

CMER Project Summary Sheets

ADAPTIVE MANAGEMENT PROGRAM

JANUARY 2020

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Active Projects on Master Project Schedule

Project Name	Extensive Riparian Status and Trends Monitoring- Vegetation, Type F/N- Westside and Eastside Projects
Work Plan Critical Questions Addressed	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?
Project Elements	Type F and N riparian forest stand conditions, shade, riparian vegetation type, large wood supply potential, channel measurements
Responsible SAG and Project Manager	RSAG Project Manager – Teresa Miskovic
Principal Investigator(s)	Precision Forestry Cooperative, University of Washington (PFC) – Dr. Monika Moskal and Andrew Cooke WA DNR – Dr. Teodora Minkova
Status	Completed testing Mashel watershed riparian forest model using Lidar and field data collected by DNR in a watershed in the Olympic Experimental State Forest (OESF). Final report approved by CMER January 2020.
Project timeline	Literature synthesis completed June 2015. Remote Sensing Pilot Study completed June 2017. Implementation Pilot Study completed June 30, 2018. Tested the Mashel Riparian Forest model utilizing existing OESF data DNR provided. Completed January 2020. RSAG and CMER approved a Status and Trends strategy presented to Policy October 2019. Policy requested a workshop (proposed for 2020) to help inform how to move forward with strategy.
Expenditures	FY 16-18: \$351,712. These funds were used to complete the literature synthesis, remote sensing pilot in the Mashel watershed, and the scoping for an implementation pilot study. FY 19 and 20: \$43,778 has been spent to date testing the Mashel watershed model.
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.

Project Summary and Purpose

This study would provide data needed to evaluate landscape-scale effects of implementing the forest practices riparian prescriptions and to provide data needed by regulatory agencies to evaluate progress toward meeting Clean Water Act requirements and riparian resource objectives such as Desired Future Conditions (DFC). A base line condition was not established prior to the writing of the riparian rules, therefore, the purpose of the riparian extensive program is to provide a quantitative inventory of riparian forest stand composition on forest lands regulated under the Forest Practices Habitat Conservation Plan (FPHCP).

Specifically, riparian forest inventory using modern remote sensing technology or other methods that would be used to inform questions relating to status, trend, ecological function, resource risk and spatial context for current and future effectiveness studies. A riparian forest inventory including mapping may provide a means to understand the dynamics of riparian forests including informing the layered cumulative effect of different forest practices regulations on the over-all riparian forest; and facilitate more cost-efficient status and trend monitoring over time.

This project is being implemented in phases.

First: a literature synthesis was completed by PFC in June 2015. Articles were reviewed on the use of remote sensing to evaluate the cost and value of various remote sensing tools. This literature review of remote sensing for forest vegetation analysis was in response to a request from Policy to RSAG to look into what remote sensing and other methods might be useful to inform Extensive Riparian Monitoring and also inform what methods they may want to test in a pilot project.

Second: the “Extensive Riparian Vegetation Monitoring – Remote Sensing Pilot Study” was completed by the PFC in June 2017. The pilot project looked at riparian forest vegetation on all stream types, (S, F, Np, and Ns) in the Mashel River watershed. The study evaluated the feasibility, accuracy and cost of using passive optical imagery based approach compared to an active LiDAR based approach or some combination of both to quantify thirteen riparian forest metrics (species, age,

hydrology, canopy cover, vegetation class, crown diameter, stand density, basal area, dbh, snag detection, conifer/ deciduous classification and large woody debris).

Third: scoping for an implementation pilot study was completed in June 2018. The proposed study would provide a better understanding of the feasibility, remote sensing data availability, cost and recommendations for how to implement an inventory of riparian vegetation conditions across FP HCP lands in Washington State.

Fourth: The riparian forest model built for the Mashel River watershed as a deliverable from the Extensive Riparian Vegetation Monitoring – Remote Sensing Pilot Study” was tested using Lidar and field data from data collected by DNR in a watershed in the OESF. This was completed January 2020.

RSAG and CMER approved a Status and Trends strategy presented to Policy October 2019. RSAG has requested Policy provide direction on the priority questions that need to be addressed prior to beginning any additional Extensive Status and Trends projects. Policy requested a workshop to help inform how to move forward with the strategy.

Project Objectives

The objective of this project is to provide tools that will assist with evaluating landscape-scale effects of implementing forest practices riparian prescriptions across Washington State.

Budget

August 14, 2019 Board Approved Budget

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	Total estimated budget
\$15,000*	0	0	0	0	0	0	0	0	\$15,000

*An additional \$4,000 was approved by CMER in December 2019 for PFC to give up to three presentations on the results of the final report.

Project phases by FY

FY 20	FY 21
Complete RSAG and CMER review of draft report written in FY 19.	Future phases unknown until Policy direction provided to CMER on strategy developed.

Project Name	Type N Experimental Buffer Treatment Project in Soft Rock Lithologies
Work Plan Critical Questions Addressed	How do survival and growth rates of riparian leave trees change following Type Np buffer treatments? Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FP HCP resource objectives and performance targets for shade, stream temperature, and LWD recruitment? How do the Type N riparian prescriptions affect water quality delivered to downstream Type F/S waters? What is the frequency and distribution of windthrow in forest practices buffers? What site and habitat conditions are associated with sites with significant blowdown?
Project Elements	Tree mortality, stand development, LWD recruitment, shade, soil disturbance, water quality, water temperature, benthic macroinvertebrates, and exports of nutrients, and suspended sediment,
Responsible SAG and Project Manager	RSAG Project Manager: Teresa Miskovic
CMER Scientist and Principal Investigator(s)	CMER Scientist: Dave Schuett-Hames and Greg Stewart Principal Investigator (DOE): Bill Ehinger
Status/Phase	Draft report for initial data collection submitted to CMER in April 2019 to initiate review. CMER comments have been received by PIs and a revised report is anticipated to be approved at the January 2020 CMER meeting. Extended data collection in ongoing.
Project timeline	<ul style="list-style-type: none"> • Harvest treatments were completed in July 2015. • Two years of post-harvest data sampling was completed fall 2017. • Draft of the 5-year study report completed and submitted to CMER/RSAG for review April 2019. • Additional post-harvest sampling has been approved through 2020.
Expenditures	FY15-FY20: \$711,647. Pass through funds to DOE from TFW Participation Agreements covers \$225,617 of this.
Complementary Projects and project sequencing	Type N Experimental Buffer Treatment Hard Rock and Type N Buffer Characteristics Integrity and Function Projects.

Project Summary and Purpose

This project will evaluate the effects of timber harvest in headwater basins on water temperature, streamflow, exports of suspended sediment and nutrients from the Type N basin, and benthic macroinvertebrate communities. This project is intended to complement the Type N Experimental Buffer Treatment Study in Basalt Lithologies. Site selection is similar to the Basalt study except that sites were selected in lithologies that are likely to produce a fine-grained stream substrate. This project began in 2012 and the final report for the initial data collection is in CMER review and data collection continues for the extended sampling. Study sites include 11 Type N stream basins located in southwestern Washington.

Project Objectives

To evaluate the effectiveness of the current Westside riparian management prescriptions for Type N Waters under Forest Practices rules relative to unharvested reference basins. This project will evaluate the effects of the Westside Type N riparian rules on stream temperature, sediment input to and storage within the channel, downstream transport of suspended sediment and nutrients, and benthic macroinvertebrate response in forest lands on marine sedimentary lithologies in western Washington.

Extended Data Collection objectives and timeline

Extended data collection will take place through September 2020, to track the recovery of water quality after the initial post-harvest response. Landowners agreed not to harvest the reference sites prior to 2020.

Stream temperature remained elevated in the Forest Practices treatment in the companion Hard Rock study streams at least 9 years after harvest. The initial post-harvest response in the Soft Rock streams was similar to the Hard Rock study, so it is possible that water temperature will remain elevated for several years after harvest. Discontinuing data collection at the sites would require some advanced planning to remove equipment, manage the data, and report the results.

Currently extended data collection has funding approved through September 2020.

Budget

August 14, 2019 Board Approved Budget

	FY 20	FY 21	Total Estimated Budget
2-yr post-harvest sampling	\$20,000		\$20,000
Extended Monitoring	\$139,000	\$151,000	\$290,000
TFW Participation Agreement	\$113,000	\$113,000	\$226,000

Budget notes:

This project has been funded through three sources. First was a \$698,000 National Estuary Program (NEP) grant via EPA. Second, Ecology has contributed approximately \$113,000 per year from TFW Participation Agreements and this will continue in FY 20 and 21. CMER funding began in FY 15 after the NEP grant ended in FY 14.

Project Name	Type N Experimental Buffer Treatment Project in Hard Rock Lithologies – Extended Sampling (CWA Project)
Workplan Critical Questions Addressed	<p><u>Critical Questions that the Hard Rock Study was explicitly designed to address:</u></p> <ul style="list-style-type: none"> • 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 FP HCP resource objectives and performance targets for shade, stream temperature, LWD recruitment, litter fall, and amphibians? • How do survival and growth rates of riparian leave trees change following Type Np buffer treatments? • How do the Type N riparian prescriptions affect water quality delivered to downstream Type F/S waters? • How do stream-associated amphibian populations respond to the Type N prescriptions over time? • What are the effects of three buffer treatments on stream-associated amphibians two years post-harvest? • Is stream-associated amphibian population viability maintained by the Type N prescriptions? <p><u>Critical Questions that the Hard Rock Study informs indirectly:</u></p> <ul style="list-style-type: none"> • What is the frequency and distribution of windthrow in forest practices buffers? • What site and habitat conditions are associated with sites with significant blowdown? • How does stream-associated amphibian habitat respond to variation in inputs (e.g., sediment, litterfall, wood)? • Do stream-associated amphibians continue to occupy and reproduce in the patch buffers? • Do stream-associated amphibians continue to occupy and reproduce in equipment limitation zone (ELZ)-only reaches?
Project Elements	Addresses the effectiveness of FP HCP riparian buffer prescription for 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: RSAG and LWAG Project Manager: Heather Gibbs
CMER Scientist and Principal Investigator(s)	CMER Scientist: Dave Schuett-Hames, Greg Stewart Principal Investigator(s): Ecology – Bill Ehinger; NWIFC – Dave Schuett-Hames; WDFW – Aimee McIntyre
Status/Phase	The Phase 2 Report covering 2006-2017 is currently in review at ISPR (delivered October 8, 2019). Stream Temperature (current work): Data collection 2018 – 2019 was completed in the Fall of 2019 and the data is being analyzed.
Project timeline	<p><u>The Phase 1 report covering 2006-2011 was approved as final by CMER in 2018.</u></p> <p><u>The Phase 2 Report covering 2006-2017 was approved by CMER and is in ISPR review:</u></p> <ul style="list-style-type: none"> • Project completion is anticipated in Spring 2020 <p><u>The Post-harvest Genetics Report was approved by CMER in 2019.</u></p> <p><u>Stream Temperature (current work): Data collection 2018 – 2019.</u></p> <ul style="list-style-type: none"> • Field data collection for this extension finish Fall 2019 • Data being analyzed <p><u>Proposed Future Monitoring for Amphibian Demographics:</u></p> <ul style="list-style-type: none"> • LWAG has proposed a budget and timeline for future amphibian demographic sampling. See details below.
Expenditures	19-21 Biennium: \$239,470
Complementary Projects and project sequencing	Stream-Associated Amphibian (SAA) Detection/Relative Abundance Methodology Project (completed), Amphibian Recovery Project (completed), Westside Type N Buffer Characteristics, Integrity, and Function Project (completed), Buffer Integrity – Shade Effectiveness (Amphibians) Project (completed), Type N Experimental Buffer Treatment in Soft Rock Lithologies Project (underway), Van Dyke’s Salamander Project (underway), Eastside Type N Riparian Effectiveness Project (underway), Amphibians in Intermittent Streams Project (planned), Eastside Amphibians Evaluation Project (planned), Eastside Np Effectiveness Project (planned), Windthrow Frequency,

Project Summary and Purpose

Responses Evaluated: tree mortality, stand structure, wood (large and small) recruitment and loading, shade, stream temperature, discharge, turbidity (suspended sediment export), nutrient export, sediment processes, stream channel characteristics, litterfall input, detritus export, macroinvertebrate export, stream-associated amphibian demographics and genetics, downstream fish (case study), and trophic pathways.

Study Sites: Seventeen (17) Type N, first-, second- and third-order stream basins located over a large geographic area of western Washington.

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

Project Objectives

This project is identified as a Clean Water Assurance (CWA) Milestone. This Effectiveness Study evaluates the effectiveness of the FP HCP 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. This study directly informs 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.

Proposed Future Monitoring – Amphibian Demographics – Data Collection Objectives and Timeline

Preliminary results from the Extended Study suggest significant declines in Coastal Tailed Frog populations 7- and 8-years post-harvest that were not apparent in the two years post-harvest (i.e., Phase 1). There was also a delayed negative response detected for torrent salamanders 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. As such, study PIs propose additional data collection for stream-associated amphibians and other relevant co-variate data to evaluate continued trends in amphibian populations. *Do populations stabilize, continue to decline, or begin to recover?* The proposed start for this extended monitoring is summer 2022; however, the exact timing is flexible given that it does not begin prior to that time. Data analysis and report writing for the continued effectiveness-monitoring phase would extend into 2024 under the current timing. This recommendation is consistent with the study design to monitor effectiveness through time. See proposed timing and budget estimates below. The exact components included could reduce the budget. The timing of resample is flexible for some study components.

Budget (MPS 07/11/2019)

	FY 20 Budget*	FY 21 Budget	FY 22 Budget	Total Budget
Completion of Hard Rock Extended Report (WDFW)	\$51,563	\$34,848		\$86,411
Completion of Hard Rock Extended Report (Ecology) & Temperature Monitoring ends Fall 2019	\$124,175	\$28,884		\$153,059
	\$175,738	\$63,732		\$239,470

*Depending on when PIs receive comments back from ISPR will determine if they are able to spend all this money in FY20 or need it in FY21

Proposed Future Work *Amphibian Demographics*

	FY 20 Budget	FY 21 Budget	FY 22 Budget	FY 23 Budget	FY 24 Budget	FY 25 Budget	FY 26 Budget	Total Budget
Budget for Proposed Future Work			\$111,000	\$262,000	\$80,000			\$453,000

Project Name	Eastside Type N Riparian Effectiveness Project (ENREP) (CWA Project)
Workplan Critical Questions Addressed	<p>Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FP HCP resource objectives and performance targets for shade, stream temperature, LWD recruitment, litter fall, and amphibians (<i>aquatic life</i> is the term used in study design)?</p> <p>Do different types of Type N channels explain the variability in the response of Type N channels to forest practices?</p> <p>What is the effect of buffering or not buffering spatially intermittent stream reaches in Type Np streams?</p>
Project Elements	Change in stream flow, canopy closure, water temperature, suspended sediment transport, 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	<p>SAGE</p> <p>Project Manager: Teresa Miskovic</p>
CMER Scientist(s) and Principal Investigator(s)	<p>CMER Scientist(s): TBD</p> <p>Principal Investigators: Timothy Link: University of Idaho, Charles Hawkins: Utah State University, Bill Ehinger: Dept. of Ecology</p>
Status/Phase	<p>Implementation of Study Design:</p> <p>Northern Rockies Ecoregion Sites:</p> <ul style="list-style-type: none"> • Installation of biophysical monitoring equipment at all sites <ul style="list-style-type: none"> ○ Installation of air temperature and shallow subsurface sensors within the study streams & 2 hydro meteorological stations per watershed pair • Completion of first year pre-harvest data collection for: benthic invertebrates, stream shade, aquatic life, biophysical variables, habitat, large wood, summer temperature, and stream cross sections. <p>Eastern Cascades Slopes/Foothills and Northern Cascades Ecoregion Sites:</p> <ul style="list-style-type: none"> • Timothy Link (UI) and Bill Ehinger (ECY) visited the three potential watershed pairs (Rattlesnake Ridge, Sedge Ridge, and Coxit Mountain) summer 2019. The Rattlesnake Ridge and Sedge Ridge sites have dropped out of the study. Policy has requested the project team look for 2 additional basin pairs ideally in the East Cascades region but NE is also acceptable if that's where the only viable sites are. • WCC field crews completed necessary site improvements at the Coxit sites to provide access. • Actively addressing habitat and other site specific matters associated with the Coxit sites.
Expenditures to Date	FY 18- FY 20: \$865,644
Project Timeline	Implementation anticipated from summer 2018-2026
Complementary Projects and project sequencing.	Westside Type N Experimental Buffer Treatment Project in Hard Rock and Incompetent Lithologies, Eastside Type Np Effectiveness Project, Type F and N Extensive Eastside – Temperature, Eastside Type N Forest Hydrology, Eastern Washington Riparian Assessment, 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 are effective in protecting water quality and some riparian functions, 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

August 14, 2019 Board approved budget

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	Total estimated budget
\$907,968	\$723,434	\$686,719	\$626,609	\$366,695	\$152,267	\$0	\$3,463,692

Updated Budget Estimates

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY26	Total estimated budget
\$753,015	\$717,947*	\$683,263*	\$699,442*	\$642,664*	\$517,640*	\$366,588*	\$4,275,559*

*Estimates from September 2019 Policy handout. These are anticipated to change once replacement basins are located.

Project Name	Westside Type F Riparian Prescription Monitoring Project
Workplan Critical Questions Addressed	<p>How do the RMZ and no-RMZ harvest prescriptions affect riparian stand characteristics and riparian functions?</p> <p>How do the characteristics of riparian forest stands and associated riparian functions in areas with RMZ and without RMZ harvest change over time?</p> <p>Do riparian forest stands in areas with RMZ and without RMZ harvest remain on trajectory to achieve DFC targets?</p> <p>How do physical stream characteristics and processes respond to changes in riparian functions in areas with RMZ and without RMZ harvest?</p> <p>Do physical stream characteristics and processes meet performance targets?</p>
Project Elements	Westside riparian conditions, DFC performance targets, riparian functions, forest stand attributes
Responsible SAG and Project Manager	<p>RSAG</p> <p>Project Manager – Teresa Miskovic</p>
Principal Investigator(s) and Project Team	<p>CMER scientists: Dave Schuett-Hames, Greg Stewart, Jenelle Black</p> <p>Project Team: Doug Martin (Martin Environmental), Rebecca Flitcroft (U.S. Forest Service, PNW Research Station), Pat Cunningham (USDA)</p>
Status	Exploratory study data analysis and report writing
Project timeline	It is anticipated that the exploratory phase of the project will be completed in 2021
Expenditures	FY 19 and FY 20: \$338,573
Complementary Projects and project sequencing	<p>Sequencing: This project is broken into two phases, an initial exploratory study to gather information on riparian conditions and functions associated with the prescription, followed by an intensive study that examines the response of riparian functions, stream habitat and aquatic resources to the prescriptions.</p> <p>Complementary projects: Bull Trout Overlay Temperature Project, Solar Radiation/Effective Shade Project, Eastside Type F Riparian Effectiveness Monitoring Project (BTO add-on).</p>
Project Summary and Purpose	
<p>Riparian prescriptions and rules are very different from Eastern to Western Washington for Type F (fish-bearing) waters. Currently no Westside Type F Effectiveness Studies are being conducted by the Cooperative Monitoring Evaluation and Research (CMER) committee. While CMER has tested the effectiveness of Eastside Type F riparian prescriptions and the Bull Trout Overlay All Available Shade Rule, the current Westside rule remains based on untested assumptions that riparian prescriptions are functioning as intended. There is therefore a need for a Westside Type F Riparian Prescription Effectiveness study to fill this knowledge gap and compliment the Eastside Type F Effectiveness Study results. However, little is known about the distribution of stand conditions in Westside Type F streams under the current suite of prescription variants. Before such a Type F effectiveness study can be implemented, an exploratory study is needed to assess the distribution of stand conditions and prescription variants. The exploratory study will produce information needed to focus and design the Westside Type F Riparian Prescription Effectiveness Before After Control Impact (BACI) study.</p> <p>The goal at the conclusion of the exploratory study is to have information including:</p> <ul style="list-style-type: none"> • The level of riparian functions associated with the Type F prescriptions, including data on post-harvest large wood recruitment, shade, and sediment delivery, • Riparian stand conditions associated with the Type F prescriptions, including stand mortality, density, basal area, and the proportion of sites currently on trajectory to meet the Desired Future Conditions (DFC) target of 325 ft/acre of basal area at 140 years, 	

- The frequency, magnitude and distribution of windthrow and its effects on stand structure, buffer tree mortality rates and riparian functions,
- The relative influence of differences in site conditions and geographic location on the above.

The results from the exploratory study will be used to design an intensive study to document direction and magnitude of change associated with the prescription variants, and determine the potential influence of site conditions on riparian stand conditions and functions following treatments. This information will be used to focus the study design to provide fine-scale assessments of treatment effects for a select set of prescription variants and site conditions. This study would improve our understanding and decrease scientific uncertainty about the linkage between riparian prescriptions, changes in riparian stands and riparian functions, and the aquatic resource response (habitat, wood recruitment, temperature, and aquatic organisms). It is anticipated this study would provide the following information:

- an estimate of the effects of specific prescription variants on riparian stand conditions, mortality and trajectory to meeting DFC targets,
- a measure (direction and magnitude of change) of treatment effects on key riparian functions (e.g. shade, large wood recruitment, streambank integrity/bank erosion, sediment attenuation, litter fall),
- measures of instream habitat, water quality and aquatic biotic responses (e.g., wood loading, habitat composition and complexity, stream temperature, macroinvertebrates, fish) to treatments,
- an assessment of riparian prescription effectiveness over the short-term (i.e., initially 2-years post-harvest with the potential to extend sampling for metrics of interest).

The exploratory study plan, Best Available Science Scoping Document, project charter and communication plan have been completed. The exploratory study data has been collected and is currently being analyzed and a report written.

Project Objectives

The overall goal of the exploratory phase is to produce information needed to focus and design the BACI phase of the project. This exploratory study will assess riparian stand conditions and selected riparian functions across a wide range of prescription variants and site conditions. Given the complexity of Type F rules and the variability in application across the landscape, there is a need to better understand how the rules influence riparian forest functions. The exploratory study will provide a coarse-level assessment of current riparian conditions that focuses on addressing scientific uncertainty surrounding their sensitivity to prescription variants.

Budget

August 14, 2019 Board Approved Budget

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	Total estimated budget
\$125,000	\$0	\$35,000	\$150,000	\$250,000	\$150,000	\$250,000	\$250,000	\$40,000	\$20,000	\$1,270,000

Updated Budget estimates

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	Total estimated budget
\$147,000	\$0	\$35,000	\$150,000	\$250,000	\$150,000	\$250,000	\$250,000	\$40,000	\$20,000	\$1,292,000

Project phases by FY

FY 20	FY 21	FY 22	FY 23	FY 24
Exploratory study data collection completed at all sites. Data Analysis and Exploratory report writing/review (completed by CMER staff).	Exploratory report through RSAG and CMER review and revisions. Write study design for Experimental study and complete RSAG and CMER review. (no budget)	ISPR and final revisions and approval of Experimental study design. Initiate site selection for Experimental study (funding to cover site selection if	Complete site selection for Experimental study. Initiate site layout and pre harvest data collection (April-June 2023). Assume we will hire a contractor to	Complete 1 st year pre harvest data collection (July-Sept 2023). Initiate 2 nd year pre harvest data collection (April-June 2024).

	b/c completed by CMER staff)	needed).	complete data collection at 55 sites.	
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Project phases by FY, cont.

FY 25	FY 26	FY 27	FY 28	FY 29
Complete 2nd year pre harvest data collection (July-Sept 2024). Implement harvest treatments.	Complete harvest treatments. initiate 1st year post harvest data collection (April – June 2026).	Complete 1 st year post harvest data collection (July – Sept 2026). Initiate 2nd year post harvest data collection (April-June 2027).	Complete 2 nd year post harvest data collection (July-Sept 2027). Data analysis and final report writing.	Final report review and revisions.

Budget notes:

Budget estimates are based on existing contract budgets for similar work and on the current exploratory study and are rough estimates. These are anticipated to change based on the final study design that is completed in FY 2022. Data collection assumes two years of data collection before treatment (1st year April 2023 – Sept 2023, 2nd year April 2024 – Sept. 2024), nine months for harvest treatments, and two years after treatment data collection (1st year April 2026 – Sept 2026, 2nd year April 2027-Sept 2027). CMER staff are utilized in all phases of the project but cost for their time is not included in budget estimates.

Project Name	Road Prescription-Scale Effectiveness Monitoring
Workplan Critical Questions Addressed	Are road prescriptions effective at meeting site-scale performance targets for sediment and water?
Project Elements	Effectiveness of road maintenance, road surface erosion, sediment production, sediment delivery, hydrologic connectivity
Responsible SAG and Project Manager	SAG: Not associated with a SAG – oversight provided by CMER Project Manager: Ben Flint
CMER Scientist(s) and Principal Investigator(s)	CMER scientist(s): Jenelle Black Principal Investigator(s): Charlie Luce
Status/Phase	<ul style="list-style-type: none"> • Team working on getting all 78 platforms completely installed and troubleshooting new issues as they arise. A Public Works Contract is being drafted for some of the larger maintenance items and to install the last platform. • WestFork Environmental is now under contract to visit each site each month to download data, collect water samples, and repair minor issues at each platform. Watershed GeoDynamics is working with WestFork to process and analyze the data. • The preliminary roads model was presented in December 2019 at the American Geophysical Union Annual Fall Meeting in San Francisco, CA. Continued model development is underway. • Parameterization experiments (Ditchline Hydraulics and Short-Time-Scale Interactions) will begin in March 2020, as detailed in the Study Design. • The Micro-Topography parameterization experiment is underway; the next series of surveys will be carried out in March/April 2020.
Project timeline	Project is scheduled to be completed in 2026. FY20-21 – completion of installation and monitoring of 78 sites, data management and QA/QC, equipment maintenance, start parametrization experiments
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 will address surface erosion sediment reductions from site-specific measures. This will be 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- Board Approved July 11, 2019

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	Total budget
\$374,500	\$330,500	\$403,000	\$400,500	\$406,000	\$291,000	\$212,000	\$2,417,500

Project Team Proposed Budget (January 2020)

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	Total budget
\$499,224*	\$406,900*	\$403,000	\$400,500	\$406,000	\$291,000	\$212,000	\$2,618,624

*Budget adjustments represent additional costs associated with the following project elements: water sample testing, increased maintenance, repair and installation costs associated with public works contracts, USFS cost estimates, unforeseen supply and equipment purchases for data collection and site efficacy.

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: Ben Flint
CMER Scientist(s) and Principal Investigator(s)	Project Team Members: Dan Miller, Ted Turner, Julie Dieu CMER Scientist: Greg Stewart
Status/Phase	<p>The project team is developing study designs for the five related studies, approved by Policy in April 2017.</p> <ol style="list-style-type: none"> 1. Compare/Contrast Landslide Hazard Zonation (LHZ) Mass Wasting Map Units with RIL (this project will be incorporated into subsequent projects per ISPR review comments). 2. Object-Based Landform Mapping with High-Resolution Topography (this will be implemented as the first project. We are currently finalizing our response to ISPR comments on the study plan). 3. Empirical Evaluation of Shallow Landslide Susceptibility and Frequency by Landform 4. Empirical Evaluation of Shallow Landslide Runout 5. Models to Identify Landscapes/Landslides Most Susceptible to Management <p>The Study Design for Object-Based Landform Mapping with High- Resolution Topography has been completed and has been approved by ISPR and CMER. The study will be implemented in 2020.</p> <p>Study Designs for Empirical Evaluation of Shallow Landslide Susceptibility and Frequency by Landform, Empirical Evaluation of Shallow Landslide Runout, and Models to Identify Landscapes/Landslides Most Susceptible to Management will be developed following completion of the Object-Based Landform Mapping with High-Resolution Topography Study Design.</p>
Expenditures to Date	17-19 Biennium: \$12,920.95
Project Timeline	<p>The project is estimated to go through 2023:</p> <p>FY 2018 – Study design submitted to ISPR for Project 2. FY 2019 – ISPR initiated for Project 2. FY 2020 – Complete ISPR review for Project 2 and develop implementation plan. Begin Development of study plan for Project 3 (SAG Review and ISPR initiation in FY 2021). FY 2021 – Initiate work on Project 2. Develop study plans for Projects 3 & 4 and initiate ISPR review. FY 2022 – Complete ISPR review for Projects 3 & 4. Initiate Project 5. FY 2023 – Complete Project 5.</p>
Complementary Project(s) and 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), Mass Wasting Landscape-Scale Extensive Monitoring
Project Summary and Purpose	
<p>This project will evaluate the degree to which the landforms described in the unstable slopes rules identify potentially unstable areas with a high probability of impacting public resources and public safety.</p> <p>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 TWIG understands that Policy’s direction was to evaluate the</p>	

landslide susceptibility of different slopes/landforms in the interest of evaluating current rule-identified landforms and identifying/characterizing additional potentially unstable landforms. The TWIG 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.

Project Objectives

This project will evaluate the degree to which the landforms described in the unstable slopes rules identify potentially unstable area with a high probability of impacting public resources and safety.

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.

Budget

Project Team Proposed Budget (January 2020)

Breakdown by Project	FY 20* Budget	FY 21 Budget	FY 22 Budget	FY 23 Budget	FY 24 Budget	FY 25 Budget	Total Budget
Object-based landform mapping	\$8,810	\$60,000	\$27,960	\$3,960			\$125,000
Shallow landslide susceptibility	\$22,700	\$10,000	\$75,000	\$75,000	\$25,000		\$200,000
Shallow landslide runout		\$15,000	\$50,000	\$50,000	\$50,000		\$150,000
Mgt Susceptibility modeling					\$100,000	\$100,000	\$200,000
Total TWIG Budget	\$31,510	\$85,000	\$152,960	\$128,960	\$175,000	\$100,000	\$673,430

*FY 2020 funds are pending contract completion to be spent by the end of the fiscal year.

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Breakdown by Project	FY 20 Budget*	FY 21 Budget*	FY 22 Budget*	FY 23 Budget*	FY 24 Budget*	Total Budget
Project 1						Incorporated below in projects 3 and 4.
Project 2	\$95,000					\$95,000
Project 3		\$10,000	\$250,000	\$150,000		\$410,000
Project 4		\$10,000		\$90,000		\$100,000
Project 5				\$10,000	\$150,000	\$170,000
Revised Total	\$95,000	\$20,000	\$250,000	\$250,000	\$150,000	\$775,000

Project Name	Forested Wetlands Effectiveness Project (FWEP)
Workplan Critical Questions Addressed	<p>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?</p> <p>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?</p>
Project Elements	Timber harvest effects on forested wetlands, wetland forest practices prescription effectiveness
Responsible SAG and Project Manager	<p>SAG: WETSAG</p> <p>Project Manager: Eszter Munes</p>
CMER Scientist and Principal Investigator(s)	<p>CMER Scientist: Wetland Scientist (vacant)</p> <p>Principal Investigator: Nate Hough-Snee, Four Peaks Environmental</p>
Status/Phase	<ul style="list-style-type: none"> • Study design ISPR and CMER approved. WetSAG and Contractor is currently working on the Policy Prospective 6 Questions report. • FWEP literature review, database, and webmap deliverables have been reviewed by WetSAG and additional funds are being requested to finalize these deliverables.
Project timeline	<p>FY 20 – Complete CMER/Policy process for approval and delivery of Study Design. Finalize and complete CMER/Policy process for approval and delivery of Literature Review deliverables.</p> <p>FY 21 – Implement Chronosequence study. Perform initial data analysis/report writing (Chronosequence). FY 22 – Complete time-series measurements from chronosequence through end of water year; Undertake design and implementation of BACI study based on the findings of the chronosequence study.</p> <p>FY 23 – BACI study year 1</p> <p>FY 24 – BACI study year 2</p> <p>FY 25 – BACI study year 3</p> <p>FY 26 – BACI study year 4</p> <p>FY 27 – BACI study year 5</p> <p>FY 28 – BACI study year 6</p> <p>FY 29 – BACI study year 7. Data analysis/report writing.</p> <p>FY 30 – Additional analysis/report writing. Project Completion.</p>
Expenditures	19-21 Biennium: \$165,000
Complementary Projects and project sequencing	Forest Practices and Wetlands Systematic Literature Review, Statewide Forested Wetlands Regeneration Pilot Project, Wetland Management Zone Effectiveness Monitoring Project, Wetlands Intensive Monitoring Project
Project Summary and Purpose	
<p>Currently, the forest practices' rules give limited protection to forested wetland systems, and little is known about the effects of harvest on these systems' ecology and hydrology as it relates to downstream ecosystem processes. The purpose of this project is to (1) evaluate the effectiveness of timber harvest rules at maintaining functions of harvested forested wetlands and to (2) identify whether there are losses in net function in and downstream of forested wetlands post-harvest and to determine the extent to which changes of function meet or fail to meet the required metrics for listed species survival and clean water act assurances. Effectively, ecosystem process loss and recovery can be quantified through these studies to determine rates of change in forested wetland and connected stream hydrology and ecology following forest harvest under current forest practice rules.</p>	

Project Objectives

The primary research objectives of this project are: 1) identify the functions that are being affected post-harvest and for what duration, and 2) to develop study design(s) that, when implemented, will yield information on the changes in wetland functions and associated watershed resources due to implementation of forest practices rules.

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FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	Total budget
\$15,000	\$150,000	\$232,500	\$232,500	\$150,000	\$150,000	\$150,000	\$200,000	\$200,000	\$1,480,000

Project Name	Riparian Characteristics and Shade Response
Work Plan Critical Questions Addressed	<p><u>Primary Critical Questions:</u></p> <p>How does stream shading change with buffer width and intensity of management across a range of stand types and characteristics in Washington?</p> <p>How does stream shading change with buffer width and stand conditions (e.g., basal area, density, age, height)?</p> <p><u>Secondary Critical Questions:</u></p> <p>How do other buffers compare with the forest practices Type N prescriptions in meeting resource objectives?</p> <p>Are both the standard eastside prescriptions and the all available shade rule effective in protecting shade and stream temperature and in meeting water quality standards?</p>
Project Elements	Type F/N riparian conditions, stream shade, and riparian vegetation type.
Responsible SAG and Project Manager	RSAG Project Manager – Teresa Miskovic
Principal Investigator(s)	Contractor: Siskowet
Status	RSAG/CMER concurrent review of study design
Project timeline	It is anticipated that the study design will be finalized and approved by the end of 2020. An RFQQ for project implementation will occur after that and a contractor hired to begin implementation.
Expenditures	FY 19 and FY 20: \$51,275
Complementary Projects and Project Sequencing	Westside Type N Experimental Buffer Treatment Project in Hard Rock and Incompetent Lithologies, Eastside Type N Effectiveness Monitoring Project, 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)
Project Summary and Purpose	
<p>It is anticipated that this study will use an unbiased stratified sampling framework to create regionally robust estimates of the effect that buffer width, and intensity of management within the buffer, has on shade under a range of stand conditions.</p> <p>The purpose of this study is to quantify how stream shade responds to a continuum of buffer management treatments of varying intensity across a range of stand types (or geo-physiographic regions)^[1] common to commercial forestlands covered under the FPHCP. The results will strengthen the ability of the Adaptive Management Program to interpret and respond to ongoing and future effectiveness monitoring studies that directly test both shade and temperature. The data collected on buffer and stand characteristics may also be used to test and potentially make improvements to Ecology’s SHADE.xls model. This would further expand our ability to estimate the response of shade to an even broader range of treatment prescriptions, including alternative prescriptions, over a broader range of riparian forest types and conditions than what we can test directly. Four options were identified in the approved scoping document and presented to the TFW Policy Group. In November 2018 they decided to move forward with a study design that includes both Alternative 1 and Alternatives 2.</p>	
Project Objectives	

The study has several objectives:

1. To determine the effect of varying buffer width and the intensity of management (i.e. thinning) within the buffer on shade provided to adjacent streams.
2. To determine relationships between stream shade and common forest-stand metrics (e.g. mean canopy height, crown ratio, relative density, trees per acre, basal area per acre).
3. To refine and calibrate Ecologies shade (SHADE.xls) model to improve application across the range of buffer configurations and timber stand types common to commercial forestlands in Washington.

The study will address the following additional critical questions refined during study design development:

1. How does stream shade change in response to a range of no-cut and thinned buffer zones used alone and in combination?
2. How does the shade provided by the tested buffer configurations vary by stand type (e.g. Douglass fir, hemlock-spruce, Ponderosa pine)?
3. What stand metrics (e.g. stand height, relative density, trees per acre, basal area, and crown ratio) alone or in combination, are the best predictor of shade and light attenuation; and how do these predictor variables vary by stand type?
4. What parameter input values and/or changes in the Ecology SHADE.xls model (e.g. canopy density, light extinction, stream overhang) would improve prediction accuracy for timber stand types common to commercial forestlands covered under the FP HCP in Washington?

[1] Recommendations on whether to use forest stand types or ecoregions, and which stand types or regions should be tested will be determined in the study design development.

Budget

August 14, 2019 Board Approved Budget

FY 20	FY 21	FY 22	FY 23	FY 24	Total estimated budget
\$10,000	\$121,445	\$341,000	\$330,000	\$20,000	\$822,445

Updated Budget Estimates

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	Total estimated budget
\$15,000	\$0	\$121,445	\$341,000	\$330,000	\$20,000	\$827,445*

*Budget estimates are based on rough estimates contained in the current scoping document alternative 2. Budget estimates are predicted to change based on the final study design that is completed in 2021.

Project phases by FY

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25
Complete RSAG and CMER review of study design. Initiate ISPR of study design.	Complete ISPR of study design. RFQQ for project implementation lead and contract logger. Finalize contracts with implementation lead and contract logger. Initiate site selection and acquire permits.	Complete site selection and acquire permits (\$20,000). Purchase remaining equipment (\$30,445). Begin tree marking sites, data collection, and harvesting for Westside of state (\$71,000).	Complete harvesting and data collection on Westside of state (\$250,000). Complete site selection and acquire permits for Eastside of state. Begin tree marking sites, data collection, and harvesting for Eastside of state (\$91,000).	Complete harvesting and data collection on Eastside of state (\$250,000). Begin data analysis, final report writing, and report review/revisions (\$80,000).	Final report review and revisions

Project Name	Deep-Seated Landslide (DSL) Research Strategy Projects
Work Plan Critical Questions Addressed	<ul style="list-style-type: none"> • 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: Ben Flint
CMER Scientist(s) and Principal Investigator(s)	CMER Scientist(s): Greg Stewart Project Investigators: TBD
Status/Phase	<p>Strategy approved by CMER (2018)</p> <p>Project components completed to date:</p> <ul style="list-style-type: none"> 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 <p>Currently scoping:</p> <ul style="list-style-type: none"> 4.5 Deep-Seated Landslide Mapping Objective 4.6 Landslide Classification <p>Future components:</p> <ul style="list-style-type: none"> 4.7 Toolkit Development 4.8 Groundwater Modeling 4.9 Physical Modeling 4.10 Landslide Monitoring 4.4 Board Manual Revision Project
Expenditures to Date	FY 16-19: \$151,725.00
Project Timeline	<p>Strategy implementation will continue to 2029 or beyond.</p> <p>UPSAG is currently scoping the Landslide Mapping and Classification Project (4.5 and 4.6) under the Strategy. Scoping document to Policy for approval ~ June 2020. Study Design document to Policy for approval ~June 2021</p>
Complementary Project(s) and Project Sequencing	<p>Complementary Project: Unstable Slopes Criteria Project</p> <p>Project Sequencing: Please see the Project Sequencing Budget table, below.</p>

Project Summary and Purpose:

The strategy utilizes the results of the literature reviews for forest harvest effects on glacial deep-seated landslides and non-glacial 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

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.

Budget

UPSAG Proposed Budget (January 2020)

Project Description	FY 2020*	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025-29 (annually)
4.5 Mapping Objective 1	\$0.00					
4.5 Mapping Objective 2		\$100,000				
4.5 Mapping Objective 3			\$100,000	\$25,000	\$25,000	\$25,000
4.6 Pilot Classification		\$65,000				
4.6 Landslide Classification			\$40,000	\$25,000	\$50,000	\$50,000
4.7 Toolkit Development			\$20,000			
4.8 Pilot Groundwater Model			\$75,000			
4.8 Groundwater Modeling				\$50,000	\$50,000	\$50,000
4.9 Physical Modeling				\$75,000	\$50,000	\$50,000
4.10 Landslide Monitoring				\$25,000	\$25,000	\$25,000
<i>Total UPSAG Budget</i>	\$0.00	\$165,000	\$235,000	\$200,000	\$200,000	\$200,000

**We are proposing LiDAR acquisition during FY 20 for \$190,000. The Board approved \$125,000 for FY 20 (August 2019, see below) which was for an FTE that we are not utilizing at this time. We propose to utilize the \$125,000 with an additional \$65,000 for FY 20 to acquire the LiDAR to come from the pool of unspent CMER funds. Please see our LiDAR Acquisition project proposal for details.*

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Project Description	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025-29 (annually)
4.5 Mapping Objective 1	\$75,000					
4.5 Mapping Objective 2		\$100,000				
4.5 Mapping Objective 3			\$100,000	\$25,000	\$25,000	\$50,000
4.6 Pilot Classification	\$50,000	\$65,000				
4.6 Landslide Classification			\$40,000	\$25,000	\$50,000	\$50,000
4.7 Toolkit Development			\$20,000			
4.8 Pilot Groundwater Model			\$75,000			
4.8 Groundwater Modeling				\$50,000	\$50,000	\$25,000
4.9 Physical Modeling				\$75,000	\$50,000	\$25,000
4.10 Landslide Monitoring				\$25,000	\$25,000	\$50,000
<i>Total UPSAG Budget</i>	\$125,000	\$165,000	\$235,000	\$200,000	\$200,000	\$200,000

** This is a long-term strategy and UPSAG recommends 1.0 FTE (~\$125,000/yr) to maintain project continuity over time. Additional contract dollars (\$50,000-\$75,000/yr) to support the strategy will also be necessary to maintain progress on the projects defined under the strategy.*

Project Name	Amphibians in Intermittent Streams Project
Workplan Critical Questions Addressed	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Characteristics of 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. • Stream-associated amphibian use of streams with intermittent flow.
Responsible SAG and Project Manager	SAG: LWAG Project Manager: Heather Gibbs
Principal Investigator(s)	TBD
Status	In 2007 this project was conceptualized and pertinent data from existing CMER projects were summarized. An updated BAS synthesis, a Scoping Document, and Study Design need to be developed.
Project timeline	FY20: Scoping Document development, including literature synthesis and a summary and preliminary analysis of data from existing studies. FY21: Development of a Study Design (pending direction from CMER/Policy).
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

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 of Type N (non-fish-bearing) streams 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. 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:

1. Scoping Document (FY20): Summarize findings from peer-reviewed literature and Type N-related CMER 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.
2. Study Design (FY21): 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 reaches would include an on-the-ground field evaluation of intermittent streams, 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 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.

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 stream reaches on stream temperature and FP-covered amphibians for the Westside FP HCP landscape.

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

Budget

Total Budget Spent to Date

Total spent to date
\$30,000

Current Biennium Allocated Budget

FY 20*+ (Scoping Document development)	FY 21**+ (Study Design development/ISPR)	Biennium Total
\$40,864	\$80,000	\$120,864

*First phase of this project (FY20) includes Scoping Document development. Funding supports the addition of a literature synthesis and summary / preliminary analyses of data from existing CMER-supported studies.

**Future work (FY21) is dependent on interest in continued work by CMER and Policy.

+All funds support salary and benefits for staff (no equipment or travel needs)

Literature Cited

Hunter, M.A., T. Quinn and M.P. Hayes. 2005. Low flow spatial characteristics in forested headwater channels of southwest Washington. *Journal of the American Water Resources Association* 41(3):503-516.

Quinn, T., M.P. Hayes, D.J. Dugger, T.L. Hicks, and A. Hoffman. 2007. Comparison of two techniques for surveying headwater stream amphibians. *Journal of Wildlife Management* 71:282-288.

Project Name and Background	<p>Water Typing Strategy</p> <p>At the November 5, 2019 WFPB Meeting the following motion was passed:</p> <p><i>“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.”</i></p> <p>In December 2019 CMER voted that ISAG should have the lead in responding to the Forest Practices Board motion (above) and developing an overall CMER based Water Typing Strategy.</p>
Strategy Elements	<p>The CMER Water Typing Strategy will include (individually or in combination) the following elements:</p> <ol style="list-style-type: none"> 1. Default Physical Criteria Assessment 2. Potential Habitat Breaks (PHB) 3. LiDAR Based Water Typing Model 4. Fish/Habitat Detection Using eDNA <p>ISAG will consider whether, or if so how, to combine these elements (as directed by the WFPB), and to consider if/how additional elements may be added to the list.</p>
Work Plan Critical Question Addressed	<p>(1) Default Physical Criteria Assessment</p> <ul style="list-style-type: none"> • 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? <p>(2) Potential Habitat Breaks (PHB)</p> <ul style="list-style-type: none"> • How can the line demarcating fish- and non-fish habitat waters be accurately identified? • To what extent does the current water typing survey window capture 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? <p>(3) LiDAR Based Water Typing Model</p> <ul style="list-style-type: none"> • To what extent can LiDAR be used with the current fish habitat model to develop a new model for predicting the upstream extent of fish habitat sufficient to meet the requirements of the Forest and Fish Agreement? <p>(4) Fish/Habitat Detection Using eDNA</p> <ul style="list-style-type: none"> • How well and under what conditions does eDNA sampling accurately and consistently identify the upstream extent of fish presence, abundance, and/or fish habitat?

Responsible SAG and Project Manager	SAG: ISAG Project Manager: Eszter Munes
Project Team Members	TBD
Status/Phase	<p>The overall CMER Water Typing Strategy is currently being developed within ISAG. The following provides specific details associated with each of the (4) active projects within the strategy:</p> <p>(1) Default Physical Criteria Assessment</p> <ul style="list-style-type: none"> • The development of a study design to evaluate default physicals was initiated in 2016. • In March 2019 Cramer Fish Sciences presented a draft ‘Physicals’ study design to ISAG. During this presentation Cramer recommended combining this project with the PHB Validation Study. • Following the March 2019 presentation ISAG provided comments back to the authors on the draft ‘Physicals’ study design, however, no final/approved ‘Physicals’ study design was produced. • In November 2019 the Board recommended that CMER develop a ‘Physicals’ study design. • In December 2019 CMER voted that ISAG should have the lead in responding to this Board motion (above). ISAG is currently considering how the ‘Physicals’ project fits within the overall Water Typing Strategy and if it could be combined with other elements per the Board’s motion. <p>(2) Potential Habitat Breaks (PHB)</p> <ul style="list-style-type: none"> • A PHB pilot project has been completed and a report was delivered to the Board in January 2016. • A ‘PHB’ study design was developed by the Board designated science panel and subsequently approved by ISPR in November 2018. • The study design was also reviewed by members of CMER/ISAG (informally, outside of the CMER process) and a comment matrix was provided to the authors in January 2019. • An updated (most recent) version of the ‘PHB’ study design was presented to the Board in May 2019. • The Board then created a special Water Typing Committee in June 2019 to provide recommendations on next steps back to the full Board in August 2019. • Per recommendation of the Water Typing Committee, in November 2019 the Board recommended that CMER develop a ‘PHB’ study design. • In December 2019 CMER voted that ISAG should have the lead in responding to this Board motion (above). ISAG is currently considering how the ‘PHB’ project fits within the overall Water Typing Strategy and if it could be combined with other elements per the Board’s motion. <p>(3) LiDAR Based Water Typing Model</p> <ul style="list-style-type: none"> • The development of a study design RE a LiDAR based water typing model was initiated in 2016. • In May 2019 Cramer Fish Sciences delivered a draft ‘LiDAR Model’ study design to ISAG, however, no final/approved ‘LiDAR Model’ study design was produced. • In November 2019 the Board recommended that CMER develop a ‘LiDAR Model’ study design. • In December 2019 CMER voted that ISAG should have the lead in responding to this Board

	<p>motion (above). ISAG is currently considering how the ‘LiDAR Model’ project fits within the overall Water Typing Strategy and if it could be combined with other elements per the Board’s motion?</p> <p>(4) Fish/Habitat Detection Using eDNA</p> <ul style="list-style-type: none"> • An eDNA pilot project has been completed (Brooke Penaluna – Principal Investigator) and a draft report was delivered for ISAG review in December 2019.
<p>Project Timeline</p>	<p>ISAG will report on the ‘Physicals’, ‘PHB’, and ‘LiDAR Model’ study design(s) to the Board by May 2020. Project timelines thereafter will be based on recommendations developed at the May 2020 FP Board meeting. The following provides specific details on near-term tasks associated with each of the (4) active projects within the Water Typing Strategy:</p> <p>(1) Default Physical Criteria Assessment</p> <ul style="list-style-type: none"> • ISAG will review the existing ‘Physicals’ study design and associated comments (from ISAG members in 2019) and develop options for how the existing study design could be modified and/or merged with other Water Typing Strategy elements moving forward. <p>(2) Potential Habitat Breaks (PHB)</p> <ul style="list-style-type: none"> • ISAG will review the existing ‘PHB’ study design, associated recommendations from the ISPR review, and associated comments (from ISAG/CMER members) and develop options for how the existing study design could be modified and/or merged with other Water Typing Strategy elements moving forward. <p>(3) LiDAR Based Water Typing Model</p> <ul style="list-style-type: none"> • ISAG member(s) will investigate other (ongoing/completed) LiDAR (fish) modeling studies to identify current knowledge gaps and assess whether further/new work on this subject is needed. An update on this topic will be provided at the February ISAG Meeting. <p>(4) Fish/Habitat Detection Using eDNA</p> <ul style="list-style-type: none"> • ISAG will provide comments on the updated (December 2019) draft eDNA report back to ISAG Co-Chair by Tuesday, February 4, and this topic will be the primary agenda item at the February ISAG Meeting.
<p>Project Summary and Purpose</p>	
<p>Summary: Refine study designs for the PHB validation, physical characteristics, and map-based LiDAR model studies in FY2020. Design the studies for cost savings, including the phasing of the studies in eastern Washington to be initiated first, and the possibility and advisability of combining the default physical criteria, PHB validation, and/or map-based LiDAR model studies.</p> <p>Purpose: Inform a permanent water typing system that meets FFR objectives.</p>	
<p>Project Objectives</p>	
<p>Determine possibility/advisability of combining the ‘Physicals’, ‘PHB’, and/or ‘LiDAR Model’ studies. Project specific objectives are listed below:</p> <p>(1) Default Physical Criteria Assessment</p> <ul style="list-style-type: none"> • 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 habitat likely to be used by fish. • Determine if sustained gradient or stream size thresholds alone serve as sufficient default physical criteria. <p>(2) Potential Habitat Breaks (PHB)</p> <ul style="list-style-type: none"> • 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 extend of fish presence and/or fish habitat when determining the F/N break.

- Determine which combinations of gradient, channel width, barriers to migration, and other physical habitat and geomorphic conditions of the Board identified PHB criteria best identifies last detected fish location in an objective and repeatable manner as applied in the FHAM.
- Provide insight into how last detected fish points, end of fish (EOF) habitat, and PHBs proposed by the Board may vary across ecoregions, seasons, and years.
- Identify PHB criteria that can be used to capture 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.

(3) LiDAR Based Water Typing Model

- Prepare ‘LiDAR Model’ study design to evaluate the effectiveness of a LiDAR based logistic regression model and identify and locate presumed fish habitat across the state.
- Develop a logistic regression model that predicts fish habitat across non-federal forestlands in Washington.
- Select the appropriate spatial scale for the study. Include analytical (validation) that may be necessary to validate the model.

(4) Fish/Habitat Detection Using eDNA

- Assess how eDNA sampling compares with electrofishing for overall effectiveness, costs, and accuracy for identifying fish presence.

Budget*

August 14, 2019 Board Approved Budget

	FY 20 Budget	FY 21 Budget	FY 22 Budget	FY 23 Budget	FY 24 Budget	FY 25 Budget	Total Budget
Water Typing Strategy	\$65,850	\$552,456	TBD	TBD	TBD	TBD	TBD

*This estimated budget is anticipated to change based on the final study designs that are developed based on the FP Board recommendations.

Project Name	Wetlands Intrinsic Potential Tool (WIP)
Workplan Critical Questions Addressed	How should wetlands be located, classified, and mapped?
Project Elements	GIS-based remote mapping of wetlands, methodology for wetland identification, wetland location maps, creation of wetland delineation model
Responsible SAG and Project Manager	SAG: WetSAG Project Manager: Heather Gibbs
CMER Scientist and Principal Investigator(s)	CMER Scientist: TBD Principal Investigator(s): University of Washington and WDOE
Status	Phase 1: complete Phase 2: -Drafts under review at WetSAG
Project timeline	Phase I was completed in 2017. A draft version for Phase II of the tool was delivered to WetSAG at the end of June 2019. In July 2019, CMER approved \$10,773 in additional funds from the contingency budget line item to finalize deliverables and complete this project.
Complementary Projects	Forest Practices and Wetlands Systematic Literature Review, Statewide Forested Wetlands Regeneration Pilot Project, Wetland Management Zone Effectiveness Monitoring Project, Wetlands Intensive Monitoring Project, Forested Wetlands Effectiveness Project

Project Summary and Purpose

Existing maps and spatial data concerning the location, distribution, size, and geophysical characteristics of wetlands is poor, especially for forested wetlands. The design and implementation of the “Forested Wetlands Effectiveness Study” requires more data to provide context for: 1) focusing research on forested wetlands and associated typed-waters that may be vulnerable to harvest and road impacts, and 2) assessing the spatial applicability (inference) of study findings to other landscapes. The use of remote sensing and associated geospatial modeling with GIS is a potentially viable tool to fill the data needs; however no suitable GIS model is currently available for forested wetlands. This project develops a GIS-based toolset to systematically compare and test different approaches and data types for remote mapping of wetlands.

This project is designed in two phases. Phase I developed a GIS-based wetland identification tool by linking pixel-based and object-based approaches for delineating forested wetlands. Pixel-based approaches utilize topographic attributes inferred from high-resolution elevation data (e.g., LiDAR DEMs) with soils and geologic mapping to identify hydro-geomorphic attributes associated with wetlands. Object-based approaches use a variety of data sources, potentially including the pixel-based results, with eCognition¹ software to delineate visual (from optical imagery) and topographic features associated with forested wetlands. To apply these tools, the project team built an add-in tool kit for ArcGIS that enables a user to (1) generate the pixel-based attributes, (2) optionally import eCognition-produced files, and (3) map potential wetlands. The wetland identification tool works either with or without object-based, eCognition-provided data files.

Phase II calibrates the wetland delineation model (i.e., using field data) to predict the probability of wetlands by type (including forested wetlands) on forest lands of western Washington.

Project Objectives

This project developed a GIS-based toolset to systematically compare and test different approaches and data types for remote mapping of wetlands. The toolset serves to: 1) determine the optimal methodology to identify wetlands for a particular region and for particular wetland types, 2) determine the accuracy and precision to which different data sources (e.g., LiDAR versus NED DEMs, spectral imagery versus DEM) can resolve wetlands, and 3) create maps delineating probable wetland locations and types that can be calibrated and validated to local conditions.

¹eCognition is a commercial software program widely used for object-based analyses.

Inactive Projects on Master Project Schedule

Project Name	Wetlands Management Zone Effectiveness Monitoring
Workplan Critical Questions Addressed	<p>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?</p> <p>Program research questions:</p> <p>Primary Focus (80% effort)</p> <ol style="list-style-type: none"> 1. To what degree do specific forest practices (timber harvest, road construction, and application of silvicultural chemicals) in or near A and B wetlands affect the magnitude, duration, frequency, and timing of water quantity and quality (including temperature): <ol style="list-style-type: none"> a) in the wetland, b) in Typed Waters (WAC 222-030 and 222-031) located up- or down-gradient (upslope, upstream, downslope, or downstream), and c) in the surface and groundwater connections between the two, if any? <p>Secondary Focus (20% effort)</p> <ol style="list-style-type: none"> 2. To what degree are plants and animals in the wetland and in Typed Waters near the wetland (downgradient or upgradient) affected by the listed forest practices? 3. To what degree are the effects (#1) and responses (#2) influenced by factors such as: <ol style="list-style-type: none"> a) harvest type & configuration (cut area, remaining tree density & pattern, timing of harvest) b) wetland type & configuration (e.g., size, position in the landscape, HGM class, vegetation/Cowardin class) c) connectivity between (a) and (b) as defined by: <ul style="list-style-type: none"> • separation distance, if any • water table depth (local groundwater) • soil runoff coefficient • presence of channels connecting harvest area with downslope wetland • frequency, duration, magnitude, seasonality of runoff, or flow in connecting channels and local groundwater paths d) characteristics of the WMZ landscape context, as defined by factors such as: <ul style="list-style-type: none"> • climate and region • underlying geology • position in watershed (elevation, distance from divide) • ratio of wetland size to size of wetland's contributing basin/sub-basin area?
Project Elements	WMZ effectiveness, wetland functions, wetland forest practices prescription effectiveness, in-stream LWD targets.
Responsible SAG and Project Manager	<p>SAG: WetSAG</p> <p>Project Manager: Eszter Munes</p>
CMER Scientist and Principal Investigator(s)	<p>CMER Scientist: Wetland Scientist (vacant)</p> <p>Principal Investigator(s): TBD</p>
Status/Phase	Initial step for this project would be to review past approved CMER study findings and pull those results into a draft BAS report.
Project timeline	<p>2021: Complete literature synthesis</p> <p>2022: Complete development of scoping document and begin development of study</p> <p>2023- 2027: Site selection, field work, data analysis, report development, CMER review, ISPR review</p>
Expenditures	19-21 Biennium: \$0

Complementary Projects and project sequencing	Forest Practices and Wetlands Systematic Literature Review, Statewide Forested Wetlands Regeneration Pilot Project, Wetlands Intensive Monitoring Project, Wetland Intrinsic Potential Tool (WIP), Forested Wetlands Effectiveness Project
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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 this project is to evaluate the effectiveness of WMZs for Type A and Type B wetlands in meeting the targets outlined in the FPHCP Appendix N, Schedule L-1 of the Forest and Fish Report, no-net-loss of hydrologic function, water quality standards, and hydrologic connectivity within the wetlands and downgradient streams. Similar work is being done with forested wetlands by the Forested Wetlands Effectiveness Project (FWEP).

Project Objectives

Specific project objectives will be determined during scoping and study design development. This project will inform several rule components, including:

Schedule L-1 performance targets

- No-net-loss in the hydrologic functions of wetlands
- Overall Performance Goals: Forest practices, either singly or cumulatively, will not significantly impair the capacity of aquatic habitat to:
 - Support harvestable levels of salmonids;
 - Support the long-term viability of other covered species; or
 - Meet or exceed water quality standards (protection of designated uses, narrative and numeric criteria, and anti-degradation).

Budget- Board Approved July 11, 2019

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	Total budget
\$0	\$0	\$100,000	\$0	\$360,000	\$360,000	\$360,000	\$360,000	\$100,000	\$1,640,000

Project Name	Wetlands Intensive Monitoring
Workplan Critical Questions Addressed	What are the spatial and temporal cumulative effects of multiple forest practices on wetlands and connected waters at the watershed scale? What are the causal relationships and effects of forest practices on wetlands and connected waters?
Project Elements	Wetland functions, HGM classification, Ecology wetland rating, wetland-type habitat criteria, forest practices relative to wetland processes
Responsible SAG and Project Manager	SAG: WETSAG Project Manager: TBD
CMER Scientist and Principal Investigator(s)	CMER Scientist: Wetland Scientist (vacant) Principal Investigator(s): TBD
Status	To be scoped. This project will be informed by the Wetland Management Zone Effectiveness Monitoring Project, Forested Wetlands Effectiveness Project, and Forest Practices and Wetlands Systematic Literature Review Project.
Project timeline	Scoping is anticipated in 2026, after completion of projects (listed above) needed to inform the study.
Complementary Projects and project sequencing	Wetland Intrinsic Potential Tool (WIP), Forest Practices and Wetlands Systematic Literature Review, Wetland Management Zone Effectiveness Monitoring, Forested Wetlands Regeneration Pilot, Forested Wetlands Effectiveness Project

Project Summary and Purpose

Wetland functions are broadly defined in WAC 222-24 and -30 as water quality, water quantity, fish and wildlife habitat, and timber production, without specific species-related, wetland-type habitat criteria, narrative, or quantitative standards. Little to no research has been conducted within wetlands specific to forestlands or forest management in the Pacific Northwest relative to the species, resources, and critical processes (i.e., movement of surface and subsurface water) occurring within different types of wetlands and covered by the FP HCP. Without baseline information about expected species use, development and maintenance of structural habitat components, and connectivity of water through surface or subsurface flowpaths, and without numeric or narrative standards, it is not possible to evaluate whether the three performance goals of the FP HCP are being met through the application of forest practices regulations.

Project Objectives

Budget- Board Approved July 11, 2019

Total budget spent to date	FY 26 Budget	FY 27 Budget	FY 28 Budget	Total Budget
\$0	\$50,000*			\$50,000

*FY26 – Scoping/study design. Exact numbers to be determined closer to implementation. Lack of certainty on project design which makes budget challenging.

Project Name	Road Sub-Basin-Scale Effectiveness Monitoring Project
Work Plan Critical Questions Addressed	Are road prescriptions effective at meeting sub-basin-scale performance targets for sediment and water?
Project Elements	Impacts of forest roads on public resources; Road conditions that reduce erosion; Use of WARSEM; Testing RMAP effectiveness.
Responsible SAG and Project Manager	UPSAG Project Manager: Ben Flint
Principal Investigator(s)	TBD
Status	Phase I was completed in 2010. Phase II, a re-measurement to assess trend is scheduled to occur following completion of the RMAP implementation period, currently scheduled for 2021. Due to the 5-year RMAP extension from 2016 to 2021, Policy decided to postpone the resample until most RMAPs are completed as reflected by the CMER Master Project Schedule.
Project timeline	Phase II is estimated to take place following completion of the Road Prescription-Scale Effectiveness Monitoring Project (Road BMP Project), after 2026.
Complementary Projects and project sequencing	<ul style="list-style-type: none"> • Road Prescription-Scale Effectiveness Monitoring Project • Road Surface Erosion Model Validation Project • Intensive Watershed Monitoring

Project Summary and Purpose

This project is intended to provide data that can be used to assess the degree to which sub-basin-scale performance targets, and therefore resource objectives, are being met throughout the state. This project also characterizes the extent of road conditions that reduce surface erosion (e.g., improved surfacing, reduced runoff to streams). Data collected at the sub-basin scale will determine the status and assess trends of key indicators of road connectivity using WARSEM sediment delivery through time. This project does not address performance targets for road performance relative to mass wasting erosion processes, which are more readily evaluated through other monitoring projects. Forest road systems in randomly selected sample areas that are proportionately distributed statewide in areas under forest practices rules, independent of ownership, are being monitored. Small forest landowner properties are included in the study whenever they fall within the sampling blocks. Data are collected to determine the degree to which roads meet established performance targets and the strength of the relationship between those reported measures and the percentage of sample area under implemented road maintenance and abandonment plans (RMAPs). Because road monitoring at the sub-basin scale extends through the 15-year road rule implementation period, this piece was put in place before model validation and performance target validation.

Results from Phase I underwent ISPR and were approved by CMER in early 2010.

Project Objectives

To determine the status and assess trends of key indicators of road connectivity using WARSEM sediment delivery through time. The extent of road conditions that reduce surface erosion will also be characterized.

Budget
August 14, 2019 Board Approved Budget

Total budget spent to date	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	Total Phase II Budget
\$878,514 (Phase I)						\$75,000	\$75,000

Project Name	Watershed Scale Assessment of Cumulative Effects (Roads and Riparian – implementation Timed Post effectiveness monitoring)
Work Plan Critical Questions Addressed	Not specifically developed but apply the questions pertaining to effectiveness monitoring for riparian and road rule analyses in the same study where the multiple activities are being implemented under the rules.
Project Elements	Type F/N riparian conditions, roads, and wetlands.
Responsible SAG and Project Manager	SAG: TBD Project Manager: TBD
CMER Scientist and Principal Investigator(s)	CMER Scientist: TBD Principal Investigator(s): TBD
Status	Pre-Scoping
Project timeline	Not formally established.

Project Summary and Purpose

Intensive monitoring is watershed-scale research designed to evaluate the cumulative effects of multiple forest practices and to provide information that will improve our understanding of causal relationships and the biological effects of forest practices rules on aquatic resources. The evaluation of cumulative effects of multiple management actions on a system requires an understanding of how individual actions influence a site and how those responses propagate through the system. This understanding will enable the evaluation of the effectiveness of management practices applied at multiple locations over time. This sophisticated level of understanding can only be achieved with an intensive, integrated monitoring effort. Evaluating biological responses is similarly complicated, requiring an understanding of how various management actions interact to affect habitat conditions and how system biology responds to these habitat changes. This program was identified in the Monitoring Design Team (MDT) Report (MDT, 2002) as an essential component of an integrated monitoring program. CMER and Policy will be scoping intensive monitoring needs for the adaptive management program.

Project Objectives

Study Objectives have not been established yet.

Study Design Alternatives and Preliminary Annual Budgets

A study design and a preliminary budget has not been developed for this study. This study is intended to build upon the knowledge gained in the effective monitoring projects conducted in riparian areas at the reach and basin scale, forested and typed wetland effectiveness monitoring studies, and roads at the section scale – all of which had been scheduled for development ahead of this project. Though scoping has not occurred for this study, we expect the cost and complexity would be similar to the Soft Rock study in (appx. 340K during implementation), but that it would sample 2 watersheds that include both Np and F streams using an After-Impact design. It is possible that we may get lucky and have a forest service watershed nearby to use as a control, but we are not providing a draft budgeting with that expectation in mind. The study would ask for no harvest for two years to set a baseline and then monitor harvests over a succeeding 3-5 year periods. Costs depend on what is monitored but having completed the Np basin-level studies (Westside anyway), Np waters would likely be monitored only at their confluence with F streams, and only key locations in the F stream(s). It is likely we would be using watersheds with 3rd or small 4th order fish-bearing F streams.

Budget – Board approved July 11, 2019

FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 33	Total Budget
\$5,000	\$50,000	\$340,000	\$340,000	\$340,000	\$340,000	\$340,000	\$340,000	\$340,000	\$2,435,000
Scoping (in house with money for outside expert)	Study design (in house but \$ for statistician and outside expert)	Site acquisition (coordinator or part time)	Pre-harvest Monitoring	Post-harvest Monitoring	Pull equipment, analyze data, begin report	Complete report and get through CMER and ISPR	Final Changes and Presentations to Policy and Science Conference	Final Changes and Presentations to Policy and Science Conference	For a Westside-only Watershed Scale Assessment of Cumulative Effects project

*These are rough estimates and are anticipated to change once the project is scoped and designed.

Active- Currently Unfunded Projects

Project Name	Eastside Modeling Evaluation Project (EMEP)
Workplan Critical Question Addressed	N/A (see Project Objectives section below)
Project Elements	Eastside forest health, riparian function, disturbance regimes, timber habitat types
Responsible SAG and Project Manager	SAG: SAGE Project Manager: Heather Gibbs
CMER Scientist(s) and/or Principal Investigator(s)	Principal Investigator: Kevin Ceder, Cramer Fish Sciences
Status/Phase	ISPR is addressing comments and then PI will respond to comments as needed and finalize project
Expenditures to Date	FY18-FY19: \$14,362
Project Timeline	Completed by Fall 2020
Complementary Projects and project sequencing	Eastside Disturbance Regime Literature Review Project, Eastside LWD Literature Review Project, Eastern Washington Riparian Assessment Project (EWRAP), 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	
<p>This project was initially part of Phase 2 of the EWRAP. Due to multiple contracting issues, this component (the modeling portion, now EMEP) was never completed and was submitted to the Adaptive Management Program as a separate project to be completed from SAGE.</p> <p>The EMEP modeling uses the riparian stand data collected from Phase 1 of the EWRAP project to assign fire and disease risk ratings (current and projected), under current or alternate plans, between eco-regions and within the 240-foot transect length from which riparian stand data were collected. Growth and yield models were used to extrapolate future stand conditions and provide detailed data about present and future stand structure and composition.</p> <p>In summary, the EMEP was designed to model current riparian stand conditions to estimate the extent to which current riparian stands achieve the three FFR eastside riparian objectives (provide necessary riparian functions, are within the range of historic stand conditions, and to reduce risk of catastrophic damage due to disease or insect outbreaks).</p> <p>The EMEP models how current riparian stands in eastern Washington respond to the eastside riparian prescriptions over time. The EMEP evaluates riparian stand conditions using surveys from Phase 1 of the Eastern Washington Riparian Assessment Project (EWRAP). EWRAP data are used to inform Forest Vegetation Simulator (FVS) modeling as the basis for evaluating a) current riparian stand conditions, b) trajectory of riparian stand conditions, c) eligibility of stands for timber harvest, and d) trajectory of managed stand conditions.</p> <p>The EMEP is part of an ongoing program that the Scientific Advisory Group Eastside (SAGE) has implemented to validate the Eastern Washington Type F riparian prescriptions.</p>	
Project Objectives	
<p>The EMEP addresses the following study questions and objectives:</p> <ol style="list-style-type: none"> To what extent do the current riparian stands meet the size and basal area thresholds for timber harvest across regulatory habitat types (elevation bands)? <ul style="list-style-type: none"> Objective 1: Determine the number of stands eligible for timber harvest in the current year and changes by decade with no silvicultural manipulation simulated. 	

- Objective 2: Develop harvest prescriptions that meet rule requirements and maximize timber harvest for each stand. Quantify the amount of basal area per acre and the number of trees per acre that can be cut from each stand that is eligible for harvest based on rule criteria for current stands.
2. Are there differences in stand characteristics associated with distance to the stream?
 - Objective 1: Determine if there are differences in stand attributes by regulatory zone.
 - Objective 2: Determine if there are differences in stand attributes by ecological zone.
 3. What are the projected rates and characteristics of stand mortality in riparian stands with and without management intervention?
 4. How susceptible to insect, disease, and crown fire are the stands sampled in EWRAP Phase 1, and how does susceptibility change over time?
 - Objective 1: Quantify stand susceptibility of current stands as: 1) regulatory and, 2) ecological zones for each insect and pathogen common to eastern Washington for which risk rating systems are available in Hessburg *et al.* (1999)
 5. How will stand characteristics change over time with no timber harvest and with timber harvest applied to the limits that rules allow?
 - Objective 1: Determine for each stand at current age and by decade to year 50: 1) basal area per acre, 2) trees per acre, 3) stand density index, 4) Curtis' relative density, 5) quadratic mean diameter, 6) cubic-foot volume per acre, and 7) board-foot volume per acre.

Budget- Board Approved July 11, 2019 MPS

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	Total Approved Budget
0	0	0	0	0	0	0	0	0	\$0

Approved Funds: \$6,899.00 was approved by CMER in FY20 from contingency funds to complete this project. Due to delays at ISPR, an additional \$4,407 will be needed to complete ISPR and CMER approval and deliver this project to Policy.

Project Name	Eastside Timber Habitat Evaluation Project (ETHEP)
Workplan Critical Question Addressed	Will application of the prescriptions result in stands that achieve eastside FP HCP 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	SAGE Project Manager: Teresa Miskovic
CMER Scientist(s) and Principal Investigator(s)	CMER Scientist: TBD Principal Investigator(s): TBD
Status/Phase	SAGE subgroup drafting scoping document: Finalizing Best Available Science, alternatives analysis, recommended approach and budget estimates.
Expenditures to Date	Current expenditures only include CMER staff time
Project Timeline	TBD following initial scoping and study design development
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

The Washington Forest Practices Rules (WAC 222-30-022) identify three Timber Habitat Types (THT) in Eastern Washington RMZ's based on elevation – Ponderosa Pine (< 2500 ft), Mixed Conifer (2500-5000 ft) and High Elevation (>5000 ft). Studies (Mason, Bruce and Girard, Inc. 2008, Schuett-Hames 2015) have documented misclassification rates in the Ponderosa Pine zone as high as 92% with 31 of the 38 (82%) sites classified as Mixed Conifer THT. As a result, harvest prescriptions for sites in the Ponderosa Pine zone are incorrectly applied. The inaccuracy and lack of resolution of the current THT system creates an impediment to identifying riparian stand conditions that are not meeting FFR riparian objectives, and determining appropriate management to achieve healthy stands that provide the ecological functions as outlined in the Forest and Fish Report.

The purpose of the project is to develop options for an eastern Washington riparian forest management system. The system will consist of: 1) an ecologically based classification system that groups riparian forests based on stand trajectory and function, 2) specific management objectives for each classification group consistent with the specific management objectives of the Washington Forest Practices HCP (Forest Practices HCP, Schedule L-1, Appendix N), and 3) scientific guidance for management prescriptions designed to achieve those objectives.

Project Objectives

SAGE proposes to address 3-primary objectives in this work:

- 1) Identify options for ecologically classifying riparian stands in eastern Washington that distinguish stands on the basis of their ability to meet FP HCP functional objectives and performance targets, and maintain resilience to fire, insect and disease disturbance.
- 2) Determine specific management goals for each proposed stand type to achieve FP HCP goals; following from these goals, provide informed scientific guidance for potential new silvicultural prescriptions to be developed by an appropriate regulatory entity.
- 3) Evaluate whether a proposed classification system, and associated prescriptions developed following scientific guidance, result in riparian conditions that achieve the goals developed in Objective 2.

Budget

Currently there is no funding allocated for this project. The Eastside scientist will work with SAGE to develop the study design. Upon completion of the scoping process and study design, SAGE will identify funding needs.

