Appendix 1A
Best Available Science

Note: All content of this appendix is newly adopted.

Best Available Science

The Delta Reform Act requires the Council to make use of the best available science in implementing the Delta Plan. Best available science is specific to the decision being made and the time frame available for making that decision. Best available science is developed and presented in a transparent manner consistent with the scientific process (Sullivan et al. 2006), including clear statements of assumptions, the use of conceptual models, description of methods used, and presentation of summary conclusions. Sources of data used are cited and analytical tools used in analyses and syntheses are identified. Best available science changes over time, and decisions may need to be revisited as new scientific information becomes available. Ultimately, best available science requires scientists to use the best information and data to assist management and policy decisions. The processes and information used should be clearly documented and effectively communicated to foster improved understanding and decision making.

Steps for Achieving the Best Science

Science consistent with the scientific process includes the following elements:

- Well-stated objectives
- A clear conceptual or mathematical model
- A good experimental design with standardized methods for data collection
- Statistical rigor and sound logic for analysis and interpretation
- Clear documentation of methods, results, and conclusions

The best science is understandable; it clearly outlines assumptions and limitations. The best science is also reputable; it has undergone peer review conducted by active experts in the applicable field(s) of study. Scientific peer review addresses the validity of the methods used, the adequacy of the methods and study design in addressing study objectives, the adequacy of the interpretation of results, whether the conclusions are supported by the results, and whether the findings advance scientific knowledge (Sullivan et al. 2006).

There are several sources of scientific information and tradeoffs associated with each (Sullivan et al. 2006, Ryder et al. 2010). The primary sources of scientific information, in a generalized ranking of most to least scientific credibility for informing management decisions, include the following:

- Independently peer-reviewed publications including scientific journal publications and books (most desirable)
- Other scientific reports and publications
- Science expert opinion
- Traditional knowledge

Each of these sources of scientific information may be the best available at a given time and contain varying levels of understanding and uncertainty. These limitations should be clearly documented when scientific information is used as the basis for decisions.

Guidelines and Criteria

There have been several efforts to develop criteria for defining and assessing best available science. In 2004, the National Research Council Committee on Defining the Best Scientific Information Available for Fisheries Management prepared a report (National Research Council Report) that concluded guidelines and criteria must be defined in order to apply best available science in natural resource management (National Research Council 2004). Major findings and recommendations included establishing procedural and implementation guidelines to govern the production and use of scientific information. The guidelines were based on six broad criteria: relevance, inclusiveness, objectivity, transparency and openness, timeliness, and peer review.

Best available science for proposed covered actions and for use in the Delta Plan should be consistent with the guidelines and criteria in Table 1A-1. These criteria were adapted from criteria developed by the National Research Council. Proponents of covered actions should document their scientific rationale for applying the criteria in Table 1A-1 (i.e., the format used in a scientific grant proposal).

Table 1A-1
Criteria for Best Available Science

Criteria	Description
Relevance	Scientific information used should be germane to the Delta ecosystem and/or biological and physical components (and/or process) affected by the proposed decisions. Analogous information from a different region but applicable to the Delta ecosystem and/or biological and physical components may be the most relevant when Delta-specific scientific information is nonexistent or insufficient. The quality and relevance of the data and information used shall be clearly addressed.
Inclusiveness	Scientific information used shall incorporate a thorough review of relevant information and analyses across relevant disciplines. Many analysis tools are available to the scientific community (e.g., search engines and citation indices).[a]
Objectivity	Data collection and analyses considered shall meet the standards of the scientific method and be void of nonscientific influences and considerations.
Transparency and openness	The sources and methods used for analyzing the science (including scientific and engineering models) used shall be clearly identified. The opportunity for public comment on the use of science in proposed covered actions is recommended. Limitations of research used shall be clearly identified and explained. If a range of uncertainty is associated with the data and information used, a mechanism for communicating uncertainty shall be employed.
Timeliness	Timeliness has two main elements: (1) data collection shall occur in a manner sufficient for adequate analyses before a management decision is needed, and (2) scientific information used shall be applicable to current situations. Timeliness also means that results from scientific studies and monitoring may be brought forward before the study is complete to address management needs[c]. In these instances, it is necessary that the uncertainties, limitations, and risks associated with preliminary results are clearly documented.
Peer review	The quality of the science used will be measured by the extent and quality of the review process. Independent external scientific review of the science is most important because it ensures scientific objectivity and validity. The following criteria represent a desirable peer review process[e]. Coordination of Peer Review. Independent peer review shall be coordinated by entities and/or individuals that (1) are not a member of the independent external review team/panel and (2) have had no direct involvement in the particular actions under review. Independent External Reviewers. A qualified independent external reviewer embodies the following qualities: (1) has no conflict of interest with the outcome of the decision being made, (2) can perform the review free of persuasion by others, (3) has demonstrable competence in the subject as evidenced by formal training or experience, (4) is willing to utilize his or her scientific expertise to reach objective conclusions that may be incongruent with his or her personal biases, and (5) is willing to identify the costs and benefits of ecological and social alternative decisions. When to Conduct Peer Review. Independent scientific peer review shall be applied formally to proposed projects and initial draft plans, in writing after official draft plans or policies are released to the public, and to final released plans. Formal peer review should also be applied to outcomes and products of projects as appropriate.

a. McGarvey 2007
b. National Research Council 2004, Sullivan et al. 2006
c. National Research Council 2004
d. Meffe et al. 1998
e. Adapted from Meffe et al. 1998

It is recognized that differences exist among the accepted standards of peer review for various fields of study and professional communities. When applying the criteria for best available science in Table 1A-1, the Council recognizes that the level of peer review for supporting materials and technical information

(such as scientific studies, model results, and documents) included in the documentation for a proposed covered action is variable and relative to the scale, scope, and nature of the proposed covered action. The Council understands that varying levels of peer review may be commonly accepted in various fields of study and professional communities.

References

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