ISAG

Project Name and Background	Potential Habitat Breaks (PHBs) At the November 13, 2019 Forest Practices Board (Board) meeting the following motion was passed: *"Recommend the Cooperative Monitoring, Evaluation and Research Committee (CMER) to develop study designs for the PHB validation, physical characteristics, and map based Lidar model studies. Design the studies for cost savings, including the phasing of the studies with eastern Washington to be initiated first, and the possibility and advisability of combining the PHB validation, physical characteristics and map based Lidar model studies, and then to report on the study designs to the Board by their May, 2020 meeting."* In December 2019, CMER voted that ISAG would be the lead in responding to the Board motion (above) and develop an overall CMER based Water Typing Strategy, of which the PHB study is a part.
Project Elements	Fish distribution, potential fish habitat, in-stream channel conditions, PHBs, obstacles to upstream fish migration, water typing, Fish Habitat Assessment Methodology (FHAM)
Critical Question Addressed	**Rule Group Critical Questions** How can the line demarcating fish- and non-fish habitat waters be accurately identified? To what extent does the current water typing survey window account for seasonal and annual variability in fish distribution considering potential geographic differences? How do different fish species use seasonal habitats (timing, frequency, duration)? How does the upstream extent of fish use at individual sites vary seasonally and annually? How does the delineation of the upstream extent of fish habitat change seasonally? **Project Critical Questions** UPSTREAM-MOST FISH LOCATIONS 1. How do the locations of the last (uppermost) detected fish vary interannually? 2. How do the locations of the last (uppermost) detected fish vary seasonally? 3. How do the locations of last (uppermost) detected fish vary geographically across the state of Washington? HABITAT ASSOCIATED WITH UPSTREAM-MOST FISH LOCATIONS 4. How do the physical channel and basin characteristics (e.g., bankfull width; average gradient, basin size) associated with the identified end (upstream extent) of fish habitat vary geographically across the state of Washington? 5. Where the location of the last (uppermost) detected fish changes (seasonally or interannually), how does that influence which PHB would be associated with the F/N break and how frequently does that occur? 6. How do the physical channel features at the locations initially identified as PHBs change over the course of the study? 7. How often do similar features appear to limit upstream fish distributions in some contexts but not others (e.g., further into the headwaters vs. downstream; different flow levels)? PHB PERFORMANCE ANALYSES 8. Which combinations of physical channel features and basin characteristics (for example, gradient, channel width, barriers to migration) best identify the end of fish habitat relative to the location of the last (uppermost) detected fish?

	9. Can protocols used to describe PHBs be consistently applied among survey crews and be expected to provide similar results in practice? 10. How well do the PHB criteria provided by the Washington Forest Practices Board accurately identify the EOF habitat when applied in the Fish Habitat Assessment Methodology (FHAM)?
Responsible SAG and Project Manager	SAG: ISAG Project Manager: Anna Toledo
Principal Investigator(s) and Project Team Members	Principal Investigator(s): TBD Project Team: Jason Walter (Weyerhaeuser Co./ISAG Co-Chair), Jenelle Black (CMER Science staff), Doug Martin (Martin Environmental/WFPA), Chris Mendoza (Conservation Caucus), and John Heimburg (WDFW). Former members include: Cody Thomas (Spokane Tribe of Indians/ISAG Co-Chair), Don Nauer (WDFW). Emma Greenwood (Spokane Tribe of Indians) and Mark Meleason (County Caucus) added as Project Team members for implementation phase.
Status/Phase	The ISPR-approved PHB Study Design was approved by CMER in May 2023. The updated Project Charter was approved by CMER in July 2023 and by TFW Policy in September 2023. The Prospective 6 Questions document was approved by CMER in October 2023 and delivered to TFW Policy in November 2023. The Project Team has initiated site selection.
Expenditures	Expenditures through FY23: $470,820
Project Timeline	FY22-FY23: ISAG and CMER approval of study design, begin ISPR. FY23: Complete ISPR of study design. FY24: Develop Project Management Plan and begin site selection. FY25: Finish site selection and begin data collection. FY26-FY28: Data collection and analysis. FY28-FY29: Final report writing, review, and approval.
Complementary Projects and Project Sequencing	The CMER Water Typing Strategy will include (individually or in combination) the following elements: Potential Habitat Breaks (PHBs) Default Physical Criteria Assessment (DPC) LiDAR Based Water Typing Model 1. Fish/Habitat Detection Using eDNA ISAG will consider whether, and if so how, to combine these elements (as directed by the Board), and to consider if/how additional elements may be added to the list. See Water Typing Strategy for additional details. From AMPA memo to Forest Practices Board (October 20, 2023): "CMER [will] prepare technical summary for TFW Policy consideration that clarifies how the AFF validation study would best fit as a companion or add-on study to the existing Potential Habitat Breaks (PHB) study, including the recommended timeline for scoping and implementation to inform effective and efficient sequencing."

Project Summary and Purpose

The purpose of this study is to develop criteria for accurately identifying PHBs and to evaluate the utility of PHB criteria for use in the Fish Habitat Assessment Methodology (FHAM) as part of a water typing rule. The study is designed to assess which combinations of gradient, channel width, barriers to migration, and other physical habitat and geomorphic conditions are associated with uppermost detected fish locations. This will 1) inform which Board-identified PHB criteria most accurately identify the upstream extent of fish habitat in an objective and repeatable manner as applied in the FHAM and 2) evaluate whether an alternative set or combination of empirically derived criteria more accurately achieves this goal (CMER 2020). Additionally, this study is intended to provide insight into how uppermost detected fish points, upstream extent of fish habitat based on FHAM, and PHBs

proposed by the Washington Forest Practice Board may vary across geography, seasons, and years. The Board is expected to use the study findings to inform which PHB criteria to use in FHAM.

Project Objectives

Test the proposed PHB criteria and evaluate if those criteria or some other criteria will allow for the identification of potential habitat breaks for use in water typing to accurately and consistently identify the upstream extent of fish habitat when determining the F/N break using the FHAM that is currently in development.

Determine which combinations of gradient, channel width, barriers to migration, and other physical habitat and geomorphic conditions of the Board identified PHB criteria best identify the upstream extent of fish habitat (WAC 222-16-010) in an objective and repeatable manner as applied in the FHAM.

Provide insight into how identification of uppermost detected fish locations (EOF), end of fish habitat (EOFH), and PHBs being considered by the Board as part of DNR's permanent water typing rule may vary across ecoregions, seasons, and years.

Identify potential alternative PHB criteria that can be used to delineate EOF habitat in forested streams across Washington; and

Better understand how PHBs may be influenced by seasonal and annual variability, and by location within Washington.

Budget*

	PHB	DPC**
FY24	$185,600	TBD
FY25	$1,134,600	TBD
FY26	$1,097,100	TBD
FY27	$1,118,300	TBD
FY28	$342,400	TBD
FY29	$65,700	TBD
Project Total	**$3,943,700**	TBD

* May 10, 2023 Board-approved budget for Water Typing Strategy which includes PHB and DPC. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.

**Some values under PHB include preliminary field work and data acquisition for sites that will be used in both the PHBs and DPC studies. Additional budget will be required for data analysis. Also, pending analysis of first year sample data, budget may be required for acquisition of additional sites for DPC.

Project Name and Background

Default Physical Criteria (DPC)

At the November 13, 2019 Forest Practices Board (Board) meeting the following motion was passed:

"Recommend the Cooperative Monitoring, Evaluation and Research Committee (CMER) to develop study designs for the PHB validation, physical characteristics, and map based Lidar model studies. Design the studies for cost savings, including the phasing of the studies with eastern Washington to be initiated first, and the possibility and advisability of combining the PHB validation, physical characteristics and map based Lidar model studies, and then to report on the study designs to the Board by their May, 2020 meeting."

In December 2019, CMER voted that ISAG would be the lead in responding to the Board motion (above) and develop an overall CMER based Water Typing

	Strategy, of which the DPC study is a part.
Project Elements	Fish distribution, potential fish habitat, in-stream channel conditions, DPC, obstacles to upstream fish migration, water typing, Fish Habitat Assessment Methodology (FHAM)
Work Plan Critical Question Addressed	**Rule Group Critical Questions** To what extent do current default physical criteria for Type-F waters, considering potential geographic differences, accurately identify the upstream extent of (detected) fish presence (all species) and/or fish habitat? Can alternative (to current) default physical criteria for Type-F waters, considering potential geographic differences, be identified that would more accurately and consistently identify the upstream extent of (detected) fish presence (all species) and/or fish habitat? Are there sustained gradient or stream size thresholds alone that serve as default physical criteria?
Responsible SAG and Project Manager	SAG: ISAG Project Manager: Anna Toledo
Principal Investigator(s) and Project Team Members	Principal Investigator(s): TBD Project Team**:** Jason Walter (Weyerhaeuser Co./ISAG Co-Chair), Jenelle Black (CMER Science staff), Doug Martin (Martin Environmental/WFPA), Chris Mendoza (Conservation Caucus), John Heimburg (WDFW), Mark Meleason (County Caucus), and Emma Greenwood (Spokane Tribe of Indians)
Status/Phase	The DPC project team is currently working on the DPC study design, which is expected to be delivered to CMER to initiate concurrent CMER/ISAG review in early 2024.
Expenditures	Expenditures through FY23: $127,809 (Approximately $115,000 of this total is from FY17-FY19)
Project Timeline	FY22-FY24: Study design development, review, and approval. FY24: Develop Project Management Plan and begin site selection. FY25: Finish site selection and begin data collection. FY26-FY28: Data collection and analysis. FY28-FY29: Final report writing, review, and approval.
Complementary Projects and Project Sequencing	The CMER Water Typing Strategy will include (individually or in combination) the following elements: Potential Habitat Breaks (PHBs) Default Physical Criteria Assessment (DPC) LiDAR Based Water Typing Model 1. Fish/Habitat Detection Using eDNA ISAG will consider whether, and if so how, to combine these elements (as directed by the Board), and to consider if/how additional elements may be added to the list. See Water Typing Strategy for additional details. From AMPA memo to Forest Practices Board (October 20, 2023): "CMER [will] prepare technical summary for TFW Policy consideration that clarifies how the AFF validation study would best fit as a companion or add-on study to the existing Potential Habitat Breaks (PHB) study, including the recommended timeline for scoping and implementation to inform effective and efficient sequencing."
Project Summary and Purpose	
The purpose of the DPC study is to assess the current (WAC 222-16-031(3)(b)(i)) and alternative default physical characteristics used to define DNR stream types as Type 'F' or 'N' in situations where	

fish use is not determined using Board approved protocol electrofishing survey (PES) methods. Research will focus on the need to (1) compare and quantify how the current DPC correspond to the uppermost point of fish presence and potential fish habitat; (2) determine the stream physical characteristics of habitat likely to be used by fish, and (3) determine if sustained gradient or stream size thresholds alone could serve as default physical criteria

Project Objectives

Compare and quantify how the current default physical criteria correspond to the uppermost point of fish presence and potential fish habitat.

Determine the physical characteristics of fish habitat in streams.

Determine if sustained gradient or stream size thresholds alone could serve as sufficient default physical criteria.

Budget*

	PHB	DPC**
FY24	$185,600	TBD
FY25	$1,134,600	TBD
FY26	$1,097,100	TBD
FY27	$1,118,300	TBD
FY28	$342,400	TBD
FY29	$65,700	TBD
Project Total	**$3,943,700**	TBD

* May 10, 2023 Board-approved budget for Water Typing Strategy which includes PHB and DPC. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.

**Some values under PHB include preliminary field work and data acquisition for sites that will be used in both the PHBs and DPC studies. Additional budget will be required for data analysis. Also, pending analysis of first year sample data, budget may be required for acquisition of additional sites for DPC.

LWAG

Project Name	Type N Experimental Buffer Treatment Project in Hard Rock Lithologies Amphibian Monitoring Phase III
Work Plan Rule Group Critical Questions Addressed	**Continued monitoring of Hard Rock Study sites for the amphibian response will address the following critical questions:** How do two other buffers compare with the forest practices Type N prescriptions in meeting resource objectives? Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FPHCP resource objectives and performance targets for *shade, stream temperature, LWD recruitment, litter fall, and* amphibians? (only amphibian response is evaluated in this work – Phase III) How do stream-associated amphibian populations respond to the Type N prescriptions over time? Is stream-associated amphibian population viability maintained by the Type N prescriptions?
Project Elements	Addresses the effectiveness of FPHCP riparian buffer prescription for FP designated amphibians in Type N Waters in western Washington, including a comparison of the current rule to buffer alternatives that provide more and less protection within the RMZ, and unharvested reference sites.
Responsible SAG and Project Manager	SAG: LWAG Project Manager: Jenny Schofield

Principal Investigator and Project Team	Principal Investigator: Aimee McIntyre Project Team: A.J. Kroll, Reed Ojala-Barbour
Status/Phase	Phase I report covering 2006-2011 was approved in 2018. Phase II (extended) report covering 2006-2017 was approved by CMER on July 27, 2021, was presented to TFW Policy on 6 January 2022, and presented to the FP Board on 10 August 2022. The Phase III monitoring, focused on stream-associated amphibian abundance, is in implementation.
Project Timeline	Amphibian demographic sampling began in FY22 and continued into FY23. The timing of resample is consistent with sampling every 7-8 years, as has been done previously. Data analysis and report writing for the continued effectiveness-monitoring phase will extend through FY25. Note that the current timeline assumes that the time required for CMER and ISPR review and revision don't exceed the current projected timeline through FY25.
Expenditures to Date	FY23 (Phase III of Hard Rock): $304,500 2006-FY22: $8,581,460 (from Phase I and Phase II of Hard Rock)
Complementary Projects and Project Sequencing	Stream-Associated Amphibian (SAA) Detection/Relative Abundance Methodology Project (completed), Amphibian Recovery Project (completed), Buffer Integrity – Shade Effectiveness (Amphibians) Project (completed), Van Dyke's Salamander Project (on hold but planned), Amphibians in Intermittent Streams Project (in scoping), Eastside Amphibians Evaluation Project (proposed).

Project Summary and Purpose

Responses Evaluated: stream-associated amphibian demographics.

Study Sites: Seventeen (17) Type N, first-, second- and third-order stream basins located in western Washington. These are the same Hard Rock sites that were included in Phase I and Phase II of the Type N Hard Rock studies.

Treatments: (1) unharvested reference; (2) current FP buffer for Type N streams (e.g., riparian buffer throughout ≥50% of the Type N RMZ); (3) 50 foot riparian buffer on the entire Type N stream; (4) no buffer.

Project Objectives

This Effectiveness Study evaluated the effectiveness of the FPHCP riparian buffer prescription for westside Type N streams. The study compared the current rule to buffer alternatives that provide more and less protection within the RMZ, and unharvested reference sites. Effectiveness was evaluated in terms of whether Forest Practices rules for Type N Waters produce forest conditions that achieve agreed upon Resource Objectives. Reports for Phase I and Phase II of the study were approved in 2018 and 2021, respectively. The study directly informed two of the four FFR goals, including (1) to support the long-term viability of stream-associated amphibians and (2) to meet or exceed water quality standards.

Preliminary results from Phase II suggested declines (65%-93%) in larval Coastal Tailed Frog densities in study sites 7- and 8-years post-harvest that were not apparent in the two years post-harvest (i.e., Phase I). There was also a delayed negative response detected for torrent salamanders in the FP treatment. Observed declines in amphibian densities were greatest in the FP treatment. One of the focal goals of the Forest Practices Rules is to provide compliance with ESA for aquatic and riparian-dependent species, including Forests and Fish-designated stream-associated amphibians, and the Forests and Fish Agreement was intended to protect amphibians in headwater streams. Additionally, the current known distribution of Coastal Tailed Frog is not uniform across the landscape; present in some streams but absent in other nearby streams. As a result, we may not be able to rely consistently on repopulation from nearby sources.

In response to study results from Phase II, additional data is being collected for stream-associated amphibians and other relevant covariate data (e.g., stream temperature) to evaluate continued trends in amphibian densities in a Phase III effort. This effort will inform the question: Do amphibian densities at long-term study sites stabilize, continue to decline, or recover over time? Continued monitoring is consistent with the study design to evaluate effectiveness through time. Sampling in post-harvest years 14 and 15 will help us evaluate

longer-term tailed frog and torrent salamander trends and densities through 40% of a 40 year harvest rotation.

MPS Budget*

FY22	FY23	FY24	FY25	Total
	$304,500	$308,142	$90,458	$845,900

*May 10, 2023 Board-approved budget. Funding approved for FY23-FY24. Budget for FY25 is an estimate.

Project Name	Water Temperature and Amphibian Use in Type Np Waters with Discontinuous Surface Flow (CWA Project)
Work Plan Critical Questions Addressed	What is the effect of buffering or not buffering spatially intermittent stream reaches in Type Np streams? (Type N Riparian Prescriptions Rule Group and Type N Riparian Effectiveness Program – Westside Critical Questions) How do stream-associated amphibians (SAAs) utilize intermittent stream reaches near the origins of Type N (headwater) streams? (Type N Amphibian Response Program Critical Question)
Project Elements	Characteristics of perennial streams with intermittent flow (i.e., Type Np stream segments with discontinuous perennial flow), including spatial and temporal patterns of flow, and how these patterns influence stream temperature in downstream non-intermittent reaches across the landscape. Stream-associated amphibian use of perennial streams with intermittent flow.
Responsible SAG and Project Manager	SAG: LWAG Project Manager: Jenny Schofield
Principal Investigator and Project Team	Principal Investigator: Aimee McIntyre Project Team Members: A.J. Kroll, Reed Ojala-Barbour, Mark Meleason, Welles Bretherton
Status	In summer 2020, a Project Team was formed for this project and work began on updating the BAS synthesis. Work on drafting the Scoping Document began in early 2021. SAG priorities were focused on finalizing Type N Hard Rock products and the scoping is still in progress. Additionally, AMP staffing shortages resulted in delays to the development and approval of the project Charter, which impacted the ability of the contractor to begin work according to the original timeline. The project team is currently developing the BAS from existing studies and the scoping document. These are expected to be to CMER in May2024.

Project Timeline	September 2021: Charter was approved. May 2024: Anticipated delivery of Scoping Document to CMER for review. FY25: Anticipated delivery of Study Design to CMER for Review
Expenditures to Date	FY19-21: $21,023
Complementary Projects and Project Sequencing	Westside Type N Experimental Buffer Treatment Project in Hard Rock Lithologies, Westside Type N Experimental Buffer Treatment Project in Soft Rock Lithologies, SAA Sensitive Sites Identification Methods, SAA Detection/Relative Abundance Methodology, Dunn's Salamander, Buffer Integrity-Shade Effectiveness, Amphibian Recovery, Riparian Characteristics and Shade Response Study, Extensive Riparian Status and Trends Monitoring Program – Stream Temperature Phase I: Westside Type F/S and Type Np Monitoring Project

Project Summary and Purpose

This study will inform the Overall Performance Goals to meet water quality standards and support the long-term viability of covered species by evaluating the influence of intermittent stream reaches on water temperature and FP-designated amphibian use. A previous CMER-funded study (Hunter et al. 2005) found that intermittent stream reaches frequently occur near the origin of headwater streams (i.e., PIP), and that they exhibit one of two spatial patterns of surface flow (i.e., a single dry reach located adjacent to the PIP, or flowing sections interspersed with dry sections). This study will expand on previous findings by evaluating the influence of intermittent reaches on stream temperature and amphibian use, as well as identifying how spatial and temporal patterns of intermittency may differentially impact temperature and amphibian use. A project concept was developed by the Type N Amphibian Response Program, LWAG and CMER in 2007. At that same time, an exploratory data review from an existing CMER-supported study (see Quinn et al. 2007) was conducted. The review provided limited information. Consequently, LWAG proposed waiting until the Type N Hard Rock project was complete to determine how that study could inform critical questions and project need/development. Though the Hard Rock Study focused primarily on 2nd order streams, it included an evaluation the entire length of the stream network from the F/N break and upstream to the uppermost point of perennial flow (i.e., perennial initiation point or PIP), including all Type Np reaches with discontinuous surface flow. Because of the pending completion of the Type N Hard and Soft Rock studies, and the desire to understand the relationship between intermittent stream reaches, stream temperature and FP-covered amphibians, LWAG proposes to continue work on this project.

LWAG proposes data summary and study development in 2 steps:

Scoping Document: Summarize findings from peer-reviewed literature and Type N-related CMER and other studies (including the Type N Hard and Soft Rock Projects) to provide an updated summary and best available science for future study context and development. Findings will be included in a scoping document to CMER and Policy.

Study Design: CMER and Policy can use the completed Scoping Document to assess the value of a field study. If interest exists, a Study Design would be developed. LWAG anticipates that a study specific to intermittent perennial reaches across the landscape would include an on-the-ground field evaluation of Type Np intermittent stream reaches, identification of spatial and temporal patterns of intermittency, and potential impacts of these patterns on water temperature (to address the water quality standards Overall Performance Goal) and amphibian use (to address the long-term viability of covered species Overall Performance Goal).

Determining the influence of intermittent perennial reaches on water temperatures and FP-designated amphibian use would provide important information for evaluating the relative benefits of riparian buffers on intermittent reaches, ultimately informing the riparian buffer rule for Type N streams. This project is intended to include both water temperature and amphibians as primary responses.

Project Objectives

This project is identified as a Clean Water Assurance (CWA) Milestone.

It will inform the Overall Performance Goals of meeting water quality standards.

A field study will help identify the effects of intermittent perennial stream reaches on stream temperature and FP-covered amphibians for the Westside FPHCP landscape.

It may also be used to inform the effectiveness of Type N prescriptions in reaches with intermittent perennial

flow.

MPS Budget*

FY20	FY21	FY22-24	FY25**	FY26	FY27	FY28	FY29	FY30	Total
$5,173	$39,827		$80,000	$250,000	$360,000	$360,000	$360,000	$250,000	$1,705,000

*May 10, 2023 Board-approved budget. Budget beyond FY24 are estimates only.
**Note that the exact budget figures and timeline for future work beginning in FY25 will depend on a study design that would be developed after scoping. FY25-FY30 funding amounts are preliminary estimates based on previous projects. These will be updated as the project is scoped.

Roads

Project Name	Road Prescription-Scale Effectiveness Monitoring (Roads BMP Study)
Work Plan Critical Questions Addressed (2023-2025 CMER Work Plan Section 5.6.5)	Are road prescriptions effective at meeting site-scale performance targets for sediment and water?
Project Elements	Effectiveness of road maintenance and BMP treatments in controlling sediment production and delivery.
Responsible SAG and Project Manager	SAG: Not associated with a SAG – oversight provided by CMER Project Manager: Alexander Prescott
CMER Scientist, Principal Investigator, Project Team	CMER Scientist: Jenelle Black Principal Investigator: Charlie Luce (USFS) Project Team: Tom Black (USFS), Amanda Alvis [Manaster] (UW), Erkan Istanbulluoglu (UW), and Julie Dieu (Rayonier)
Status/Phase	In July 2023, the fourth data collection season for the main experiment was completed. The project team continued to work on a tri-layer mass-balance model representing vertical layers of the road prism. In this model, equations were developed for calculating sediment fluxes between layers and production of fine sediment from coarse sediment within layers. Further work was done to refine these equations. Existing equations were used for overland flow sediment transport on the top layer. The data collected under the Micro-Topography experiment continued to be analyzed by UW staff and students, including the finalization of code to automate some of the data processing. West Fork Environmental continues to be under contract to visit each site monthly to download data, collect water samples, and repair minor issues at each platform. Watershed Geo Dynamics is working with West Fork to process data and provide QA/QC. The West Fork Environmental contract has been expanded through FY25 to support the project in additional fieldwork and data analysis tasks. AmTest Laboratory is under contract to complete water/sediment sample testing through FY25. In February 2023, part 1 of the second year of the Short-Time-Scale Parameterization experiment was completed. Part 2 was delayed until FY24 due to issues scheduling for significant precipitation. In February 2023, a synthesis paper looking at the literature surrounding traffic-induced sediment production processes and examining the gaps in this research has been completed and published in *Environmental Reviews*.

	(https://cdnsciencepub.com/doi/abs/10.1139/er-2022-0032) In April 2023, the project began to work with a forestry student at Green River College to delineate detailed watersheds for site scale hydrologic analyses as their capstone project. In May 2023, the Washington State Department of Transportation was contracted to analyze the rock quality of approximately 10 samples from sources used throughout the project road segments. The results were utilized in the project-wide rock changes occurring in the summer of 2023. In May 2023, the Cost vs. Maintenance Survey was developed and distributed to local road managers and engineers. The results of the survey informed the allocation of BMPs during the summer change-over. In June 2023, S&R Sheet Metal Inc. was contracted to repair previously fabricated troughs and fabricate new trough covers in two lengths, 1-foot and 2.5-foot. Amanda Alvis developed a paper discussing the results of the Ditch Line Hydraulics Experiment, entitled "Using Additional Roughness to Characterize Erosion Control Treatment Effectiveness in Roadside Ditch Lines". This paper discusses using ditch line roughness to evaluate BMP efficiency, discusses the theory behind using roughness as an efficiency metric, describes the methodology of the experiment, and presents results from the experiment. The paper was submitted to the journal *Earth Surface Processes and Landforms* on June 2, 2023. Within the review process, major revisions were received on July 21, 2023, and the paper was edited and resubmitted on September 27, 2023. Minor revisions were received on November 4, 2023, and the paper was edited and resubmitted on November 15, 2023. In August 2023, aging traffic counters were replaced at 19 locations across our road segment network. In September 2023, high flow sites with flumes were further modified to include roughness elements to improve evenness of flow. In October 2023, the DNR Pacific Cascade Region's Heavy Equipment Crew completed the annual road maintenance needs across the sites which included the addition of new rock, implementation of ditchline BMPs, and road grading. In October 2023, the project team completed flume calibration following the installation of roughness elements the previous month.
Project Timeline	FY23-FY26: Monitoring and data collection at 78 sites, data management and QA/QC, equipment maintenance, conduct parametrization experiments and continue model development. FY27-FY29: Data analysis and report writing/review.
Expenditures through FY23	$3,219,680
Complementary Projects and Project Sequencing	Road Sub-Basin-Scale Effectiveness Monitoring; Road Surface Erosion Model Validation/Refinement Project; Intensive Watershed-Scale Monitoring to Assess Cumulative Effects.
Project Summary and Purpose	
This project addresses surface erosion sediment reductions from site-specific measures. This is accomplished by empirical sampling of effectiveness of road maintenance, road surface erosion, sediment production, sediment delivery and hydrologic connectivity, coupled with detailed physical modeling to better understand and quantify the interactions of these elements with each other and with rainfall and traffic.	
Project Objectives	
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.	

Budget*

FY24	FY25	FY26	FY27	FY28	FY29	Total Estimated Future Budget
$587,397	*$555,000*	*$596,047*	*$351,000*	*$75,000*	*$25,000*	*$2,189,444*
** Approved May 10, 2023. Board approved budget. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only*						

Project Phases by FY

FY21	FY22	FY23	FY24	FY25
Data collection, site maintenance for site repairs and final installation, model development. Parameterization studies: Micro-topography (Yr. 1) and Ditch-line Hydraulics (Yr. 1). Completion of Biennial Report.	Data collection, site maintenance, model development. Parameterization studies: Micro-topography (Yr. 2) Ditch-line Hydraulics (Yr. 2) Short-Time Scale (Yr.1)	Cost vs. Maintenance survey. Data collection, site maintenance, model development. Parameterization studies: Short-Time Scale (Yr. 2)	Ditch line and rock quality BMP change-over Data collection, site maintenance, model development. Short-Time Scale (Yr. 3) Interim Project Report	Sediment Trap Efficiency Experiment GRAIP/WA RSEM Survey Last year of data collection, finalize model.

FY26	FY27	FY28	FY29
Field equipment removal. Data analysis (all experiments).	Completion of draft final report.	Final report review and revision. CMER approval of Final Report.	ISPR completed. Final CMER approval. 6 questions drafted. Findings Report delivered to Policy. Present to Board.

RSAG

Project Name	Riparian Characteristics and Shade (RCS) Response
Work Plan Critical Questions Addressed **(2023-2025 CMER Work Plan, 5.2.8)**	Rule Group Critical Question: • How does stream shading change with buffer width and intensity of management across a range of stand types and characteristics in Washington? Program Research Question: • How does stream shading change with buffer width, stand conditions, and treatments (e.g., basal area, density, age, height, and thinning)? Study Design Critical Questions: • How does stream shade respond to riparian harvest treatments with different stream-adjacent no-harvest zone widths and adjacent-stand harvest intensities? • How does stream shade response to the riparian harvest treatments vary among ecoregions where commercial timber harvest commonly occurs? • What are the important patterns, trends, and relationships between stand characteristics and stream shade response to the riparian harvest treatments?
Project Elements	Type F/N riparian conditions and stream shade
Responsible SAG and Project Manager	RSAG Project Manager: Anna Toledo
Principal Investigator(s) and Project Team	CMER scientist: Rachel Rubin Project Team: Rachel Rubin, Jenelle Black, Joe Murray, Doug Martin, Mark Meleason
Status	The PI, in coordination with the Project Team, has selected two sites in the Northwest Coast ecoregion for implementation in summer 2024. The PI and PM are coordinating with the landowner, Weyerhaeuser, to plan plot layout.

	The RCS Prospective 6 Questions document was approved by CMER in August 2023 and delivered to TFW Policy in September 2023.
Project Timeline	• FY22: Finalized study design and ISPR approval in March 2022. Began site selection and field trial. • FY23: RCS field trial field work completed summer 2023. • FY23-FY25: Hire contractors, complete site selection, complete implementation at 10 westside sites. • FY26-FY27: Complete implementation at 10 eastside sites. Complete photo processing, data analysis, and write final report. • FY28: Final report review and revisions. *Timeline will be reviewed following implementation in 2024.*
Expenditures	FY19-FY23: $114,979
Complementary Projects and Project Sequencing	Westside Type N Experimental Buffer Treatment Projects in Competent and Incompetent Lithologies (Hard Rock and Soft Rock), Eastside Type N Effectiveness Monitoring Project (ENREP), Bull Trout Overlay Temperature Project, Solar Radiation/Effective Shade Project, Eastside Type F Riparian Effectiveness Monitoring Project (BTO add-on), Buffer Integrity- Shade Effectiveness Project, Westside Type F Effectiveness Monitoring Study, Westside Type N Buffer Characteristics, Integrity, and Function (BCIF), Extensive Riparian Status and Trends Monitoring.

Project Summary and Purpose

Field research examining the combined effect of stream-adjacent no-harvest zone width and adjacent-stand harvest intensity (i.e., thinning density) on stream shade is limited. While other existing and planned CMER research studies support decisions on the effectiveness of the Type F and Type N prescriptions tested, they will not inform policy makers of other buffer configurations involving thinning. The purpose of this study is to evaluate how stream shade responds to a range of riparian harvest treatments within environments (ecoregions) common to commercial forestlands covered under the FPHCP. Results from this study will help the Adaptive Management Program interpret and respond to ongoing and future monitoring studies that directly test both shade and temperature and will provide information about how well alternative riparian buffer prescriptions meet shade targets.

Project Objectives

The study has two objectives:

1. Estimate stream shade response to a range of riparian harvest treatments that combine different stream-adjacent no-harvest zone widths and adjacent-stand harvest intensities (i.e., thinning treatments or clear-cut).
2. Examine how stand composition and structure characteristics influence stream shade response to the riparian harvest treatments.

Budget*

FY24	FY25	FY26	FY27	FY28	Total Estimated Future Budget
$177,993	$142,238	$178,914	$283,914	$20,000	$803,059

** Approved May 10, 2023. Board approved budget. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.*

Project Name	Extensive Riparian Status and Trends Monitoring – Riparian Vegetation and Stream Temperature
Work Plan Critical Questions Addressed (2023-2025 CMER Workplan 5.2.8)	<u>Rule Group Critical Questions:</u> What is the current status of riparian conditions and the HCP-specified functions in and along Type F/N streams on a statewide scale, and how are conditions changing over time? <u>Program Research Critical Questions*:</u> What is the distribution of maximum summer stream temperature and 7-day mean maximum daily water temperature on FP HCP lands, and how is the distribution changing over time as the forest practices prescriptions are implemented? What proportion of stream length, at the landscape scale, on FP HCP lands meets specific benchmarks for water temperature, and is this proportion changing over time as the forest practices prescriptions are implemented? What are current riparian stand attributes on FP HCP lands, and how are stand conditions changing over time as the forest practices prescriptions are implemented? ***** *The above critical questions are provided as they currently exist in the CMER Workplan. Project Research Critical Questions will be revised as part of the project scoping phase.*
Project Elements	Type F and N riparian forest structure/functions and stream temperatures. (*TFW Policy directed CMER to consider cost efficient add-ons, specifically such as amphibian presence/eDNA in their April 2022 memo which the project team describes here as 'desired habitat conditions'.)*
Responsible SAG and Project Manager	RSAG Project Manager – Alexander Prescott
Principal Investigator(s) and Project Team	Principal Investigator TBD CMER Scientist: Jenelle Black Project Team: Jenelle Black, Hans Berge, Mark Meleason, Aimee McIntyre, Douglas Martin, Ash Roorbach
Status	Following a series of memos and joint workshops in 2022, TFW Policy gave a summary directive to CMER in the March 2023 meeting, "Develop options for a monitoring program to help determine how stream temperature and riparian functions have changed or are changing in association with the application of the forest practice rules". In March 2023 CMER approved the project team formed by RSAG.

	In April 2023 Watershed DCG was contracted to assess and report on the availability of both existing data needed, and future data to be collected, in order to inform an extensive monitoring program for riparian functions and stream temperature occurring within the millions of acres of lands where Forest Practices Rules apply to forest management. Watershed DCG delivered a final report and data appendix to the project team and RSAG in July 2023. In May 2023 the project team approved a charter for RSAG review. RSAG completed their review and provided feedback to the project team in September 2023. In October 2023 RSAG and CMER approved the project charter in October 2023. TFW Policy approved the project charter in November 2023.
Project Timeline	FY22: Conducted joint workshops between RSAG/CMER/TFW Policy. FY22: Policy transmitted two directives to CMER to initiate this project. FY23: Project team was formed, data assessment contract initiated and completed, project charter drafted and approved by RSAG, CMER, and TFW Policy. FY24: Project team will initiate Scoping Document Development. FY24-26: RSAG, CMER, and Policy Approval of Scoping Documents.
Expenditures	FY22-23: $54,220
Complementary Projects and Project Sequencing	Extensive Riparian Status and Trends – Temperature, Type F/N Westside and Eastside; Riparian Characteristics and Shade Response Study; Mass Wasting Landscape Scale Extensive Monitoring; Remote Sensing for Assessing Riparian Stand Conditions Literature Synthesis Review; Extensive Riparian Vegetation Monitoring Remote Sensing Pilot; Extensive Riparian Vegetation Monitoring Implementation Pilot; Extensive Riparian Vegetation Monitoring, Model Transferability Testing Draft Report

Project Summary and Purpose

The purpose of the Extensive Riparian Status and Trends Monitoring Program is to provide data needed to evaluate landscape-scale effects and changes over time of implementing forest practice riparian prescriptions. This information will inform State and Federal regulatory agencies if the Forest Practices Rules meet resource objectives for key aquatic conditions and processes affected by forest practices and Clean Water Act requirements. This program will also help CMER prioritize, plan, conduct, interpret, and assess scope of inference of other CMER studies and monitoring work.

Project Objectives

The Timber Fish and Wildlife Policy Committee has directed CMER to, "develop options for a monitoring program to help determine how stream temperature and riparian functions have changed or are changing in association with the application of forest practices rules." The objective is to build and maintain a status and trends monitoring program that will evaluate how aquatic condition, riparian forest structure and functions, and the desired habitat conditions they support change on the landscape scale.

Budget*

FY24	FY25	FY26	FY27	FY28	Total Estimated Future Budget**
$50,000	*$50,000*	*$300,000*	*$300,000*	*$250,000*	*$950,000*

* Approved May 10, 2023. Board approved budget. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.

** Estimated budget does not reflect estimated need, due to undetermined project scope. Preliminary budget estimates will be determined in the Scoping Document.

SAGE

Project Name	Eastside Type N Riparian Effectiveness Project (ENREP) (CWA Project)
Workplan (Rule Group) Critical Questions Addressed	• Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FPHCP resource objectives and performance targets for shade, stream temperature, LWD recruitment, litterfall, and amphibians?* • Do different types of Type N channels explain the variability in the response of Type N channels to forest practices? • What is the effect of buffering or not buffering spatially intermittent stream reaches in Type Np streams? *Litterfall and amphibians are not included in the Study Design.
Project Elements	Change in stream flow, canopy closure, water temperature, suspended sediment transport, large wood loading, upland canopy conditions, and aquatic life following harvest on Type N streams. Harvest effects on downstream Type F waters where treatment effects can be isolated.
Responsible SAG and Project Manager	SAG: SAGE Project Manager: Anna Toledo
CMER Scientist(s) and Principal Investigator(s)	CMER Scientist: Rachel Rubin Principal Investigators: Timothy Link, University of Idaho; Charles Hawkins, Utah State University Project Team: Tim Link, Charles Hawkins, Rachel Rubin, Paul Robinson, Lana Cohen, Daniel Nelson, Welles Bretherton
Status/Phase	Implementation of Study Design: • Springdale and Tripps basins: Completion of two years of pre-harvest, harvest year, and two years of post-harvest data collection. • Blue Grouse basin: Completion of three years of pre-harvest, harvest year, and one year of post-harvest data collection. Monitoring at Blue Grouse was extended for one year to allow for two full years of post-harvest data collection. • Coxit basin: Completion of two years of pre-harvest and harvest year data collection. Harvest completed fall 2023. • Fish Creek basin: Completion of two years of pre-harvest data collection. Harvest is scheduled to span two seasons (2023 and 2024). • Data collection includes: biophysical variables, including streamflow, wetted channel extent, suspended sediment concentrations, stream shade, riparian forest mensuration, large wood loading, temperature, and stream cross sections, aquatic life (benthic macroinvertebrates), and habitat.
Expenditures through FY 23	FY15-FY19: $944,876 (includes ENREP TWIG Participation and UCUT ENREP Scientist) FY20: $474,753 FY21: $729,177 FY22: $441,014 FY23: $738,152 Total expenditures through FY23: $3,327,972

Project Timeline	FY18-FY25: Implementation FY26: Data analysis and final report development FY27-FY28: Final report review and revisions
Complementary Projects and Project Sequencing	Westside Type N Experimental Buffer Treatment Project in Hard Rock and Soft Rock Lithologies (completed), Type F and N Extensive Eastside – Temperature, Eastside Type N Forest Hydrology (completed), Eastern Washington Riparian Assessment Project Phase I and II (completed), Bull Trout Overlay Temperature, Solar Radiation/Effectiveness, Eastside Type F Riparian Effectiveness, Westside Type N Buffer Characteristics, Integrity, and Function (BCIF)
Project Summary and Purpose	
This project will help inform if, and to what extent, the prescriptions found in the Type N Riparian Prescriptions Rule Group and/or a related commonly applied prescription affording more protection than the current rules require (i.e., full-length two-sided 50-foot no-cut RMZs) are effective in achieving performance targets and water quality standards, particularly as they apply to sediment and stream temperature in eastern Washington. The discharge regime of headwater streams influences a number of functions including water temperature and sediment transport. Although the effect of forest management on discharge has been studied for more than half a century, it is not possible to fully predict management-related changes in discharge timing or magnitude, because of the large variability in headwater attributes and functions and relative paucity of research on the colder and drier eastside systems.	
Project Objectives	
The objectives are to inform Policy of the quantitative changes in FPHCP-covered resources, water quality, and aquatic life coincident with forest harvest activities in eastern Washington, and to determine if and how observed changes are related to activities associated with forest management.	

Budget*

FY24	FY25	FY26	FY27	FY28	Total
$656,703	$581,370	$489,632	$330,688	$276,442	$2,334,835

**May 10, 2023 Board approved budget. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.*

Project Name	Eastside Timber Habitat Evaluation Project (ETHEP)
Workplan Critical Question Addressed	Will application of the prescriptions result in stands that achieve eastside FPHCP objectives (forest health, riparian function, and historical disturbance regimes)?
Project Elements	Eastside forest health, riparian function, disturbance regimes, timber habitat types.
Responsible SAG and Project Manager	SAG: SAGE Project Manager: Jenny Schofield
CMER Scientist(s) and Principal Investigator(s)	CMER Scientist: Rachel Rubin Principal Investigator: Rachel Rubin Project Team: Ben Spei, Rachel Rubin, Mark Kimsey, Mark Teply, Charles Goebel
Status/Phase	The study design has been approved by ISPR and will be delivered to CMER for final approval in November 2023.
Expenditures	FY23: $106,849

through FY23	
Project Timeline	FY22-FY24: Study Design development and approval FY24: Development of field manual and protocols, Phase I implementation (framework development) FY25: Phase II implementation (field data collection, refinement of framework) FY26: final report writing and approval Project timeline and budget will be refined following study design final approval.
Complementary Projects and Project Sequencing	Eastside Disturbance Regime Literature Review Project, Eastside LWD Literature Review Project, Eastside Temperature Nomograph Project, Eastern Washington Riparian Assessment Project (EWRAP), Eastside Modeling Evaluation Project (EMEP), Bull Trout Habitat Prediction Models, Bull Trout Overlay Temperature Project, Solar Radiation/Effective Shade Project, Eastside Type F Riparian Effectiveness Monitoring Project (BTO add-on).

Project Summary and Purpose

Washington's Forest Practices Rules for non-federal forestlands in eastern Washington use a Timber Habitat Type (THT) system to apply riparian rule prescriptions along fish-bearing (Type S and Type F) and perennial non-fish-bearing (Type Np) streams (WAC 222-30-022). This system defines THTs according to three elevation zones: <2500 feet ("Ponderosa Pine"), 2500-5000 feet ("Mixed Conifer"), and >5000 feet ("High Elevation"). The riparian harvest rules specify different leave tree requirements for each THT.

Elevation bands alone, however, likely oversimplify the factors that drive forest stand development in eastern Washington and further oversimplify *riparian* forest stand development in particular. While there is coarse correlation between elevation band and climatic regime and, in turn, stand composition and structure (as introduced by Daubenmire and Daubenmire (1968), the landform, underlying geology, aspect, and parent material also influences soil moisture regimes at the watershed scale (e.g., Franklin and Dyrness 1973, Lillybridge et al. 1995, Williams et al. 1995). Forest vegetation is further influenced at the riparian scale via fine-scale differences in valley form, gradient, and groundwater-surface water interaction that affect microclimate, soil development, and water availability (Kovalchik and Clausnitzer 2004). These constructs show riparian stands express the influence of many factors besides just elevation.

Results from Phase II of the Eastern Washington Riparian Assessment Project (EWRAP; Schuett-Hames 2015) demonstrate the need for this further work. The author determined potential climax species for 103 riparian sites in eastern Washington using Cooper et al. (1991) and Kovalchik and Clausnitzer (2004) and found that the distribution of these riparian forest vegetation "series" can span the THT elevational zones. That is, some of the forest vegetation series were found above *and* below 2500 feet in elevation. Schuett-Hames' finding is compelling evidence that elevation is not the only influence on forest stand development. Further, this finding also suggests that leave tree requirements based on elevation alone could be, at times, be mismatched to factors dictating stand development at a given site. This finding supports the need to improve the existing framework toward one that is more ecologically and silviculturally meaningful.

The purpose of this project is to develop an ecologically meaningful and reliable framework for applying riparian harvest rules along Type S and Type F streams in eastern Washington.

Project Objectives

Objective 1: Develop a framework for applying riparian harvest rules in eastern Washington based on the FPHCP functional objectives and performance targets (Schedule L-1, Appendix N).

Objective 2: Test the preferred framework(s) for characterizing eastside riparian forests using data collected in the field.

Budget*

FY24	FY25	Total
$160,521	$162,000	$322,521

** May 10, 2023 Board approved budget. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.*

UPSAG

Project Name	Unstable Slopes Criteria Project (CWA Project)
Work Plan Critical Question Addressed	Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard?
Project Elements	Unstable landform identification, landslide susceptibility of different slopes/landforms
Responsible TWIG*, SAG, and Project Manager	Project Team: Unstable Slope Criteria SAG: UPSAG Project Manager: Theryn Henkel **The Project Team was formerly organized as a Technical Writing and Implementation Group (TWIG)*

Project Team and Principal Investigator(s)	Project Team Members: Dan Miller, Ted Turner, Julie Dieu, Jenelle Black, Tiffany Justice, Susan Shaw, and Jeff Keck CMER Scientist/ Principal Investigator: Elise Freemen
Status/Phase	The Unstable Slopes Criteria Project consists of five distinct projects approved by Policy in April 2017: Compare/Contrast Landslide Hazard Zonation (LHZ) Mass Wasting Map Units with RIL (this project will be incorporated into subsequent projects per ISPR review comments). Object-Based Landform Mapping with High-Resolution Topography Empirical Evaluation of Shallow Landslide Susceptibility and Frequency by Landform Empirical Evaluation of Shallow Landslide Runout Models to Identify Landscapes/Landslides Most Susceptible to Management The Project Team is currently completing mapping for Project 2, Object-Based Landform Mapping with High-Resolution Topography Study, in order to evaluate the consistency in landform mapping among observers, and between observers and computer-generated mapping. The team is also working on revising and finishing the final report for this project. The report is scheduled to be presented to CMER early in 2024. A Study Design that combines the Empirical Evaluation of Shallow Landslide Susceptibility and Frequency by Landform (Project 3) and the Empirical Evaluation of Shallow Landslide Runout (Project 4) was approved by UPSAG and CMER in March, 2023 and was sent to ISPR at that time. The study design received final approval after addressing ISPR, in September 2023. The project team will focus on developing the Prospective 6 Questions and Implementation Plan documents, and beginning implementation in 2024.
Expenditures to Date	FY23: $26,138 FY21-FY23 Biennium: $59,575
Project Timeline	The project is estimated to continue through 2027: FY2020 – Completed ISPR review for Project 2 and developed implementation plan. FY2024 – Continue work on Project 2 and work to complete draft final report. FY2024 – Develop and complete ISPR review of study plans for Projects 3 & 4. FY2024 – Initiate work on Projects 3 & 4. FY2025 – Complete work on and develop final reports for Projects 3 & 4 FY2026 – Develop a study plan and initiate ISPR review for Project 5. FY2026 –Finalize study plans and begin implementation of Project 5. FY2027 – Completion of work on Project 5. FY2027/2028 – Development of final report for Project 5.
Complimentary Project(s) and/or Project Sequencing	Mass Wasting Effectiveness Monitoring (completed), Literature Syntheses of the Effects of Forest Practices on 1) Glacial Deep-Seated Landslides and Groundwater Recharge and 2) Non-Glacial Deep-Seated Landslides and Groundwater Recharge (both completed), Deep-Seated Landslide Research Strategy.
Project Summary and Purpose	
This project will evaluate the degree to which the "rule-identified" landforms defined in the Forest Practices rules (WAC 222-10-030) identify potentially unstable areas that are likely to impact public resources or threaten public safety. The project will be designed to evaluate the original Forests & Fish Report Schedule L-1 research topic: "Test the accuracy and lack of bias of the criteria for identifying unstable landforms in predicting areas with a high risk of instability" (FFR p. 127). The project replaces	

the Testing the Accuracy of Unstable Landform Identification Project, based on feedback from Policy at the November 2010 meeting. At that meeting, UPSAG presented two interpretations of the original Forests & Fish Report Schedule L-1 topic and asked for direction as to how to proceed and prioritize efforts. The Project Team (formerly organized as a Technical Writing and Implementation Group, or TWIG) understands that Policy's direction was to evaluate the landslide susceptibility of different slopes/landforms in the interest of evaluating current rule-identified landforms and identifying/characterizing additional potentially unstable landforms**.** The Project Team developed a document that summarizes Best Available Science and proposed alternative approaches for addressing the critical questions; the TWIG's preferred alternative was approved by Policy on April 6, 2017.
Project Objectives
The project will be designed to evaluate the landslide susceptibility of different slopes/landforms in the interest of evaluating current rule identified landforms and identifying/characterizing additional potentially unstable landforms.

Breakdown by Project	FY24 Budget	FY25 Budget	FY26 Budget	FY27 Budget	Total Remaining Budget
Object-based landform mapping (Project 2)	$14,800				$14,800
Shallow landslide susceptibility and runout (Projects 3 and 4)	$40,145	$49,210			$89,355
Mgt Susceptibility modeling (Project 5)			$75,000	$25,000	$100,000
Total Budget	**$54,945**	**$49,210**	**$75,000**	**$25,000**	**$114,035**

Budget*

*May 10, 2023 Board-approved budget. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.

Project Name	Deep-Seated Landslide (DSL) Research Strategy Projects
Work Plan Critical Questions Addressed	Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard? Does harvesting of the recharge area of a glacial deep-seated landslide promote its instability? Can relative levels of response to forest practices be predicted by key characteristics of glacial deep-seated landslide and/or their groundwater recharge areas?
Project Elements	Forest practices effects and response levels on deep-seated landslides.
Responsible SAG and Project Manager	SAG: UPSAG Project Manager: Theryn Henkel
Project Team and Principal Investigator(s)	CMER Scientist/ Principal Investigator: Elise Freeman Current Project Team: Julie Dieu, Anne Weekes, Jennifer Parker, Rachel Pirot

Status/Phase	Strategy approved by CMER (2018) Project components completed to date: 4.1 Model Evapotranspiration in Deep-Seated Landslide Recharge Areas 4.2 Glacial Deep-Seated Landslide Literature Synthesis 4.3 Non-Glacial Deep-Seated Landslide Literature Synthesis Currently in Study Design Development: 4.5 Deep-Seated Landslide Mapping Objective 4.6 Landslide Classification Future components: 4.7 GIS Toolkit Development 4.8 Groundwater Modeling 4.9 Physical Modeling 4.10 Landslide Monitoring 4.11 Evapotranspiration Model Refinement (as needed for modeling) 4.4 Board Manual Revision Project (intermittent process pending direction from the FP Board)
Expenditures to Date	Expenditures prior to FY24: $155,600
Project Timeline	The Study Design for the Landslide Mapping and Classification Projects (4.5 and 4.6) was developed and received UPSAG approval in April, 2023 and CMER approval in August, 2023. The study design is currently in ISPR, with expected return late 2023. The Study Design will go out for solicitation in early 2024 and implementation will begin once the solicitation process is complete. Through the development of projects 4.5 and 4.6, tools will be developed that will inform Project 4.7, GIS Toolkit Development and later elements in the larger strategy (4.8-4.11) Strategy implementation will continue to 2029 or beyond.
Complimentary Project(s) and Project Sequencing	Complimentary Project: Unstable Slopes Criteria Project Strategy.

Project Summary and Purpose:
The strategy utilizes the results of the literature reviews for forest harvest effects on glacial and bedrock deep-seated landslides to address key knowledge gaps identified during the literature reviews and to address questions from the Forest Practices Board and Policy regarding the potential effects of forest practices on deep-seated landslides. This strategy includes a description of multiple projects, identifies their priority, timeline, sequence, and estimated cost, and describes the relationship between the project and the critical questions. The strategy evaluates the existing CMER deep-seated landslide work plan projects and proposes revisions.
Project Objectives
The objective of the research strategy is to evaluate the potential effects of forest practices on deep-seated landslide processes, to include initiation and transport, and risks to public resources and public safety. This project includes mapping and describing different landslide classes, which are the first steps toward evaluating the potential effects of forest practices.

Budget*

Project Description	FY 2024	FY 2025	FY 2026	FY 2027	Total Remaining Budget**

4.5/4.6 Landslide Mapping & Classification	$150,000	$150,000	$85,000		$385,000
4.7 GIS Toolkit Development	$25,000				$25,000
4.8 Groundwater Modeling	$25,000	$50,000	$25,000		$100,000
4.9 Physical Modeling	$25,000	$50,000	$25,000	$25,000	$125,000
4.10 Landslide Monitoring			$65,000	$75,000	$140,000
Total DSL Budget	*$225,000*	*$250,000*	*$200,000*	*$100,000*	*$775,000*

** May 10, 2023 Board-approved budget. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.*

***The budget includes the near-term estimates; however, project work budgets may extend to 2032 or beyond.*

WetSAG

Project Name	Forested Wetlands Effectiveness Project (FWEP) – Chronosequence Study
Workplan Critical Questions Addressed	**Rule Group Critical Questions**: What are the magnitude and duration of effects of timber harvest in and upslope of forested wetlands on water regimes, water quality, habitat functions, and aquatic resources in those wetlands, in downgradient waters, and the connectivity between them? Are current Forest Practices Rules for timber harvest in and around forested wetlands effective at meeting the Forest and Fish aquatic resource objectives and performance targets, and the goal of no-net-loss of functions of those wetlands? **Program Research Questions:** What are the effects, and their magnitudes and durations, of forest practices on water regimes, water quality, plant and animal habitats, and watershed resources in forested wetlands and linked (via surface or subsurface flow) downstream waters? How does timber harvest in forested wetlands alter processes that influence hydrologic regimes in those wetlands, in downgradient waters, and the connectivity between them? How does timber harvest in forested wetlands alter processes that influence water quality in those wetlands and in downgradient waters? How does timber harvest in forested wetlands alter processes that influence plant and animal habitat functions in wetlands, in connected waters, and in surrounding uplands? How well do current Forest Practices Rules in forested wetlands meet the Forest and Fish aquatic resource objectives and performance targets, and the goal of no-net-

	loss of functions of those wetlands by half of a timber rotation cycle? **FWEP Chronosequence Project Research Questions**: The FWEP Chronosequence study strives to answer two sets of research questions derived from the CMER work plan's critical questions (Hough-Snee et al. 2019): 1. How does forested wetland hydrology change over time following post-harvest forest stand development? Specifically: a. How does the hydrology of recently harvested forested wetlands compare to the hydrology of recently undisturbed second-growth forested wetlands? b. How does the timing, duration, and magnitude of flow and material transport differ between recently harvested and recently undisturbed second-growth forested wetlands? 2. How do forested wetland vegetation and canopy-mediated habitat conditions change over time following post-harvest forest stand development? Specifically: a. How does recently harvested forested wetland vegetation composition compare to recently undisturbed second-growth forested wetland vegetation over time? b. Do canopy and vegetation-mediated habitat attributes (e.g., inundation duration, soil, and wetland temperature, etc.) converge between recent post-harvest forested wetlands and recently undisturbed second-growth forested wetlands over time?
Project Elements	Timber harvest effects on forested wetlands and wetland forest practices prescription effectiveness.
Responsible SAG and Project Manager	SAG: WetSAG Project Manager: Jenny Schofield
CMER Scientist and Principal Investigator(s)	CMER Scientist and PI: Tanner Williamson (NWIFC) Project Team Members: Debbie Kay, Joseph Murray, Amy Yahnke, Nate Hough-Snee, Douglas Martin
Status/Phase	ISPR and CMER approval of the FWEP Chronosequence study design in December 2019. The Prospective 6 Questions document was delivered to Policy in August 2020. The FWEP literature review, database, and webmap were approved by CMER in June 2020 and presented to Policy in August 2020. Wetland Intrinsic Potential Tool Final Report was approved by CMER in April 2021 and presented to TFW Policy in June 2021. Wetland Intrinsic Potential Tool Final Report answers to the Six Questions was approved by CMER in April 2021 and presented to TFW Policy in June 2021. The Wetland Intrinsic Potential Tool was published in October 2022 in EGUsphere. (https://doi.org/10.5194/egusphere-2022-665) FWEP Chronosequence Project Management Plan was developed and approved by CMER in October 2022. FWEP Chronosequence pilot sites (4) were selected and instrumented in October of 2022. Remaining FWEP Chronosequence project sites (20) were selected and instrumented in June of 2023. Field data collection is ongoing by the project team through Summer 2025.

Project Timeline	FY22: Hire principal investigator. Complete project documents, site selection, field reconnaissance, and instrumentation of pilot four sites. FY23: Instrumentation of 20 sites, data collection and data QA/QC FY24 - FY25: Data collection and data QA/QC. FY26: Data QA/QC, data analysis, CMER-approved final report. FY27: ISPR-approved final report, Findings Report, begin FWEP BACI study design. FY28: Develop FWEP BACI study design and complete WetSAG and CMER review. FY29: ISPR approved BACI study design. Develop site selection and data management document. Initiate site selection. FY30: Year 1 BACI data collection.
Expenditures	FY17 - FY20: $182,968 FY21: $11,312 FY22: $29,200 FY23: 385,005.67 Sum of all FY expenditures through FY23: 608,485.67
Complementary Projects and Project Sequencing	Forest Practices and Wetlands Systematic Literature Review (complete); Statewide Forested Wetlands Regeneration Pilot Project (complete); Wetland Management Zone Effectiveness Monitoring Project (planned); Wetlands Intensive Monitoring Project (proposed)

Project Summary and Purpose

Phases I (Chronosequence) and II (BACI) of the FWEP projects will look at the effectiveness of forest practices prescriptions to protect, maintain, and restore aquatic resources, namely water quality and wetland hydrologic and ecological functions (CMER 2021). It will be evaluated to determine if they achieve the FPHCP goal of no net loss of functions of wetlands (Schedule L-1) "...when measured over the length of a harvest rotation, although some of the functions may be reduced until the midpoint of the timber rotation cycle" (WAC 222-30-020(4)), while meeting state water quality standards.

The Forested Wetland Effectiveness Project is designed as a two-phase, scientific investigation into how forested wetlands and their connected waters are affected by forest practices, as presently implemented under Washington State DNR's Forest Practices Rules. This FWEP Chronosequence study is the predecessor study to a BACI study on how forested wetlands recover from harvest and will help inform how disturbance associated with forest harvest is affecting forested wetland hydrology, habitat, and water quality over time. The Chronosequence substitutes space for time, studying multiple sites at different development states post-harvest (two, ten, twenty, and 40 years), in lieu of studying a set of sites over the same 40-year time period.

Project Objectives

The primary research objectives of the FWEP are:

1. To examine how well current forest practices rules meet the performance target of a no-net-loss of wetland functions by half of a timber rotation cycle (≥ 20 years), and Washington State Department of Ecology water quality standards.
2. To develop study designs that, when implemented, will yield information on the changes in wetland functions and associated aquatic resources due to the implementation of forest practices under existing forest practices rules.

Approved MPS Budget*

FY22	FY23	FY24	FY25	FY26	FY27	FY28	Total Budget
$368,934	$189,753	$171,562	$116,219	$55,000	$55,000	$200,000	$1,156,468

Revised Budget

Pre-FY22 Spending	FY22	FY23	FY24	FY25	FY26	FY27	Total Budget
$194,279	$144,279	$280,176	$173,305	$165,024	$85,000	$35,000	$1,077,063

*May 10, 2023 Board approved budget. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.

Project Name	Wetlands Management Zone Effectiveness Monitoring
Workplan Critical Questions Addressed	**Rule Group Critical Question**: • Are current Forest Practice Rules-specified wetland buffers (WMZ) for Type A and B wetlands (WAC 222-16-035) effective at meeting the Forest and Fish aquatic resource objectives and performance targets, and the goal of no-net-loss of functions of those wetlands? **Program Research Questions**: . What are the magnitude and duration of effects of timber harvest occurring upslope of Type A and B wetlands on processes, functions, and aquatic resources within and downstream of those wetlands? . How effective are current forest practice wetland buffers at facilitating no-net-loss in wetland functions following timber harvest?
Project Elements	WMZ effectiveness, wetland functions, wetland forest practices prescription effectiveness, in-stream LWD targets.
Responsible SAG and Project Manager	SAG: WetSAG Project Manager: Jenny Schofield
CMER Scientist and Principal Investigator(s)	CMER Scientist and PI: Tanner Williamson (NWIFC) Project Team Members: Debbie Kay, Joseph Murray, Amy Yahnke, Douglas Martin
Status/Phase	Scoping. Initial steps for this project would be to review past-approved CMER study findings and combine those results with additional relevant science into a draft BAS report.
Project timeline	FY22: Updated project charter. FY23: Develop scoping document. Initiate WetSAG and CMER review of scoping document. FY24: CMER approval of scoping document. Policy Six Questions Document for the scoping phase. Initiate project study design. FY25: Complete study design and initiate WetSAG and CMER review of study design. FY26 - FY34: Complete CMER review and ISPR of study design. Phases will include site selection, field implementation, data analysis, reporting, and approval processes. Timeline will be determined based on the scoping document.

Expenditures	Expenditures to date: $0
Complementary Projects and Project Sequencing	Forest Practices and Wetlands Systematic Literature Review (complete); Statewide Forested Wetlands Regeneration Pilot Project (complete); Wetlands Intensive Monitoring Project (proposed); Wetland Intrinsic Potential Tool (WIP) (complete); Forested Wetlands Effectiveness Project (in progress)

Project Summary and Purpose

This project will evaluate wetland functions to determine if the target of no-net-loss of hydrologic function, CWA assurance targets, and hydrologic connectivity are being achieved. This would include informing these two research questions: 1) test whether the wetland prescriptions are effective in preventing downstream temperature increases beyond targets, and 2) evaluate the effectiveness of current WMZs in meeting in-stream LWD targets.

Problem Statement

The Forest Practices and Wetlands Systematic Literature Review (CMER #12-1202) highlighted the lack of applied research projects focused on the effectiveness of wetland management zones (WMZs) for Type A and B wetlands at meeting the Forest and Fish aquatic resource objectives and performance targets. Adamus notes in the Wetland Research and Monitoring Strategy (2014, CMER #12-1203) that extrapolations from studies examining effects of forest practices on streams are "fraught with many interpretive difficulties." Some of these difficulties are attributed to variations in sampling and data analysis, short duration studies that would be ineffective at monitoring wetland functions, and variations in buffers from those prescribed specifically for wetlands. There is little research specific to forest practices and wetlands in the Pacific Northwest, and no TFW or CMER research relative to the effectiveness of forest practices WMZs for large woody debris contribution (LWD), shade, meeting water quality targets for receiving streams, or other functions. Thus, this study will build upon the Forest Practices and Wetlands Systematic Literature Synthesis to further test whether the functional objectives for fish, wildlife, and water quality are met through the application of WMZs and BMPs for WMZ management.

Purpose Statement

The purpose of the Wetland Management Zone Effectiveness Monitoring Program is to evaluate the effectiveness of WMZs for Type A and Type B wetlands in meeting the targets outlined in the FPHCP, namely no net loss of functions of wetlands (Schedule L-1), "...when measured over the length of a harvest rotation, although some of the functions may be reduced until the midpoint of the timber rotation cycle (WAC 222-30-020(4)). Similar work is being done with forested wetlands for the Forested Wetlands Effectiveness Project (FWEP).

Project Objectives

This project will evaluate wetland functions to determine if the target of no net loss of hydrologic function, water quality standards, assurance targets, and hydrologic connectivity are being achieved.

This would include informing two Schedule L-2 research questions:

1. Test whether the wetland prescriptions are effective in preventing downstream temperature increases above targets.
2. Evaluate the effectiveness of current WMZs in meeting in-stream LWD targets.

Budget*

FY22 - FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	Total Budget

$0	$100,000	$360,000	$360,000	$360,000	$360,000	$360,000	$100,000	$45,000	$2,045,000

*May 10, 2023 Board approved budget. Funding approved for FY24-FY25. Budget beyond FY24 are estimates only.