

Appendix A

**FINALIZATION SUMMARY FOR THE FINAL REPORT FOR THE STUDY:
EFFECTIVENESS OF RIPARIAN MANAGEMENT ZONES IN PROVIDING HABITAT FOR WILDLIFE:
RESAMPLING AT THE 10-YEAR POST-TREATMENT INTERVAL**

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BY

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FOR

THE COOPERATIVE MONITORING, EVALUATION, & RESEARCH (CMER) COMMITTEE
WASHINGTON DEPARTMENT OF NATURAL RESOURCES (WDNR)

This summary is intended to provide background context, clarify finalization issues, and describe key results for the study Effectiveness Of Riparian Management Zones In Providing Habitat For Wildlife: Resampling At The 10-year Post-treatment Interval. This study investigated the efficacy of riparian management zone (RMZ) buffers for providing habitat to terrestrial vertebrate populations in managed forest stands in Washington. This study was completed in 2008, but the final report will have atypical finalization due to a variety of circumstances. Reading the information summarized in this memo is **absolutely necessary** to understanding these circumstances and reading this final report.

Background Context

- This study is **Part 2** of the RMZ buffer research begun in the early 1990s. This research was designed to experimentally test the efficacy of RMZ buffers for providing habitat to various terrestrial vertebrate groups. **Part 1** of this research is described in O'Connell et al. (2000. Effectiveness Of Riparian Management Zones In Providing Habitat For Wildlife TFW-LWAG1-00-001) and the bird segment of this research was published in Pearson and Manuwal (2001. Ecological Applications 11(3):840-853). One should refer to these documents for details of the research in **Part 1**. Both **Part 1** and **Part 2** of this RMZ research included the following general design elements in common:
 - Three treatments: two types of RMZ buffers left after harvest, and one no-harvest reference (= control).
 - Six replicates of each treatment (n = 18) for each geographic area.
 - Two geographic areas: western Washington and eastern Washington.
 - The forest harvest adjacent to the two RMZ buffer treatments followed standard regional methods: in western Washington, the harvest adjacent to the RMZ buffer treatments was a clearcut; in eastern Washington, the harvest adjacent to the RMZ buffer treatments was a selective harvest with 40-60% retention.
 - A before/after-treatment/control study (BACI) design where all 36 sites were sampled for two seasons immediately prior to forest harvest, two seasons after forest harvest (the combination of which comprised **Part 1**), and two seasons roughly 10 years after forest harvest, which comprises **Part 2**. **This final report describes the results of Part 2.**
 - Songbirds, small mammals, and amphibians (western Washington only) were sampled to assess changes in species and community (= assemblage) composition and relative abundance. Songbirds were sampled using point counts. Small mammals were sampled using snap traps and pitfall traps. Amphibians were sampled using pitfall traps.

- Vertebrate sampling occurred along two transect types: a riparian transect parallel to the stream within riparian habitat, and an upland transect parallel to the stream in upland habitat 100 m upslope from the riparian transect.
- Study sites in western Washington were located over a relatively broad geographic area on public and private commercial forest land, which was scattered from the Willapa Hills east to the west slope of the South Cascade Mountains and north to King County.
- Study sites in eastern Washington were located on public and private commercial forest land and were clustered in a relatively small geographic area in northeast Washington north of Spokane.
- The design and methods of a long-term and geographically large-scale project such as this ultimately resulted in challenges that influenced the outcome of this research.
 - Not all treatments in western Washington were harvested in the same year in **Part 1** due to economic conditions surrounding commercial harvest. This resulted in temporal staggering of treatment application in **Part 1**. However, all sampling in **Part 2** occurred in the same years (2003 & 2004). Therefore, time elapsed since treatment application was roughly 1 year shorter for two western Washington study sites.
 - Not all reference (no-harvest) replicates had remained unharvested when **Part 2** was implemented, thus requiring surrogates (replacement sites).
 - Selected vertebrate sampling methods became out-dated by the time **Part 2** was implemented but were used regardless in order to maintain comparability between all sampling intervals of this research.
 - In **Part 1**, there were ambiguities and lack of statistical power for bat sampling using bat detectors, amphibian sampling using in-stream surveys, and all eastern Washington herpetofaunal sampling. As a result, LWAG decided to remove these sampling efforts from **Part 2**.
 - Two different contractors were used for **Parts 1** and **2**.
 - The raw data from **Part 1** was misplaced by WDNR and was not relocated until after the completion of **Part 2**. This resulted in cancellation of analysis using data from all sampling intervals. Instead, **Part 2** analysis for the eastern Washington sites included only data collected during **Part 2** sampling. **Part 2** analysis for the western Washington sites included data collected during **Part 2** sampling and a reconstructed version of **Part 1** data, which was developed before the original **Part 1** data was relocated by WDNR.

Final Report Completion

Steps leading to the finalization of this report were complicated for several reasons.

- Contractor funds were largely exhausted before the final report preparation stage and therefore resources to complete the report were limited. This resulted in a less responsive approach to addressing LWAG and CMER comments to the draft final report.
- LWAG asked the contractor to organize this report as a series of stand-alone chapters in anticipation that some chapters would be submitted for peer-reviewed publication. Unfortunately, this resulted in a lengthy report with uneven consistency across chapters which made all stages of the review process more difficult.
- LWAG participation (few people, busy schedules) hindered a thorough, timely, and effective review of early drafts of the final report.

- A large portion of review comments from LWAG and CMER related to format, grammar, and spelling. LWAG had an editor make these revisions prior to advancing the final report to the Independent Scientific Peer Review (ISPR) Committee.
- The ISPR Committee pointed out multiple issues including organization, consistency in application of selected aspects of statistics, approach in analysis, and interpretation. These comments are attached at the end of this document. These comments include important issues that ideally should be addressed prior to finalization of this report, especially for sections that might be considered for peer-reviewed publication.
- LWAG has recommended that these revisions should not be made at this time. The cost of addressing these changes in the report is a luxury not affordable in this fiscally constrained time. Instead this final report has been finalized with ISPR Committee comments and this summary appended. Additional revisions are unlikely to result in changes in interpretation in the key results of this study (see below), both in context of this report and from that of O'Connell et al. (2000).

Key Results Of This Study

- No marked differences between RMZ buffer treatments appear evident for any taxon group, which may partly reflect too great a similarity between the treatments. Differences between treatments and references (no harvest units) were limited and inconsistent over years, species, or geographic locations.
- Differences detected seemed attributable to predictable species-specific habitat associations (riparian/upland, successional stage, geographic location) or between-year variation.
- Western Washington songbirds seemed to show only one important difference among the three treatments. Similarity in riparian songbird assemblages was lowest in comparison to upland assemblages at harvested sites between and among sampling intervals irrespective of riparian treatment. Similarity in those assemblages was greater for the modified treatment than the state treatment, presumably reflecting greater species turnover in the latter, during both the post-harvest interval in this study and in the original study. Species richness and abundance seemed to increase with succession since harvest, but neither upland nor riparian transects seemed to differ significantly among treatments. Differences between upland and riparian transects seemed greatest for the harvest treatments.
- Eastern Washington songbirds showed no clear difference among the three treatments based on species richness, abundance, and species composition. As with western Washington songbirds, species richness and abundance seemed to increase with succession since harvest.
- Western Washington small mammals showed no clear response to the three treatments. Deer Mice (*Peromyscus* spp.), Shrews (*Sorex* spp.), and Voles (*Microtus* spp.) were the three species groups with the most captures. Species richness did not change significantly over time or between treatments. Abundance of individual species appeared to varied over time and between treatments but this could only partially be attributable to the treatments. Although there may have been some response to the harvest treatments (control vs. either of the two buffer treatments) this appeared to be confounded by natural population fluctuations over time.
- Eastern Washington small mammals showed marginal response between the three treatments. Captures were dominated by Southern Red-backed Vole (*Clethrionomys gapperi*), Deer Mouse (*Peromyscus maniculatus*), Masked Shrew (*Sorex cinereus*), and Wandering Shrew (*Sorex vagrans*). Response to the treatments was highly species-specific, and though some differences

were observed between the control and either of the two RMZ buffer treatments, site effects confounded comparisons.

- Amphibians (western Washington only) showed no uniform response to harvest treatments. Rather, species showed individual responses that varied over time and between treatments and transects. Two species, *Ensatina* (*Ensatina eschscholtzii*) and Western Red-backed Salamander (*Plethodon vehiculum*), had sufficient data upon which to withdraw meaningful analyses.

LWAG respectively reminds CMER that though we are confident that the results of the study summarized here represent the true final results, their peer-reviewed formalization will require significant special effort at the future time at which CMER may consider taking this step.