PROJECT CHARTER

Road Prescription-Scale Effectiveness Monitoring Project
June 15, 2022~~[DATE]~~

1. Charter Overview

Purpose of Charter

The purpose of the Road Prescription-Scale Effectiveness Monitoring Project Charter is to describe the project and give the Project Manager (PM) and the Project Team the authority to begin spending allocated project funds.

2. Charter Approval Dates

Dates charter approved and/or modified.

	Team Approval Date	CMER Approval Date
Version 1	8 February 2018	27 February 2018
Version 2	5 February 2020	25 February 2020
Version 3	15 June 2022~~xx~~	xx

3. Project Team Members

Alexander Prescott (PM), Charlie Luce (PI), Tom Black, Jenelle Black, Julie Dieu, Erkan Istanbulluoglu, Amanda Manaster

4. Problem Statement

General Background

Scientific knowledge of road best management practices (BMP) prescription and implementation effectiveness is insufficient to make the best possible recommendations. This leads to the potential for:

1) Landowners wasting money on ineffective treatments;
2) Rule and BMP implementations being inadequate to achieve functional objectives and performance targets (FPHCP Schedule L-1);
3) Overconfidence about the degree of protection landowners can attain (with implications for road construction and maintenance standards); and
4) Treatments creating additional environmental risks (e.g., landslides and gullies).

Forest roads play an important role in providing many useful functions such as allowing timber products to be transported efficiently to mills; providing access for recreationists, hunters and fishermen; providing emergency access; and even giving wildlife travel corridors. These roads also influence a variety of watershed processes, including sediment production, hydrologic event timing, and slope stability. Of particular concern are road erosion and the locations where sediment from such erosion is delivered to streams and rivers which can be a large source of anthropogenic sediment in watersheds managed for forest production. The fine-grained sediment produced by road-surface erosion can adversely affect water quality and aquatic resources at the site scale (e.g., the water quality at a culvert outlet), the reach scale of a channel, and the watershed scale.

Excessive sedimentation is the leading cause of lotic ecosystem degradation in the United States in terms of stream distance impacted. Such excessive sedimentation is a concern to environmental managers because increased inorganic sediment loads alter the natural biotic community (algae, macrophytes, invertebrates, amphibians and fishes) in streams. Increased inorganic sediment loads, beyond quantities or frequencies that occur naturally, can influence the stream biota in several ways. Increased turbidity can reduce stream primary production by reducing photosynthesis, physically abrading algae and other plants, and preventing attachment of autotrophs to substrate surfaces. Substratum size is important to aquatic insects and is a primary factor influencing the abundance and distribution of aquatic insects. Aquatic macroinvertebrates are adversely affected by habitat reduction and/or habitat change resulting in increased drift, lowered respiration capacity (by physically blocking gill surfaces or lowering dissolved oxygen concentrations), and reducing the efficiency of certain feeding activities especially filter feeding and visual predation. Deposited sediments affect fish directly by smothering eggs in redds, altering spawning habitat and reducing overwintering habitat for fry, as well as indirectly by altering invertebrate species composition, which decreases the abundance of preferred prey. Declines in salamander abundance also were seen with increases in fine sediment inputs.

Specific Statement of the Problem

Roads are persistent sources of fine sediment to forest streams, which otherwise have characteristically clear water except during significant storm events. Substantial improvements in water quality have been secured in recent decades through diligent application of mitigation measures (usually called best management practices or "BMP") for sediment from forest roads. However, there are still some locations where noticeable loading occurs related to forest roads. Recent work has demonstrated that sediment delivery from forest roads is focused in a small fraction of the road network. A Washington study found that only 10-11% of the forested road length is delivering sediment to the channel network. Work in Oregon and Idaho shows that 90% of the delivered sediment comes from less than 9.2% of the drainage points. That fraction is primarily comprised of larger, more heavily travelled roads in proximity to streams. A survey of over 5,000 drainage points in Western Montana and subsequent sediment modeling found that 76% of road sediment delivery occurred within 10 meters of the stream. Mitigation for these locations has proven more challenging than in other places, and better information is needed to hone our capacity to efficiently handle sediment from these high-traffic, near-stream (HTNS) road segments.

For several reasons, HTNS road segments are particularly challenging for sediment control. Frequent heavy traffic decreases the effectiveness of surfacing roads with quality rock by the crushing of the rock and pumping of fines from the substrate. Drainage modifications such as crowning or outsloping that limit delivery are also compromised when ruts form. These roads also need frequent maintenance of the surface (e.g., frequent grading to reduce pothole development) to maintain their ability to handle traffic. The proximity to streams makes it difficult to rely on infiltration into the forest floor to disconnect road discharges from streams. The proximity to streams or stream crossings also means that these roads will be the wettest and most affected by groundwater and exfiltration from the hillslope. In technical parlance, these are high production (detachment of sediment from the road surface and ditch), high delivery (greater fraction of produced sediment carried to stream) road segments.

These HTNS roads present imposing technical challenges. Excessive fine sediment in fish-bearing streams is perhaps the single largest, management-related factor impacting instream biota, including listed fish species, so reducing road surface erosion and delivery to stream is of critical importance. Not only are HTNS roads more likely to deliver sediment to streams, they are critical to the transportation network as key mainline roads. Therefore, HTNS roads may warrant additional investment by landowners to use enhanced BMP (e.g., improved road surfacing, better ditch line BMP with rock check dams) not only to meet stewardship goals but for operational needs as well.

Additional mitigation for erosion of HTNS forest roads may allow forest operations to be conducted in a wider range of weather conditions, with higher vehicle-use capacity and potentially reduced maintenance. However, road upgrades and enhanced BMP add a significant cost; therefore, improved knowledge of individual and in-combination BMP is essential for understanding the return on BMP investments.

5. Purpose Statement

A central question is what combinations of surfacing, ditch line management, traffic control, and drainage management will most efficiently and effectively mitigate sediment yields and hydraulic effects from HTNS roads? The question pivots on combinations because significant information on what individual treatments such as rocking or traffic changes can do to mitigate sedimentation already exist. Such information has been formulated into simple empirical approaches that estimate sediment yield from a road surface based on several empirically-derived multipliers similar to the Universal Soil Loss Equation (USLE). Importantly, these efforts depend on two pivotal assumptions: 1) That implementation of multiple BMP has the expected positive benefits; and 2) That those positive benefits are additive, multiplicative or synergistic.

BMP treatments are rarely used in isolation and it is the combination of multiple BMP that has been inadequately studied. Under selected circumstances, one BMP may even reduce another's effectiveness. These key issues of most previous research and the simple, multiplicative nature of existing models fundamentally drive the sample design of this project.

6. Project Objectives

The forest practices road rules are designed to protect water quality and riparian/aquatic habitats through road prescriptions (WAC 222-24) and best management practices (BMP – Forest Practices Board Manual, Section 3, 2013). These prescriptions and BMP, also called "treatments" in this document, are broadly intended to minimize: 1) sediment production and delivery from the road prism; 2) hydrologic connection between roads and the stream network; and 3) the risk of road-related landslides caused by inadequately built and maintained roads and culverts. This project will specifically focus on 1) and 2) – evaluating the treatment effectiveness of 3) will take a different study design.

An extensive body of research on the performance of individual BMP already exists. However, not all BMP are well-studied and gaps exist in our understanding of road BMP at the site scale in reducing sediment production, sediment delivery, and hydrologic connectivity. Of concern is that conceptual models used in the design of road BMP field studies in the literature assume a multiplicative approach such that data collection is focused on observing and measuring factors that are used in multiplicative models. This limits the scalability of those observations using different, more process-based models.

As landowners work to complete implementation of their RMAP and to meet road sediment performance targets and water quality standards, it is important to provide them and other stakeholders with a more complete technical foundation for determining: a) which BMP are most effective at minimizing the discharge of sediment to the stream network; b) which BMP are most cost effective; and c) the practical and operational limitations of what can be achieved in sensitive environmental settings.

7. Critical Questions

CMER Work Plan Critical Question

Are road prescriptions effective at meeting site-scale water quality standards and performance targets for sediment and water? (Exclusive of mass wasting prescriptions, which are covered in the Unstable Slopes Rule Group.)

Study Design Critical Questions

1) How effective are road sediment BMP, individually and in combination, at minimizing production and delivery of coarse and suspended sediments from forest roads to streams (DNR Typed Waters)?
2) What is the comparative effectiveness of BMP in minimizing the production, routing, and delivery of sediment to streams (defined as DNR Typed waters)? And what are the comparative installation cost effectiveness, and maintenance cost effectiveness and frequency, of these BMP?
3) For individual or combinations of BMP, are increases in turbidity minimized?
4) Are the effects of combined BMP for the road surface and ditch lines additive, multiplicative, synergistic, or antagonistic with respect to runoff and sediment production from road segments?
5) To what extent do road BMP affect water storage and erosion potential at site-scale road segments?
6) How do different characteristics of topography and lithology effect the selection and design of road BMP?
7) How quickly after installation or removal of BMP does the post-construction disturbance that temporarily increases sediment production and delivery abate?

8. CMER Rule Group and Program

Roads Rule Group.

9. Project Deliverables and Project Timeline

Project Deliverable	Estimated Completion Date	Actual Completion Date
Scoping (CMER & Policy Approved)	2/28/2016	2/28/2016
Study Design (CMER & Policy Approved)	3/5/2018	3/5/2018
Implementation Plan (Initial - CMER Approved)	2/27/2018	2/27/2018
Field Work (Site Selection/Development)	9/30/2019	11/15/2019
Field Work (Ditch Line Hydraulics – Yr. 1)	5/31/2020	5/31/21
Field Work (Ditch Line Hydraulics – Yr. 2)	~~5/31/2021~~10/31/2022	
Field Work (Ditch Line Hydraulics – Yr. 3)	~~5/31/2022~~5/31/2023	
Field Work	~~5/31/2020~~3/31/2022	3/31/2022

(Short-Time-Scale – Yr. 1)		
Field Work (Short-Time-Scale – Yr. 2)	~~5/31/2021~~5/31/2023	
Lab Work (Sediment Trap Efficiency)	~~4/30/2021~~4/30/2024	
Field Work (Micro-Topography)	~~5/31/2021~~12/31/2022	
Office Work (Cost v. Maint. Survey)	~~2/28/2022~~2/28/2024	
Road Public Works (Ditch Line + Rock BMP)	~~8/30/2022~~5/31/2023	
Field Work (GRAIP/WARSEM Survey - Yr. 1)	~~3/30/2023~~3/30/2024	
Field Work (GRAIP/WARSEM Survey - Yr. 2)	~~3/30/2024~~3/30/2025	
Field Work (Execution - Major Experiment)	~~5/31/2025~~6/30/26	
Data Analysis (All Experiments)	~~3/31/2026~~3/31/27	
Interim Report** (Provided to CMER)	~~6/30/2023~~6/30/24	
Final report (Provided to CMER)	~~6/30/2026~~6/30/27	
CMER Review	~~11/18/2026~~8/31/27	
Revise Report; CMER Approval	~~4/1/2027~~11/30/27	
ISP Review	~~10/1/2027~~7/31/28	
Revise Report; ISPR Review	~~2/1/2028~~8/31/28	
CMER Final Approval	~~3/28/2028~~10/31/28	
6-Questions Document	~~5/15/2028~~1/31/29	
Policy Review	~~7/10/2028*~~2/28/29	
Policy Final Approval	~~8/10/2028*~~3/31/29	
Publication (CMER Website)	~~8/30/2028*~~4/15/29	

*~~*Budgeting includes funding in FY 2029 for the potential for delayed CMER and Policy delivery due to additional review and/or ISPR periods.~~*

***Interim report will be produced to summarize and report on the first 4~~3~~ years of data collection, as there is a significant change in the Best Management Practices being utilized at the field sites at that time. Many of the parameterization experiments will be complete with some data analysis and modeling efforts being completed at the time of interim report generation which will be included, as applicable, in the interim report. The focus will be on lessons learned, preliminary results and major study observations to date.*

10. Budget

FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029
461,047	496,047	616,047	596,147	596,047	351,000	75,000	25,000*

*~~*Budgeting includes funding in FY 2029 for the potential for delayed CMER and/or Policy approval due to additional review periods.~~*

*** Board approved budget. Funding approved for FY22-23. Budget beyond FY23 are estimates only.*

11. Project Team

Alexander Prescott
Project Team Role: Project Manager
Official Title: Project Manager, WA Department of Natural Resources
Role and responsibilities:

- Provides project oversight, status tracking and budget development and tracking.
- Monitors project activities and the performance of the project team.
- Communicates progress, problems, and problem resolution to the AMPA and CMER.
- Develops, updates and maintains the Project Charter, Project Management Plan and all pertinent project management plans and ~~documentation~~documents.
- Develops and reviews proposals, RFPs or RFQQs, reviews contractor proposals, monitors contract performance, and drafts and/or provides input on budgeting, scheduling, scope changes, and contract amendments.
- Develops, administers and complies with all Public Works contracts for all road related maintenance, repair and installation requirements of the study sites.
- As member of the Project Team, work with PI and Project Team members to develop interim and final draft reports.
- Ensures communication between all team members is clear, concise and consistent.
- ~~Ensure~~ Supports coordination between CMER, Project Teams and Landowners.
- Coordinates with other PMs.
- Coordinates all technical reviews and responses in a timely fashion.
- Facilitates archiving of all data and documents.
- Sees that contract provisions are followed.
- Provides direction and support to the Project Team to achieve clear and specific scopes of work, schedules, and budgets within approved contracts.
- ~~Responsible for c~~Communicatesing or authorizesing communication with all project-related contractors. Including the authorization or communication between the project team and contractors on substantive project elements.
- Maintains sole responsibility for all aspects of project management even if other individuals (meaning co-operators who may or may not be contracted under the project) are completing or helping complete parts of the project.
- Manages contracted study site maintenance activities (excluding Public Works related activities).
- Coordinates data collection activities and oversee contract activities associated with data collection.

Charlie Luce
Project Team Role: Principal Investigator
Official Title: Research Hydrologist, USFS Rocky Mountain Research Station
Role and responsibilities:

- Help develop project Charters.
- Work with PM and Project Team to identify additional expertise and time commitments needed for successful completion of project.
- Develop/write scoping documents, literature reviews, and study designs.
- Help implement study designs, including site selection and collecting data.
- Analyze data.

- Write interim and final draft reports.
- Present technical findings to CMER, TFW Policy, and at science conferences.
- Lead the development of detailed implementation plans and coordinate fieldwork activities.
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Tom Black
Project Team Role: Field Lead
Official Title: Hydrologist, USFS Rocky Mountain Research Station
Role and responsibilities:

- In coordination with PM and Field CoordinatorProject Team:
  - Oversee Ddata cCollection.
  - Complete and/or advise on data QA/QC and data management.
  - Development and engineering of test equipment and instrumentation.
  - Equipment and instrumentation installation, operation, maintenance and troubleshooting.
  - Equipment installation, operation, maintenance and troubleshooting.Assist with development of detailed implementation plans and coordinate fieldwork activities.
- Help design and implement projects and project phases.
- Oversee and conduct analyses.
- Provide expertise necessary for successful completion of projects.
- Help write and review technical documents and interim and final project reports.

Julie Dieu
Project Team Role: Project Team Member
Official Title: Geomorphologist, Rayonier Inc.
Role and responsibilities:

- In coordination with PM and Project Team:
  - Act as the principal team/project contact with all landowners for all communications between the project and the landowners.
  - Function as the point of contact with landowners for the use of their lands in this study including: Site assessment and selection; Data collection; and Equipment installation/operation/maintenance
  - Site assessment and selection
  - Data collection, Data QA/QC and Data Management
  - Equipment installation, operation, maintenance and troubleshooting.
- Help design and implement projects and project phases.
- Provide expertise necessary for successful completion of projects.
- Help write and review technical documents and interim and final project reports.

Erkan Istanbulluoglu
Project Team Role: Research Scientist, Project Team Member
Official Title: Associate Professor, University of Washington, Watershed Dynamics Research Group
Role and responsibilities:

- Provide technical assistance to the project team focused on the modeling efforts and the parameterization experiments.
- Complete and/or assist in the completion of data analysis for modeling efforts and the parameterization experiments.
- Help design and implement projects and project phases.

- Provide expertise necessary for successful completion of projects.
- Help write and review technical documents and interim and final project reports.

Amanda Manaster
Project Team Role: Research Scientist, Project Team Member
Official Title: Ph.D. Graduate Student, University of Washington, Watershed Dynamics Research Group
Role and responsibilities:

- Complete data analysis, model development and model testing.
    - Model development
    - Data analysis for model development
- In coordination with PM and Project Team:
    - Site assessment and selection
    - Data collection, Data QA/QC and Data Management
    - Equipment installation, operation, maintenance and troubleshooting.
- Help design and implement projects and project phases.
- Provide expertise necessary for successful completion of projects.
- ~~Complete data analysis, model development and model testing.~~
- Help write and review technical documents and interim and final project reports.

Jenelle Black
Project Team Role: Project Team Member
Official Title: CMER Staff Scientist, Hydrologist
Role and responsibilities:

- In coordination with PM and Project Team:
    - Advise on data QA/QC and data management.
    - Equipment development, engineering, installation, operation, maintenance and troubleshooting.
    - Assist with development of detailed implementation plans and coordinate fieldwork activities.
- Help design and implement projects and project phases.
- Provide expertise necessary for successful completion of projects.
- Help write and review technical documents and interim and final project reports.

12. Authorization

The Washington Forest Practices Board (Board) has empowered the CMER committee and the TFW Policy committee to participate in the Adaptive Management Program (AMP) (WAC 222-12-045(2)(b)). CMER is responsible for completing technical information and reports for consideration by TFW Policy and the Board. CMER has been tasked with completing a programmatic series of work tasks in support of the AMP; these tasks are outlined in CMER's biennial work plan approved by TFW Policy and the Board.