on the impacts of roads and ghost roads on sediment delivery in the Blackwood Creek Watershed. Need to add outsloping roads analysis	Report drafted by Cao	Partially Funded in FY17; For FY 19 Phase I Requesting \$1,600
Webinar on Emerald fire and road interactions	Completed	PSW paid for Travel on 9/18 RMRS contributed time
Webinar on impacts of ghost roads in Blackwood Creek Watershed	Completed	PSW paid for Travel on 9/18 RMRS contributed time
Develop methods to aid Tahoe Managers to interpret online landscape fire and erosion modeling	Ongoing	Funded in FY18
Webinar led by U ID on modeling landscape fire severity with Random Forests	Pending	Funded in FY18
Webinar led by U ID on accessing fire and erosion data from WEPP Cloud Tahoe Interface	Pending	Funding in FY18
Report from U ID on Random Forests burn severity study	Pending	Funded in FY18
Explore ways to develop linkages between LANDIS, fire severity predicted by Random Forests, and erosion by WEPP	In progress	Funded in FY18
Road network sedimentation distribution for current, closed, and logging	Proposed	FY 19 Phase 1 Request for \$16,000 for RMRS
Final report on Ghost Roads after expanding road impact analysis to include outsloping roads	Proposed	FY19 Phase II Request for \$4,400 for U ID.
Report on West Shore Road sedimentation analysis	Proposed	FY 19 Phase II Request for \$4,400 for U ID
Develop Online Tool to access results of West Shore Road Erosion Study	Proposed	FY 19 Phase II Request for \$21,400 for U ID
Workshop in the Tahoe Basin on West Shore road network erosion and mitigation strategies	Proposed	FY 19 Phase II Request for \$4,000 for U ID

current WEPP Cloud online interface the results of the proposed road network erosion study. Table 1 summarizes the completed, ongoing and proposed water quality module activities, and the status of their funding.

Proposed Activities for FY19.

Activities for FY19 are divided into two phases. Phase I will be from November 15, 2018 until January 31, 2019. In Phase I, a road network sediment delivery analysis will be carried out by RMRS following the

Table 2. Funding requesting for the West Shore Restoration Water Quality Project for FY 19 Phase 1 activities, November 15, 2018 – January 31, 2019. W. Elliot, RMRS, PI

Activity	Cost	per unit	Total
RMRS			
Ina Sue Miller, modeling the West Shore road network erosion, 30 days	\$400	per day	\$12,000
W. Elliot modeling support and administration, 5 days	\$800	per day	\$4,000
W. Elliot finish Ghost Roads Initial Report, 2 days	\$800	per day	\$1,600
Total Requested for FY19 Phase I			\$17,600

procedures used in the Clear Creek Road Network Analysis (Elliot et al., 2018a). The analysis will be expanded to evaluate the effects of logging traffic and traffic exclusion on all roads in the Forest Service GIS Road database. The deliverables from Phase I will be spreadsheets and GIS summaries of the estimated road sediment delivery amounts by road segment for several thousand road segments.

A second activity during Phase 1 will be to complete an initial report on the Cao and Elliot ghost roads study in the Blackwood Creek Watershed that modeled all reopened roads as insloping. The deliverable will be a report on the findings to date of that study. Funding requested for Phase I is summarized in Table 2.

The FY19 Phase II analysis will follow on from Phase 1, from February 1, 2019 until September 30, 2019. RMRS will transfer the road network sedimentation study GIS and spreadsheet results to the University of Idaho to add to the WEPP Cloud Tahoe Basin database. Methods will be developed to aid users in accessing and interpreting the results of the roads analyses. A report describing the road network sedimentation analysis methodology and summarizing the results will be prepared by the University of Idaho. Funding requested for Phase II is summarized in Table 3.

The University of Idaho will continue to work on activities funded in FY18 during FY19, including:

1. Developing methods to aid users in accessing and interpreting results of fire and erosion modeling;
2. Presenting Webinars on:
 - a. Random Forests fire modeling;
 - b. Accessing results of West Shore Erosion analysis for current conditions, wildfire and fuel treatment;
3. Developing linkages from LANDIS outputs to the Random Forests fire severity prediction tool and subsequent WEPP Watershed erosion runs;
4. Ongoing improvement of a Cloud-based computing platform for the Tahoe Basin;
 - a. For FY19 Phase II, developing methods for accessing and interpreting results of the road network sedimentation study;
5. Preparing reports on
 - a. Predicting soil burn severity with a Random Forests statistical analysis; and

Table 3. Funding requesting for the West Shore Restoration Water Quality Project for FY 19 Phase II activities, February 1, 2019 – September 30, 2019. F. McCormick, RMRS, Program Manager

Activity	Cost	per unit	Total
Univ of ID			
Brooks, Management, 5 days	\$500	per day	\$2,500
Brooks Fringe 33%			\$825
Dobre, putting road sedimentation online and other online development, 20 days	\$200	per day	\$4,000
Dobre Fringe, 33%			\$1,320
Lew, online web interface development, 10 day	\$360	per day	\$3,600
Lew Fringe 33%			\$ 1,188
Elliot report preparation, Interface development and workshop 15 days	\$800	per day	\$12,000
Elliot Fringe 8.7%			\$ 1,044
Elliot trip to Tahoe Basin for workshop			\$ 1,500
U of ID Subtotal			\$27,977
RMRS			
Ina Sue Miller, interpreting results of road erosion analysis, 5 days	\$400	per day	\$2,000
RMRS Project Administration			\$6,000
RMRS Subtotal			\$8,000
Total Requested for FY19 Phase II			\$35,977

b. The distribution of soil erosion on the Tahoe West Shore for current, conditions, from fuel treatments, and following wildfire for a treated or untreated landscape;

And with funds requested for FY 19 Phase II:

c. The impacts of roads and ghost roads on sediment delivery in the Blackwood Creek Watershed including incorporation of outsloping road designs for roads that are reopened;

6. As part of Phase II, a half day workshop will be held in the Tahoe Basin presenting the results of the road network sedimentation analysis and modeling road erosion mitigation strategies.

References

- Elliot, W. J. 2013. Erosion processes and prediction with WEPP technology in forests in the Northwestern U.S. *Trans ASABE*. 56(2): 563-579.
- Elliot, W.J., I. S. Miller and L. Cao. 2018a. Results of erosion analysis of the Clear Creek Road Network. Moscow, ID: Rocky Mountain Research Station. 15 p.

Elliot, W., L. Cao, J.W. Long, M. Dobre, R. Lew and M.E. Miller. 2018b. Estimates of surface and mass erosion following the 2016 Emerald Fire, Final Report to the Lake Tahoe West Shore Restoration Project. Moscow, ID: Rocky Mountain Research Station. 27 p.