

**Systematic Review Pilot Project  
Executive Summary - Final Report  
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Institute of Natural Resources  
Oregon State University**

**Executive Summary**

This report documents an Oregon Department of Forestry pilot project conducted through the Institute for Natural Resources at Oregon State University on a science synthesis method known as *systematic review*- a rigorous, transparent literature review technique developed and now widely used in clinical medicine. A systematic review focuses narrowly on a single question and uses an explicit protocol for finding, screening, grading and integrating all primary research relevant to that question.

Systematic review is now being explored as a means to collate scientific evidence in natural resource conservation. But natural resource management and science differ significantly from clinical medicine, and much remains to be learned about adapting systematic review techniques for use in conservation research.

ODF commissioned this project to learn more about applying systematic review to technical natural resource questions. The project investigated the feasibility of using systematic review techniques to locate and synthesize technical information regarding the effectiveness of the salmonid habitat restoration practice of placing of large wood into streams. A key question was whether the systematic review process could be simplified and used to credibly assess scientific research concerning a topic that is relevant to ODF and their stakeholders.

This report summarizes the project **process** and key lessons learned from testing systematic review in the context of natural resource science. A companion document- "*Does wood placement in Pacific northwestern North American streams affect salmonid abundance, growth, survival or habitat complexity? A pilot test of systematic review techniques*" covers findings of the review itself.

**Key findings**

- Successfully recruiting and supporting qualified reviewers may be the most significant barriers to getting credible, defensible systematic reviews accomplished in the natural resource fields.
- Systematic review is only beginning to be used in the natural resource and conservation sciences. Institutional awareness, professional recognition and capacity for such work remains limited.
- An expert reference librarian improved the review by more efficiently and effectively aligning the question and search strategy with available reference database resources. A reference librarian should be involved early in the systematic review process.

- Structuring the review to address a very specific question of the literature compelled the reviewers to look at studies in a different and more focused way. Reviewers found this interesting and valuable for distilling scientific information.
- Experimental designs, study contexts and outcome measures differed among included studies, making them harder to compare than is normally the case for reviews in clinical medicine. Study alignment with the review question also varied.
- Judging each study on its own merits was relatively straightforward. But disparity in study quality and alignment with the review topic left the reviewers with no clear way to *rank* studies strictly in terms of quality or rigor.
- Reviewers used a decision tree to generate a composite “relevance” rating for each study. Study quality was only one of several factors considered.
- The overall body of evidence to support wood placement was somewhat unclear, with significant information gaps. Evidence was stronger for direct effects on habitat components than for effects on salmon numbers or survival.
- Despite some challenges in adapting systematic review techniques to the available evidence base, a relatively robust review was produced.
- The primary benefits of using a documented search strategy and review methods might lie more with transparency than with repeatability.
- Involving stakeholders in question development and post-review discussions appeared to add credibility to the review.
- Unequivocal ranking of study quality was problematic. But even more limited statements regarding the quality/relevance/suitability of included studies added value to the review. Study summary tables help document how decisions were made regarding the validity and reliability of study findings.
- A systematic review can provide a tightly packaged set of information specific to the review question in a form that is usable by policy makers. This in turn helps foster a stronger, more defensible basis for policy decisions.
- Systematic reviews may also identify evidence gaps that restrict the ability to reach strong, unequivocal conclusions. By clarifying information needs regarding policy-relevant science questions, systematic reviews may have potential to help focus and prioritize research agendas.

### **Review process**

The review team consisted of two expert reviewers, a reference librarian, two ODF staff members and an INR review coordinator. Members of two stakeholder groups also provided input. The review process consisted of

- question identification and refinement
- reviewer recruitment
- developing the review protocol and search strategy
- stakeholder involvement
- finding, filtering and evaluating the evidence
- collating the evidence and writing the review
- a “lessons learned” workshop
- final project report

### **Review question**

In clinical medicine, a systematic review question is tightly focused on a particular treatment rather than open-ended about a general topic, relevant to medical policy or practice but answerable in scientific terms, and value-free to the extent possible. The intent of this project was to find a reasonable analog to this type of question from the field of forest ecosystem management. Within these constraints, ODF identified the topic of large wood placements to aid salmonids. Review team collaboration with stakeholder review resulted in the finalized review question: *Does instream wood placement affect salmonid abundance, growth, survival or habitat complexity?*

### **Reviewer recruitment**

A defensible systematic review hinges on qualified reviewers- ideally, academic scientists in the field under which the review question falls who do not have a vested interest in review outcomes. But the synthesis work required to produce a good systematic review garners little professional recognition compared to original research- a disincentive for natural resource scientists to participate. Two excellent reviewers served in this project but overall reception among potential reviewers contacted to the idea of participating in the review was lukewarm at best. Successfully recruiting and supporting qualified reviewers may prove to be significant barriers to conducting systematic reviews in natural resources.

### **Protocol and search strategy**

A systematic review starts with a written protocol that specifies review methods, including literature search strategy details. During protocol development, the reviewers suggested recruiting a reference librarian from Hatfield Marine Science Center. The reference librarian refined and executed a precisely documented literature search based on her familiarity with reference database structure and content, and test searches. Involving a reference librarian strengthens a systematic review in many ways - a key lesson learned from this project.

### **Stakeholder involvement**

Stakeholder involvement helps assure that the review question is relevant to policy and practice, and promotes stakeholder “buy-in” and use of review results. Stakeholders with some technical background and interest in the review question from an environmental group and a timber products company were invited to comment on the review question and protocol, and to participate in a post-review workshop. The stakeholders agreed that the question was relevant and related to science rather than values. Their interests focused on ensuring that studies were evaluated objectively, outcome metrics, gray literature, and documenting the larger ecological context and use history of study areas.

### **Finding and filtering the evidence**

The systematic search of references databases produced 457 publications. Due to a lack of standardized stream restoration keywords and the need to favor inclusiveness, most of these publications were not relevant to the review. A “coarse filter” excluded publications that did not: 1) address salmonids, 2) address active placement of large wood.

This reduced the set to about 65. Limited to peer-reviewed journal articles reporting on studies conducted in the Pacific northwest only, the final review included 22 publications. Review of 11 additional papers from outside the PNW indicated that including the larger body of international literature would not have significantly altered review conclusions.

### **Evaluating and collating the evidence**

Each reviewer reviewed and summarized 50% of included studies. Independent reviews of four studies by both reviewers showed high consistency. To allow comparison among studies and provide transparency into assessments about their relevance and quality, a summary table showing details about study parameters was prepared for each. The reviewers used a decision tree to judge relevance of each study, created summary tables and graphics to characterize the studies, and documented important points to serve as a basis for integrating the evidence.

Systematic review methods forced reviewers to assess the findings of each study through a focused lens. Putting study details and conclusions in summary tables helped clarify studies with flaws or unclear findings. The overall body of evidence to support wood placement was unclear, with significant information gaps. Study variables such as season, life stage, topography, and species differed. Many studies were designed to answer a somewhat different question than the review question asked of the literature.

Unequivocal ranking of study “quality”- based on overall rigor of study design and execution- proved challenging due to the variable nature of the evidence. Reviewers used a decision tree to generate a composite “relevance” rating for each study. Study quality was only one of several factors considered. Even more limited statements regarding the quality/relevance/suitability of included studies added value and rigor to the review.

### **Review document and “lessons learned” workshop**

The review coordinator, reviewers, reference librarian, ODF technical staff and the timber industry stakeholder representative attended a half-day “lessons learned” workshop. Discussion topics included the review process and what had been learned during the project about the review topic itself, and the feasibility of applying systematic review techniques to natural resource questions. ODF project review questions were addressed. Responses to those questions are provided in this document.

There are challenges associated with applying systematic review in the natural resource and conservation fields- especially with recruiting qualified reviewers. But the need for “best available science” to use in natural resource and environmental remediation policymaking is greater than ever. Systematic review shows promise, both for identifying and packaging scientific evidence, and for helping set science agendas to address critical knowledge gaps.