Roads Prescription-Scale Effectiveness Monitoring

PROJECT MANAGEMENT PLAN

Including the Communication Plan and Risk Management Plan

Washington State Cooperative Monitoring, Evaluation, and Research Committee (CMER)
Protocols and Standards Manual (PSM)
Chapter 7, Section 5, 6, & 11

Project Management Plan 1[1]: Background, Project Milestones and Tasks, Project Deliverables, Project Team Members, Project Constraints and Assumptions, Decision Making Authority, Project Resource Needs, Project Budget, Project Sites, CMER Companion Documents, Communication Plan, Risk Management Plan,

Oversight Committee: Cooperative Monitoring, Evaluation, and Research Committee (CMER)

Project Team Members: Alexander Prescott~~Benjamin Flint~~ (PM), Charlie Luce (PI), Tom Black, Julie Dieu~~, Bob Danehy~~, Erkan Istanbulluoglu, Amanda Manaster, and Jenelle Black ~~(CMER Scientist), and Heather Gibbs (Field Coordinator)~~

June 15, 2022~~June 23, 2020~~

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Background

In 2001, the Washington State Forest Practice Board (Board) approved a comprehensive set of new forest practice rules based on the Forests & Fish Report. One of the goals of these rules is to protect water quality, including aquatic life, in streams on non-federal forest lands in Washington State. To this end, the Cooperative Monitoring Evaluation and Research Committee (CMER) has been tasked with performing research in support of an Adaptive Management Program (AMP). This research includes the Roads Prescription-Scale Effectiveness Monitoring Project (Roads BMP Project) to evaluate the effectiveness of current forest road best management practices (BMP) at minimizing or eliminating the delivery of anthropogenic sediment to forested watersheds. The fine-grained sediment produced by road surface erosion can adversely affect water quality and aquatic resources at the site scale, the reach scale and the watershed scale. This study addresses seven questions related to the effectiveness of road prescriptions at meeting site-scale water quality standards and performance targets for sediment and water in the State of Washington:

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?

[1] The purpose of the Project Management Plan breaks down project work into logical steps to help provide a framework to efficiently allocate resources, reliably estimate project costs, and help guide schedule, budget development and project scope. The Project Management Plan documents and tracks the progress of a CMER project through its various stages. The contents of the Project Management Plan will vary depending on the type and complexity of the project. (PSM Ch. 7 ~~CMER review 5 06_19_2017 final draft~~).

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?

This project currently includes up to 78 test sites located across varying geographies in southwestern Washington. Data collected from the test sites will be utilized both for the empirical evaluation of BMP effectiveness and in the generation of a comprehensive model to examine road surface erosion and road evolution to improve the understanding of individual and collective roles of BMP on the road surface in relation to rainfall and traffic. Although the data being collected at the test sites will be the backbone of the modeling effort, there is additional data that is needed in order to train or "parameterize" the model to improve the functionality and applicability of the modeled results. The additional efforts that will provide the data needed to improve the model are collectively referred to as the parameterization experiments. These experiments will occur at much smaller spatial and time scales compared to the overarching study. This project is multifaceted and broad, covering a majority of industrial lands within southwestern Washington, from the Cascade crest to the coast and from the Chehalis River to the Columbia River. This project management plan focuses on the tasks, functions and requirements needed to effectively execute this project as outlined in the ISPR- and CMER-approved Study Design.

Project Milestones, Tasks and Timeline

The large size of this project resulted in the generation of several project milestones from which to track the progress of the study. The milestones represent all of the facets of the study; which includes: the overarching study, the various parameterization experiments and the survey work. Figure 1 below represents the specific milestones for this project and includes the timeline for which each milestone is to be executed and an estimate of when it would be completed.

Project milestones by fiscal year and estimated completion date.

	Actual and Estimated Completion Dates by Fiscal Year											
Project Milestones	**2014 - 2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Scoping	Act. 9/2/14											
BAS Alternatives	Act. 3/4/16											
Study Design	Act. 2/28/17											
Implementation Plan	Act. 2/27/18											
Site Selection/Development	Act. 11/15/2019											
Field Work (Overarching Study)			Est. 6/30/26									
Field Work (Micro-Topography)				Est. 5/31/22								
Field Work (Ditch Line Hydraulics)				Est. 5/31/23								
Field Work (Short-Time-Scale)				Est. 5/31/22								
Lab Work (Sediment Trap Efficiency)				Est. 5/31/21								
Office Work (Cost vs. Mtn. Survey)					Est. 5/31/22							
Ditch Line & Rocking (BMP Change)						Est. 8/30/22						
Field Work (GRAIP/WARSEM Survey)							Est. 3/30/25					
Data Analysis (All Experiments)			Est. 3/31/26									
Interim Report						Est. 6/30/23						
Final Report									Est. 6/30/26			
CMER Review										Est. 4/1/27		
ISPR										Est. 10/1/27		
Report Revision											Est. 2/21/28	
CMER Final Approval											Est. 3/28/28	
6 questions Document											Est. 5/15/28	
Policy Review												Est. 7/10/28
Policy Approval												Est. 8/10/28
Publication (CMER Website)												Est. 8/30/28

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Project Milestones	Actual and Estimated Completion Dates by Fiscal Year											
	2014 - 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Scoping	Act. 9/2/14											
BAS Alternatives	Act. 3/4/16											
Study Design	Act. 2/28/17											
Implementation Plan	Act. 2/27/18											
Site Selection/Development	Act. 11/15/2019											
Field Work (Overarching Study)			Est. 6/30/25						Reporting			
Field Work (Micro-Topography)				Est. 12/31/22			Reporting					
Field Work (Ditch Line Hydraulics)				Est. 5/31/23			Reporting					
Field Work (Short-Time-Scale)					Est. 5/31/23		Reporting					
Lab Work (Sediment Trap Efficiency)							Est. 5/31/24	Reporting				
Office Work (Cost vs. Mtn. Survey)						Est. 5/31/23						
Ditch Line & Rocking (BMP Change)							Est. 08/31/23					
Field Work (GRAIP/WARSEM Survey)						Est. 3/30/25			Reporting			
Data Analysis (All Experiments)			Est. 3/31/27									
Interim Report							Est. 6/30/24					
Final Report										Est. 6/30/27		
CMER Review											Est. 8/31/27	
CMER Approval											Est. 11/30/27	
ISPR												Est. 7/31/28
Report Revision												Est. 8/31/28
CMER Final Approval												Est. 10/31/28
6 questions Document												Est. 1/31/29
Policy Review												Est. 2/28/29
Policy Approval												Est. 3/31/29
Publication (CMER Website)												Est. 4/15/29

The project milestones function as a guide to direct the actions of the project team with respect to the specific tasks that are completed in each given fiscal year. The following is a list of the specific tasks that need to be completed within each fiscal year in order to reach the milestones for the project.

~~Fiscal year 2020~~

~~Project Milestone: Overarching Study~~

- ~~Task 1: Complete monthly field data collection and site maintenance activities.~~
  - ~~Subtask 1: Complete training of field technicians and field staff on sampling and maintenance protocols and procedures.~~
    - ~~*Responsible Party: Tom Black (USFS RMRS)*~~
  - ~~Subtask 2: Collect monthly (Nov. – Mar.) water samples from suspended sediment tank (SST), download: data loggers, traffic cameras and counters.~~
    - ~~*Responsible Party: West Fork Environmental (Contractor)*~~
  - ~~Subtask 3: Complete monthly (Nov. – Mar.) maintenance of data collection equipment.~~
    - ~~*Responsible Party: West Fork Environmental (Contractor)*~~
  - ~~Subtask 4: Complete monthly (off-week, (Nov. – Jun.)) site visits to ensure site efficacy, complete needed maintenance and collect samples (if tanks/data loggers are full).~~
    - ~~*Responsible Party: Bob Danehy – Volcanic Province (Contractor) and Julie Dieu – Siltstone Province (CMER – Rayonier)*~~
  - ~~Subtask 5: Transport all samples collected from subtask 1 and subtask 2 to the laboratory for samples testing (Completed monthly (Nov. – Mar.)).~~
    - ~~*Responsible Party: West Fork Environmental (Contractor)*~~
  - ~~Subtask 6: Complete end of season tub syphoning, sediment weighing and equipment maintenance (Completed in June or July).~~
    - ~~*Responsible Party: West Fork Environmental (Contractor)*~~
- ~~Task 2: Complete water sample testing.~~
  - ~~Subtask 1: Complete suspended sediment concentration testing per ASTM D3977-97(b).~~

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- *Responsible Party: Department of Ecology (DOE) Manchester Environmental Laboratory.*

- Task 3: Make progress on the modeling effort.
  - Subtask 1: Evaluate our representative element parameterization of the road erosion model against experimental data both from this study and from the literature. Refine processes to improve predictions consistent with observations.
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

Project Milestone: Micro-Topography Parameterization Experiment (Pilot Year)

- Task 1: Complete method validation
  - Subtask 1: Complete detailed road survey to provide baseline dataset for comparison with drone data.
    - *Responsible Party: Greg Stewart (CMER Staff)*
  - Subtask 2: Complete drone flights and process flight data for comparison to survey data.
    - *Responsible Party: Amanda Manaster (University of Washington)*

Fiscal year 2021

Project Milestone: Overarching Study

- Task 1: Complete monthly field data collection and site maintenance activities.
  - Subtask 1: Collect monthly (Nov. – Mar.) water samples from suspended sediment tank (SST), download: data loggers, traffic cameras and counters.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 2: Complete monthly (Nov. – Mar.) maintenance of data collection equipment.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 3: Complete monthly (off-week, (Nov. – Jun.)) site visits to ensure site efficacy, complete needed maintenance and collect samples (if tanks/data loggers are full).
    - *Responsible Party: Bob Danehy – Volcanic Province (Contractor) and Julie Dieu – Siltstone Province (CMER – Rayonier)*
  - Subtask 4: Transport all samples collected from subtask 1 and subtask 2 to the laboratory for samples testing (Completed monthly (Nov. – Mar.)).
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 5: Complete end of season tub syphoning, sediment weighing and equipment maintenance (Completed in June or July).
    - *Responsible Party: West Fork Environmental (Contractor)*
- Task 2: Complete water sample testing.
  - Subtask 1: Complete suspended sediment concentration testing per ASTM D3977-97(b).
    - *Responsible Party: Department of Ecology (DOE) Manchester Environmental Laboratory.*
- Task 3: Make progress on the modeling effort
  - Subtask 1: Begin changing our representative element model into a spatially-distributed (2D) version by constructing flow connectivity and testing the applicability of existing Landlab erosion/deposition functions. This task may require modifying the existing grid architecture of Landlab.

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- *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

- Task 4: Complete Public Works Contract
  - Subtask 1: Complete a public works contract to complete: the installation of the last site in Volcanic, critical site fixes and standard site maintenance in both provinces.
    - *Responsible Party: Ben Flint (DNR – PM) and Julie Dieu (CMER – Rayonier)*

Project Milestone: Micro-Topography Parameterization Experiment

- Task 1: Complete year one of the experiment
  - Subtask 1: Complete detailed road survey (pre- and post-treatment) to provide baseline dataset for comparison with drone data.
    - *Responsible Party: Greg Stewart (CMER Staff)*
  - Subtask 2: Complete drone flights and process flight data for comparison to survey data.
    - *Responsible Party: Amanda Manaster (University of Washington)*
  - Subtask 3: Examine year 1 results to estimate sediment movement. Develop preliminary flow modeling experiments to identify computational bottlenecks. Utilize year one results in the modeling effort for the overarching study.
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

Project Milestone: Ditch Line Hydraulics Parameterization Experiment

- Task 1: Complete year one of the experiment.
  - Subtask 1: Complete an RFQQ for a contractor to provide water truck services for the project.
    - *Responsible Party: Ben Flint (DNR – PM)*
  - Subtask 2: Execute year one of the experiment in each province.
    - *Responsible Party: University of Washington and USFS RMRS*
  - Subtask 3: Utilize year one results in the modeling effort for the overarching study.
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

Project Milestone: Short Time Scale Parameterization Experiment

- Task 1: Complete year one of the experiment.
  - Subtask 1: Complete an RFQQ for a contractor to provide dump truck services for the project.
    - *Responsible Party: Ben Flint (DNR – PM)*
  - Subtask 2: Execute year one of the experiment in each province.
    - *Responsible Party: University of Washington and USFS RMRS*
  - Subtask 3: Utilize year one results in the modeling effort for the overarching study.
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

Project Milestone: Sediment Trap Efficiency Parameterization Experiment

- Task 1: Complete the experiment
  - Subtask 1: Utilizing the laboratory at the University of Washington, execute the experiment.
    - *Responsible Party: University of Washington and USFS RMRS*
  - Subtask 2: Utilize the results in the modeling effort for the overarching study.
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

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Fiscal year 2022

Project Milestone: Overarching Study

- Task 1: Complete monthly field data collection and site maintenance activities.
  - Subtask 1: Collect monthly (Nov. – Mar.) water samples from suspended sediment tank (SST), download: data loggers, traffic cameras and counters.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 2: Complete monthly (Nov. – Mar.) maintenance of data collection equipment.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 3: Complete monthly (off-week, (Nov. – Jun.)) site visits to ensure site efficacy, complete needed maintenance and collect samples (if tanks/data loggers are full).
    - *Responsible Party: ~~Bob Danehy~~West Fork Environmental – Volcanic Province (Contractor) and Julie Dieu – Siltstone Province (CMER – Rayonier)*
  - Subtask 4: Transport all samples collected from subtask 1 and subtask 2 to the laboratory for samples testing (Completed monthly (Nov. – Mar.)).
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 5: Complete end of season tub syphoning, sediment weighing and equipment maintenance (Completed in June or July).
    - *Responsible Party: West Fork Environmental (Contractor)*

- Task 2: Complete water sample testing.
  - Subtask 1: Complete suspended sediment concentration testing per ASTM D3977-97(b).
    - *Responsible Party: Department of Ecology (DOE) Manchester Environmental Laboratory.*
- Task 3: Make progress on the modeling effort
  - Subtask 1: Begin full integration of the model components for distributed road evolution experiments with runoff generation, routing, and erosion and deposition components
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*
- Task 4: Complete Public Works Contract
  - Subtask 1: Complete a public works contract to complete standard site maintenance in both provinces.
    - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR - PM) and Julie Dieu (CMER – Rayonier)*

Project Milestone: Micro-Topography Parameterization Experiment

- Task 1: Complete year two of the experiment.
  - Subtask 1: Complete detailed road survey (pre- and post-treatment) to provide baseline dataset for comparison with drone data.
    - *Responsible Party: Greg Stewart (CMER Staff)*
  - Subtask 2: Complete drone flights and process flight data for comparison to survey data.
    - *Responsible Party: Amanda Manaster ~~Student~~ (University of Washington)*
  - Subtask 3: Utilize year two results in the modeling effort for the overarching study.
    - *Responsible Party: Amanda Manaster ~~Student~~ & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

Project Milestone: Ditch Line Hydraulics Parameterization Experiment

- Task 1: Complete year two of the experiment.

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- Subtask 1: Execute year two of the experiment in each province.
  - *Responsible Party: University of Washington, CMER Staff and- USFS RMRS*
- Subtask 2: Utilize year two results in the modeling effort for the overarching study.
  - *Responsible Party: University of Washington and -USFS RMRS*

Project Milestone: Short-Time-Scale Parameterization Experiment

- Task 1: Complete year one of the experiment.
  - Subtask 1: Complete an RFQQ for a contractor to provide dump truck services for the project.
    - *Responsible Party: Alexander Prescott(DNR – PM)*
  - Subtask 2: Execute year one of the experiment in each province.
    - *Responsible Party: University of Washington, CMER Staff and USFS RMRS*
  - Subtask 3: Utilize year one results in the modeling effort for the overarching study.
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

~~**Project Milestone: Short-Time-Scale Parameterization Experiment**~~

- ~~Task 1: Complete year two of the experiment.~~
  - ~~Subtask 1: Execute year two of the experiment in each province.~~
    - ~~*Responsible Party: University of Washington and -USFS RMRS*~~
  - ~~Subtask 2: Utilize year two results in the modeling effort for the overarching study.~~
    - ~~*Responsible Party: Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*~~

~~**Project Milestone: Cost versus Maintenance Industry Survey**~~

- ~~Task 1: Develop and execute a survey of industrial landowners to assess the cost and functionality of commonly applied BMPs.~~
  - ~~*Responsible Party: Ben Flint (DNR – PM) and Julie Dieu (CMER – Rayonier)*~~
- ~~Task 2: Using Survey and Study Design, establish details of Ditch Line and Rocking BMP Change~~
  - ~~*Responsible Party: Project Team*~~

Fiscal year 2023

Project Milestone: Overarching Study

- Task 1: Complete monthly field data collection and site maintenance activities.
  - Subtask 1: Collect monthly (Nov. – Mar.) water samples from suspended sediment tank (SST), download: data loggers, traffic cameras and counters.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 2: Complete monthly (Nov. – Mar.) maintenance of data collection equipment.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 3: Complete monthly (off-week, (Nov. – Jun.)) site visits to ensure site efficacy, complete needed maintenance and collect samples (if tanks/data loggers are full).
    - *Responsible Party: West Fork Environmental – Volcanic Province (Contractor) and Julie Dieu – Siltstone Province (CMER – Rayonier)*
  - ~~Subtask 3: Complete monthly (off-week, (Nov. – Jun.)) site visits to ensure site efficacy, complete needed maintenance and collect samples (if tanks/data loggers are full).~~
    - ~~*Responsible Party: Bob Danehy – Volcanic Province (Contractor) and Julie Dieu – Siltstone Province (CMER – Rayonier)*~~
  - Subtask 4: Transport all samples collected from subtask 1 and subtask 2 to the laboratory for samples testing (Completed monthly (Nov. – Mar.)).

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        - *Responsible Party: West Fork Environmental (Contractor)*
    - Subtask 5: Complete end of season tub syphoning, sediment weighing and equipment maintenance (Completed in June or July).
        - *Responsible Party: West Fork Environmental (Contractor)*
- Task 2: Complete water sample testing.
    - Subtask 1: Complete suspended sediment concentration testing per ASTM D3977-97(b).
        - *Responsible Party: Department of Ecology (DOE) Manchester Environmental Laboratory*.
- Task 3: Make progress on the modeling effort
    - Subtask 1: Continue full integration of the model components for distributed road evolution experiments with runoff generation, routing, and erosion and deposition components. ~~I~~Start implementation, testing, and calibration of the model at sites with sediment data.
        - *Responsible Party: Amanda Manaster ~~Student~~ & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

Project Milestone: Ditch Line Hydraulics Parameterization Experiment

- Task 1: Complete year three of the experiment.
    - Subtask 1: Execute year three of the experiment in each province.
        - *Responsible Party: University of Washington, CMER Staff -and- USFS RMRS*
    - Subtask 2: Utilize year three results in the modeling effort for the overarching study.
        - *Responsible Party: University of Washington ~~CMER Staff~~ and USFS RMRS*

Project Milestone: Short-Time-Scale Parameterization Experiment

- Task 1: Complete year two of the experiment.
    - Subtask 1: Execute year two of the experiment in each province.
        - *Responsible Party: University of Washington, CMER Staff and USFS RMRS*
    - Subtask 2: Utilize year two results in the modeling effort for the overarching study.
        - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

~~**Project Milestone: Ditch Line and Rocking (BMP Change)**~~

- ~~Task 1: Complete Public Works Contract~~
    - ~~Subtask 1: Complete a public works contract to overhaul the study sites with respect to the applied ditch line and rocking BMPs utilizing results from the cost vs. maintenance industry survey. Complete other standard maintenance items in both provinces.~~
        - ~~*Responsible Party: Ben Flint (DNR – PM) and Julie Dieu (CMER – Rayonier)*~~

Project Milestone: Cost versus Maintenance Industry Survey

- Task 1: Develop and execute a survey of industrial landowners to assess the cost and functionality of commonly applied BMPs.
        - *Responsible Party: Alexander Prescott~~Ben Flint~~ (DNR - PM) and Julie Dieu (CMER – Rayonier)*
- Task 2: Using Survey and Study Design, establish details of Ditch Line and Rocking BMP Change
        - *Responsible Party: Project Team*

~~**Project Milestone: Draft an Interim Report**~~

- ~~Task 1: Develop, draft and submit an interim report following the completion of year 3 data collection.~~
        - ~~*Responsible Party: Charlie Luce (PI – USFS RMRS)*~~

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Fiscal year 2024

Project Milestone: Overarching Study

- Task 1: Complete monthly field data collection and site maintenance activities.
  - Subtask 1: Collect monthly (Nov. – Mar.) water samples from suspended sediment tank (SST), download: data loggers, traffic cameras and counters.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 2: Complete monthly (Nov. – Mar.) maintenance of data collection equipment.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 3: Complete monthly (off-week, (Nov. – Jun.)) site visits to ensure site efficacy, complete needed maintenance and collect samples (if tanks/data loggers are full).
    - *Responsible Party: West Fork Environmental – Volcanic Province (Contractor) and Julie Dieu – Siltstone Province (CMER – Rayonier)*
  - ~~Subtask 3: Complete monthly (off-week, (Nov. – Jun.)) site visits to ensure site efficacy, complete needed maintenance and collect samples (if tanks/data loggers are full).~~
    - ~~*Responsible Party: Bob Danehy – Volcanic Province (Contractor) and Julie Dieu – Siltstone Province (CMER – Rayonier)*~~
  - Subtask 4: Transport all samples collected from subtask 1 and subtask 2 to the laboratory for samples testing (Completed monthly (Nov. – Mar.)).
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 5: Complete end of season tub syphoning, sediment weighing and equipment maintenance (Completed in June or July).
    - *Responsible Party: West Fork Environmental (Contractor)*
- Task 2: Complete water sample testing.
  - Subtask 1: Complete suspended sediment concentration testing per ASTM D3977-97(b).
    - *Responsible Party: Department of Ecology (DOE) Manchester Environmental Laboratory*.
- Task 3: Make progress on the modeling effort
  - Subtask 1: Continue model calibration and testing. Resolve any issues emerged during model tests and calibration, complete model development, provide official code in the Landlab ~~Github~~GitHub code repository
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*
- Task 4: Complete Public Works Contract
  - Subtask 1: Complete a public works contract to complete standard site maintenance in both provinces.
    - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR - PM) and Julie Dieu (CMER – Rayonier)*

Project Milestone: Sediment Trap Efficiency Parameterization Experiment

- Task 1: Complete the experiment
  - Subtask 1: Utilizing the laboratory at the University of Washington, execute the experiment.
    - *Responsible Party: University of Washington and USFS RMRS*
  - Subtask 2: Utilize the results in the modeling effort for the overarching study.
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*

~~**Project Milestone: Ditch Line Hydraulics Parameterization Experiment**~~

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- ~~Task 1: Complete year three of the experiment.~~
  - ~~Subtask 1: Execute year three of the experiment in each province.~~
    - ~~*Responsible Party: CMER Staff and USFS RMRS*~~
  - ~~Subtask 2: Utilize year three results in the modeling effort for the overarching study.~~
    - ~~*Responsible Party: CMER Staff and USFS RMRS*~~

Project Milestone: Ditch Line and Rocking (BMP Change)

- Task 1: Complete Public Works Contract
  - Subtask 1: Complete a public works contract to overhaul the study sites with respect to the applied ditch line and rocking BMPs utilizing results from the cost vs. maintenance industry survey. Complete other standard maintenance items in both provinces.
    - *Responsible Party: Alexander Prescott (DNR - PM) and Julie Dieu (CMER – Rayonier)*

Project Milestone: GRAIP/WARSEM Delivery Analysis and Survey

- Task 1: Complete a field survey to better determine outfall delivery from cross-drains and reevaluating past WARSEM data.
  - *Responsible Party: CMER Staff and USFS RMRS.*

Project Milestone: Draft an Interim Report

- Task 1: Develop, draft and submit an interim report following the completion of year ~~4~~3 data collection.
  - *Responsible Party: Charlie Luce (PI – USFS RMRS)*

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Fiscal year 2025

Project Milestone: Overarching Study

- Task 1: Complete final year of monthly field data collection and site maintenance activities.
  - Subtask 1: Collect monthly (Nov. – Mar.) water samples from suspended sediment tank (SST), download: data loggers, traffic cameras and counters.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 2: Complete monthly (Nov. – Mar.) maintenance of data collection equipment.
    - *Responsible Party: West Fork Environmental (Contractor)*
  - Subtask 3: Complete monthly (off-week, (Nov. – Jun.)) site visits to ensure site efficacy, complete needed maintenance and collect samples (if tanks/data loggers are full).
    - *Responsible Party: West Fork Environmental – Volcanic Province (Contractor) and Julie Dieu – Siltstone Province (CMER – Rayonier)*
  - ~~Subtask 3: Complete monthly (off-week, (Nov. – Jun.)) site visits to ensure site efficacy, complete needed maintenance and collect samples (if tanks/data loggers are full).~~
    - ~~*Responsible Party: Bob Danehy – Volcanic Province (Contractor) and Julie Dieu – Siltstone Province (CMER – Rayonier)*~~
  - Subtask 4: Transport all samples collected from subtask 1 and subtask 2 to the laboratory for samples testing (Completed monthly (Nov. – Mar.)).
    - *Responsible Party: West Fork Environmental (Contractor)*

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- Subtask 5: Complete end of season tub syphoning, sediment weighing and equipment maintenance (Completed in June or July).
  - *Responsible Party: West Fork Environmental (Contractor)*
- Task 2: Complete final year of water sample testing.
  - Subtask 1: Complete suspended sediment concentration testing per ASTM D3977-97(b).
    - *Responsible Party: Department of Ecology (DOE) Manchester Environmental Laboratory*.
- Task 3: Finalize the model.
  - Subtask 1: Finalize all model comparisons and write synthesis.
    - *Responsible Party: Amanda Manaster & Erkan Istanbulluoglu (University of Washington), Charlie Luce (USFS RMRS)*
- Task 4: Complete Public Works Contract
  - Subtask 1: Complete a public works contract to complete standard site maintenance in both provinces.
    - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR - PM) and Julie Dieu (CMER – Rayonier)*

Project Milestone: GRAIP/WARSEM Delivery Analysis and Survey

- Task 1: Finalize the results from the field analysis to determine outfall delivery from cross-drains and reevaluating past WARSEM data.
  - *Responsible Party: CMER Staff and USFS RMRS.*

Fiscal year 2026

Project Milestone: Overarching Study

- Task 1: Remove all equipment.
  - Subtask 1: Remove tipping buckets, data loggers, traffic counters and cameras
    - *Responsible Party: West Fork Environmental (Contractor)*
- Task 2: Complete Public Works Contract.
  - Subtask 1: Complete a public works contract to remove troughs and tubs and complete requested maintenance by landowners.
    - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR - PM) and Julie Dieu (CMER – Rayonier)*

Project Milestone: Data Analysis

- Task 1: Complete data analysis
  - Subtask 1: Complete data analysis and provide meaningful results for the generation of a final study report.
    - *Responsibility: Tom Black (USFS RMRS), Charlie Luce (USFS RMRS), CMER Staff and Erkan Istanbulluoglu (University of Washington)*

~~**Project Milestone: Draft Final Report**~~

- ~~Task 1: Develop, draft and submit an interim report following the completion of year 3 data collection.~~
  - ~~*Responsible Party: Charlie Luce (PI – USFS RMRS)*~~

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Fiscal year 2027

Project Milestone: Draft Final Report

- Task 1: Develop, draft and submit a final report following the completion of year 6 data collection.
  - *Responsible Party: Charlie Luce (PI – USFS RMRS)*

~~**Project Milestones: CMER Review/Approval and ISPR**~~

- ~~Task 1: Submit report to CMER for review and approval~~
  - ~~*Responsible Party: Ben Flint (DNR – PM)*~~
- ~~Task 2: Submit report to ISPR via the AMPA~~
  - ~~*Responsible Party: Ben Flint (DNR – PM)*~~

Fiscal year 2028

Project Milestones: CMER Review/Approval and ISPR

- Task 1: Submit report to CMER for review and approval
  - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR – PM)*
- Task 2: Submit report to ISPR via the AMPA
  - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR - PM)*

~~**Project Milestone: ISPR, Report Revision, CMER Approval, 6 Questions Document**~~

- ~~Task 1: Complete ISPR and make all necessary revisions and edits to ensure a final document is completed.~~
  - ~~*Responsible Party: Charlie Luce (PI – USFS RMRS)*~~
- ~~Task 2: Provide ISPR approved final report to CMER for approval.~~
  - ~~*Responsible Party: Ben Flint (DNR – PM)*~~
- ~~Task 3: Complete the 6 questions document for transmittal to Policy.~~
  - ~~*Responsible Party: Ben Flint (DNR – PM), Charlie Luce (PI – USFS RMRS)*~~

Fiscal year 2029

Project Milestone: ISPR, Report Revision, CMER Approval, 6 Questions Document

- Task 1: Complete ISPR and make all necessary revisions and edits to ensure a final document is completed.
  - *Responsible Party: Charlie Luce (PI – USFS RMRS)*
- Task 2: Provide ISPR approved final report to CMER for approval.
  - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR – PM)*
- Task 3: Complete the 6 questions document for transmittal to Policy.
  - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR – PM), Charlie Luce (PI – USFS RMRS)*

Project Milestone: Policy Review, Policy Approval, Publication (CMER Website)

- Task 1: Complete Policy review of the CMER & ISPR approved final report.
  - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR – PM)*
- Task 2: Present the final report to Policy.
  - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR – PM), Charlie Luce (PI – USFS RMRS)*
- Task 3: Publish the final report on the CMER Website.
  - *Responsible Party: ~~Ben Flint~~Alexander Prescott (DNR –PM)*

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Project Deliverables

Project deliverables are the tangible products that result from the project, according to specified quantitative or qualitative measures of quality (PSM Ch. 7). Due to the sheer size and scale of this project, there are several deliverables that can be listed based on their applicability to the various efforts being achieved within this study. Table 1 below provides a comprehensive list of the deliverables within this project.

Deliverable	Deliverable Type	Responsible Party	Completion Date (Act.* or Est.)
Project Charter	CMER Document	PM, Project Team	Feb. 25, 2020*
Scoping Document	CMER Document	Project Team	Sept. 2, 2014*
BAS Alternatives	CMER Document	Project Team	Mar. 4, 2016*
Study Design	CMER Document	Project Team	Feb. 28, 2017*
Project Management Plan	CMER Document	PM, Project Team	Jul. 28, 2020*
Suspended sediment water sample testing (ASTM D3977-97 (b)).	Data Collection	PM, ~~PM, Field Coordinator~~Contractor	Collected Monthly (Nov. to Mar.)
Tipping bucket data loggers downloads.	Data Collection	PM, Contractor ~~PM, Field Coordinator~~	Collected Monthly (Nov. to Mar.)
Traffic counter and camera downloads.	Data Collection	PM, Contractor ~~PM, Field Coordinator~~	Collected Monthly (Nov. to Mar.)
Rain gauge data collection.	Data Collection	PM, Contractor ~~PM, Field Coordinator~~	Collected Monthly (Nov. to Mar.)
Data reduction and data QA/QC.	Data Analysis	PM, Contractor~~PM, Field Coordinator~~, Project Team	Monthly (Nov. to Mar.)
Tub sediment weight determination.	Data Collection	PM, Contractor ~~PM, Field Coordinator~~	Collected Jun./Jul. (FY 20 – 26)
Tub sediment sampling (sediment distribution determination).	Data Collection	PM, Contractor ~~PM, Field Coordinator~~	Collected Jun./Jul. (FY 20 – 26)
Develop a comprehensive model on the effects of BMPs on sedimentation.	Data Analysis	PI, Project Team	On-going work anticipated to be finalized in FY 26~~5~~
Determination of sheer-stress (Ditch Line Hydraulics parameterization)	Data Collection	PM, Project Team	Complete 3 times, once in

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			each year (FY 21, 22, 23)
Determination of tread surface conditions as they change over time (Micro-Topography parameterization)	Data Collection	PM, Project Team	Complete 2 times, once in each year (FY 21, 22)
Determination of efficacy of in-ditch sediment traps (Sediment Trap Efficiency parameterization)	Data Collection	PM, Project Team	Completed in Lab (FY 24~~1~~)
Develop an understanding of operational costs of mainline road maintenance (Cost v. Mtn. Survey)	Data Collection	PM, Project Team	Complete with landowners (FY 2~~2~~3)
Determination of sediment detachment during discrete rainfall and traffic conditions (Short-Time-Scale parameterization)	Data Collection	PM, Project Team	Complete 2 times, once in each year (FY 2~~2~~1, 2~~3~~2)
Complete GRAIP/WARSEM sediment delivery analyses to complete model refinements.	Data Collection/Analysis	PI, Project Team	Anticipated to be completed (FY 23, 24~~4~~, 25)
Provide project updates to CMER (verbal and written)	CMER Document	PM, Project Team	Annual summary, monthly CMER update, as needed
Interim Report	CMER Document	PI, Project Team	~~August 2023~~June 2024
Final Report (CMER and ISPR Approved)	CMER Document	PI, Project Team	~~March 2028~~June 2027
6 Questions Document	CMER Document	PM, Project Team	~~June 2028~~January 2029

Project Team Roles and Responsibilities

Position	Roles and Responsibilities
Project Manager (PM): Alexander Prescott ~~Benjamin Flint~~ (DNR AMP)	• 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 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. • Supports coordination between CMER, Project Teams and Landowners.

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	• 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. • Communicates or authorizes 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. • Oversee study site maintenance activities (excluding Public Works related activities). • Coordinate data collection activities and oversee contract activities associated with data collection. • Oversee data management activities to ensure data integrity, storage and transfer activities. ~~• Monitor project activities and the performance of the project team.~~ ~~• Communicate progress, problems, and problem resolution to the AMPA and CMER.~~ ~~• Develops, updates and maintains the Project Charter, Project Management Plan and all other project documentation.~~ ~~• Develops and reviews proposals, RFPs or RFQQs, reviews contractor proposals, monitors contract performance, and completes all budgeting, scheduling, scope changes, and contract amendments.~~ ~~• Develops, administers and complies 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 reports.~~ ~~• Ensures communication between all team members is clear, concise and consistent.~~ ~~• Ensure coordination between CMER, Project Teams and Landowners.~~ ~~• Coordinate all technical reviews and responses in a timely fashion.~~ ~~• Facilitate archiving of all data and documents.~~ ~~• See that contract provisions are followed.~~ ~~• Provide direction and support to the Project Team to achieve clear and specific scopes of work, schedules, and budgets within approved contracts.~~ ~~• Responsible for communicating or authorizing 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.~~
Principal Investigator (PI): Charlie Luce (USFS Contractor)	• 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.

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	• 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. ~~• 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.~~

Project Team Member (Field Lead): Tom Black (USFS Contractor)	• In coordination with PM and Project Team:
	  ○ Oversee data collection.
	  ○ 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.
	  ○ Assist with development of detailed implementation plans and coordinate fieldwork activities.
	• Help design and implement projects and project phases.
	• Oversee and conduct analysis.
	• Provide expertise necessary for successful completion of projects.
	• Help write and review technical documents and interim and final project reports.
	~~• In coordination with PM and Field Coordinator:~~
	  ~~○ Oversee Data Collection.~~
	  ~~○ Complete and/or advise on 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.~~

Project Team Member: Julie Dieu (CMER – Rayonier)	• 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.

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	• ~~In coordination with PM and Field Coordinator:~~
	  ○ ~~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.~~

Project Team Member: Erkan Istanbulluoglu (UW Contractor), Amanda Manaster (UW Contractor)	• 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. • ~~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.~~ • ~~Complete model development and model parametrization.~~ • ~~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.~~

Project Team Member: ~~Bob Danehy (Contractor),~~ Jenelle Black (CMER Staff Scientist)	• 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.
	• ~~In coordination with PM and Field Coordinator:~~
	  ○ ~~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.~~
	• ~~Help write and review technical documents and interim and final project reports.~~

~~**Field Coordinator:**~~	• ~~In coordination with Project Manager:~~

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~~Heather Gibbs (DNR AMP)~~	~~o Manage and oversee all field data collection and study site maintenance activities (excluding Public Works related activities).~~ ~~o Manage data collection equipment operation and maintenance activities and the contracts associated with those activities.~~ ~~o Coordinate data collection activities and oversee contract activities associated with data collection.~~ ~~o Oversee data collection QA/QC protocols, including the development of QA/QC samples to be tested at the laboratory.~~ ~~o Oversee data management activities to ensure data integrity, storage and transfer activities.~~ ~~o Assist in field data collection for use in Public Works contracts for road specific maintenance activities.~~

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Project Constraints and Assumptions

Project constraints are limiting factors (internal or external) that affect the initiation, planning, execution, monitoring & control, and close-out of a project. Constraints restrict or dictate the actions of the project team. There are four specific constraint types that will be considered herein: schedule constraints, budget constraints, human resource constraints and resource constraints. Assumptions on the other hand are factors in the planning process that are considered to be true, real, or certain, without proof or demonstration and are outside the total control of the project team.

Constraints

Schedule Constraints

Constraint	Schedule Requirements
Data collection to be completed during the "rainy season".	November to March (annually)
Tub sediment weights to be determined at the end of the "rainy season".	June or July (annually)
Site maintenance (Public Works) must be completed before sampling begins each year.	Prior to November (annually)
Some parameterization experiments require specific weather conditions (i.e heavy rain for short-time scale).	January to May (FY 21-25~~, 22, 23~~)

Budget Constraints

Although this project requires substantial levels of funding to complete. There are no specific budget constraints, such as: grant timelines, fiscal year considerations or anticipated lack of long term funding.

Human Resource Constraints

The following are the human resource constraints within this project:

1. A large portion of the modeling effort is being completed by a graduate student from the University of Washington. The graduate student will be completing her dissertation and graduating prior to the completion of the overarching study. This will require the project team to complete certain tasks or activities in a set sequence in order to provide the graduate student with the relevant data to allow her to meet all project milestones prior to her departure from the project. There could be other,

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currently unforeseen, constraints that may arise at the time that the graduate student transitions off of the project team.

2. The loss of contracting or purchasing expertise could slow down the execution of the experiments for over a year.
    a. Procurement of materials and the execution of contracts requires experienced DNR staff. Unexpected staff changes could significantly alter the ability of the project to be successfully implemented.
3. The project requires trained field technicians to collect experimental data and solve problems and collect opportunistic data that become available after large storms or periods of high road activity. This labor is in short supply and may not be available on short notice.
4. Project team members, contractors and/or technicians may not be permitted to work as usual due to the limitations on workflow presented by COVID-19 restrictions and/or social distancing requirements.

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Resource Constraints

The following are the resource constraints within this project:

1. Study sites efficacy and data collection continuity.
    a. Study sites are a limiting factor as we do not have any high-quality spare sites identified that could fill in if any current sites need to be dropped or become unavailable.
    b. We do not have management control of the study sites, although we do have landowner access agreements. We could lose access to a group of sites and some sites receive BMP treatments without our knowledge.
2. Significant technological requirements to execute this project successfully.
    a. Much of the data collection utilizes custom made sampling technology that takes time to design, manufacture, test and maintain. New technology or new applications of existing technology can take time to optimize.

Assumptions

The following represents the key assumptions that represent the foundation of the implementation of this project:

1. The core members of the Project Team stay on the team throughout the majority of the project.
    a. If certain core members were unavailable, time could be lost in replacing them.
    b. Loss of certain expertise could limit or slow the ability to execute some portions of the study design.
2. The project will maintain access to the study site roads through the time of the study.
    a. Private land ownership or management changes could cause us to lose access to groups of study sites.
3. The study roads will continue to have log–haul traffic throughout the study period.
    a. Changes in road use could disrupt certain study treatments.
    b. A steep decline in the timber market could result in a cessation of haul on many roads, which could have a significant impact on results.
4. Funding for the project remains stable and sufficient.
    a. Inconsistent funding of key project functions could slow, or stop, the execution of the study.

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Decision-Making Authority

The TFW Adaptive Management Program strives for a consensus decision-making process. Decision-making authority described in this section needs to be consistent with CMER process and ground rules (Adaptive Management Board Manual, Section 22).

Decision Making Process

The Project Team, for the purpose of decision making for this project, is organized in two different aspects. The first is the science and/or technical decision making. With science and/or technical items, the decision making rests firmly with the PI and the Project Team. If needed, the decision making for scientific and/or technical items could be expanded to include CMER and in the case of finalized documents, ISPR and/or TFW Policy. Although the PM will assist in the facilitation of the discussion and decision making process, the PM will not be directly involved in decisions related to science and/or technical items.

The second aspect of decision making for this project team is around decisions made for contractual (scope of work, RFQQ, contract process, contractor interaction, etc.) and budgetary items. With contractual and/or budgetary items the decision making rests with the PM along with input from the Project Team. Requests for additional funding will be formally approved by the PM and Project Team and sent to CMER for formal approval. Minor budgetary or contractual items will be handled directly by the PM with notification provided to the Project Team. Major budgetary or contractual items will be decided in concert between the PM and the Project Team. If needed, decision making for budgetary items may require CMER and/or TFW Policy input and/or approval.

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. This project listed under the Roads Rule Group, Road Prescription-Scale Effectiveness Monitoring Program.

Project Resource Needs

Project resources are any infrastructure or specialized equipment that will be necessary to complete the project. The sheer scale and scope of this project, coupled with the relatively novel methodology, has provided for a robust list of project resources needed to execute and complete this project. The source for many of these resources was hard to determine as many of the items were "purpose built" for this project rather than simply purchased "off of the shelf". The following is a list of project resources and their subsequent quantities, source and utilization.

Project Resource	Quantity	Source	Utilization
Tipping Buckets	85~~78~~	Purpose Built	Overarching study
~~Motion Detection Counter~~Tip Counter Frame	78	Purpose Built	Overarching Study
Suspended Solids Tank	78	Off the Shelf	Overarching Study
Sediment Tubs	78	Off the Shelf	Overarching Study

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18” Cross Drain Culverts (30’ length)	200	Off the Shelf	Overarching Study
Steel Troughs	156	Off the Shelf	Overarching Study
Bump Stops	156	Purpose Built	Overarching Study
Hobo Pendants	78	Off the Shelf	Overarching Study
Traffic Counters	14	Off the Shelf	Overarching Study
Traffic Cameras	30	Off the Shelf	Overarching Study
Lockable Camera Housing	30	Off the Shelf	Overarching Study
Erosion Control Fabric	78	Off the Shelf	Overarching Study
Rain Gauges	11	Off the Shelf	Overarching Study
Public Works – Excavator (ditching, culvert, trough & site installation and maintenance)	Each Year	Unique Contract Per Occurrence	Overarching Study
Public Works – Dump Truck (Rock Haul (Road rock and site rock), Spoil end-haul)	Each Year	Unique Contract Per Occurrence	Overarching Study
Public Works – Spread Cat (Road rock spreading)	Each Year	Unique Contract Per Occurrence	Overarching Study
Grass Seed	100	Off the Shelf	Overarching Study
Dump Truck (Haul simulation)	1	Contract	Short-Time-Scale
Vacuum Collector	1	Off the Shelf	Short-Time-Scale
Sampling Frame	1	Off the Shelf	Short-Time-Scale
Point Gauges/Penetrometers	3	Off the Shelf	Short-Time-Scale
Turbidity Monitors	4	Off the Shelf	Short-Time-Scale and Ditch Line Hydraulics
Water Tanker (Min. 4000 Gallons)	1	Contract	Ditch Line Hydraulics
Flow Meter	1	Off the Shelf	Ditch Line Hydraulics
Salt Tracer Equipment (set)	1	Off the Shelf	Ditch Line Hydraulics
Lab time and equipment (University of Washington)	1	Off the Shelf	Sediment Trap Efficiency
Drone with topography Sensors	1	Off the Shelf	Micro-Topography

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Project Budget

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Budget/Cost Items	Past Expenditures (FY 16-19)	FY 2020 Budget	FY 2021 Budget	FY 2022 Budget	FY 2023 Budget	FY 2024 Budget	FY 2025 Budget	FY 2026 Budget	FY 2027 Budget	FY 2028 Budget
Inter-Agency Agreements (IAAs)	$ 471,269.2	$ 180,900.0	$ 175,380.0	$ 179,980.0	$ 179,980.0	$ 179,980.0	$ 179,980.0	$ 83,500.0	$ 30,000.0	$ -
USFS - Rocky Mountain Research Station	$ 75,675.0	$ 47,400.0	$ 35,400.0	$ 40,000.0	$ 40,000.0	$ 40,000.0	$ 40,000.0	$ 20,000.0	$ 15,000.0	$ -
University of Washington	$ 395,594.2	$ 123,500.0	$ 123,500.0	$ 123,500.0	$ 123,500.0	$ 123,500.0	$ 123,500.0	$ 63,500.0	$ 15,000.0	$ -
DOE - Manchester Environmental Lab	$ -	$ 10,000.0	$ 16,480.0	$ 16,480.0	$ 16,480.0	$ 16,480.0	$ 16,480.0	$ -	$ -	$ -
Service Contracts (PSCs)	$ 30,329.1	$ 186,061.0	$ 171,000.0	$ 259,000.0	$ 224,000.0	$ 224,000.0	$ 224,000.0	$ 117,000.0	$ -	$ -
West Fork Data Collection/Site Maintenance	$ -	$ 147,061.0	$ 146,000.0	$ 147,000.0	$ 147,000.0	$ 147,000.0	$ 147,000.0	$ 100,000.0	$ -	$ -
Bob Danehy Personal Service Contract	$ 30,329.1	$ 29,000.0	$ 5,000.0	$ 17,000.0	$ 17,000.0	$ 17,000.0	$ 17,000.0	$ 17,000.0	$ -	$ -
Parametrization and Misc. Actions	$ -	$ -	$ 10,000.0	$ 85,000.0	$ 50,000.0	$ 50,000.0	$ 50,000.0	$ -	$ -	$ -
Water Sample - Direct Buy	$ -	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ -	$ -	$ -
Public Works	$ 200,678.9	$ -	$ 60,000.0	$ 40,000.0	$ 100,000.0	$ 40,000.0	$ 40,000.0	$ 40,000.0	$ -	$ -
Lump Sum Projects	$ 200,678.9	$ -	$ 40,000.0	$ -	$ 60,000.0	$ -	$ -	$ 40,000.0	$ -	$ -
On-going Maintenance	$ -	$ -	$ 20,000.0	$ 40,000.0	$ 40,000.0	$ 40,000.0	$ 40,000.0	$ -	$ -	$ -
Supply and Expense (On-going)	$ 33,677.9	$ 18,110.4	$ 22,540.0	$ 23,000.0	$ 23,000.0	$ 23,000.0	$ 23,000.0	$ 10,000.0	$ -	$ -
DNR Supply Purchase & Motorpool	$ 16,621.6	$ 15,000.0	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ -	$ -
Storage Agreements	$ 950.0	$ 1,476.9	$ 2,040.0	$ 2,500.0	$ 2,500.0	$ 2,500.0	$ 2,500.0	$ -	$ -	$ -
Science Technician Supplies (Small Supplies, Tools)	$ 4,588.2	$ 500.0	$ 500.0	$ 500.0	$ 500.0	$ 500.0	$ 500.0	$ -	$ -	$ -
Site maintenance Supplies (Grass Seed, SD Cards, Batteries, Etc.)	$ 11,518.1	$ 1,133.5	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ 10,000.0	$ -	$ -	$ -
Supply and Expense (One-time)	$ 492,566.3	$ 17,132.6	$ -	$ 20,000.0	$ 20,000.0	$ 20,000.0	$ 20,000.0	$ -	$ -	$ -
Initial site services (Internal and External)	$ 28,130.4	$ 17,132.6	$ -	$ 5,000.0	$ 5,000.0	$ 5,000.0	$ 5,000.0	$ -	$ -	$ -
Data Collection devices/Equipment Manufacture/Equipment Purchase	$ 464,435.9	$ -	$ -	$ 15,000.0	$ 15,000.0	$ 15,000.0	$ 15,000.0	$ -	$ -	$ -
CMER/Policy Processes	$ -	$ -	$ -	$ -	$ -	$ 20,000.0	$ -	$ 40,500.0	$ 45,000.0	$ 25,000.0
Document Generation	$ -	$ -	$ -	$ -	$ -	$ 15,000.0	$ -	$ 30,000.0	$ -	$ -
Document Review/Editing (non-ISPR)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,500.0	$ 20,000.0	$ 10,000.0
ISPR	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,000.0	$ -
Project Presentations	$ -	$ -	$ -	$ -	$ -	$ 5,000.0	$ -	$ -	$ 5,000.0	$ 15,000.0
Summary Totals	**$1,228,521**	**$402,204**	**$428,920**	**$521,980**	**$546,980**	**$506,980**	**$486,980**	**$291,000**	**$75,000**	**$25,000**

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

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

Project Sites

The sites for this project were selected based on characteristics related to two distinct lithologies. The first lithology, the siltstone province, is one that has high proportions of fine particles and low levels of permeability as outlined within the ISPR and CMER approved Study Design. The siltstone province represents the coastal zone (Coast Range) of industrial timberlands spanning from Grays Harbor County in the northern extent of the study to Pacific County along the Columbia River in the southern extent of the study. The second lithology, the volcanic province, is on that has lower proportions of fine particles and higher levels of permeability as outlined within the ISPR and CMER approved Study Design. Specifically, the sites were established in cooperation with industrial timberland owners on high traffic mainlines in order to test the real world implications of applying BMP on sedimentation. The table below summarizes the number and location of sites within this study.

Province	Sub-Area	Number of Sites	County
Siltstone	Bishop (BISH)	11	Pacific
Siltstone	Delezenne (DELE)	5	Grays Harbor
Siltstone	Melbourne (MEL)	8	Grays Harbor
Siltstone	Naselle (NASE)	13	Pacific
Volcanic	East Kid Valley (KID)	17	Lewis
Volcanic	Toutle (TOUT)	12	Cowlitz
Volcanic	West Kid Valley (KID)	10	Lewis

Companion CMER Documents

The following is a list of the stand-alone CMER documents that currently exist or will be created to complete this project.

Document	Completion Date (Act.* or Est.)
Project Charter (Version 2)	February 25th, 2020*
Scoping Document	September 2nd, 2014*
BAS and Research Alternatives ("Road BMP Effectiveness Research Alternatives")	March 4th, 2016*
Study Design ("Empirical and Modeled Evaluation of Forest Road BMP Effectiveness in Western Washington")	February 28th, 2017*
Prospective 6 Questions – Study Design	February 22nd, 2018*
Project Management Plan (Including Communication Plan and Risk Management Plan)	June 23rd, 2020*
Interim Findings Report	~~August, 2023~~June, 2024
Final Report	~~March, 2028~~June, 2027
Final 6 Questions Document	~~June, 2028~~January, 2029

Communication Plan

Project Tracking and Guidance

The first point of contact for a project is the PM. Project Teams are expected to provide regular updates to the overseeing committee (CMER).

The PM is responsible for ensuring that all reporting tasks are complete and provided on schedule. When preparing progress reports, the PI is responsible for providing detailed and comprehensive costs, schedule, and project updates, in writing, to the PM consistent with prior written agreement. The PM, in turn, is responsible for summarizing project update information into progress reports, and presenting these progress reports to CMER per the project schedule or as requested by CMER. The PM may delegate preparation or presentation of progress reports to the PI or other Project Team members, with their consent.

The format of the communication between a Project Team and the oversight committee depends on which committee is involved, and the type of communication.

Type of Communication	**CMER**		**TFW Policy**	
Project Updates	Verbal/Written	Monthly	Written Report/ Presentation	As Needed
Progress Reports	Brief Written Report	Quarterly	Written Project Summary	Annually
CMER & TFW Policy Requests	CMER Request Form	As Needed	TFW Policy Request Form	As Needed
Decision	Meeting Minutes	As Needed	TFW Policy Response Form	As Needed

Project Updates

Project updates are provided to CMER per the schedule or as requested. Updates are verbal descriptions of the project's current status and include information on project tasks, milestones (e.g., site selection, data collection, report writing). If an update to CMER results in a substantive change to a project, the PM will maintain written documentation of the change. What constitute a substantive change will be determined on a case-case basis depending on specific project issues, and is determined by the Project Team.

Occasions may also exist when the PM or PI will be asked to provide an update on the project to TFW Policy beyond the regular CMER project updates.

The PM may delegate to the other PMs, CMER co-chairs, or AMPA the presentation of any update, with their consent.

Progress Reports

Project progress reports are brief quarterly and annual written reports on the progress of the project. The reports should describe progress on project tasks, milestones, and timelines, and the status of the current budget. Reports should be distributed to CMER when the meeting agenda is distributed. Any problems or

deviations from predicted timelines that arise during periods between progress reports should be included in the progress reports.

CMER Requests

CMER requests are written documents from the Project Team that, with PM support, formally seek project approvals, changes to prior agreed upon study elements, guidance and/or resources. The PM is responsible for preparing CMER requests, though depending on the nature of the request, may delegate this task to the PI, or Project Team, with prior agreement. For requests that ask for guidance on project direction, changes in scope, priorities, or any other substantive issue, the PM needs to consult with the Project Team when drafting the request. For CMER requests that are procedural in nature, such as asking for CMER review of a specific document, the PM will inform the Project Team when drafting the request prior to forwarding the request to CMER.

CMER requests are frequently accompanied by additional documents, such as a report that is to be reviewed/approved, or a short memo that describes in detail the issue surrounding the CMER request. Any attachments that accompany a CMER request will be distributed and approved by the project team before forwarding to CMER. Depending on the nature of the issue/request, either the PM or PI can be lead author on the memo, though ultimately it is the responsibility of the PM to ensure these memos are ready for distribution to CMER at the appropriate time (i.e. with the CMER mail-out).

CMER requests may also take the form of project issues/questions' that are brief summaries of issues or questions that the Project Team would like to discuss with the oversight committee as it relates to completing project tasks or milestones. This can include any problems or circumstances that may result in changes in project scope, budget or integrity (quality). The CMER request in this situation should be in the form of a short memo. Specific questions the Project Team would like answered should be listed with enough information so the members of the oversight committee(s) will have a basic understanding of the context within which the questions are being asked.

TFW Policy Requests

TFW Policy requests are written requests submitted by CMER seeking approval of a document (e.g., Project Charter, the scoping documents, final reports, project budgets); or asking for clarification or guidance on specific issues identified by the Project Team or CMER. The AMPA facilitates communication between CMER and TFW Policy, and depending on the nature of the request can delegate preparation/presentation of the request/update to either the PM, PI or other CMER member/Project Team member with prior agreement.

The AMPA works with members of the Project Team and CMER to draft the request in a way that clearly and concisely communicates the issues, purpose, and/or decision identified in the submittal. Often a TFW Policy request includes a presentation to TFW Policy about the CMER document, report or issue, which can be given by the PM, PI, or the AMPA, depending on the nature of the request. When a TFW Policy request originates from a Project Team, the PM consults with the AMPA and submits it to CMER for approval before forwarding to TFW Policy.

Contractor Communication

In all cases, the PM is primarily responsible for facilitating open and transparent communication between contractor(s) and Oversight Committee members. Committee members should generally not directly communicate with the contractor(s) about substantive project elements outside of formally organized meetings, conference calls or PM-facilitated group e-mail discussions unless specifically authorized in pre-

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established contract terms, or approved in advance to do so by the PM. The PM may verbally grant authorization, and the rest of the Project Team and Oversight Committee should be informed when this occurs. The PM is responsible for informing the contractor(s) of this policy as well.

Intra-Project Team Communications

The following section outlines expectations for open and effective communication among the team members. It is intended to guide communication, not restrict it. The expectation is that team members, including PMs and PIs, who communicate outside of normal project meetings, conference calls, and other venues will share substantive conversations they have with the rest of the team.

Project Manager

The PM provides assistance to Project Team members by coordinating communication (e.g. one-on-one and group meetings, conference calls, etc.) when needed as well as maintaining the e-mail distribution list for the Project Team. The PM also ensures that any communication resulting in a formal decision about the project occurs in a transparent and inclusive way.

In all cases, the PM is responsible for communicating any changes to a contractor's scope of work – other project Team members are not authorized to provide such guidance. Conversations affecting the scope of a contractor's work on a project, or a substantive change in project objectives or tasks, need to include the entire Project Team.

The PM is responsible for keeping track of the project status. To this end, the PM works with the Project Team members to develop a status and progress reporting schedule. These reports will be written memos prepared by the PM and presented at scheduled Project Team meetings/conference calls. Draft copies of the memos will be sent out to Project Team members via e-mail prior to the meeting. Status and progress reports should include information on the status of project, tasks, milestones (e.g., site selection, data collection, report writing), and budget as well as any issues that require Project Team input. With prior agreement, the PM may delegate preparation or presentation of the project status and progress reports to the PI or another Project Team member. These memos may also then be used later as updates and project status reports to CMER, as appropriate.

Principal Investigator

The PI is responsible for preparing and writing technical reports for CMER. How the PI communicates and works with other Project Team members to produce these documents will vary based on the nature of the project and dynamics of the Project Team. The PI works together with the PM to coordinate communication with other team members as described in the above section concerning the PM role in Intra-Team Communication.

The PI is responsible for communicating to the PM concerns or issues that may come up throughout project implementation.

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Technical Document	Primary Author	Co-Authors	Review/Approval[1]	Primary Audience
Stand-Alone Literature Review	PI	Project Team	CMER	CMER
Scoping Document	PI	Project Team	CMER, TFW Policy	CMER, TFW Policy
Study Design Plan	PI	Project Team	CMER	CMER
Site Selection and Data Collection Protocols	PI	Project Team	--	CMER
Draft and Interim Reports	PI	Project Team	CMER	CMER
Final Project Reports	PI	Project Team	CMER	CMER, TFW Policy

[1] *Committees which review and approves the document.*

Other Team Members

Communication by individual team members includes participation at meetings and conference calls, providing feedback on draft documents, researching specific topics/issues, taking the lead on writing report sections, and/or acting as co-author(s) on documents. The PM will document expectations on individual team member roles, responsibilities, tasks, deliverables, and levels of participation in the Communication Plan. Other Project Team members may engage in 'off-line' communications about the project with other Project Team members and/or adaptive management participants. In the spirit of transparency, team members will share the elements of any substantive, project-related conversation with the Project Team.

Project Findings

Once a final report has gone through ISPR and has final approval by CMER, the PM and PI prepare the 'six questions' document in collaboration with the overseeing committee, that is ultimately delivered to TFW Policy. The PI is responsible for ensuring the scientific findings communicated in the "six questions" document are accurate. The AMPA is responsible for writing the cover letter accompanying the "six questions."

"Six Questions"

1. *Does the study inform a rule, numeric target, performance target, or resource objective?*
2. *Does the study inform the Forest Practices Rules, the Forest Practices Board Manual guidelines, or Schedules L-1 or L-2?*
3. *Was the study carried out pursuant to CMER scientific protocols (i.e., study design, peer review)?*
4. *What does the study tell us? What does the study not tell us?*
5. *What is the relationship between this study and any others that may be planned, underway, or recently completed?*
6. *What is the scientific basis that underlies the rule, numeric target, performance target, or resource objective that the study informs? How much of an incremental gain in understanding do the study results represent?*

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Findings Report	Primary Author	Co-Authors	Final Approval	Primary Audience
Answers to "six questions"	PIs	Project Team/ PM	CMER	TFW Policy
Findings Report cover letter	AMPA	--	--	TFW Policy
Final CMER-approved report	PIs	Project Team	CMER	TFW Policy

Other Communication

Presentations

For presentation of study findings at science conferences, etc. the PM and PI will work with the Project Team to identify the appropriate presenter based on the nature of the presentation. Any public presentation of the study will explicitly acknowledge CMER and AMP contributions. The Project Team will be part of the preparation/review of project presentations. Any presentation that uses adaptive management funding should explicitly acknowledge CMER and AMP contributions.

Risk Management Plan

The Risk Management plan ensures positive risks are maximized, and negative risks are minimized. Risk procedures and evaluation provide a consistent method to identify, assign, analyze, and mitigate risks. Risks will be tracked on a log and periodically reported to the sponsor.

Risk Procedures

The procedure to handle risks that have the potential to alter the baseline schedule, budget, scope, and objectives is listed below:

1. Risks are identified and evaluated at project team meetings.
2. Each risk evaluated as moderate or high will be assessed by team members for risk probability and impact.
3. Each risk will be assigned to an individual that is responsible for mitigating the risk and following-up. The assignee will report back to the project manager with regular status updates.
4. This is a continuous process where new risks are identified and existing risks are re-evaluated.
5. Risks rated as high will be reported to executive management so they are aware of the risk and can make recommendations in risk mitigation.

Estimating Risk Exposure

Risk Probability

- Low (0.1) – Unlikely to occur. Based on current information, the circumstances likely to trigger the risk condition are unlikely to occur.
- Moderate (0.5) – Likely to occur. Based on current information, the circumstances likely to trigger the conditions is unclear that risk will or will not occur.
- High (0.9) – Very likely to occur, Based on current information, the circumstances likely to trigger the condition is likely to occur.

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Risk Impact

- Low (1) – Minor impact on the project, e.g. Less than 5% deviation in the scheduled end-date or project budget is anticipated.
- Moderate (3) – Moderate impact on the project, 6% – 10 % deviation in the scheduled end-date or project budget is anticipated.
- High (5) – High impact on the project, 11% or greater deviation in the scheduled end-date or project budget is anticipated.

Calculating Schedule and Budget Impact

- The schedule impact is calculated by dividing the estimated number of days needed for the change by the total estimated number of project days.
- The budget impact is calculated by dividing the estimated budget needed for the change by the total estimated project budget.

Calculating Risk Exposure

- Risk exposure equals the probability times the impact.
- The formula: exposure = (probability * impact)

Score	Rating
2.5 to 4.5	High
1.5 to 2.5	Medium
0.1 to 1.5	Low

References

Cooperative Monitoring Evaluation and Research (CMER) Committee. (~~January 2019~~April 2021), ~~2019~~2021-202~~1~~3 Biennium Work Plan. https://www.dnr.wa.gov/publications/bc_fpb_cmerworkplan_20210512.pdf~~https://www.dnr.wa.gov/publications/fp_cmer_2019_2021_workplan_20190119.pdf?o9uq19w~~.

Protocols and Standards Manuael (PSM). (2020~~2017~~). ~~,~~ https://www.dnr.wa.gov/publications/fp_cmer_psm_version_20201210.pdf~~CMER Review5 06_19_2017 Final Draft, Chapter 7, Section 4.~~

~~Protocols and Standards Manuel (PSM). (2017), CMER Review5 06_19_2017 Final Draft, Chapter 7, Section 6.3.~~

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