2022

CMER Project Summary Sheets

ADAPTIVE MANAGEMENT PROGRAM

JANUARY 2022

Projects

Project Name	Forested Wetlands Effectiveness Project (FWEP) – Chronosequence Study
Workplan Critical Questions Addressed	**Rule Group Critical Questions**: • What are the magnitude and duration of effects of timber harvest in and upslope of forested wetlands on water regimes, water quality, habitat functions, and aquatic resources in those wetlands, in downgradient waters, and the connectivity between them? • Are current Forest Practices Rules for timber harvest in and around forested wetlands effective at meeting the Forest and Fish aquatic resource objectives and performance targets, and the goal of no-net-loss of functions of those wetlands? **Program Research Questions:** • What are the effects, and their magnitudes and durations, of forest practices on water regimes, water quality, plant and animal habitats, and watershed resources in forested wetlands and linked (via surface or subsurface flow) downstream waters? • How does timber harvest in forested wetlands alter processes that influence hydrologic regimes in those wetlands, in downgradient waters, and the connectivity between them? • How does timber harvest in forested wetlands alter processes that influence water quality in those wetlands and in downgradient waters? • How does timber harvest in forested wetlands alter processes that influence plant and animal habitat functions in wetlands, in connected waters, and in surrounding uplands? • How well do current Forest Practices Rules in forested wetlands meet the Forest and Fish aquatic resource objectives and performance targets, and the goal of no-net-loss of functions of those wetlands by half of a timber rotation cycle? **FWEP Chronosequence Project Research Questions**: The FWEP Chronosequence study strives to answer two sets of research questions derived from the CMER workplan's critical questions (Hough-Snee et al. 2019): 1. How does forested wetland hydrology change over time following post-harvest forest stand development? Specifically: a. How does the hydrology of recently harvested forested wetlands compare to the hydrology of recently undisturbed second-growth forested wetlands? b. How does the timing, duration, and magnitude of flow and material transport differ between recently harvested and recently undisturbed second-growth forested wetlands? 2. How do forested wetland vegetation and canopy-mediated habitat conditions change over time following post-harvest forest stand development? Specifically: a. How does recently harvested forested wetland vegetation composition compare to recently undisturbed second-growth forested wetland vegetation over time? b. Do canopy and vegetation-mediated habitat attributes (e.g., inundation duration, soil, and wetland temperature, etc.) converge between recent post-harvest forested wetlands and recently undisturbed second-growth forested wetlands over time?

Project Elements	Timber harvest effects on forested wetlands and wetland forest practices prescription effectiveness.
Responsible SAG and Project Manager	SAG: WetSAG Project Manager: TBD
CMER Scientist and Principal Investigator(s)	CMER Scientist: Jenelle Black PI: TBD
Status/Phase	• ISPR and CMER approval of the FWEP Chronosequence study design in December 2019. • The Prospective 6 Questions document was delivered to Policy in August 2020. • The FWEP literature review, database, and webmap were approved by CMER in June 2020 and presented to Policy in August 2020. • WetSAG is currently developing the implementation plan and data management documents, acquiring and testing field equipment, and initiating site selection. Anticipated completion of these tasks is fall of 2021. • Recruitment of a wetland research scientist is ongoing with the objective of fulfilling the PI functions with CMER staff. Discussions around contracting for the PI functions as an alternative are also ongoing.
Project Timeline	• FY22: Hire principal investigator. Complete project documents, site selection, field reconnaissance, and site instrumentation. • FY23-FY25: Data collection and data QA/QC. • FY26: Data QA/QC, data analysis, CMER-approved final report. • FY27: ISPR-approved final report, Findings Report, begin FWEP BACI study design. • FY28: Develop FWEP BACI study design and complete WetSAG and CMER review. • FY29: ISPR approved BACI study design. Develop site selection and data management document. Initiate site selection. • FY30: Year 1 BACI data collection.
Expenditures	• FY17-FY20: $182,968 • FY21: $11,312 • Expenditures through FY21: $194,280
Complementary Projects and Project Sequencing	Forest Practices and Wetlands Systematic Literature Review (complete); Statewide Forested Wetlands Regeneration Pilot Project (complete); Wetland Management Zone Effectiveness Monitoring Project (planned); Wetlands Intensive Monitoring Project (proposed)
Project Summary and Purpose	
The FWEP projects will look at the effectiveness of forest practices prescriptions to protect, maintain, and restore aquatic resources, namely water quality and wetland hydrologic and ecological functions (CMER 2021). It will be	

evaluated to determine if they achieve the FPHCP goal of no-net-loss of functions of those wetlands by half of a timber rotation cycle while meeting water quality standards (FPHCP).

The Forested Wetland Effectiveness Project is designed as a two-part, scientific investigation into how forested wetlands and their connected waters are affected by forest practices, as presently implemented under Washington State DNR's Forest Practices Rules. This FWEP Chronosequence study is the predecessor study to a BACI study on how forested wetlands recover from harvest and will help inform how disturbance associated with forest harvest is affecting forested wetland hydrology, habitat, and water quality over time. The Chronosequence substitutes studying multiple sites at different development states post-harvest (recently undisturbed, two, ten, and twenty years) in lieu of studying a set of sites for half of a timber harvest rotation (~20 years) following timber harvest.

Project Objectives

The primary research objectives of the FWEP are:

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

Current Budget*

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

Revised Budget

Pre-FY22 Spending	FY22	FY23	FY24	FY25	FY26	FY27	Total Budget
$194,279	$330,176	$190,555	$173,305	$165,023	$85,000	$35,000	$1,166,066

*May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

Project Name	Wetlands Management Zone Effectiveness Monitoring
Workplan Critical Questions Addressed	**Rule Group Critical Question**: • Are current Forest Practice Rules-specified wetland buffers (WMZ) for Type A and B wetlands (WAC 222-16-035) effective at meeting the Forest and Fish aquatic resource objectives and performance targets, and the goal of no-net-loss of functions of those wetlands? **Program Research Questions**: What are the magnitude and duration of effects of timber harvest occurring upslope of Type A and B wetlands on processes, functions, and aquatic resources within and downstream of those wetlands? How effective are current forest practice wetland buffers at facilitating no-net-loss in wetland functions following timber harvest?
Project Elements	WMZ effectiveness, wetland functions, wetland forest practices prescription effectiveness, in-stream LWD targets.
Responsible SAG and Project Manager	SAG: WetSAG Project Manager: TBD
CMER Scientist and Principal Investigator(s)	CMER Scientist: Wetland Scientist (vacant) Principal Investigator(s): TBD
Status/Phase	Scoping. Initial step for this project would be to review past-approved CMER study findings and combine those results with additional relevant science into a draft BAS report.
Project timeline	• FY22: Preliminary scoping work. Update project charter. • FY23: Develop scoping document. Initiate WetSAG and CMER review of scoping document. • FY24: CMER approval of scoping document. Policy Six Questions Document for the scoping phase. Initiate project study design. • FY25: Complete study design and initiate WetSAG and CMER review of study design. • FY26-FY34: Complete CMER review and ISPR of study design. Phases will include site selection, field implementation, data analysis, reporting, and approval processes. Timeline will be determined based on the scoping document.
Expenditures	Expenditures to date: $0
Complementary Projects and Project Sequencing	Forest Practices and Wetlands Systematic Literature Review (complete); Statewide Forested Wetlands Regeneration Pilot Project (complete); Wetlands Intensive Monitoring Project (proposed); Wetland Intrinsic Potential Tool (WIP) (complete); Forested Wetlands Effectiveness Project (in progress)
Project Summary and Purpose	
This project will evaluate wetland functions to determine if the target of no-net-loss of hydrologic function, CWA assurance targets, and hydrologic connectivity are being achieved. This would include informing these two research questions: 1) test whether the wetland prescriptions are effective in preventing downstream temperature increases beyond targets, and 2) evaluate the effectiveness of current WMZs in meeting in-stream LWD targets.	

Problem Statement

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

Purpose Statement

The purpose of 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; and
- 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).

Project Research Questions developed from the Adamus strategy:

Primary Focus

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):
    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?

Secondary Focus

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:
    - Harvest type & configuration (cut area, remaining tree density & pattern, timing of harvest);
    - Wetland type & configuration (e.g., size, position in the landscape, HGM class, vegetation/Cowardin class);
    - Connectivity between (a) and (b) as defined by:

- Separation distance, if any,
- Water table depth (local groundwater),
- Soil runoff coefficient,
- Presence of channels connecting harvest area with downslope wetland, and
- Frequency, duration, magnitude, seasonality of runoff, or flow in connecting channels and local groundwater paths; and

- Characteristics of the WMZ landscape context, as defined by factors such as:
  - Climate and region,
  - Underlying geology,
  - Position in watershed (elevation, distance from divide), and
  - Ratio of wetland size to size of wetland's contributing basin/sub-basin area?

Budget*

FY22-FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	Total Budget
$0	$100,000	$0	$360,000	$360,000	$360,000	$360,000	$100,000	$45,000	$1,685,000

*May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

Project Name	Westside Type F Riparian Prescription Effectiveness Project – Exploratory Field Study
Workplan Critical Questions Addressed	This is one phase of the overall project to address the following critical questions: • How do the RMZ and no-RMZ harvest prescriptions affect riparian stand characteristics and riparian functions? • How do the characteristics of riparian forest stands and associated riparian functions in areas with RMZ and without RMZ harvest change over time? • Do riparian forest stands in areas with RMZ and without RMZ harvest remain on trajectory to achieve DFC targets? • How do physical stream characteristics and processes respond to changes in riparian functions in areas with RMZ and without RMZ harvest? • Do physical stream characteristics and processes meet performance targets?
Project Elements	Westside riparian conditions, DFC performance targets, riparian functions, forest stand attributes.
Responsible SAG and Project Manager	RSAG Project Manager – Lori Clark
Principal Investigator(s) and Project Team	CMER scientists: Jenelle Black and Greg Stewart Project Team: Doug Martin, Chris Mendoza
Status	The Project Team is making revisions to the exploratory report per RSAG review. The report is expected to gain RSAG and CMER approval in winter 2022.
Project Timeline	• The exploratory phase was implemented in FY19-FY20. The final report is expected to have RSAG and CMER approval in FY22 and be presented to Policy in FY22. Discussions have begun on the BACI study elements in RSAG. • The Project Team will develop the BACI study design and expect to have an ISPR/CMER approved study design by FY24. • FY22: Develop BACI study design and RSAG review. • FY23: RSAG and CMER review and approval. ISPR review and approval. Additional Project Team members will be needed for BACI study design; may need funding for participation. • FY24: Develop prospective findings report. Develop implementation plan and begin site selection. • Board-approved funds for Westside Type F implementation begin in FY25. o FY25: Complete site selection. Site layout and pre-harvest data collection (May - June). o FY26: Pre-harvest data collection (July - Sept 2025 & May - June 2026). o FY27: Pre-harvest data collection (July - Sept 2026). Apply harvest treatment. o FY28: Complete harvest treatment. Post-harvest data collection (May - June 2028). o FY29: Post-harvest data collection (July - Sept 2028 & May - June 2029).

	o FY30: Post-harvest data collection (July - Sept 2029). Data QA/QC and analysis. Draft final report and gain RSAG and CMER approval. Initiate ISPR review. o FY31: ISPR approval and findings report.
Expenditures	FY19-FY21: $338,573
Complementary Projects and Project Sequencing	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 BACI study that examines the response of riparian functions, stream habitat and aquatic resources to the prescriptions. Complementary Projects: Bull Trout Overlay Temperature Project, Solar Radiation/Effective Shade Project, Eastside Type F Riparian Effectiveness Monitoring Project (BTO add-on), Wood Recruitment Volume and Source Distances from Riparian Buffers Project, Mass Wasting Buffer Integrity and Windthrow Assessment Project, Windthrow Frequency, Distribution, and Effects Project, Extensive Monitoring Program, and Cumulative Effects Monitoring Program.

Project Summary and Purpose

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 project to fill this knowledge gap and complement 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 is providing information needed to focus and design the Westside Type F Riparian Prescription Effectiveness BACI study.

The goal at the conclusion of the exploratory study is to have information including:

- 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 sq. 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; and
- The relative influence of differences in site conditions and geographic location on all of the above.

The results from the exploratory study will be used to design a BACI 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 BACI study design to provide fine-scale assessments of treatment effects for a select set of prescription variants and site conditions. The BACI 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 overall Westside Type F Riparian Prescription Effectiveness Project 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; and
- 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 report is currently in-progress.

Project Objectives

1. To evaluate post-harvest riparian stand conditions and riparian ecological functions across prescription variants with and without inner zone harvest.
2. To evaluate the extent to which post-harvest riparian forest stands are on trajectory to achieve DFC targets at sites with and without inner zone harvest.

The overall goal of the exploratory phase is to produce information needed to focus and design the BACI phase of the project. The exploratory study assessed riparian stand conditions and selected riparian functions across a wide range of prescription variants and site conditions. It also provides a coarse-level assessment of current riparian conditions that focuses on addressing scientific uncertainty surrounding their sensitivity to prescription variants.

Budget*

FY21-FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	Total Estimated Budget
$0	$167,272	$375,020	$245,860	$134,660	$375,020	$297,860	$21,600	$1,617,292

*May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

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 scheduled to be completed in FY22. Data collection assumes two years of data collection before treatment, nine months for harvest treatments, and two years after treatment data collection. CMER staff are utilized in all phases of the project but cost for their time is not included in budget estimates.

Proposed Budget**

FY23**	FY24**
$30,000	$30,000

**Funding for additional Project Team members (based on $150/hr., 16 hours per month).

Project Name	Type N Experimental Buffer Treatment Project in Soft Rock Lithologies
Workplan 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 within the Type N stream and where delivered to downstream Type F/S waters? • What is the frequency and distribution of windthrow in forest practices buffers? • What site conditions are associated with sites with significant windthrow?
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: Lori Clark
CMER Scientist and Principal Investigator(s)	CMER Scientist: Greg Stewart, Dave Schuett-Hames (contractor) Principal Investigator: Bill Ehinger (Ecology)
Status/Phase	• The Type N Experimental Buffer Treatment Project in Soft Rock Lithologies report was approved by ISPR spring/summer 2021. • Chapters 1-4 were approved by CMER in August 2021. • Chapters 5-7 were approved by CMER in July 2021. • Soft Rock 6 Questions document were presented to CMER in September 2021 and approved in December 2021. • The Type N Experimental Buffer Treatment Project in Soft Rock Lithologies final report was presented to Policy in January 2021. • The final report will be presented to the Forest Practices Board in February 2022. **Extended Monitoring:** Data collection ended October 2020 after one of the reference sites was harvested per agreement with the landowners. Data were approved by CMER in December 2021.
Project Timeline	• Site Selection completed and field work initiated in 2012. • FY16: First site harvested in December 2013 and last in July 2015. • FY18: Two years of post-harvest data sampling was completed fall 2017. • FY19: Draft of the 5-year study report completed and submitted to CMER/RSAG for review April 2019. • FY20: The report was approved by CMER in January 2020. • FY21: Additional post-harvest sampling (extended monitoring) concluded in October 2020. • FY21: The Type N Experimental Buffer Treatment Project in Soft Rock Lithologies report was approved by ISPR spring/summer 2021. • FY22: Soft Rock Chapters 1-4 were approved by CMER in August 2021 and Chapters 5-7 were approved by CMER in July 2021. 6 Questions document was presented to CMER in September 2021 and approved by CMER in December 2021.

	The final report will be presented to Policy in January 2022 and will be presented to the Forest Practices Board in February 2022.
Expenditures	FY11-FY18: $1,403,786 FY19-FY21: $336,267 Expenditures to date: $2,076,320
Complementary Projects and Project Sequencing	Type N Experimental Buffer Treatment Hard Rock (completed), Westside Type N Buffer Characteristics, Integrity, and Function Projects (BCIF) (completed), and Extensive Riparian Status and Trends Monitoring Project - Stream Temperature Westside Type F/S and Type Np (completed).

Project Summary and Purpose

This project evaluated 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 Competent Lithologies (Hard Rock). Site selection was similar to the Hard Rock except that sites were selected in lithologies that are likely to produce a fine-grained stream substrate. This project began in 2012 and fieldwork ended in summer 2017, except for stream temperature, which extended through fall 2020. The final report for the initial data collection was approved by CMER in summer 2021. An addendum to the final report that includes the analysis and interpretation of the final 2017-20 temperature data will be available in November 2021.

Study sites included 10 Type N stream basins (7 treatment sites and 3 control sites) located in southwestern Washington.

Project Objectives

Phase 1: 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 evaluated the effects of the Westside Type N riparian rules on riparian stands, stream temperature, downstream transport of suspended sediment and nutrients, and benthic macroinvertebrates in forest lands on marine sedimentary lithologies in western Washington.

Extended Monitoring: Extended data collection occurred through October 2020 to track the longer-term trajectory of water temperature. Harvest in the reference sites began in 2020 marking the end of monitoring in this study.

Stream temperature remained elevated in the Forest Practices treatment in the companion Hard Rock study streams at least 9 years after harvest. The mean temperature response in the Soft Rock streams was also elevated. The analysis of the 2017-20 temperature data is needed to describe the long-term impacts of harvest.

Budget*

Budget	Board Approved Budget FY21	Adjusted Budget FY21**	Board Approved Budget FY22	Adjusted Budget FY22***
Extended Monitoring	$151,000	$91,000	$0	$10,500
TFW Participation Agreement	$112,655	$112,655	$0	$0

Budget Notes:

* May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.
**In an agreement with the DOE, the budget was decreased to $91,000 in anticipation of actual FY21 expenditures.

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 FY20 and FY21. CMER funding began in FY15 after the NEP grant ended in FY04.

***Additional funds were added to remove flumes and associated equipment from two sites using WCC crews.

Project Name	Riparian Characteristics and Shade Response
Workplan Critical Questions Addressed	Primary Critical Questions: • How does stream shading change with buffer width and intensity of management across a range of stand types and characteristics in Washington? • How does stream shading change with buffer width and stand conditions (e.g., basal area, density, age, height)? Study Design Critical Questions: • How does stream shade respond to riparian harvest treatments with different stream-adjacent no-harvest zone widths and adjacent-stand harvest intensities? • How does stream shade response to the riparian harvest treatments vary among ecoregions where commercial timber harvest commonly occurs? • What are the important patterns, trends, and relationships between stand characteristics and stream shade response to the riparian harvest treatments?
Project Elements	Type F/N riparian conditions and stream shade
Responsible SAG and Project Manager	RSAG Project Manager – TBD
Principal Investigator(s)	CMER scientist: Malia Volke
Status	The study design is currently in ISPR. RSAG is discussing options for pursuing a related study or add on to this study or other Type F studies to look at additional treatments and potential paths forward.
Project Timeline	• FY22: Finalize study design. Hire field coordinator to begin site selection. • FY23-FY25: Hire contractors, complete site selection, complete implementation at 10 westside sites. • FY26-FY27: Complete implementation at 10 eastside sites. Complete photo processing, data analysis, and write final report. • FY28: Final report review and revisions.
Expenditures	FY19-FY22: $65,844
Complementary Projects and Project Sequencing	Westside Type N Experimental Buffer Treatment Projects in Competent and Incompetent Lithologies (Hard Rock and Soft Rock), Eastside Type N Effectiveness Monitoring Project, 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	

Field research examining the combined effect of stream-adjacent no-harvest zone width and adjacent-stand harvest intensity (i.e., thinning density) on stream shade is limited. While other existing and planned CMER research studies support decisions on the effectiveness of the Type F and Type N prescriptions tested, they will not inform policy makers of other buffer configurations involving thinning. The purpose of this study is to evaluate how stream shade responds to a range of riparian harvest treatments within environments (ecoregions) common to commercial forestlands covered under the FPHCP. Results from this study will help the Adaptive Management Program interpret and respond to ongoing and future monitoring studies that directly test both shade and temperature, and will provide information about how well alternative riparian buffer prescriptions meet shade targets. Four study alternatives 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, however in February 2020, it was approved to complete a study design just for Alternative 1 and to drop Alternative 2.

Project Objectives

The study has two objectives:

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

Budget*

FY21	FY22	FY23	FY24	FY25	Total Estimated Budget
$6,000	$136,345	$242,089	$347,112	$20,000	$745,546

* May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

Updated Budget Estimates**

FY22	FY23	FY24	FY25	FY26	FY27	FY28	Total Estimated Budget
$10,000	$105,448	$177,993	$142,238	$178,914	$283,914	$20,000	$918,507

**Budget estimates are based on the RSAG approved study design and may change based on revisions made during ISPR. It is assumed landowners will cover upland harvesting costs and removal of logs. Project timeline and budget has increased from approved MPS in May 2021 due to:

- Input from landowners suggests it will take approximately 1 year on the Westside and 1 year on the Eastside to find sites and get them on the landowner's harvest schedules. This added 1 year to the project schedule and approximately $37,000.
- It is likely it will only be feasible to implement treatments and collect data at 5 sites maximum per year. This added 2 additional years on to the project schedule.
- Due to the complexity of implementation logistics, costs for a field coordinator have been incorporated into the budget to oversee field crews and coordinate with landowners on treatments for all sites. This added approximately $125,000.

Project Phases by FY

FY22	FY23	FY24	FY25	FY26	FY27	FY 28
Complete ISPR and final CMER approval of study design. RFQQ for project implementation lead (field coordinator). Initiate westside site selection.	RFQQ for westside foresters, cutters, and data collectors. Finalize contracts. Complete westside site selection and acquire access permits. Complete pre-harvest field tasks and data collection at 5 sites on the Westside.	Implement harvest treatment sequence and collect hemispherical photos at 5 sites on westside. At 5 additional sites on the westside complete pre-harvest field tasks and data collection.	Implement harvest treatment sequence and collect hemispherical photos at 5 additional sites on westside. Complete eastside site selection and acquire access permits. RFQQ for eastside foresters, cutters, and data collectors. Finalize contracts.	At 5 sites on the eastside complete pre-harvest field tasks and data collection. Implement harvest treatment sequence and collect hemispherical photos.	At 5 additional sites on the eastside complete pre-harvest field tasks and data collection. Implement harvest treatment sequence and collect hemispherical photos. Complete photo processing, data analysis, and final report writing.	Final report review and revisions.

Project Name and Background	Water Typing Strategy At the November 5, 2019 Forest Practices Board (Board) meeting the following motion was passed: *"Recommend the Cooperative Monitoring, Evaluation and Research Committee (CMER) to develop study designs for the PHB validation, physical characteristics, and map based Lidar model studies. Design the studies for cost savings, including the phasing of the studies with eastern Washington to be initiated first, and the possibility and advisability of combining the PHB validation, physical characteristics and map based Lidar model studies, and then to report on the study designs to the Board by their May, 2020 meeting."* In December 2019, CMER voted that ISAG would be the lead in responding to the Board motion (above) and develop an overall CMER based Water Typing Strategy.
Strategy Elements	The CMER Water Typing Strategy will include (individually or in combination) the following elements: 1. Default Physical Criteria Assessment 2. Potential Habitat Breaks (PHB) 3. LiDAR Based Water Typing Model 4. Fish/Habitat Detection Using eDNA ISAG will consider whether, and if so how, to combine these elements (as directed by the Board), and to consider if/how additional elements may be added to the list.
Workplan Critical Questions Addressed	**1. Default Physical Criteria Assessment** • 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? **2. Potential Habitat Breaks (PHB) (Critical questions from study design)** • How can the line demarcating fish- and non-fish habitat waters be accurately identified? • To what extent does the current water typing survey window account for seasonal and annual variability in fish distribution considering potential geographic differences? • How do different fish species use seasonal habitats (timing, frequency, duration)? • How does the upstream extent of fish use at individual sites vary seasonally and annually? • How does the delineation of the upstream extent of fish habitat change seasonally? **3. LiDAR Based Water Typing Model** • 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?

	4. Fish/Habitat Detection Using eDNA • 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: TBD
Project Team Members	Cody Thomas (Spokane Tribe of Indians/ISAG co-chair), Jason Walter (Weyerhaeuser Co./ISAG co-chair), Jenelle Black (CMER Science staff), Doug Martin (Martin Environmental/WFPA), Chris Mendoza (Conservation Caucus), and John Heimburg (WDFW)
Status/Phase	In May 2020, the AMPA delivered a water typing strategy update to the Board on behalf of ISAG. The update contained a summary of the three water typing approaches, recommendations to the Boards request, proposed workplan, and budget. The AMPA delivered an update to the Board in February 2021, May 2021, and November 2021 on the progress that ISAG has made on the water typing projects, along with updated project timelines and budgets. The ISAG project team is currently working on the PHB and DPC study designs. As part of their recommendation to the Board, ISAG will develop the LiDAR study design after the completion of the DPC and PHB study designs and development of a statewide LiDAR derived stream network. The eDNA final report and answers to the 6 questions were approved by CMER in May 2021. The final report was delivered to the Board with a presentation at their August 2021 meeting with a recommendation from Policy that no formal action be taken in response to the study. ISAG is exploring options for including an eDNA component into the PHB/DPC study designs.
Expenditures	**1. Default Physical Criteria Assessment (DPC)** Expenditures through FY19: $115,133 **2. Potential Habitat Breaks (PHB)** Expenditures through FY21: $413,336 **3. LiDAR Based Water Typing Model** Expenditures through FY19: $189,326 **4. Fish/Habitat Detection Using eDNA** Expenditures through FY21: $65,012
Project Timeline	Timelines are based on the assumption that PHB and DPC will be implemented as part of the same field effort. **1. Default Physical Criteria Assessment (DPC)** FY22-FY24: Study design development, review, and approval. FY24: Develop implementation plan and begin site selection. FY25: Finish site selection and begin data collection. FY26-FY28: Data collection and analysis. FY28-FY29: Final report writing, review, and approval. **2. Potential Habitat Breaks (PHB)** FY22: ISAG and CMER approval of study design, begin ISPR. FY23: Complete ISPR of study design and begin site selection.

	FY24: Develop implementation plan and site selection. FY25: Finish site selection and begin data collection. FY26-FY28: Data collection and analysis. FY28-FY29: Final report writing, review, and approval. **3. LiDAR Based Water Typing Model (LiDAR)** Timeline TBD upon completion of DPC and PHB studies. **4. Fish/Habitat Detection Using eDNA** FY22: The final report was delivered to the Board with a presentation at their August 2021 meeting with a recommendation from Policy that no formal action be taken in response to the study. ISAG is currently working on a recommendation for possible inclusion of an eDNA component into the PHB and/or DPC study designs.

Project Summary and Purpose

Summary: Refine study designs for the PHB validation and DPC studies in FY21-FY24. Develop LiDAR study design after the completion of PHB and DPC, and development of statewide LiDAR derived stream network. 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.

Purpose: To inform a permanent water typing system that meets FFR objectives.

Project Objectives

Determine possibility/advisability of combining the 'Physicals,' 'PHB,' and/or 'LiDAR Model' studies. Project specific objectives are listed below:

1. **Default Physical Criteria Assessment**
   - 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.
2. **Potential Habitat Breaks (PHB)**
   - 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 identify the upstream extent of habitat likely to be used by fish 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 delineate EOF habitat in forested streams across Washington; and better understand how PHBs may be influenced by seasonal and annual variability, and by location within Washington.
3. **LiDAR Based Water Typing Model**
   - Prepare 'LiDAR Model' study design to evaluate the effectiveness of a LiDAR based logistic regression model to identify and locate the extent of 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 analyses 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*

	PHB	DPC	LiDAR	eDNA
FY22**	$31,247	$0	$0	$0
FY23**	$35,300	TBD	$0	$0
FY24**	$185,600	TBD	$0	$0
FY25**	$911,400	TBD	$0	$0
FY26**	$929,900	TBD	$0	$0
FY27**	$953,400	TBD	TBD	$0
FY28**	$419,300	TBD	TBD	$0
FY29**	$59,500	TBD	TBD	$0
Project Total	**$3,525,647**	TBD	TBD	$0

*May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

**Estimated budget based on the current project timeline and PHB study design. Additional revisions will be made as study designs and implementation plans are developed.

Project Name	Unstable Slopes Criteria Project (CWA Project)
Workplan 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/ TWIG SAG: UPSAG Project Manager: Lori Clark **The Project Team was formerly organized as a Technical Writing and Implementation Group (TWIG)*
CMER Scientist(s) and Principal Investigator(s)	Project Team Members: Dan Miller, Ted Turner, and Julie Dieu CMER Scientist: Greg Stewart
Status/Phase	The Unstable Slopes Criteria Project consists of five distinct projects, approved by Policy in April 2017: 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 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 The Project Team is currently working on Project 2, Object-Based Landform Mapping with High-Resolution Topography Study, implementation. The report is scheduled to be presented to CMER in spring 2022. Study Designs for Empirical Evaluation of Shallow Landslide Susceptibility and Frequency by Landform (Project 3) and the Empirical Evaluation of Shallow Landslide Runout (Project 4) will be developed following completion of the Object-Based Landform Mapping with High-Resolution Topography Study Design. These Study Designs are expected to go through ISPR and CMER review in the spring of 2022.
Expenditures to Date	FY19-FY21 Biennium: $55,052
Project Timeline	The project is estimated to continue through 2027: • FY20: Completed ISPR review for Project 2 and developed implementation plan. • FY21: Continue work on Project 2 and work to complete draft final report. • FY22: Develop and complete ISPR review of study plans for Projects 3 & 4. • FY23: Initiate work on Projects 3 & 4. • FY24: Continued work on Projects 3 & 4 and develop a study plan and initiate ISPR review for Project 5. • FY25: Complete work on and develop final reports for Projects 3 & 4, finalize study plans and begin implementation of Project 5. • FY26: Completion of work on Project 5. • FY27: Development of final report for Project 5.

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

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.

The project will be designed to evaluate the original Forests & Fish Report Schedule L-1 research topic: "Test the accuracy and lack of bias of the criteria for identifying unstable landforms in predicting areas with a high risk of instability" (FFR p. 127). The project replaces the Testing the Accuracy of Unstable Landform Identification Project, based on feedback from Policy at the November 2010 meeting. At that meeting, UPSAG presented two interpretations of the original Forests & Fish Report Schedule L-1 topic and asked for direction as to how to proceed and prioritize efforts. The Project Team (formerly organized as a Technical Writing and Implementation Group, or TWIG) understands that Policy's direction was to evaluate the landslide susceptibility of different slopes/landforms in the interest of evaluating current rule-identified landforms and identifying/characterizing additional potentially unstable landforms. The Project Team developed a document that summarizes Best Available Science and proposed alternative approaches for addressing the critical questions; the TWIG's preferred alternative was approved by Policy.

Project Objectives

The project will be designed to evaluate the landslide susceptibility of different slopes/landforms in the interest of evaluating current rule identified landforms and identifying/characterizing additional potentially unstable landforms.

Budget*

Breakdown by Project	FY22	FY23	FY24	FY25	FY26	FY27	Total Budget
Object-Based Landform Mapping	$28,450						$28,450
Shallow Landslide Susceptibility	$50,000	$150,000	$78,960	$25,000			$123,960
Shallow Landslide Runout		$50,000	$100,000	$25,000			$175,000
Mgt Susceptibility Modeling			$25,000	$100,000	$75,000	$25,000	$225,000
Total TWIG Budget	**$78,450**	**$200,000**	**$203,960**	**$150,000**	**$75,000**	**$25,000**	**$732,410**

* May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

Project Name	Deep-Seated Landslide (DSL) Research Strategy Projects
Workplan Critical Questions Addressed	• Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard? • Does harvesting of the recharge area of a glacial deep-seated landslide promote its instability? • Can relative levels of response to forest practices be predicted by key characteristics of glacial deep-seated landslide and/or their groundwater recharge areas?
Project Elements	Forest practices effects and response levels on deep-seated landslides.
Responsible SAG and Project Manager	SAG: UPSAG Project Manager: Lori Clark
CMER Scientist(s) and Principal Investigator(s)	CMER Scientist/Principal Investigator: Greg Stewart Project Team: Julie Dieu, Anne Weekes, Jennifer Parker, Joe Murray, Michael Maudlin, Rachel Pirot, Ted Turner, and Kara Whittaker
Status/Phase	Strategy approved by CMER (2018) Project components completed to date: 4.1 Model Evapotranspiration in Deep-Seated Landslide Recharge Areas 4.2 Glacial Deep-Seated Landslide Literature Synthesis 4.3 Non-Glacial Deep-Seated Landslide Literature Synthesis Currently in Study Design Development: 4.5 Deep-Seated Landslide Mapping Objective 4.6 Landslide Classification Future components: 4.7 GIS Toolkit Development* 4.8 Groundwater Modeling 4.9 Physical Modeling 4.10 Landslide Monitoring 4.4 Board Manual Revision Project (intermittent process pending direction from the FP Board) **The timing for Project 4.7, GIS Toolkit Development, is contingent upon the timing of the development of Study Design for Projects 4.5/4.6.*
Expenditures to Date	Expenditures to date: $151,725
Project Timeline	Strategy implementation will continue to 2029 or beyond. UPSAG is currently developing a study design based on the Policy approved Scoping Document for the Landslide Mapping and Classification Project (4.5 and 4.6) under the Strategy. Study Design is anticipated to be provided to CMER for review in spring of 2022. Through the development of 4.5 and 4.6, tools will be developed that will inform Project 4.7, GIS Toolkit Development.
Complementary Project(s) and Project Sequencing	Complementary Project: Unstable Slopes Criteria Project Project Sequencing: Please see the Project Sequencing Budget table below.

Project Summary and Purpose
The strategy utilizes the results of the literature reviews for forest harvest effects on glacial and bedrock deep-seated landslides to address key knowledge gaps identified during the literature reviews and to address questions from the Forest Practices Board and Policy regarding the potential effects of forest practices on deep-seated landslides. This strategy includes a description of multiple projects, identifies their priority, timeline, sequence, and estimated cost, and describes the relationship between the project and the critical questions. The strategy evaluates the existing CMER deep-seated landslide workplan 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*

Project Description	FY21	FY22	FY23	FY24	FY25	FY26
4.5/4.6 Landslide Mapping & Classification	$0		$50,000	$150,000	$150,000	$85,000
4.7 GIS Toolkit Development	$0	$25,000**	$35,000			
4.8 Groundwater Modeling	$0		$45,000	$25,000	$50,000	$25,000
4.9 Physical Modeling	$0		$45,000	$25,000	$50,000	$25,000
4.10 Landslide Monitoring	$0					$65,000
Total DSL Budget	**$0**	**$25,000**	**$175,000**	**$200,000**	**$250,000**	**$200,000**

*The May 12, 2021 Board approved budget allocated $165,000 in FY22. UPSAG will not need funding for these projects until the Study Design for Project 4.5/4.6 is completed. The FY22 budget was revised by shifting funding for Projects 4.5, 4.6, 4.8, 4.9, and 4.10 out one FY. FY23 Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

**The timing for Project 4.7, GIS Toolkit Development, is contingent upon the timing of the development of Study Design for Projects 4.5/4.6.

Budget, continued

Project Description	FY27	FY28	FY29	FY30	FY31	FY32	Total
4.5/4.6 Landslide Mapping & Classification	$50,000						$485,000
4.7 GIS Toolkit Development							$60,000
4.8 Groundwater Modeling	$50,000	$15,000					$210,000
4.9 Physical Modeling	$50,000	$15,000					$210,000
4.10 Landslide Monitoring		$160,000	$200,000	$200,000	$200,000	$100,000	$925,000
Total DSL Budget	**$150,000**	**$190,000**	**$200,000**	**$200,000**	**$200,000**	**$100,000**	**$1,890,000**

Project Name	Type N Experimental Buffer Treatment Project in Hard Rock Lithologies - Extended Sampling Phase II (CWA Project)
Workplan Critical Questions Addressed	**Critical Questions that the Hard Rock Study was explicitly designed to address:** • How do two other buffers compare with the forest practices Type N prescriptions in meeting resource objectives? • Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FPHCP resource objectives and performance targets for shade, stream temperature, LWD recruitment, litter fall, and amphibians? • 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 within the Type Np stream and where it delivers 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? **Critical Questions that the Hard Rock Study informs indirectly**: • What are 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 FPHCP 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: Lori Clark
CMER Scientist and Principal Investigator(s)	CMER Scientist: Greg Stewart Principal Investigator(s): Ecology – Bill Ehinger and Dave Schuett-Hames; WDFW – Aimee McIntyre
Status/Phase	The Hard Rock Phase II Report covering 2006-2017 was approved by ISPR and CMER in the summer of 2021. Additional stream temperature data collection for 2018-2019 was analyzed and will be attached as an Addendum to the Phase II report.
Project Timeline	The Phase I report covering 2006-2011 was approved as final by CMER in 2018. The Post-Harvest Genetics Report was approved by CMER in 2019.

	The Phase II Report covering 2006-2017 was approved by CMER and ISPR in 2021. The Hard Rock Phase II 6 Questions document was approved by CMER in November 2021. The Hard Rock Phase II final report will be presented to Policy in January 2022 and is expected to be presented to the Forest Practice Board in February 2022. Stream temperature data collection for 2018-2019 was analyzed and attached as an Addendum to the Hard Rock Phase II report.
Expenditures to Date	FY19-FY21: $231,805 $8,436,529
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), Windthrow Frequency, Distribution, and Effects Project (planned), Extensive Riparian Status and Trends Monitoring Program – Stream Temperature Phase I: Westside Type F/S and Type Np Monitoring Project (completed).

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 in western Washington.

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

Project Objectives

This project is identified as a Clean Water Assurance (CWA) Milestone. This Effectiveness Study evaluates the effectiveness of the FPHCP riparian buffer prescription for westside Type N streams. The study compared the current rule to buffer alternatives that provide more and less protection within the RMZ, and unharvested reference sites. Effectiveness was evaluated in terms of whether Forest Practices rules for Type N Waters produce forest conditions that achieve agreed upon Resource Objectives. 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.

Project Name	Type N Experimental Buffer Treatment Project in Hard Rock Lithologies Amphibian Monitoring Phase III (CWA Project)
Workplan Critical Questions Addressed	**Critical Questions that continued monitoring of Hard Rock Study sites for stream-associated amphibian response would address:** • How do two other buffers compare with the forest practices Type N prescriptions in meeting resource objectives? • Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FPHCP resource objectives and performance targets for *shade, stream temperature, LWD recruitment, litter fall, and* amphibians? (only amphibian response is evaluated in this work – Phase III) • How do stream-associated amphibian populations respond to the Type N prescriptions over time? • Is stream-associated amphibian population viability maintained by the Type N prescriptions?
Project Elements	Addresses the effectiveness of FPHCP riparian buffer prescription for FP designated amphibians in Type N Waters in western Washington, including a comparison of the current rule to buffer alternatives that provide more and less protection within the RMZ, and unharvested reference sites.
Responsible SAG and Project Manager	SAG: LWAG Project Manager: Lori Clark
CMER Scientist and Principal Investigator(s)	CMER Scientist: N/A Principal Investigator: WDFW – Aimee McIntyre
Status/Phase	Phase I report covering 2006-2011 was approved in 2018. Phase II (extended) report covering 2006-2017 was approved by ISPR and CMER in 2021.
Project Timeline	FY22: Future amphibian demographic sampling has been proposed beginning in FY22. This is consistent with sampling every 7-8 years as has been done previously.
Expenditures to Date	2006-present: $8,276,960 (from Phase I and Phase II of Hard Rock 2006-present)
Complementary Projects and Project Sequencing	Stream-Associated Amphibian (SAA) Detection/Relative Abundance Methodology Project (completed), Amphibian Recovery Project (completed), Buffer Integrity – Shade Effectiveness (Amphibians) Project (completed), Van Dyke's Salamander Project (planned), Amphibians in Intermittent Streams Project (planned), Eastside Amphibians Evaluation Project (planned).
Project Summary and Purpose	
Responses Evaluated: stream-associated amphibian demographics. Study Sites: Seventeen (17) Type N, first-, second- and third-order stream basins located in western Washington. These are the same Hard Rock sites that were included in Phase I and Phase II of the Type N Hard Rock studies. Treatments: (1) unharvested reference; (2) current FP buffer for Type N streams (e.g., riparian buffer throughout ≥50% of the Type N RMZ); (3) 50 foot riparian buffer on the entire Type N stream; (4) no buffer.	
Project Objectives	

This project is identified as a Clean Water Assurance (CWA) Milestone. This Effectiveness Study evaluates the effectiveness of the FPHCP riparian buffer prescription for westside Type N streams. The study compared the current rule to buffer alternatives that provide more and less protection within the RMZ, and unharvested reference sites. Effectiveness was evaluated in terms of whether Forest Practices rules for Type N Waters produce forest conditions that achieve agreed upon Resource Objectives. 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.

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

Study PIs propose additional data collection for stream-associated amphibians and other relevant covariate data (e.g., stream temperature data) to evaluate continued trends in amphibian densities. Do amphibian densities stabilize, continue to decline, or recover over time? Timing for Phase II amphibian demographic monitoring is scheduled for summers of 2022 and 2023. Data analysis and report writing for the continued effectiveness-monitoring phase would extend into FY25. This recommendation is consistent with the study design to monitor effectiveness through time. Sampling in post-harvest years 14 and 15 would help us understand longer-term tailed frog and torrent salamander trends and densities through 40% of a typical harvest rotation.

Budget*

FY22	FY23	FY24	FY25	Total
$142,800	$304,500	$300,300	$82,950	$830,550

*May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

Project Name	Water Temperature and Amphibian Use in Type Np Waters with Discontinuous Surface Flow (CWA Project)
Workplan Critical Questions Addressed	What is the effect of buffering or not buffering spatially intermittent stream reaches in Type Np streams? (Type N Riparian Prescriptions Rule Group and Type N Riparian Effectiveness Program – Westside Critical Questions) How do stream-associated amphibians (SAAs) utilize intermittent stream reaches near the origins of Type N (headwater) streams? (Type N Amphibian Response Program Critical Question)
Project Elements	Characteristics of streams with intermittent flow (i.e., Type Np stream segments with discontinuous perennial flow), including spatial and temporal patterns of flow, and how these patterns influence stream temperature in downstream non-intermittent reaches across the landscape. Stream-associated amphibian use of streams with intermittent flow.
Responsible SAG and Project Manager	SAG: LWAG Project Manager: Lori Clark
Principal Investigator(s)	WDFW – Aimee McIntyre
Status	In summer 2020, a Project Team was formed for this project and work began on updating the BAS synthesis. Work on drafting the Scoping Document began in early 2021. SAG priorities were focused on finalizing Type N Hard Rock products and the scoping is still in progress. Additionally, AMP staffing shortages resulted in delays to the development and approval of the project Charter, which impacted the ability of the contractor to begin work according to the original timeline.
Project Timeline	September 2021: Charter was approved. February 2022: Complete literature synthesis and a summary of data from existing studies. April 2022: Anticipated delivery of Scoping Document to CMER for review.
Expenditures to Date	FY19-FY21: $21,023
Complementary Projects and Project Sequencing	Westside Type N Experimental Buffer Treatment Project in Hard Rock Lithologies, Westside Type N Experimental Buffer Treatment Project in Soft Rock Lithologies, SAA Sensitive Sites Identification Methods, SAA Detection/Relative Abundance Methodology, Dunn's Salamander, Buffer Integrity-Shade Effectiveness, Amphibian Recovery, Riparian Characteristics and Shade Response Study, Extensive Riparian Status and Trends Monitoring Program – Stream Temperature Phase I: Westside Type F/S and Type Np Monitoring Project
Project Summary and Purpose	
This study will inform the Overall Performance Goals to meet water quality standards and support the long-term viability of covered species by evaluating the influence of intermittent stream reaches on water temperature and FP-designated amphibian use. A previous CMER-funded study (Hunter et al. 2005) found that intermittent stream reaches frequently occur near the origin of headwater streams (i.e., PIP), and that they exhibit one of two spatial patterns of surface flow (i.e., a single dry reach located adjacent to the PIP, or flowing sections interspersed with dry sections). This study will expand on previous findings by evaluating the influence of intermittent reaches on stream temperature and amphibian use, as well as identifying how spatial and temporal patterns of intermittency may differentially impact temperature and amphibian use. A project concept was developed by the Type N	

Amphibian Response Program, LWAG and CMER in 2007. At that same time, an exploratory data review from an existing CMER-supported study (see Quinn et al. 2007) was conducted. The review provided limited information. Consequently, LWAG proposed waiting until the Type N Hard Rock project was complete to determine how that study could inform critical questions and project need/development. Though the Hard Rock Study focused primarily on 2nd order streams, it included an evaluation the entire length of the stream network from the F/N break and upstream to the uppermost point of perennial flow (i.e., perennial initiation point or PIP), including all Type Np reaches with discontinuous surface flow. Because of the pending completion of the Type N Hard and Soft Rock studies, and the desire to understand the relationship between intermittent stream reaches, stream temperature and FP-covered amphibians, LWAG proposes to continue work on this project.

LWAG proposes data summary and study development in 2 steps:

1. Scoping Document (April 2022): 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 (delayed due to budget constraints to FY25): 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 across the landscape 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. This project is intended to include both water temperature and amphibians as primary responses.

Project Objectives

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

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

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

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

Budget*

FY20	FY21	FY22	FY23	FY24	FY25**	FY26	FY27	FY28	FY29	FY30	Total
$5,173	$39,827				$80,000	$250,000	$360,000	$360,000	$360,000	$250,000	$1,705,000

*May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

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

Project Name	Eastside Type N Riparian Effectiveness Project (ENREP) (CWA Project)
Workplan Critical Questions Addressed	• Are riparian processes and functions provided by Type Np buffers maintained at levels that meet FPHCP resource objectives and performance targets for shade, stream temperature, LWD recruitment, litter fall, and amphibians (*aquatic life* is the term used in study design)? • Do different types of Type N channels explain the variability in the response of Type N channels to forest practices? • What is the effect of buffering or not buffering spatially intermittent stream reaches in Type Np streams?
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	SAG: SAGE Project Manager: TBD
CMER Scientist(s) and Principal Investigator(s)	CMER Scientist(s): Malia Volke Principal Investigators: Timothy Link, University of Idaho; Charles Hawkins, Utah State University; Bill Ehinger, Dept. of Ecology
Status/Phase	Implementation of Study Design: • Completion of second year pre-harvest data collection at the Springdale, Blue Grouse, and Tripps basins and first year pre-harvest data collection at the Fish Creek and Coxit basins for: biophysical variables, including streamflow, wetted channel extent, suspended sediment concentrations, stream shade, riparian forest mensuration, large wood, temperature, and stream cross sections, aquatic life (benthic macroinvertebrates), and habitat. • Springdale basin harvest was completed spring 2021. • Harvests are initiated at the Blue Grouse and Tripps basins.
Expenditures through FY21	FY15-FY19: $944,876 (includes ENREP TWIG Participation and UCUT ENREP Scientist) FY20: $474,753 FY21: $701,179 Total expenditures through FY21: $2,120,808
Project Timeline	FY18-FY25: Implementation FY26: Data analysis and final report development FY27-FY28: Final report review and revisions
Complementary Projects and Project Sequencing	Westside Type N Experimental Buffer Treatment Project in Hard Rock and Incompetent Lithologies (in progress), Type F and N Extensive Eastside – Temperature, Eastside Type N Forest Hydrology (completed), Eastern Washington Riparian Assessment Project Phase I and II (completed), Bull Trout Overlay Temperature, Solar Radiation/Effectiveness, Eastside Type F Riparian Effectiveness, Westside Type N Buffer Characteristics, Integrity, and Function (BCIF)
Project Summary and Purpose	

This project will help inform if, and to what extent, the prescriptions found in the Type N Riparian Prescriptions Rule Group 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*

FY22	FY23	FY24	FY25	FY26	FY27	FY28	Total
$600,730	$602,922	$630,233	$524,608	$456,029	$289,904	$100,000	$3,204,426

*May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

Updated Budget Estimates

FY22	FY23	FY24	FY25	FY26	FY27	FY28	Total Estimated Budget
$600,730	$606,744	$656,703	$581,370	$489,632	$330,688	$276,442	$3,542,309

Project Name	Eastside Timber Habitat Evaluation Project (ETHEP)
Workplan Critical Question Addressed	Will application of the prescriptions result in stands that achieve eastside FPHCP objectives (forest health, riparian function, and historical disturbance regimes)?
Project Elements	Eastside forest health, riparian function, disturbance regimes, timber habitat types.
Responsible SAG and Project Manager	SAG: SAGE Project Manager: TBD
CMER Scientist(s) and Principal Investigator(s)	CMER Scientist: Malia Volke Principal Investigator(s): TBD Project Team: Malia Volke, Mark Kimsey, Mark Teply
Status/Phase	The scoping document was approved by SAGE and CMER. The study design is currently being developed by the Project Team.
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

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

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

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

The current THT system of three fixed elevation zones is generally too coarse to accurately capture the diversity

and complex distribution of eastside riparian forest composition and structure. Although elevation has a major influence on climate and consequently on vegetation patterns, forest site potential is also determined by localized topographic, climatic, and edaphic (soil) conditions that do not strictly follow elevation zones (Cooper et al. 1991). Thus, there are expected differences in forest composition and structure at similar elevations – or expected similarities in forest composition and structure at different elevations – depending on local microclimate and other environmental conditions. This may be especially pronounced for riparian forests which are strongly influenced by fine-scale changes in hydrology (Naiman et al. 2005). An improved framework could be used in the future to develop site-appropriate riparian harvest prescriptions to better meet the stated goals of the FPHCP for managing eastside riparian forests. For the purposes of this project, a framework is generally defined as a system that can be used to inform and guide management prescriptions that support the goals and objectives of the FPHCP.

The purpose of this project is to develop an ecologically meaningful and reliable framework for applying riparian harvest rules along Type S and Type F streams in eastern Washington. The Project Team is currently developing the Study Design. The project objectives may be modified based the development of the Study Design but have not been considered/approved by CMER/Policy.

Project Objectives

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

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

Budget

Currently there is no funding allocated for this project. The eastside CMER scientist is working with the project team to develop the study design. Upon completion of the study design, SAGE will identify funding needs.

Project Name	Road Prescription-Scale Effectiveness Monitoring (Roads BMP Study)
Workplan Critical Question 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: TBD
CMER Scientist(s) and Principal Investigator(s)	CMER scientists: Jenelle Black and Greg Stewart Principal Investigator: Charlie Luce (USFS) Project Team: Tom Black (USFS), Amanda Manaster (UW), Erkan Istanbulluoglu (UW), and Julie Dieu (Rayonier)
Status/Phase	• The second data collection season was completed in August 2021 with the tub draining and sediment weighing. • The third data collection season began in November 2021. • The DNR's Heavy Equipment Crew completed the annual road maintenance needs across the sites. • Many retrofits were made to the tipping buckets and platforms to improve hardiness and ensure site efficacy. These improvements include: installation of a flow splitter at 10 high-flow sites, installation of trough covers, deployment of fish plates to all sites, and improved traffic counter/camera combinations. • West Fork Environmental is under contract to visit each site monthly to download data, collect water samples, and repair minor issues at each platform. Watershed Geo Dynamics is working with West Fork to process data and provide QA/QC. The Department of Ecology's Manchester Environmental Laboratory is under an Inter-Agency Agreement to complete water sample testing. • Data reduction and preliminary data analysis is being completed by the U.S. Forest Service Rocky Mountain Research Station (overarching study) and the University of Washington (modeling and parameterization). • The 2019-2021 plot discharge and fine sediment data for all sites have been summarized. The annual coarse sediment data have been summarized, as have the rainfall data. The USFS is working on the traffic counter data and traffic camera data. • The first Ditch Line Hydraulics Parameterization experiment was completed in May 2021. The Short-Time-Scale Parameterization experiment pilot was completed in November 2021 with the full experiment anticipated in February 2022. • The Micro-Topography Parameterization experiment is underway with multiple surveys completed in FY21. Additional surveys will be completed at least every other month (weather-permitting) for the duration FY22 and possibly FY23. • Continued work on a tri-layer mass-balance model representing vertical layers of the road prism. In this model, equations were developed for calculating sediment fluxes between layers and production of fine sediment from coarse sediment within layers. Existing equations were used for overland flow sediment transport on the top layer.

	• Continued work on a synthesis paper to look at the literature surrounding traffic-induced sediment production processes and examine the gaps in this research. • Biennial report completed and presented to CMER with preliminary results from the 2019-2021 biennium.
Project Timeline	FY28-FY26: Monitoring and data collection at 78 sites, data management and QA/QC, equipment maintenance, start parametrization experiments, continue model development. FY27-FY29: Data analysis and report writing and review.
Expenditures through FY21	$2,228,434
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*

FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	Total Budget
$661,047	$696,047	$616,047	$596,147	$596,047	$351,000	$75,000	$25,000	$3,616,335

*May 12, 2021 Board approved budget. Funding approved for FY21-FY22. Budget beyond FY22 are estimates only.

Proposed Budget FY23-FY29**

FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	Total Budget
$661,047	$696,047*	$616,047*	$596,147*	$596,047*	$351,000*	$75,000	$25,000	$3,616,335

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

Project Phases by FY

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

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