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Standards for Best Available Science: A Guidance Document

Independent Research and Science Team Adaptive Management Program, Oregon Board of Forestry

This document was approved by the Independent Research and Science Team (IRST) during a public meeting on January 19, 2024, with the understanding that it will consider amendments of the following items in February and/or March 2024:

- Adding a section on researchable questions;
- Distinguishing between research and monitoring;
- Refining the set of principles regarding the quality of scientific work;
- Determining if the IRST should crosswalk this document with the IRST charter (the role of external experts in providing information);
- Adding definitions for the categories in the section on types and sources of available science;
- Asking an expert to review the indigenous knowledge section; and,
- Establishing a process for peer review (consider the CMER process as a template).

Introduction

The mission of the Independent Research and Science Team (IRST) is to provide science-based recommendations and technical information to assist the Oregon Board of Forestry's Adaptive Management Program (AMP) in determining when it is necessary or advisable to adjust rules, guidance, procedures, and training programs to achieve its biological goals and objectives. This document fulfills one of IRST's initial required tasks, which is the development of standards for best available science (BAS) to use in its work [administrative rules 629-603-0400(4)].

The IRST reviews and interprets existing knowledge and defines and solicits studies from others that add to the knowledge base (i.e., creating new knowledge) to support the decision-making processes of the AMP. In this context, BAS encompasses both the identification and use of existing scientific results (best available science information) and a process for how new research will be developed (best available science practices) to address AMP questions. Additionally, monitoring is an important part of the adaptive management process. Monitoring is usually based on methods and relationships that have been previously established by research, rather than attempting to discover new relationships. These three applications can be supported by the same set of standards, to varying degrees, which are described in the next section.

The IRST held its first meeting on November 16, 2023 and by rule is required to approve BAS standards by January 31, 2024. This document is a working document and will be revised as the IRST gains experience in executing its tasks.

Defining and Assessing Science Quality

A number of federal and state laws and organizational policies mandate the use of best available science. A review of the literature prepared for the January 9, 2024 IRST meeting found that BAS is dependent both on the research topic being considered and the context of the information used; however, broader principles relate to both the quality and relevance of existing scientific reports as well as plans for new research and, to a more limited degree, monitoring plans.

Quality principles

The scientific method aims to produce verifiable and replicable results, which requires identifying a clear objective, proper data collection and analysis methodologies, and the logical explanation of conclusions and limitations. The following list is a set of principles the IRST intends to use to assess the quality of scientific studies (the first six apply to both planned and completed studies, and the final three only to completed studies):

1. Clear statement of the scope and objective(s) of the study, and definition of the research problem;
2. A conceptual model, which is a framework for characterizing systems, stating assumptions, making predictions, and testing hypotheses;
3. Complete and thorough references and acknowledgement of previous work by others and the author(s);
4. Detailed description/documentation of methods;
5. Appropriate experimental design and a standardized method for collecting data;
6. Application of proper research techniques, including whatever chemical, physical and/or statistical parameters/data are appropriate to the subject/study;
7. Recency of the work;
8. Statistical rigor and sound logic for analysis and interpretation; acknowledgement of uncertainties; and
9. Clear statements of findings, reasonable conclusions based on the data collected, questions left unresolved, and questions for further investigation.

Relevance

It is expected that both existing research and new research commissioned by the AMP may not specifically and precisely address the questions proposed under the AMP (i.e., at the broad scale Oregon forest practices rules are applied). Given this imperfect match, the degree of relevance to the questions can be assessed as follows:

- Level of congruence between the study subject matter and the research question of interest; and
- Spatial and temporal scales of a study versus the research question of interest.

Testable hypotheses as a crucial element for successful research

Testable hypotheses were described in administrative rules as an important element of scientific standards [629-603-0400(4)(c)]. The IRST concurs that testable hypotheses are an important element for many forms of best available science (e.g., research manuscripts and findings), but also recognizes that these hypotheses may not be as relevant for some products. Nevertheless, the IRST expects other science-based products to clearly define purposes and conceptual frameworks, as described above.

The types of sources of available science

The quality of scientific information can also be partially judged by its source. Sources that have passed independent peer review (e.g., most academic journal articles) are generally considered the most reliable. However, there are many other sources of scientific information, which will be important to consider, particularly in less-studied topic areas. A general categorization and hierarchy of science information sources is as follows:

- peer-reviewed literature
- gray literature
- expert opinion
- anecdotal evidence

The IRST believes that all these sources should be considered as appropriate for the research questions, and that all will require consideration of the quality principles described above.

Indigenous knowledge

The IRST recognizes and acknowledges that indigenous knowledge, or other forms of knowing, may make valuable contributions to answering research questions. The IRST does not currently have a formal approach to integrate indigenous knowledge but will continue to explore and develop such procedures. “Two-Eyed Seeing” is a relevant concept, which seeks to examine questions using both indigenous knowledge and positivist science perspectives.

Peer review

The AMP rules require “A peer review process that is transparent and addresses both study designs and study reports. The IRST shall not grant anonymity to authors, handling editors, or peer-reviewers before January 1, 2028. After January 1, 2028, the IRST may modify the anonymity requirements to peer reviewers by a substantial decision of the IRST” [629-603-0400(4)(d)]. Based on discussion in the IRST January 9, 2024 meeting, this peer review clause is primarily intended to apply to the research products commissioned by the IRST. Therefore, the IRST will provide one or more peer reviews of these products from individuals with the appropriate topic expertise, which in some cases may be IRST members themselves and in other cases will be outside experts. Per the rule, reviewers will attach their names to reviews. It seems logical that these peer reviews should accompany the technical and summary reports submitted to the AMPC and Board of Forestry, but in some cases an extension to the 30-day report delivery timeline specified in 629-603-0200(7) may be needed to complete the peer review.