

ADDITIONAL PROJECT PROPOSALS- Unspent Funds

LWAG- Landscape and Wildlife Scientific Advisory Group

Project Name	Type N Experimental Buffer Treatment Project in Hard Rock Lithologies – <u>Proposed Future</u> Amphibian Monitoring (CWA Project)
Workplan Critical Questions Addressed	<p><u>Critical Questions that continued monitoring of Hard Rock Study sites for stream-associated amphibian response would 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 <i>shade, stream temperature, LWD recruitment, litter fall, and amphibians</i>? • 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? • 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: LWAG Project Manager: Heather Gibbs
CMER Scientist and Principal Investigator(s)	CMER Scientist: Greg Stewart Principal Investigator: WDFW – Aimee McIntyre
Status/Phase	Phase I report covering 2006-2011 was approved in 2018. Phase II (extended) report covering 2006-2017 is currently in review at ISPR (delivered October 8, 2019).
Project timeline	Future amphibian demographic sampling has been proposed beginning in FY22. This is consistent with sampling every 7-8 years as has been done previously. However, the exact timing <i>could be</i> pushed out 1-3 years to accommodate CMER MPS priorities, timelines and project budgets.
Expenditures to Date	\$8,229,545 (from Phase I and Phase II of Hard Rock 2006-present)
Complimentary 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	
<u>Responses Evaluated:</u> stream-associated amphibian demographics and genetics.	
<u>Study Sites:</u> Seventeen (17) Type N, first-, second- and third-order stream basins located over a large geographic area of western Washington.	
<u>Treatments:</u> (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.

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, and the Forests and Fish Agreement was intended to protect rare amphibians in *each* headwater stream. 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 co-variate data to evaluate continued trends in amphibian populations. *Do populations stabilize, continue to decline, or recover over time?* The proposed start for this extended monitoring is summer 2022; however, the exact timing is somewhat 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 or 2025 under the current timing. This recommendation is consistent with the study design to monitor effectiveness through time. If numbers of detected amphibians continue to be as low as observed for some species and study sites as in the last sampling period (2015/2016), an additional year of resample may be necessary and ideal if a rigorous statistical comparison is desired. If we see recovery or no further decline in the FP-treatment after one more sample effort, it would be a logical time to conclude the study. Sampling in post-harvest years 14 and 15 would help us understand longer-term tailed frog population trends through 40% of a typical harvest rotation.

Budget

	FY 20 Budget	FY 21 Budget	FY 22 Budget	FY 23 Budget	FY 24 Budget	FY 25 Budget	FY 26 Budget	Total Budget
Future Work – Amphibian Response (Only 1 year of resample)	\$0	\$0	\$111,000	\$262,000	\$80,000			\$453,000
Future Work – Amphibian Response (Ideal 2 years of resample)	\$0	\$0	\$145,000	\$262,000	\$262,000	\$104,000		\$773,000

Project Name	Sensitive Site and Amphibian Use Investigation from Existing Study Data
Workplan Critical Questions Addressed	Can the methods used to identify and characterize sensitive sites be improved? Are rule-identified sites valuable for amphibians? Are sites important to amphibians correctly identified by rule?
Project Elements	LWAG proposes to use existing data from the Type N Experimental Buffer Treatment in Hard Rock Lithologies (hereafter, Type N Hard Rock) Project and any other relevant CMER-funded projects to develop data summaries and comparisons for: <ol style="list-style-type: none"> 1) Numbers, locations and characteristics of sensitive sites in Type Np basins (i.e., Type Np intersections, headwall seeps, side-slope seeps, headwater springs) and temporal changes, including annual variability in location and hydrological footprints of seeps; 2) Characteristics of other streamside hydrologic features in Type Np basins that do not meet the definitions for either seep sensitive site category under current Forest Practices Rules; and 3) Amphibian use of above features.
Responsible SAG and Project Manager	LWAG Project Manager – Heather Gibbs
Principal Investigator(s)	WDFW
Status	This project is currently proposed in the CMER Work Plan as a part of the Type N Riparian Effectiveness Program. Data from the Type N Hard Rock Project has focused predominantly on evaluations of a basin-wide response. This is an opportunity to look at sensitive site-specific characteristics and amphibian use to give a broader understanding of within-site variability.
Project timeline	1 st month: project charter development 2 nd month: project charter approval, contract finalization 3 rd -5 th month: identify all relevant projects and data and begin report development 6 th -9 th month: develop summary report 9 th month: draft report ready for review
Complementary Projects and project sequencing	Type N Experimental Buffer Treatment Project in Hard Rock Lithologies, SAA Sensitive Sites Identification Methods, SAA Detection/Relative Abundance Methodology, Dunn’s Salamander, Buffer Integrity-Shade Effectiveness, Amphibian Recovery

Project Summary and Purpose

The Type N Study Hard Rock Project addressed the effectiveness of riparian prescriptions in Type Np basins using a robust BACI design at a basin scale. The proposed work will use existing data from this study to examine sensitive sites for an increased understanding of characteristics and amphibian use. Four of the Type N sensitive site categories will be examined, including Type Np intersections, headwall seeps, side-slope seeps, and headwater springs. While there has been interest in this topic among some CMER and Timber, Fish and Wildlife (TFW) Policy caucuses and/or members, it has not been addressed to date as this information was outside of the scope of the original study objective. Information on sensitive sites and identification under Forest Practices rules and relative use by amphibians, has the potential to inform important Policy discussions, including those of the Technical Type Np Prescriptions Workgroup that was recently convened to develop alternative Riparian Management Zone (RMZ) buffer prescriptions for Type Np streams in western Washington for Policy’s consideration.

Project Objectives

Ultimately, project findings will inform whether current rules support the Overall Performance Goal of maintaining the long-term viability of stream-associated amphibians. Specifically, this product will support the work currently being conducted by the Technical Type Np Prescriptions Workgroup by evaluating if the methods used to identify and characterize sensitive sites can be improved; whether rule-identified sites are valuable for amphibians; and if sites important to amphibians are correctly identified by the rule.

Budget

Total budget spent to date	FY 20	FY 21
\$0	\$22,522	\$22,522

Cost details by year

	FY20	FY21	Biennium Total
Salaries	\$12,359	\$12,359	\$24,718
Employee Benefits	\$4,927	\$4,927	\$9,854
Indirect	\$5,236	\$5,236	\$10,472
TOTAL	\$22,522	\$22,522	\$45,044

Project Name	Van Dyke's Salamander Project – Scoping and GIS database cleanup
Workplan Critical Questions Addressed	<p>What are the common findings and inconsistencies in published studies on the habitat associations of Dunn's and Van Dyke's salamanders? (addressed by the Phase I literature review of the Van Dyke's Salamander Project)</p> <p>How does large wood and decay class affect the distribution and abundance of Van Dyke's salamander? (addressed, in part, by the Phase I literature review of the Van Dyke's Salamander Project)</p>
Project Elements	<p>(1) Review the GIS database of known Van Dyke Salamander occurrences and remove and/or combine duplicative records.</p> <p>(2) Develop a scoping document for possible future work.</p>
Responsible SAG and Project Manager	LWAG Project Manager – Heather Gibbs
Principal Investigator(s)	WDFW
Status	A literature review for the Van Dyke's Salamander was completed in FY2018, which included the creation of a GIS database of known occurrence locations. This project has not been scoped.
Project timeline	<p>FY20: Refine GIS database of occurrence information by hiring a technician for 2 months as FTE. Then about 3 months to finalize and review at CMER. (~5 months after hiring of technician)</p> <p>FY21: Develop scoping document.</p> <p>1st month: project charter development, contract finalization</p> <p>2nd month: project charter approval, contract finalization</p> <p>3rd-5th month: scoping document development</p> <p>6th month: draft report ready for review</p>
Complementary Projects and project sequencing	Type N Experimental Buffer Treatment Project in Hard Rock Lithologies, SAA Sensitive Sites Identification Methods, Dunn's Salamander, Buffer Integrity-Shade Effectiveness
Project Summary and Purpose	
<p>One of the four Overall Performance Goals of the Forest Practices Habitat Conservation Plan (FP HCP) is to support the long-term viability of FP-covered species, which includes the Van Dyke's salamander, a species endemic to Washington State. Forest management implications for the Van Dyke's Salamander are not fully understood and previous CMER research has not focused on this topic. This species has a cool-adapted life history, which may make it vulnerable to Forest Practices activities, perhaps especially under future probable climate change scenarios for the Pacific Northwest.</p> <p>As part of the Literature Review of the Van Dyke's Salamander Project, all known site occurrence information was collected in a GIS database. The database currently includes approximately 2,000 points acquired from federal, state and private partners. Because information was gathered from as many sources as could be identified, many site localities are represented by more than one point. As a result, the historic status of the species in the state is not fully understood due to: 1) the duplicative nature of the site localities in the database, and 2) poor accuracy information for some historic sites. To address duplicity and poor accuracy, funding would support an effort to review the GIS database of known Van Dyke Salamander occurrences and remove and/or combine duplicative records (i.e., the same site, with multiple observations through time). This effort will contribute to a comprehensive understanding of the distribution of historic site localities for the species.</p> <p>LWAG also proposes to develop a scoping document with the intent of refining objectives and developing alternatives for possible future study plan development.</p>	
Project Objectives	

Proposed work is for two discrete products that are part of the Van Dyke’s Salamander Project proposed in the current CMER Work Plan. Ultimately, this project seeks to inform the Overall Performance Goal of supporting the long-term viability of stream-associated amphibians.

- (1) Refine the existing database of known Van Dyke’s occurrences to better understand historic distribution of the species. This information will be useful for potential future work including occupancy modeling, site selection and monitoring occupancy for the species through time. (proposed for FY20), and
- (2) Develop a scoping document for future work (proposed for FY21).

Budget

Expenditures to Date	FY20 Budget	FY21 Budget
\$44,443	\$18,220	\$11,432

Cost details by year

	FY20	FY21	Biennium Total
Salaries	\$9,817	\$6,288	\$16,105
Employee Benefits	\$4,167	\$2,486	\$6,635
Indirect	\$4,236	\$2,658	\$6,894
TOTAL	\$18,220	\$11,432	\$29,652

Project Name	LWAG Strategy Development
Workplan Critical Questions Addressed	N/A
Project Elements	Develop a SAG Strategy for LWAG
Responsible SAG and Project Manager	LWAG PM: Heather Gibbs
CMER Scientist and Principal Investigator(s)	TBD
Status/Phase	Proposed for unspent FY20 CMER Funds
Project timeline	1 st month: Development of LWAG Strategy Statement of Scope, contract finalization 3 rd month: Submit first draft Strategy to LWAG for review 5 th month: Submit second draft Strategy to LWAG for review 6 th month: Submit third draft/LWAG approved draft of Strategy to CMER for review Presentation to CMER (discretionary) 7 th or 8 th month: Submit final draft of Strategy to CMER for final review 9 th month: CMER approval of Strategy
Complementary Projects and project sequencing	Wetland Research and Monitoring Strategy, Deep-seated Landslide Research Strategy

Project Summary and Purpose

Develop SAG Strategy for LWAG. Identify future scope, objectives and study priorities to address scientific uncertainty and identify risks to resources.

Project Objectives

LWAG is interested in developing a strategy for future work under the Adaptive Management Program. The SAG has many projects at or near completion, and several more remain in the CMER Work Plan, including some proposed in recent years. Currently proposed projects included continued work on the Van Dyke’s Salamander, future possible work on the Type N Experimental Buffer Treatment in Hard Rock Lithologies, and an Eastside Amphibian Evaluation, among other priorities. Historically, LWAG has participated primarily in the Type N Riparian Prescription Rule Group, specifically the Sensitive Site Program and Type N Amphibian Response Program. LWAG was also identified as one of two SAGs (alongside ISAG) equipped to address Rule Group Critical Questions under the Pesticides Rule Group, Wetlands Rule Group, and Wildlife Rule Group.

The objective of the proposed work is to develop an integrated strategy for research and monitoring, including prioritization of studies currently proposed in the CMER Work Plan, identification of additional contributions and/or study opportunities to include in the Work Plan in the future, identification of opportunities to contribute in meaningful ways to other SAG projects in either an advisory or implementation capacity. Outcomes of the work will include a focused and efficient direction for future LWAG work, and possibly, a broadening of our current active membership, which has declined in recent years. Overall, LWAG wants to ensure that they remain relevant and useful to the CMER Adaptive Management Program, with the shared vision and goal of reducing scientific uncertainty and identification of risks to resources, for the future benefit of the Overall Performance Goals of the Forest Practices Habitat Conservation Plan.

Budget

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	Total budget
\$9,072	\$8,684						\$17,756

Project Name	Eastside Amphibian Evaluation Project
Workplan Critical Questions Addressed	Does sufficient stream-associated amphibian-occupied area exist in Eastside managed lands that is under FFR jurisdiction to justify study attention? Does the distribution of stream-associated amphibians on Forests and Fish lands across Eastern Washington warrant inclusion in CMER effectiveness research?
Project Elements	Occurrence of covered amphibian species in Forest Practices (FP) Habitat Conservation Plan (HCP)-managed forestlands in eastern Washington.
Responsible SAG and Project Manager	TBD (LWAG and/or SAGE) Project Manager – TBD
Principal Investigator(s)	TBD
Status	LWAG recommends a literature review and compilation of species distribution information for FP-designated stream-associated amphibians in eastern Washington (Coastal Tailed Frog and Rocky Mountain Tailed Frog). This project is currently in the CMER Work Plan under the Type N Amphibian Response Program (Effectiveness). This project has not been initiated.
Project timeline	FY 2021: Literature review and occurrence mapping. 1 st month: Development of project charter, contract finalization 2 nd month: Begin literature review and occurrence mapping 5 th month: Submit draft to LWAG for review 6 th month: Submit draft to CMER for review Presentation to CMER (discretionary) 7 th month: Submit final draft to CMER for final review
Complementary Projects and project sequencing	Type N Experimental Buffer Treatment Project in Hard Rock Lithologies , SAA Sensitive Sites Identification Methods, SAA Detection/Relative Abundance Methodology, Dunn’s Salamander, Buffer Integrity-Shade Effectiveness, Amphibian Recovery

Project Summary and Purpose

Previous CMER-supported research informing the effectiveness of Forest Practices in meeting the Overall Performance Goal of maintaining long-term viability of other covered species focused entirely on managed landscapes in western Washington. The reason for this focus is based on the fact that most FFR-designated amphibians have westside distributions and the assumption that those with eastside distributions have little overlap with eastside managed landscapes. However, this latter assumption is based on limited coarse-level data available from Washington GAP Analysis modeling. As a preliminary step to inform potential future project scoping for the Eastside Amphibian Evaluation Project, LWAG proposed to conduct a literature review and develop a distribution map overlaying the occurrences of FP-designated amphibians with FP-managed lands in eastern Washington. Two FP-designated amphibians, Coastal Tailed Frog and Rocky Mountain Tailed Frog, are known to occur in eastern Washington. To date, no CMER study has evaluated amphibians in eastern Washington or the Rocky Mountain Tailed Frog, which in Washington occurs only in the east. These products will help inform FP-designated amphibian distribution on eastside managed landscapes as well as priorities for future CMER work. While this project is currently listed under Type N Amphibian Response Program, its footprint likely encompasses some of the Type F landscape.

Project Objectives

This project will look at the literature and distribution of FP-designated amphibians in eastern Washington to determine if their currently known distribution on the managed landscapes, or gaps in knowledge, support continued study in the future. This project addresses the Overall Performance Goal of maintaining long-term viability of stream-associated amphibians, including for one species (Rocky Mountain Tailed Frog) that has yet to be studied in terms of the FP HCP.

Budget

Total to date	FY20 Budget	FY 21 Budget
\$0	\$0	\$18,870

Cost details by year

	FY20	FY21	Biennium Total
Salaries	\$0	\$10,357	\$10,357
Employee Benefits	\$0	\$4,057	\$4,057
Indirect	\$0	\$4,366	\$4,366
TOTAL	\$0	\$18,780	\$18,780

UPSAG- Upslope Scientific Advisory Group

Project Name	CMER Land LiDAR Acquisition	
Workplan 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 and Principal Investigator(s)	CMER Scientist(s): Greg Stewart Principal Investigators: TBD	
Status/Phase	The LiDAR will initially support UPSAGs Deep-Seated Landslide Research Strategy Project 4.5. It will also supplement and accelerate the WGS planned acquisitions for the state. Lidar has been acquired for much of the lands covered by the forest practices rules, but the LiDAR is of varying quality. Some remaining areas in western Washington have been given a lower priority while the DNR focuses on data collection in areas with no existing LiDAR. A few significant areas remain that will be covered by this project to facilitate future landslide mapping.	
Project timeline	Lidar will be acquired during the leaf-off period (typically before mid-April) in 2020. The DNR has a contract in place with a LiDAR provider that may allow us to expand their existing scope of work to quickly move forward with is project. <i>This project could be completed in a short time span (January to April) if funds are approved prior to January for the DNR to contract and execute the LiDAR flight.</i>	
Expenditures	No expenditures to date on the DSL mapping and classification project, for which \$125,000 is currently allocated for FY 2020. However, this money will not be utilized as planned. Instead, we propose to use the \$125,000 for the LiDAR acquisition and fund the remaining cost (\$106,800) with surplus funds under this request.	
Complementary Projects and project sequencing	The LiDAR acquisition will support several projects in the Deep-Seated Landslide Strategy, including projects currently being scoped. The data could also be used for other CMER projects that require high resolution topographic data.	
Project Summary and Purpose		
The project will fund LiDAR acquisition for approximately 112,000 acres (\$136,640) in King and 78,000 acres (\$95,160) in Lewis counties (Figure 1). The acquisition for these counties could be split into two or three separate projects, depending on available funding. These areas are considered a priority for mapping and analysis of a variety of deep-seated landslides and evaluating the effects of forest practices on different types of deep-seated slides. High quality LiDAR (~1 ground return per 1 meter pixel) is expected to cost approximately \$1.22 per acre.		
Project Objectives		
The project will complete topographic data collection for areas of interest in the deep-seated landslide mapping and classification projects. The topographic data will be used to define landslide boundaries and measure various physical attributes that will be important for developing classes of deep-seated landslides.		
FY 20	FY 21	Total budget
\$231,800*	\$0	\$231,800*

* The proposed LiDAR acquisition detail here will cost \$231,800. However, we currently have \$125,000 allocated for FY 20 for the UPSAG Deep-Seated Landslide Mapping Project. The \$125,000 will not be utilized as originally planned. Therefore, we propose to use these funds instead for the LiDAR data.

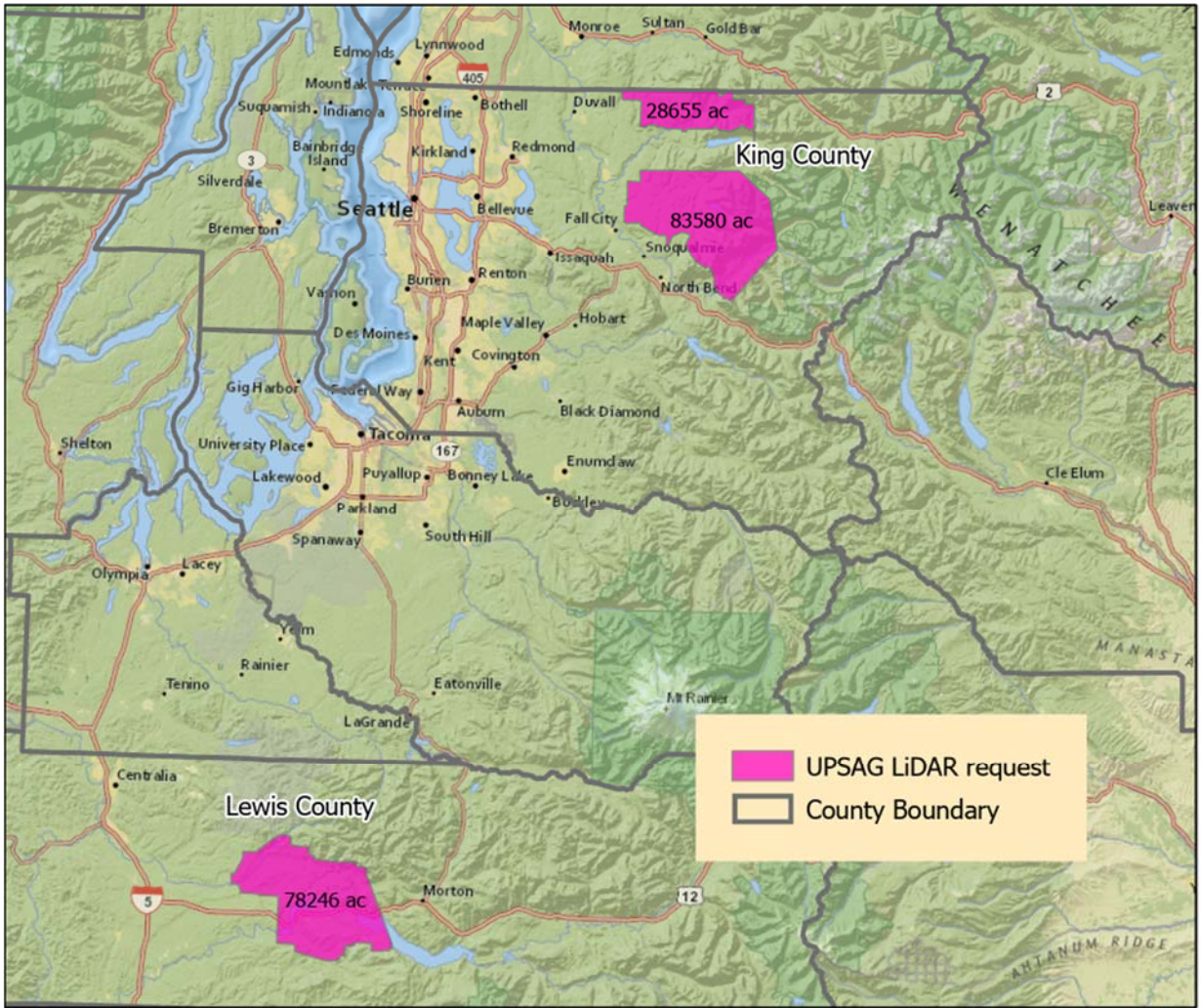


FIGURE 1. UPSAG proposed LiDAR acquisition areas to support the deep-seated landslide mapping and classification project.

RSAG- Riparian Scientific Advisory Group

Project Name	Windthrow spatial data extraction and compilation
Workplan Critical Questions Addressed	How do survival and growth rates of riparian leave trees change following Type Np buffer treatments? 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	Stream buffer types, windthrow, wood recruitment, channel type, state region, timber type, Type F and N riparian forest stand conditions
Responsible SAG and Project Manager	RSAG PM: Teresa Miskovic
CMER Scientist and Principal Investigator(s)	TBD
Status/Phase	Scoping
Project timeline	February 2020 - June 2020
Expenditures	None
Complementary Projects and Project Sequencing	All CMER riparian buffer studies
Project Summary and Purpose	
Review existing CMER and DNR data regarding the relationship between windthrow and contemporary forest management. Then complete a meta analysis that summarizes the range of windthrow and the attributes that may be associated with it. Create a geospatial database showing where data have been collected and studied. Information from this project would complement a future Windthrow Literature Review, both of which would inform Section 5.2.6.5 of the CMER Workplan, Windthrow Distribution and Effects Project; 5.3.8.6 Wood Recruitment Volume and Source Distances from Riparian Buffers Project; and 5.3.7 Westside Type F Riparian Effectiveness.	
Project Objectives	
Utilize existing CMER and DNR windthrow data to summarize the range of windthrow by: region, harvest type, topography, tree species, and other factors that emerge from the data. Build a database that shows geospatial location of relevant data. Identify the gaps in attribute and spatial coverage.	

Budget

FY 20	Total budget
\$35,000	\$35,000

Project Name	Extensive Riparian Status and Trends Monitoring- Vegetation, Type F/N- Westside and Eastside Project (Add on to an active project)
Workplan 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
CMER Scientist and Principal Investigator(s)	CMER scientist: Malia Volke PI: Precision Forestry Cooperative, University of Washington (UW) – Dr. Monika Moskal and Andrew Cooke
Status/Phase	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). This project would build upon this work.
Project timeline	This project is proposed to be implemented in four steps which should occur in sequential order but can be completed as separate phases as funding is available: <ol style="list-style-type: none"> 1) Summarize existing plot and LIDAR data and test two modelling approaches: 4.5 months 2) Develop enhanced database with additional modeling approaches: 3 months 3) Develop Model Validation Plan: 1.5 months 4) Model Validation: 7 months
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 project would build upon previous riparian extensive vegetation monitoring work completed by UW. This project would utilize existing plot and LIDAR data to test two modelling approaches, develop an enhanced data base with additional modeling approaches, develop a model validation plan and then validate the model in the field.

Project Objectives

Previous Riparian Extensive Vegetation Monitoring work identified that the linear regression modeling approach used in the Pilot Study and the Model Transferability Report may be a limiting factor to using models outside of the forest conditions in which they were developed. It is possible with the currently existing plot and LIDAR data to test alternative modeling approaches for the basal area, diameter, and plot density models. These alternative approaches include linear regression using principal components rather than lidar metrics, and regression tree models, most likely, random forest.

There are four separate components included.

1. A base project to assemble existing summarized plot and lidar data into a database and test two modeling approaches.
2. Develop an enhanced database with raw plot and lidar data, and explore if there are additional modeling approaches to test.
3. Develop a model validation plan.
4. Performing model validation in the field.

Budget

FY 20	FY 21	Total budget
\$40,159 (component 1)	\$120,875 (components 2-4)	\$161,134

SAGE- Scientific Advisory Group- Eastside

Project Name	Eastside Riparian Extensive Vegetation Monitoring, Model Transferability Testing
Workplan Critical Questions Addressed	
Project Elements	Lidar to measure Riparian and upland DBH, BA, Stand Density, Tree Height, Canopy Cover
Responsible SAG and Project Manager	SAG: SAGE Project Manager: Teresa Miskovic
CMER Scientist and Principle Investigator(s)	Principal Investigator: Precision Forestry Cooperative, University of Washington (PFC) – Dr. Monika Moskal and Andrew Cooke CMER scientist: Malia Volke
Status/Phase	Midyear Project Proposal to utilized FY 20 unspent funds
Project timeline	FY20-FY21
Expenditures	None at this time.
Complementary Projects and project sequencing	Riparian Extensive Vegetation Monitoring, Model Transferability Testing, Extensive Riparian Status and Trends Monitoring – Vegetation, Type F/N Westside and Eastside Projects,

Project Summary and Purpose

This project would test the transferability of several forest inventory models developed in the Mashel watershed as part of the Riparian Extensive Vegetation Monitoring Pilot Study. Models will be tested using inventory plots established in Eastern Washington. This project will test the DBH, Basal Area, and Stand Density data against the Mashel watershed inventory data and Pilot Study results.

Project Objectives

- Identify up to 40 plots for model testing; these plots need to be accessible in March and May for geo-location.
- Acquire existing inventory plot data from the eastside.
- Technicians will measure plot locations using survey grade GPS receivers; plots must be measured by the end of June. GPS receivers will be provided by UW.
- Post process GPS locations for each plot and build plot boundary dataset using GPS location data.
- Clip 2012 and 2014 LIDAR data sets for appropriate plots using plot location dataset, and use Fusion to develop LIDAR metrics for each plot.
- Use Mashel DBH, Basal Area, and Stand Density models to predict eastside plot values and the model accuracies will be compared to those in the Mashel watershed.
- Use the Mashel height model to run and canopy cover calculations without accuracy assessment; the field data does not exist to test model accuracy for these metrics, but literature shows LIDAR is excellent at estimating them.
- Time permitting, develop DBH, Basal Area, and Stand Density models, using eastside inventory and LIDAR, and apply them to Mashel plots.
- Write and revise project report
- Final presentation to SAGE and CMER

Budget

FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	Total budget
\$50,000	\$15,000						\$65,000

Project Name	Eastside Type N Riparian Effectiveness Project (ENREP) LiDAR Acquisition
Workplan Critical Questions Addressed	<ul style="list-style-type: none"> • 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)? • 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, stream shade, water temperature, suspended sediment transport, riparian geomorphology, 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	SAGE Project Manager: Teresa Miskovic
CMER Scientist and Principal Investigator(s)	CMER Scientist(s): TBD Principal Investigators: Timothy Link: University of Idaho, Charles Hawkins: Utah State University, Bill Ehinger: Dept. of Ecology
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, water, and shallow subsurface temperature sensors within the study streams & 2 hydro meteorological stations per watershed pair • Completion of first year pre-harvest data collection 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, including benthic macroinvertebrates, and habitat. <p>Eastern Cascades Slopes/Foothills and Northern Cascades Ecoregion Sites:</p> <ul style="list-style-type: none"> • Two of the original three sites (Rattlesnake Ridge and Sedge Ridge) have been dropped from the study because timber harvest cannot occur at these sites due to habitat concerns. Policy has requested the project team look for 2 additional basin pairs ideally in the East Cascades region in addition to the remaining Coxit Mountain site. However Policy agreed additional sites in the NE are 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.
Project timeline	It's feasible for Lidar to be acquired during the leaf-off or leaf-on period and after snow melt (typically after mid-May) to meet the needs of the project. The DNR has a contract in place with a LiDAR provider (Quantum Spatial, Inc.) that may allow us to expand their existing scope of work to quickly move forward with this acquisition. At this time, flying this area is not on DNRs schedule until FY 23-25, however there are partners interested in cost sharing on acquiring LiDAR for this area such as State Parks or DNR Forest Health program which could move this timeframe up. In order to capture pre-harvest conditions LiDAR needs to be acquired summer/fall 2020.
Expenditures	Total expenditures to date on the ENREP project are \$869,778, not including LiDAR acquisition in FY 19. In FY 19, LiDAR for the Springdale study basins was acquired (176,852 acres in SE Stevens County) for \$160,870 with FY 19 AMP funds that were unspent by other projects.

Complementary Projects and project sequencing

The lidar acquisition may also support future CMER projects that require high-resolution topographic data as the area to be flown contains a large portion of lands managed under the FP HCP. In addition to benefiting the ENREP study, this LiDAR acquisition may have additional benefits such as: water typing, estimating fish end points, locating streams for FPAs, water type modeling, looking at stand and riparian conditions for extensive status and trends monitoring/forest health, and looking at fire impacts/surface erosion.

Project Summary and Purpose

This project would fund LiDAR acquisition for up to approximately 93,000 acres (145 sq. miles) in the Mount Spokane area within Spokane County, WA (Figure 1 and 2), including the Tripps Knob (223 acres) and Blue Grouse (168 acres) ENREP basin pairs and two potential ENREP basins, Hay Ridge (356 acres), and Fish Creek (286 acres). If no cost sharing opportunities are secured, we would most likely look at flying a smaller area around only our study basins. The area of interest will be buffered by 100 meters to ensure complete coverage and adequate point densities around the study area boundary for a total of approximately 6,200 acres (10 sq. miles). Services for data acquisition, processing, QA/QC and delivery of LiDAR remote sensing data for eastern Spokane County would be purchased. LiDAR will only be collected and completed if seasonal snow pack on Mt. Spokane melts off sufficiently to collect high quality LiDAR data. This area doesn't currently have high-resolution LiDAR which will benefit the ENREP study objectives by providing important spatially-distributed quantitative information about the pre-harvest canopy conditions to assist with the assessment of the effects of harvest on snowpack processes, evapotranspiration, and flow dynamics in the study basins. High quality LiDAR (~8 ground return per 1 meter pixel) is expected to cost approximately \$1 per acre if we fly the larger area. We will lose some cost efficiency if we fly the smaller area just around the study basins. The cost per acre will be more and a bid from the contractor will need to be obtained to get actual costs.

Project Objectives

The project will complete topographic LiDAR data collection for areas of interest in the Mount Spokane area for the ENREP. The topographic data will be used to determine the specific canopy characteristics and potential shading in the entire riparian network to extend the utility of the forest mensuration data that has been collected at the study reach breaks. The resulting DEM will also be used for a number of applications including a quantification of distinct channel characteristics and confirmation of reach breaks, identification of legacy features on the landscape and how they potentially affect the current channel network, and locations and extent of other hydrological and geomorphological features that may affect the sensitivity of the systems to timber harvest. The LiDAR dataset will also provide a critical baseline for comparison of canopy and geomorphological changes following timber harvest. Specific deliverables will be:

NIR (topographic) LiDAR data for area in Figures 1 and 2, using a high pulse rate LiDAR system to produce a highly accurate, high resolution (>8 pulses/m²) LiDAR dataset with no gaps and ample buffers (at least 100m) around project boundaries;

GPS measurements made with dual frequency L1-L2 receivers with carrier-phase correction;

Data that is delivered in tiles that are rectangular in geographic coordinates and correspond to standard USGS 7.5-minute quadrangles and divisions;

GIS-compatible data and files with metadata;

Survey report that contains: project overview, LiDAR acquisition information, report of the ground survey, WA State Licensed surveyor certification, Calibration report for the system used in the data acquisition, projection, datum, epoch of adjustment, and Geo data used for the survey, accuracy assessment, assessment of Pulse densities including maps, summary table of deliverables, and metadata.

Budget: Approximately \$93,000 for the larger area. State Parks may be able to contribute \$12,000-\$14,000 to this effort and possibly some funds from the DNR forest health program. Cost for smaller area is unknown at this time until we receive a bid from the contractor.

FIGURE 1 and 2. LiDAR acquisition areas in northeast Spokane County, WA to support the ENREP project.

