

RSAG
Riparian Function Literature Synthesis

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Description

On Washington lands subject to the riparian policy and management guidelines covered by the FPHCP (Forest Practices Habitat Conservation Plan, 2006) and laid out in the 1999 Forests and Fish report (FFR) are strongly influenced by the science of riparian processes articulated in the FPHCP Environmental Impact Statement (EIS Chapter 6 References, Appendix A Regional Summaries, Appendix B Riparian Modeling, 2005). Included with the EIS references is the Forest Ecosystem Management Assessment Team (FEMAT) report, “Forest Ecosystem management: an ecological, economic, and social assessment. Section V: Aquatic Ecosystem Assessment (1993).” Although the Forests and Fish Report and FPHCP and the rules derived from it considered many sources, our scientific understanding of riparian processes has evolved since then based on additional research that has been completed since that time. Some aspects of the then-current state of knowledge on riparian processes and the effects of timber harvest on them have been affirmed by more recent science, but for other parts some of the scientific conclusions are changing. In addition, the riparian management strategies have evolved to address resource objectives. This synthesis will look at literature that has been completed since the FEMAT and Forests and Fish reports, and the FPHCP EIS, and will inform us regarding the effects of forest harvest and other management practices on riparian functions and processes. The following types of information addressing the effects of timber harvest on riparian functions and processes will be included:

- Electronic databases
- Bibliographies
- Peer-reviewed publications
- Other published material – conference proceedings, white papers, newsletters, blogs
- Geotechnical reports
- Unpublished data

The riparian function literature synthesis will include literature pertinent to, and relevant citations related to, timber harvest impacts on “riparian functions” as defined in the forest practices rules. For an example of similar recent work, see Appendix A.

A synthesis of the literature will also be produced that summarizes the overall findings by key riparian function, and related physical processes, that will provide recommendations for future research. The riparian literature synthesis will help inform the Adaptive Management Program and future research.

The five riparian functions defined in the Washington Forest Practice Rules includes bank stability, the recruitment of woody debris, leaf litter fall, nutrients, sediment filtering, shade, and other riparian features that are important to both riparian forest and aquatic system conditions (WAC 222-16-010).

The Systematic Literature review will address specific questions (listed below) and identify appropriate variables and associated metrics that can be used to quantify and assess timber harvest effects on the above riparian functions.

Focal Questions for Literature Synthesis

- 1) What are the effects of harvest intensity and extent on the five key riparian functions in comparison to conditions before harvest?
 - a. What are the effects of thinning (intensity, extent) on the five riparian functions, over the short and long-term compared, to unthinned stands?
 - b. How do buffer width and upland timber harvest influence impacts of thinning treatments?
 - c. What are the effects of making clearcut gaps in riparian stands (intensity, extent) on the five riparian functions, over the short and long-term compared, to unthinned stands?
 - d. How do buffer width and upland timber harvest influence impacts of clearcut gaps treatments?
 - e. What are the effects of any combinations of the above treatments?
- 2) How and to what degree do specific site conditions (e.g., topography, channel width and orientation, riparian stand age and composition) influence the response of the five functions?
- 3) What is the frequency of post-harvest weather effects (e.g., storm-driven windthrow, ice storms, excessive heat, and drought events) and what are their effects on the long-term response of the five riparian functions; and how are they distinguished from harvest effects? How does this compare to the impacts of these events on untreated stands?
- 4) How do the riparian functions provided by the stands change over time?
- 5) Are there feedback mechanisms related to forest management (e.g., microclimate changes within the riparian buffer) that affect the recovery rates of riparian functions?
- 6) What major data gaps and uncertainties exist relative to timber harvest effects on the five riparian functions?

Appendix A

As an example of similar recent work, CMER’s most recent literature review and synthesis of riparian functions and processes was conducted under the Westside Type F Prescription Effectiveness Monitoring project by a TWIG (Technical Writing and Implementation Group) as one of the Washington Forest Practices Board-directed Lean pilot projects. The TWIG’s project “best available science” scoping process, approved by CMER and TFW Policy, focused on similar key riparian functions and aquatic conditions (Schuett-Hames et al. 2015). The literature review ultimately informed the selection of a “Preferred Alternative” for pursuing additional research on the impacts for forest practices on riparian functions and processes. The riparian literature was sorted by topic listing the number of papers for each riparian function and aquatic and instream condition:

“Table 2. Frequency of topics in the reviewed literature. “

Topic	Count
Water Temperature	22
Stand Response	20
Shade/cover/solar radiation	18
Macroinvertebrates/drift	17
Wood Loading	15
Tree mortality/windthrow	13
Wood Recruitment	11
Substrate	11
Aquatic Habitat	9
Fish	8
Litter fall	7
Water Quality/Nutrients/TSS	6
Organic Matter	5
Microclimate	4
Amphibians	4
Sediment Input	3
Periphyton	3
Discharge	2

The Type F TWIG also sorted the riparian literature by study design type in order to more thoroughly identify the limitations by research method and type when applying to the BAS supporting their Preferred Alternative. A similar approach could potentially be used as an outline for an updated riparian literature synthesis:

Table 3. Frequency distribution by study design.

Design	Count
After, impact (AI)	14
After, control-impact (ACI)	18
Before-after, control- impact (BACI)	28
Before-after, impact (BAI)	1
Modeling	4
Meta analysis	2