

**CMER/POLICY INTERACTION FRAMEWORK SIX QUESTIONS:
EASTSIDE TYPE F RIPARIAN EFFECTIVENESS MONITORING PROJECT (BTO ADD-ON)
NOVEMBER 15, 2019**

The results from this study are found in the following report:

Schuett-Hames, D., 2018. Post-Harvest Change in Stand Structure, Tree Mortality and Tree Fall in Eastern Washington Riparian Buffers: Comparison of the Standard and All Available Shade Rules for the Fish-Bearing Streams in the Mixed Conifer Timber Habitat Type Under Washington's Forest Practices Habitat Conservation Plan. Prepared for the Washington State Department of Natural Resources

1. Does the study inform a rule, numeric target, performance target, or resource objective?

Yes. (See question 2).

2. Does the study inform the Forest Practices Rules, the Forest Practices Board Manual guidelines, or Schedules L-1 or L-2?

Yes.

Forest Practices Rules. This study informs Forest Practices Rules:

WAC 222-30-022 * Eastern Washington riparian management zones, *(1) Eastern Washington RMZs on Type S and F Waters, and

WAC 222-30-040 Shade requirements to maintain water temperature *(1) within the bull trout overlay, and *(2) determination of shade outside the bull trout overlay. While this study didn't directly measure shade and temperature, the WAC is the source of the prescription that was tested for stand characteristics.

Schedule L1 Resource Objectives, Functional Objectives and Performance Targets. This is an effectiveness monitoring study that informs Schedule L-1 Key Question 2:

"Will the prescriptions produce forest conditions and processes that achieve resource objectives while taking into account the natural spatial and temporal variability inherent in forest ecosystems?"

This study addresses the Schedule L-1 resource objectives for LWD/organic inputs:

Functional objective *"Provide complex in- and near-stream habitat by recruiting large woody debris and litterfall to streams."*

1. Performance target *"Eastside (except high elevation): DFC; current stands on pathways to achieve Eastside condition ranges for each habitat series."*

CMER Work Plan Critical Questions. This study informs the following critical questions for the Eastside Type F Riparian Effectiveness Program:

- Are the Type F riparian rules effective in meeting the performance targets, resource objectives, and overall performance goals of the FP HCP?
- Will application of the prescriptions result in stands that achieve eastside FPHCP objectives (forest health, riparian functions and historic disturbance regimes)?

3. Was the study carried out pursuant to CMER scientific protocols (i.e., study design, peer review)?

Yes. This study was a component added to the Bull Trout Overlay Temperature (Eastside Riparian Shade/Temperature) Project and Solar Radiation/Effective Shade Project study design and was reviewed and approved by RSAG and CMER. The study was conducted with oversight from RSAG and SAGE. The final report was reviewed and approved by RSAG, SAGE, CMER and completed the ISPR review process.

4A. What does the study tell us?

This report compares the response of riparian stands, tree fall and wood input in riparian management zone (RMZ) buffers following harvest under two variations of the eastern Washington riparian prescriptions for fish-bearing streams in the Mixed Conifer Timber Habitat Type (2500-5000 feet elevation). Both prescriptions have an unharvested core zone within 30 feet of the stream, but differ in leave tree requirements within the inner zone, 30–75 feet from the stream, due to differences in shade requirements. The All Available Shade (AAS) rule requires retention of all inner zone trees that provide shade, while standard rule (SR) prescription has a lower shade requirement that typically allows greater inner zone harvest. We documented changes in stand structure, tree mortality, ingrowth, and wood recruitment from tree fall over a five-year post-harvest period and compared responses to the AAS and SR prescriptions with unharvested reference (REF) sites. The eight SR and nine AAS sites were originally selected for the Eastside Riparian Shade/Temperature Project (Bull Trout Overlay).

The SR treatment resulted in the greatest change in stand structure, tree mortality, and wood recruitment from fallen trees compared to the unharvested REF sites. The responses to the AAS treatment were intermediate, but more similar to the REF than to the SR treatment. The SR responses, including change in stand structure, tree mortality, and wood recruitment from tree fall were significantly different from both the AAS and REF treatments; but there were no significant differences in the AAS and REF responses. For further details see Tables 16 and 25 in the final report.

Thinning within the inner zone under the SR and AAS treatments reduced live density, basal area and relative density compared to unharvested reference sites. Inner zone thinning guided by the preferred species list (WAC 222-26-010) appeared to increase the proportion of preferred species and reduce the proportion of shade tolerant species relative to the core zones; however the effects were limited and SR and AAS RMZs continued to be dominated by shade tolerant species not on the preferred species list. Post-harvest tree mortality was significantly higher in SR buffers compared to AAS and REF sites. Damage from wind was the most frequent cause of mortality at SR and AAS sites in contrast to the reference sites. Mortality rates were classified as chronic (i.e., <5%/year) at all nine AAS sites and seven of eight SR sites, but reached the partial stand replacement level (7.5%/year) at one SR site with extensive windthrow. We did not observe episodic mortality from fire, insects, or disease during the five-year post-harvest period.

The pattern of wood recruitment from fallen trees followed the pattern of tree mortality. Wood input from tree fall in SR RMZs was significantly greater than in AAS or REF RMZs. The cumulative density of fallen trees that provided wood input in SR RMZs was nearly double that in AAS RMZs, primarily due to extensive windthrow at two of eight SR sites. About 60% of recruiting fallen tree pieces at SR and AAS sites were uprooted trees with attached roots, which are likely to remain stable and persist through time. Most recruiting fallen tree pieces initially came to rest over the channel where they provide shade and cover but do not to influence channel morphology or create in-channel habitat. While the SR and AAS prescriptions increased wood input during the first five years after harvest, inner zone thinning and post-harvest mortality reduced the standing stock of trees available for future wood

recruitment. The density of standing trees in SR inner zones was only half that of the unharvest REF sites, while AAS stocking was more similar to REF stocking.

4B. What does the study not tell us?

This study is limited by the relatively small number of sites (17), the limited geographic distribution of the sites, and the five-year post-harvest timeframe. The scope of inference is the strongest and limited to well-stocked conifer-dominated stands adjacent to fish-bearing streams <15 feet wide in mixed conifer forests at 2500-5000 feet in elevation in the northeast part of Washington State.

5. What is the relationship between this study and any others that may be planned, underway, or recently completed? a) *Feasibility of obtaining more information to better inform Policy about resource effects?* b) *Are other relevant studies planned, underway, or recently completed?* c) *What are the costs associated with additional studies?* d) *What will additional studies help us learn?* e) *When will these additional studies be completed (i.e., when will we learn the information)?* f) *Will additional information from these other studies reduce uncertainty?*

This study augments previous findings from two completed studies on shade and stream temperature response to the Eastside Type F standard rules and all available shade prescriptions in the Eastside Bull Trout Overlay Temperature study and the Solar Radiation/Effective Shade Project by examining changes in riparian stand structure, buffer tree mortality and large wood recruitment over a five year post-harvest period.

Two previous studies, Eastern Washington Riparian Assessment Project (EWRAP) and the Extensive Riparian Status and Trends Monitoring – Temperature, Type F/N Eastside, used data from randomly selected Type F riparian sites on eastern Washington forest land managed under the Forest Practices Rules to characterize current stand and aquatic resource conditions. The EWRAP characterized existing stand conditions and the Extensive Riparian Status and Trends Monitoring- Temperature, Type F/N Eastside project characterized shade and summer stream temperature. In addition, the Eastside Modeling Evaluation Project (EMEP) projected future stand trajectories and forest health risks using data from the EWRAP sites. All three studies documented variability in stand and resource conditions across sites representing a wide range of past and current management, in contrast to the focus on response to the sub-set of FPHCP management prescriptions in this study.

Two additional studies that will inform the Eastside Type F riparian prescriptions are in the planning process:

- The Extensive Riparian Status and Trends Monitoring- Vegetation, Type F/N Eastside would document the current status of riparian vegetation and provide landscape context for the findings of the BTO Add-on project.
- The Eastside Timber Habitat Evaluation Project (ETHEP) will evaluate alternatives to the current Timber Habitat Type system which is one component of the framework for the Eastside Type F riparian prescriptions.

6. What is the scientific basis that underlies the rule, numeric target, performance target, or resource objective that the study informs? How much of an incremental gain in understanding do the study results represent?

The eastern Washington Type F riparian prescriptions and performance targets represented a new approach to management of riparian stands. This approach was the result of negotiations that culminated in the Forests and Fish Report (FFR) which were incorporated in the Washington Forest Practices Rules. The scientific basis for the Eastern Washington Type F riparian prescription recommendations in the FFR were not documented the eastern Washington Type F riparian prescriptions represent an untested management approach. The results of this study, combined with the results from the associated Eastside Bull Trout Overlay Temperature and Solar Radiation/Effective Shade studies, provide a scientific analysis of the response in stand structure, buffer tree mortality, wood recruitment, shade and stream temperature response to the standard rules and all available shade prescriptions for Eastern Washington Type F streams. This information reduces scientific uncertainty about the extent to which FPHCP resource objectives for Heat/water temperature and LWD/Organic inputs are being met, and have increased our understanding of buffer tree mortality and post-harvest stand trajectory following harvest.

Technical implications/recommendations

We recommend: 1) additional long-term monitoring of a larger sample of sites to address uncertainty about the effect of the prescriptions on episodic mortality due to windthrow, insects, fire, and disease, and 2) intensive in-channel research to document the effects of the prescriptions on water quality, wood loading, and fish habitat.