

**Questions Leading to a Forests & Fish Policy
Adaptive Management Update to the Forest Practices Board**

Project Title: **Road Prescription-Scale Effectiveness Monitoring Project (Lean Pilot)**
Study Design Title: **Empirical and Modeled Evaluation of Forest Road BMP Effectiveness in Western Washington**

1. Does the study inform a rule, numeric target, performance target, or resource objective?

As stated in the work plan, the objectives of monitoring forest roads at the prescription scale are to: (1) evaluate the effectiveness of road maintenance categories in meeting road performance targets; and (2) identify sensitive situations where prescriptions are not effective. This project will address surface erosion sediment reductions from site-specific measures. We anticipate that the results of this study will inform the forest practices adaptive management process about the effectiveness of road rules and BMP in achieving the FP HCP goals. Ultimately, results of this study will allow us to more accurately quantify road erosion for comparison with the performance targets.

2. Does the study inform the Forest Practices Rules, the Forest Practices Board Manual guidelines, or Schedules L-1 or L-2?

This study will inform the following Schedule L-2 questions:

1. *“Develop road sediment targets and determine the effectiveness of road maintenance BMPs on a site-scale in meeting those targets.”* (Note: This study will quantify BMP effectiveness under the best possible maintenance conditions which potentially creates targets by identifying what is possible.)
2. *“Determine the effectiveness of road maintenance BMPs on a site-scale and sub-basin scale in meeting road sediment targets.”* (Note: This study addresses BMP effectiveness at the *site-scale*, but not the *sub-basin-scale*.)
3. *“Test the effectiveness of the roads program at disconnecting road drainage from the stream network.”*

The results of this study, potentially coupled with the second sample of the Road Sub-Basin Scale Effectiveness Monitoring (RSBM) Project, may cause T/F/W Policy and the Forest Practices Board to revisit the rules and board manual to refine the requirements and application of road BMP.

3. Was the study carried out pursuant to CMER scientific protocols (i.e., study design, peer review)?

The CMER Work Plan identified this project as a Lean pilot. A TWIG was identified in April of 2014. The TWIG has produced: 1) A scoping document consisting of the Problem Statement, Objectives and Critical Questions - CMER approval 8/26/2014 and Policy approval 9/5/2014; 2) A Best Available Science and Alternatives Document - CMER approval 1/26/2016 and Policy approval 3/4/2016; and 3) A study design titled “Empirical and Modeled Evaluation of Forest

Road BMP Effectiveness in Western Washington” - CMER approval to send study design to ISPR 2/28/2017, ISPR approval 1/17/2018, final CMER approval anticipated on 2/27/2018 with this 6-questions document.

The development of the study design followed all LEAN protocols, including TWIG, CMER and Independent Science Panel reviews & revision.

4. What does the study tell us? What does the study not tell us?

This study is designed to help inform the following 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 affect 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?

The approach will collect extensive focused field data while simultaneously developing a process-based model, which will later be refined based on the empirical data. This experimental design will determine how individual and combinations of BMP affect sediment supply, sediment transport, and road runoff across a range of environmental conditions. The statistical analysis of the modeled and experimental data will produce relationships that can be implemented using road erosion models to aid decision making on the selection of BMPs across a range of environmental conditions and BMP combinations. This project will provide landowners, managers, and regulatory agencies with better information to more cost effectively address delivering road segments.

5. What is the relationship between this study and any others that may be planned, underway, or recently completed?

Project Name	Project Status	Anticipated knowledge to be gained	How this project informs it
Road Surface Erosion Model Validation Project	In CMER Work Plan, not yet scoped	Refined model to better predict sediment generation	This project will provide critical data needed to improve confidence in sediment production and delivery values; it may provide direct modeling improvements to WARSEM without additional effort
Road Sub-Basin Scale Effectiveness Monitoring Project	WARSEM Model (2004); First Sample (2010); Second Sample scheduled for (2023)	Evaluates whether forest roads meet the Numeric Targets for hydrologic connectivity and sediment delivery to streams; multiple (two or more) samples to see trend	Model improvements as well as better understanding and parameterization of road BMP and hydrologic/traffic effects will lead to more accurate estimates during the second sample
Intensive Watershed Monitoring	In CMER Work Plan, not yet scoped	Biologically based performance targets for sediment and connectivity	Model improvements will lead to more accurate estimates so that when we understand how road sediment affects biota, we will more accurately understand our impacts and be better able to adjust rules/guidance to reduce those impacts

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?

Performance Targets were developed using field data from Watershed Analyses and similar road studies. The first sample of the RSBM Project indicated a wider range in road conditions than anticipated, and revealed that individual “sub-basins” significantly exceeded performance targets. This study specifically targets: 1) Gaps in our knowledge about how roads are functioning in the contexts of lithology and hydrology; 2) Gaps in our knowledge about the effectiveness of commonly used individual BMP and about how multiple BMP interact; and 3) Those high traffic, near stream (HTNS - read “stream adjacent mainline”) roads that are responsible for a critical piece of the variability observed during RSBM.