

Developing high-quality syntheses: Guidelines for syntheses that meet fire managers' needs and are scientifically defensible

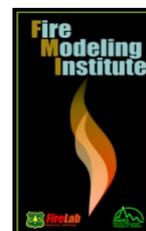
Final Report

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Abstract

What constitutes a high-quality synthesis for wildland managers? Syntheses are often requested by managers and many have been produced by scientists, but they may not always hit the mark. This project integrated guidelines from the literature with reflections from interviews with natural resource professionals (scientists, managers, and science delivery specialists) to develop guidelines for increasing the usefulness of syntheses for managers.

Different kinds of syntheses serve different needs. Narrative syntheses are the most common form published for wildland managers. This format allows the author to include background information and incorporate detailed explanations and case studies. Peer-reviewed literature reviews and systematic reviews are more rigorous formats, which may be especially useful in resolving specific management issues; however, these formats may be more constrained than narrative reviews in regard to length, extent of background information, and information sources used.

The most important thing to do, to ensure that a synthesis is useful to managers, is to include managers, science delivery specialists, and scientists throughout the development process. The planning stage requires thorough discussion among all stakeholders. Managers may be particularly helpful in fully developing the management applications. Science delivery specialists have a great deal to offer in regard to format, content, packaging, and delivery of syntheses.

This report is a condensed version of the main deliverable for this project—“Looking into Syntheses: Improving relevance and usefulness for managers”, a draft General Technical Report in review as of Jan. 2, 2013. Below, I refer to specific sections of “Looking into Syntheses” for more thorough discussion, illustrations, examples, and complete documentation.

Background and purpose

Fire managers often request syntheses, and JFSP has responded-- publishing more than 30 syntheses on its website (as of 2012—see “Looking into Syntheses”, Appendix C) and supporting online publication of nearly 300 species reviews in the Fire Effects Information System. However, these documents may not be well known or widely used, and they may not meet managers’ needs as well as they could. In fall of 2011, I was asked to look into this issue and develop guidelines for improving the usefulness of syntheses for managers. Objectives of the project were to:

1. Describe what managers expect from a synthesis
2. Describe strengths and weaknesses of existing syntheses in terms of scientific rigor and usefulness to managers
3. Provide guidelines for writing a synthesis that is scientifically defensible and highly useful for managers
4. Provide guidelines for managers to use in applying information from syntheses to on-the-ground management
5. Review other considerations related to this project, including the selection of topics for synthesis, media used to deliver information, and timeliness of information

Study description

I examined literature regarding reviews and syntheses, studied the content and presentation of published syntheses, and interviewed managers, scientists, and science delivery specialists. I also relied on my own experience: teaching technical writing at the university level and writing and editing syntheses for fire management. I did not limit my searches to fire-related syntheses, because other natural resource fields, the medical literature, and the field of communications and information science in general all contain useful guidance and good examples.

I invited 69 people to be interviewed. Of those, 40 responded. I interviewed 35 and received informative correspondence from several others. Interviewees were invited based on field of expertise, geographic location, agency or employer, and recommendations from other interviewees. The resulting group covered all of the JFSP Fire Science Consortia and included natural resource experts from the federal wildland management agencies, universities, state and nongovernmental organizations. Every person I spoke with provided valuable, unique insights about how to produce better syntheses and how to deliver the knowledge they produce more effectively. **Every interviewee, without exception, gave my questions full attention and offered new ideas. I am deeply grateful for their time, consideration, and expertise.** For a list of these generous people and further details on methods, see “Looking into Syntheses”, Appendix B.

Key findings— listed here with references to details in “Looking into Syntheses”

Section I. Introduction

The most important thing to do, to ensure that a synthesis is useful to managers, is to include them throughout the production process. The second-most important thing is to include science delivery specialists as well (pp. 4-7)

Section II. What is a synthesis? What kind is best?

- A synthesis for managers (p. 8)
 - examines and summarizes a body of information
 - describes pattern or lack of pattern in the information
 - explains what is known and what is not known
 - describes applications
- **Literature reviews** may be most appropriate for syntheses covering controversial issues on which published studies are relatively abundant, especially if the studies are so diverse that it is impossible to compare results directly (p. 9).
- **Meta-analysis** (not a form of synthesis but a technique used for synthesis) is most appropriate for issues in which most of the evidence has been collected using similar techniques, and either raw data or complete descriptive statistics are available (p. 10).
- **Systematic reviews** may be most appropriate for focused management questions, especially if they are controversial (p. 10-11).
- **Narrative syntheses** may be most appropriate for topics that are relatively new or highly interdisciplinary, topics that vary regionally, and issues that are best addressed with examples and case studies (pp. 11-12).
- **Guidebooks and handbooks** may be appropriate vehicles for synthesis if they link to thorough background and documentation (p. 12).

Section III. What makes a synthesis scientifically defensible?

- The basis for a high-quality synthesis is a thorough, unbiased search for information. The search should be

carefully discussed in the planning stage and documented for the reader (pp. 13-14).

- Information should be evaluated based on scope of inference and reliability of findings (pp. 15).
- Synthesis authors use many tools to search for patterns, but all should lead to the authors telling the readers what the information *means*. That is the heart of synthesis (pp. 15-16).
- The authors should communicate their level of confidence in the patterns described and explain what information is *not* known (pp. 16-19).

Section IV. What makes a synthesis useful to managers?

- The science should be presented accurately with use of tools such as hedges, identification of inferences, and use of links and in-text citations (pp. 20-21).
- Management applications should be fully developed via dialogue with managers in the planning stage and review of drafts by managers, and possibly by including managers as authors of management sections (p. 22).
- Layering of information may be a fruitful technique for packaging synthesis products so a concise summary is available and it provides easy access to full explanations and documentation (pp. 23-24).
- Packaging and delivery of syntheses should be addressed in the planning stage and carried out just as carefully as preparation of the foundational synthesis document (p. 27).

Sections V, VI, VII

- Store syntheses systematically and let managers know how to find them (p. 30).
- Package supplements and key new research together with original syntheses (p. 28).
- Embed pedagogy within syntheses: “how to use”, “how to read”, “how to think about this issue” (p. 29).

Implications for managers

“Looking into Syntheses” can serve as a guidebook for developing new syntheses and suggests packaging techniques that could be applied to existing ones. It addresses specific roles for scientists, managers, and science delivery specialists, but these roles are not split out in handbook-like fashion because everyone involved in developing a synthesis needs to be familiar with everyone else’s role.

Managers should participate throughout the process of synthesis development, particularly:

- In planning, to fully develop the topic or question and to help determine potential sources of information and the format and packaging of final product(s)
- By providing information to authors, as needed
- By helping authors fully develop management applications, possibly by authoring or co-authoring those sections
- By reviewing drafts
- By helping advertise and deliver final product(s)

The most innovative suggestion I found on packaging of syntheses was called “layering”: A suite of carefully layered, linked products could provide multiple levels for accessing knowledge in syntheses. A short, concise product could provide a gateway to the in-depth knowledge of the full synthesis. In electronic publishing, there are at least two ways to do this:

1. **EXPANDABLE DOCUMENT:** The file opens with a brief description of the subject and a list of management applications. Each of these points is expandable into full discussion and documentation.
2. **MULTIPLE LINKED DOCUMENTS:** The full synthesis is the foundation for this suite of documents. Above the foundation is one or more documents addressed specifically to management, with

each main point linked to the full discussion and documentation in the foundation synthesis.
Downloadable primary sources could be linked from the full synthesis.
See pp. 23-24 of “Looking into syntheses” for details and illustrations.

Below is a full list of potential applications for this report (p. 7 of “Looking into Syntheses”):

For proposed syntheses:

- In the planning stage, include scientists, managers, and science delivery specialists. If the synthesis has unique regional components, include someone from each region.
 - Develop a well-defined focus question, issue, or topic
 - Determine the nature and scope of information sources
 - Determine the kind of synthesis product(s) that will best address the need
- In the writing stage, include managers to help fully develop management applications. Consider having managers author or co-author these sections.
- Use expertise from science delivery specialists to plan packaging in ways that will make the product most accessible and efficiently used by managers.
- In the review stage, include scientists, managers, and science delivery specialists. Emphasize carefully review of management applications.
- Include all parties in advertising and delivering the final products. Rely especially on science delivery specialists’ understanding of communication networks in the management community.

For existing syntheses:

- Consider repackaging with a “layered” structure that presents management applications up front in a 1- or 2-page summary, with links to details, further discussion, and documentation in the full synthesis. Include managers and science delivery specialists to address:
 - Are the management applications fully developed in the original synthesis? If not, collaborate with scientists to develop them now.
 - Are two layers (the short summary and full synthesis) enough? Is an intermediate layer needed—an in-depth guide for managers?
 - If the synthesis has unique regional components, should they be broken out into separate, smaller products?

For storing and updating syntheses:

- There is currently no one way to locate the >100 syntheses available on fire. Even if you search several sources, you can’t be sure you’ve found them all. Develop a systematic way to store syntheses, a “reference library” of foundational information on fire management.
- Package supplements and key new research so they are associated with original syntheses. Thus the background and history of the research is available through the original synthesis, but key new findings can be found in the same place.
- Let managers know what is in the reference library. Focus especially on communicating with staff who are new to the field of fire management.

For more effective, efficient use of syntheses:

- Embed pedagogy within syntheses: “how to use”, “how to read”, “how to think about this issue”.
- Consider whether direct teaching tools are needed, especially for staff new to fire management. If anything is developed, it should be short. Consider a podcast or YouTube presentation (15 minutes or less), downloadable PowerPoint (15 slides or less), online tutorial, or 15-minute segment in the S and/or Rx training series.

Relationship to other recent findings and ongoing work

Publications about science synthesis in natural resource fields were few before the 2000s. Discussion of synthesis has increased in the last decade with the development of systematic reviews. The Centre for Evidence-Based Synthesis (CEBC) provides thorough instructions for preparing systematic reviews (CEBC 2012). In “Looking into Syntheses”, I adapted their guidelines to apply to syntheses in general.

I did not find any single, clear definition of synthesis for natural resource management in the literature. Based on thoughts from Krueger and Kelley (2000), Thomas & Burchfield (2000), and interviewees, I developed the following:

A synthesis created to contribute to science-based management of wildland ecosystems is a product that

- *examines and summarizes a body of information*
- *describes pattern or lack of pattern in the information, thus creating new knowledge*
- *explains what is not known as well as what is known*
- *describes applications to wildland management*

Future work needed

I found sufficient information in this project to fully develop the ideas on the nature of a synthesis, what makes it scientifically defensible, and what makes it useful for managers (Sections II through IV of “Looking into syntheses”). However, since I used a convenience sample and did not thoroughly examine every fire-related synthesis, I am obtaining peer review and also inviting comments from a wide audience, including all who participated or were invited to participate in the project. After review and revision, the paper is planned for publication as a General Technical Report from the Rocky Mountain Research Station.

I found only a small amount of guidance in the literature and from interviewees on how to keep synthesis products up-to-date (p. 28) and how to help field practitioners improve their skill in critical reading of science and using syntheses (p. 29). Few of the managers and science delivery specialists interviewed expressed much interest in direct instruction regarding these skills. The issue is addressed on p. 29, but I did not pursue that aspect of the project further or develop a separate deliverable. However, more work on this topic could be fruitful.

There is currently no systematic way for managers to find syntheses on a specific management issue (p. 30), so the dozens—perhaps hundreds—of syntheses that have been written may not be found when needed, especially as staff changes occur. This issue could potentially be addressed through a national citation database, perhaps the FRAMES Research Cataloging System. If it is done, then the solution should be well advertised in the management community.

Deliverables crosswalk

The proposal for this project identified two deliverables: a paper that articulates standards for what makes a synthesis scientifically defensible and of optimal use to managers, and guidelines to help managers make the best possible use of the syntheses provided.

	Deliverable	In proposal?	Status
1	Smith, Jane Kapler. [In review]. Looking into syntheses: improving relevance and usefulness for managers. Missoula, MT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory. 43 p.	yes	In review. Posted on JFSP website
2	Section VI. What are some techniques for helping practitioners use syntheses more efficiently & effectively? In Deliverable 1 above	yes	Short section in deliverable 1 (p. 28). Little interest expressed by managers and science delivery specialists.
3	Smith, Jane Kapler. 2012. Looking into Syntheses: How can we improve relevance and usefulness for managers? PowerPoint presentation at: Fifth International Fire Ecology and Management Congress: Uniting research, education, and management; 2012 December 3-7; Portland, OR.	no	Done. Posted on JFSP website

Literature Cited

Centre for evidence-based conservation, UK. 2010. Guidelines for systematic review in environmental management. Version 4.0. Environmental evidence: www.environmentalevidence.org/Authors.htm. 74 p.

Krueger, William C.; Kelley, Claudia E. 2000. Describing and categorizing natural resources literature. *Rangelands*. 22(4): 37-39.

Thomas, Jack Ward; Burchfield, James. 2000. Science, politics, and land management. *Rangelands*. 22(4): 45-48.