Eastside Timber Habitat Evaluation Project (ETHEP)
Scoping Paper and Alternatives Analysis

CONTEXT

The Eastside Timber Habitat Evaluation Project (ETHEP) is being developed by the Scientific Advisory Group Eastside (SAGE) of the Cooperative Monitoring Evaluation and Research committee (CMER) as part of Washington's Department of Natural Resources (DNR) forest practices Adaptive Management Program (AMP) approved by the Forest Practices Habitat Conservation Plan (FPHCP 2005). The ETHEP Project is part of the Type F Riparian Prescriptions Rule Group, Eastside Type F Riparian Rule Tool Program (Table 1).

Washington's Forest Practices Rules for private forestlands use a Timber Habitat Type (THT) system to apply riparian rule prescriptions along Type S and Type F streams in eastern Washington (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.

There is uncertainty about the scientific basis underlying the THT rules because no documentation is available that describes how the riparian prescriptions were developed and agreed upon during the Forests and Fish Report (FFR 1999) negotiations. Results from Phase II of the Eastern Washington Riparian Assessment Project (EWRAP) indicated that the distribution of riparian stand types based on potential climax species (forest series) did not fit well within the elevational zones of the regulatory timber habitat type system (Cooper et al. 1991, Kovalchek and Clausnitzer 2004, Schuett-Hames 2015). Many forest series occurred in both the low (<2500 feet) and mid-elevation (2500-5000 feet) zones. Further study is needed to determine a framework for applying riparian prescriptions to achieve Washington Forest Practices Habitat Conservation Plan (FPHCP 2005) resource objectives for riparian function (Schedule L-1, Appendix N).

The effectiveness of the THT rules and potential risks to resources have not been evaluated. However, due to the coarse scale of the elevation zone designations, the current system of THTs may pose risks to resources and forest practices management objectives. Because each THT is associated with a specific range of riparian harvest prescriptions, there is the potential for prescriptions to be applied in forest types for which they are not intended. Misapplication of riparian harvest prescriptions may limit the ability to achieve the FPHCP resource objectives (functional objectives and performance targets) for eastside forest riparian functions such as bank stability, recruitment of large wood, leaf litter fall, nutrients, sediment filtering, and shade.

Informing Rule Group Critical Questions and Resource Objectives

Table 1 contains critical questions from the 2019 CMER Work Plan that are associated with the relevant rule group and associated projects within the Eastside Type F Riparian Rule Tool Program. The critical question associated with ETHEP is bolded. The ETHEP study will inform this critical question by developing alternative(s) to the THT system, but it will not directly test the effectiveness of the current THT rules or associated prescriptions.

Table 1. Eastside Type F Riparian Rule Tool Program: Applicable Rule Group Critical Questions with Associated Research Projects.

Rule Group Critical Questions	Project Names
What is the current range of conditions for eastside riparian stands and streams?	• Eastern Washington Riparian Assessment Project (EWRAP) Phase 1 • Eastside Type F Channel Wood Characterization Study • Eastern Washington Riparian Assessment Project (EWRAP) Phase 2
What are appropriate LWD performance targets?	• Eastside LWD Literature Review Project • Eastside Type F Channel Wood Characterization Study
Can the shade/temperature relationships in the eastside temperature nomograph be refined?	• Eastside Temperature Nomograph Project
Will application of the prescriptions result in stands that achieve eastside FP HCP objectives (forest health, riparian function, and historical disturbance regimes)?	• Eastside Disturbance Regime Literature Review Project • **Eastside Timber Habitat Evaluation Project (ETHEP)**

This project will use the resource objectives and performance targets from the Forests and Fish Report Schedule L-1 and L-2 to identify criteria important for informing development of the alternative framework (Table 2).

Table 2. L-1 and L-2 resource objectives and performance targets.

Schedule L-1 Resource objective	**Schedule L-1 Performance target**	**Schedule L-2 Project**
Heat/Water Temperature	Shade • Type F & S streams, except Eastside bull trout habitat: that produced by shade model or, if model not used, 85-90% of all effective shade. • Westside and eastside high elevation, Type N streams: shade available within 50 ft for at least 50% of stream length.	TH7a. Understand how local conditions affect the performance of the prescriptions.
LWD/Organic Inputs	Riparian condition • Westside and high elevation Eastside habitats: riparian stands are on pathways to meet Desired Future Condition (DFC) targets (species, basal area, trees per acre, growth, mortality). • Eastside (except high elevation): DFC; current stands on pathways to achieve Eastside condition ranges for each habitat series. Litterfall • Eastside Type N: at least 70% of recruitment available from within 50 ft.	LWD1. Validate assumptions, models and data used to develop Desired Future Conditions (DFC) targets and eastside stand conditions. Conduct field reconnaissance of mature riparian reference stands and compare results with interim targets. LWD2. Validate the assumptions, models, and data used to develop growth and succession pathways to riparian DFC's. Conduct field reconnaissance of riparian stands (management age and mature); utilize new data on validation and refinement of growth models. LWD4. Determine rates of natural regeneration and tree mortality in riparian management zones and their effects on the ability of management prescriptions to provide riparian function(s), including LWD recruitment. Identify practices to reduce adverse impacts. LWD5. Assess the historical ranges of conditions and disturbance regimes of the eastside riparian ecosystems.

Project timeline

SAGE anticipates scoping for this project will be complete with alternatives for Policy to approve in FY 2021. Independent scientific peer review (ISPR) and CMER approved study design could be completed in FY 2022. The timeline for implementation is uncertain until an approved study design is complete but could be conducted FY 2023-2026, pending approval.

PROBLEM STATEMENT

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.

PURPOSE STATEMENT

The purpose of this project is to develop a framework for applying riparian harvest rules along Type S and Type F streams in eastern Washington based on the Forest Practices Habitat Conservation Plan (FPHCP) functional objectives and performance targets (Schedule L-1, Appendix N).

STUDY OBJECTIVES & CRITICAL QUESTIONS

This study will examine and develop alternative(s) to the current THT system using primarily GIS analysis of existing geospatial datasets. Testing the effectiveness of the existing THT rules and silvicultural prescriptions or alternative silvicultural prescriptions is beyond the scope of this study. However, specific silvicultural applications for eastside riparian forests based on a new framework could be examined in a follow-on study to ETHEP.

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).

Critical Questions

- What type and quality of data, including scale and resolution, is needed to characterize riparian forests in eastern Washington based on criteria important for meeting FPHCP functional objectives and performance targets? For example:
    - Stand composition and structure
    - Potential natural vegetation and/or existing vegetation
    - Site potential (e.g., climate, topography, soils) and maximum stand density index

    - Field data, geospatial data, remote sensing data, and/or modeled vegetation data
- Based on the above criteria, do existing datasets (alone or in combination) provide the necessary information to accurately characterize riparian stands based on FPHCP functional objectives and performance targets?
- If existing datasets do not provide all of the necessary information, how can this additional information be acquired and utilized?

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

Critical Questions

- Does the framework accurately characterize riparian forests in the field based on characteristics important for meeting FPHCP functional objectives and performance targets?

DATA REQUIREMENTS

The data requirements include a series of geospatial datasets and models related to riparian forest composition, structure, and environment in eastern Washington. These datasets are described in further detail under Alternative 1 (below).

Field data requirements include measurements for effective shade, defined as the fraction of solar radiation flux blocked from reaching the stream surface over a specified period of the day. Hemispherical photography is one established method for estimating effective shade. Field data requirements may also include metrics for riparian forest stand structure and composition, such as species, basal area, and trees per acre.

Alternative 1 would utilize existing field datasets from previous studies. Only Alternatives 2 and 3 would collect contemporary field data using targeted field surveys based on GIS analyses.

ALTERNATIVES ANALYSIS

This section provides potential research approaches for the ETHEP study, including the benefits and limitations of each approach for meeting the objectives and answering the critical questions. Once CMER and TFW Policy select and approve a preferred alternative for further development, a detailed study design will be developed that describes specific data collection and analysis methods following CMER Protocols and Standards Manual (Chapter 7).

All three study alternatives propose using a GIS survey and analysis as the primary method for developing a framework for characterizing eastside riparian forests. Relevant geospatial data will be acquired and synthesized to help understand riparian forest composition, structure, and environment across eastern Washington. The specific details of the GIS methods will be further developed in the study design.

Alternative 1: GIS survey and analysis + testing utilizing existing field data

A geographic information system (GIS) can integrate many types of spatial data relevant to forest practices questions, including aerial imagery, climate, topography, and vegetation. This integration can

help reveal spatial patterns and relationships among variables of interest, such as the distribution of plant associations across space and time.

This alternative would employ GIS analysis to integrate existing biological and physical spatial datasets related to riparian forest composition, structure, and environment across eastern Washington. Some of the available GIS datasets include, but are not limited to:

- Landscape Ecology, Modeling, Mapping, and Analysis (LEMMA) dataset produced by the USDA Forest Service, Pacific Northwest Research Station, and the Department of Forest Ecosystems and Society at Oregon State University (e.g., Ohmann and Spies 1998, Ohmann et al. 2011).
- Modeled Potential Vegetation Zones of Washington and Oregon and Modeled Plant Association Groups of Washington and Oregon produced by the USDA Forest Service and hosted by Ecoshare, the Interagency Clearinghouse for Ecological Information.
- Ecological Systems of Washington produced by NatureServe and the Washington Natural Heritage Program (Rocchio and Crawford 2015).
- Maximum Stand Density Index models developed by the University of Idaho Intermountain Forestry Cooperative (Kimsey et al. 2019).
- Climate Data and Predictions, Maps of Specific Forest Plant Species and Climate Profile Predictions, and Climate-FVS (Forest Vegetation Simulator) Ready Data (USDA Forest Service).
- Forthcoming products from the Washington Department of Natural Resources Forest Practices Division and Forest Health and Resiliency Division.

GIS analysis would evaluate and compare the existing datasets to determine the relative benefits and limitations of each dataset for answering the critical questions in this study. The available datasets would be evaluated incrementally using criteria developed in the study design and eliminated from further analysis if they do not meet the criteria. The analysis would examine the relationships among the datasets, including where there is agreement and disagreement in predictions for variables of interest. Where there are areas of disagreement, the analysis would identify the variables that contribute to this disagreement (e.g., differences in spatial resolution or specific data inputs). The analysis may indicate that a combination of datasets or a different approach would best meet the study objectives.

The GIS survey and analysis could be supplemented *as needed* with previously collected field data. This includes forest inventory data collected for previously completed CMER studies (e.g., Eastern Washington Riparian Assessment Project, Eastside Type F Riparian Effectiveness Project, Bull Trout Overlay Temperature Project, Solar Radiation/Effective Shade Project, and Eastside Model Evaluation Project), and by the Washington Department of Natural Resources, and the US Forest Service (Forest Inventory and Analysis program data). Analysis of existing field data will identify the most important variables for characterizing riparian forests based on FPHCP functional objectives and performance targets, and whether end users can realistically and accurately characterize riparian forests based on these variables. Analysis will also indicate what, if any, modifications are needed to ensure the framework meets the study objectives.

Benefits: This alternative would utilize existing well-established geospatial datasets that describe and/or classify vegetation and related environmental variables (e.g., climate, topography, soils) across eastern Washington. These datasets are generally freely available and have broad applicability, so there would be a substantial time and cost savings compared to developing an entirely new system. A GIS study could reveal new or refined patterns and trends by combining data from multiple efforts. This approach

would allow for comparison of the available datasets, and selection and combination of the most useful components.

Limitations: Although the existing GIS datasets have broad applicability, they may lack certain characteristics, resolution, or information that are important for the study questions. For example, the existing datasets generally cover the entire landscape, so they may not capture the level of detail desired for riparian forests, which occur as narrow linear features. The GIS datasets may not exactly align with the FPHCP functional objectives and performance targets, because they were not created for that specific purpose. Additionally, this alternative relies on existing field data to test the selected frameworks rather than a targeted field survey based on the results of GIS analyses. Existing field datasets may be outdated or lack information important for answering the study questions with a high level of accuracy, especially those related to Objective 2.

Timeline

Year 1. The GIS survey and analysis would be performed primarily by CMER science staff (Principal Investigator). Relevant geospatial datasets would be acquired, organized, and analyzed to compare how well each dataset (or combination of datasets) characterizes riparian stands based on FPHCP functional objectives and performance targets. These analyses will result in selecting the preferred framework(s), followed by identifying relevant existing field datasets to test the frameworks. Work would be planned and overseen by CMER science staff (Principal Investigator). The need for additional expertise and staff will be determined during the study design phase.

Year 1.75. CMER science staff will conduct data analysis, interpretation, and report writing. The need for additional expertise and staff will be determined during the study design phase.

Costs

It is anticipated that CMER science staff will acquire, organize, and analyze the GIS information and existing field data, and write the final report, so costs associated with these tasks would be included in the existing CMER staff budget.

Environmental or landowner limitations

Existing geospatial datasets may need to be supplemented with additional data or analyses to meet the study objectives. This may require more time than originally estimated to fully develop an adequate geospatial dataset for this study.

Alternative 2: GIS survey and analysis + field testing

In addition to the GIS survey and analysis described in Alternative 1, this alternative would include targeted field surveys to test the selected framework(s) within a diversity of riparian environments and geographic regions across eastern Washington. The study design will define the study population and field site selection criteria based on features such as geographic region, elevation, stream size, stream order, and stand age. The Washington Department of Natural Resources Forest Practices Application Review System (FPARS) may be queried for active or planned Forest Practices Applications (FPAs) for stands that fall within the study population. The study design will also determine the sample unit and the sample size needed for field sites.

Field testing will assess the accuracy and applicability of a given framework for characterizing riparian forests based on FPHCP functional objectives and performance targets (Schedule L-1, Appendix N). These include targets for shade, species, basal area, and trees per acre.

Field data analysis will identify the most important variables for characterizing riparian forests based on FPHCP functional objectives and performance targets, and whether end users can realistically and accurately characterize riparian forests based on these variables. Analysis will also indicate what, if any, modifications are needed to ensure the framework meets the study objectives.

As in Alternative 1, analyses could be supplemented *as needed* with existing field datasets.

Benefits: In addition to the benefits described for Alternative 1, Alternative 2 would include targeted field surveys to test the selected framework(s) for on-the-ground accuracy and applicability. Field surveys would address the areas of greatest uncertainty identified during GIS analyses, and would inform any modifications needed to improve the framework(s).

Limitations: In addition to the limitations described for Alternative 1, the addition of field surveys would require more time and effort by CMER science staff to plan and conduct fieldwork. This means that CMER science staff would potentially have limited time to participate in other CMER priority projects. It is possible that targeted field surveys would not substantially improve upon existing datasets, depending on the outcome of the GIS analyses and related applicability of existing field data.

Timeline

Year 1. The GIS survey and analysis would be performed primarily by CMER science staff (Principal Investigator). Relevant geospatial datasets would be acquired, organized, and analyzed to compare how well each dataset (or combination of datasets) characterizes riparian stands based on FPHCP functional objectives and performance targets. These analyses will result in selecting the preferred framework(s), followed by identifying potential field sites and planning for field surveys. Field surveys for testing the preferred framework(s) would be planned and overseen by CMER science staff (Principal Investigator), but may require hiring additional outside staff to assist with field surveys. The need for additional expertise and staff will be determined during the study design phase.

Year 2. CMER science staff will conduct data analysis, interpretation, and report writing. The need for additional expertise and staff will be determined during the study design phase.

Costs

It is anticipated that CMER science staff will acquire, organize, and analyze the GIS information, and write the final report, so costs associated with these tasks would be included in the existing CMER staff budget. Field surveys may require hiring additional field staff. Based on previous projects, it would cost approximately $60,000 for a two-person crew to survey 35 sites. It may be possible for SAGE members to participate in field data collection, which would reduce project costs. The budget will be finalized during the study design phase, which will determine the number of field sites and data collection requirements.

Environmental or landowner limitations

Existing geospatial datasets may need to be supplemented with additional data or analyses to meet the study objectives. This may require more time than originally estimated to fully develop an adequate geospatial dataset for this study. For the field survey portion of the study, it may be difficult to identify a sufficient number of sites that meet the selection criteria and are located where there is landowner willingness to participate in the study.

Alternative 3: In-depth review of existing frameworks + GIS survey and analysis + field testing

In addition to the GIS survey and analysis and field testing described in Alternatives 1 and 2, this alternative would include an in-depth review and synthesis of the relevant literature for classifying riparian forests in eastern Washington (see suggested list below). This would be a more in-depth review than was previously completed. The review would help inform the GIS component, and where possible, would be integrated with the geospatial analysis to help identify patterns and trends for eastside riparian forests. Literature would be selected, reviewed, and synthesized based on criteria developed in the study design.

Previous efforts to describe riparian forests for the eastern Washington region include but are not limited to:

- Forest Habitat Types of Northern Idaho (Cooper et al. 1991)
- Field Guide for Forested Plant Associations of the Wenatchee National Forest (Lillybridge et al. 1995)
- Forested Plant Associations of the Colville National Forest (Williams et al. 1995)
- Classification and Management of Aquatic, Riparian, and Wetland Sites on the National Forests of Eastern Washington (Kovalchik and Clausnitzer 2004)
- Forest Habitat Types of the Colville Indian Reservation (Clausnitzer and Zamora 1987)

A review and synthesis of these and other similar efforts could reveal important patterns about riparian forests in eastern Washington. As in Alternatives 1 and 2, existing forest inventory field data could be incorporated *as needed* to help inform the analysis and interpretation of results.

Benefits: In addition to the benefits described for Alternatives 1 and 2, this approach would provide a highly comprehensive analysis and integration of the existing knowledge about riparian forest types in eastern Washington. The integration of the literature with geospatial data would potentially reveal stronger relationships and/or patterns than a single approach. This combined approach would make use of public datasets that have already completed some amount of research related to riparian forests in eastern Washington.

Limitations: Previous studies have not directly addressed the questions of this ETHEP study, so an in-depth review may only add limited information to the analysis. In addition to the limitations described for Alternatives 1 and 2, it may be difficult to relate and integrate the literature with the geospatial data because the data were generated by different methods and for different purposes. This combined approach might require a substantial amount of time and effort for a relatively small gain in information. This additional amount of time required by CMER science staff means they would potentially have limited time to participate in other CMER priority projects.

Timeline

Year 1.5. The literature review and GIS survey and analysis would be performed primarily by CMER science staff (Principal Investigator). Relevant literature and geospatial datasets would be acquired, organized, and analyzed to compare how well each dataset (or combination of datasets) characterizes riparian stands based on FPHCP functional objectives and performance targets. These analyses will result in selecting the preferred framework(s), followed by identifying potential field sites and planning for field surveys. Field surveys for testing the preferred framework(s) would be planned and overseen by CMER science staff (Principal Investigator), but may require hiring additional outside staff to assist with field surveys. The need for additional expertise and staff will be determined during the study design phase.

Year 2.5. CMER science staff will conduct data analysis, interpretation, and report writing. The need for additional expertise and staff will be determined during the study design phase.

Costs

As in Alternatives 1 and 2, it is anticipated that CMER science staff will acquire, organize, and analyze the GIS information and complete the literature review and synthesis. CMER science staff will also write the final report, so costs associated with this task would be included in the existing CMER staff budget. The addition of a literature review would require an estimated additional six months of CMER staff time. Field surveys may require hiring additional field staff. Based on past projects, it would cost approximately $60,000 for a two-person crew to survey 35 sites. It may be possible for SAGE members to participate in field data collection, which would reduce project costs. The budget will be finalized during the study design phase, which will determine the number of field sites and data collection requirements.

Environmental or landowner limitations

Existing geospatial datasets may need to be supplemented with additional data or analyses to meet the study objectives. This may require more time than originally estimated to fully develop an adequate geospatial dataset for this study. For the field survey portion of the study, it may be difficult to identify a sufficient number of sites that meet the selection criteria and are located where there is landowner willingness to participate in the study.

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Table 3. Comparison of study components included in Alternatives 1, 2, and 3, and estimated timeline and cost to complete each alternative. Cost estimates assume CMER Staff would complete the majority of project tasks “in-house”.

	GIS survey	Field testing	In-depth literature review	Timeline to complete	Cost
Alternative 1	X			1.75 years	$0
Alternative 2	X	X		2 years	$60,000
Alternative 3	X	X	X	2.5 years	$60,000

Recommended Approach

SAGE has selected Alternative 2 as the recommended approach. This alternative provides the benefits of Alternative 1 with the added benefit of targeted field surveys as needed to fill any data gaps or uncertainties identified from the existing data reviewed. Alternative 3 was not selected, as the in-depth review may only add limited information to the analysis and require a substantial amount of time and effort for a relatively small gain in information.

As described in further detail in the above Alternatives Analysis, Alternative 2 would utilize existing geospatial datasets that describe vegetation and environmental conditions across eastern Washington. These datasets are generally freely available and have broad applicability, so there would be a substantial time and cost savings compared to developing an entirely new system. GIS analysis should reveal new or refined patterns and trends by combining data from multiple efforts.

GIS analyses will be supplemented with existing field datasets where applicable. This includes forest inventory data collected for previous CMER studies (e.g., Eastern Washington Riparian Assessment Project, Eastside Type F Riparian Effectiveness Project, Bull Trout Overlay Temperature Project, Solar Radiation/Effective Shade Project, and Eastside Model Evaluation Project).

Alternative 2 incorporates targeted field surveys to test the selected framework(s) for on-the-ground accuracy and applicability. Field surveys would focus on filling data gaps and uncertainties identified by the GIS analysis that may not be resolved effectively with existing field data. For example, targeted field surveys would ensure that data is collected from the full range of environments within the study region (i.e., that the data is representative of the study population). Field surveys would ensure that data is up-to-date with current on-the-ground conditions and is compatible with the GIS datasets of interest. Field surveys would also improve understanding about how accurately the selected framework(s) can be applied in the field, which would help inform any necessary modifications to the methodology.

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