

**RSAG**  
**Riparian Function Literature Synthesis**

**September 14, 2022**

**Description**

Washington State Forest Practices rules and management guidelines covered by the FPHCP (Forest Practices Habitat Conservation Plan, 2006) 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 the Adaptive Management Program (AMP) committees and the Forest Practices Board (FPB) 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- Unpublished data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 riparian functions specified in the HCP include “large woody debris recruitment, sediment filtration, stream bank stability, shade, litterfall and nutrients, in addition to other processes important to riparian and aquatic systems.” (FPHCP, 2006).

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 timber harvest intensities and extent on the riparian functions, with an emphasis on the five key functions listed above, in comparison to conditions before harvest?
  - a. What are the effects of thinning (intensity, extent) on the riparian functions, over the short and long-term compared, to untreated stands?
  - b. How do buffer widths and adjacent upland timber harvest prescriptions influence impacts of riparian thinning treatments?
  - c. What are the effects of clearcut gaps in riparian stands (intensity, extent) on the riparian functions, over the short and long-term, compared to untreated stands?
  - d. How do buffer widths 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 riparian functions?
- 3) What is the frequency of weather-related effects (e.g., windthrow, ice storms, excessive heat, flood and drought events) on riparian areas? What are the weather-related effects (positive and negative) on the riparian functions, and how are they distinguished from harvest effects? How do these effects differ between treated and untreated riparian forests?
- 4) How do various treatments within riparian buffers relate to forest health and resilience to fire, disease, and other forest disturbances?
- 5) How do the functions provided by riparian stands change over time (e.g., large woody debris recruitment from farther away from the stream)?
- 6) Are there feedback mechanisms (e.g., microclimate changes within the riparian buffer) related to forest management that affect the recovery rates of riparian functions?
- 7) What major data gaps and uncertainties exist relative to effects of timber harvest (both riparian and adjacent upland) on the 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. “

<b>Topic</b>	<b>Count</b>
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.

<b>Design</b>	<b>Count</b>
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