Healthy Rivers and Landscapes Science Committee: Draft Charter

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Preamble

The purpose of this document is to provide a description of the Healthy Rivers and Landscapes Science Committee (hereafter Science Committee), including its major responsibilities, and operation principles and procedures. The Science Committee is a separate body from the Healthy Rivers and Landscapes Systemwide Governance Committee (SWGC) and informs SWGC on science direction and scope for understanding the outcome of the Healthy Rivers and Landscapes Flow and Non-flow Measures. This includes appendices outlining the oversight and development of the Science Plan (Appendix A) and the Science Program's commitments to best available science (Appendix B), peer-review (Appendix C) and open data (Appendix D).

1 Science Committee Responsibilities

The March 29, 2022 Memorandum of Understanding (MOU) and Section 10 of the Term Sheet identifies the purposes of the Healthy Rivers and Landscapes Science Program. The Science Program will be a collective of monitoring and research programs relevant to understanding the outcomes of implementation. The Science Committee, a body of scientists and science program managers largely from the implementing parties, will represent and document the activities of the Science Program. Consistent with the description of the Science Program in the March 29, 2022 MOU and Section 10 of the Term Sheet, the purpose of the Science Program will be to:

- Inform decision-making by the SWGC and Tributary/Delta Governance entities;
- Track and report progress relative to the metrics in the Science Plan;
- Reduce management-relevant uncertainty; and
- Provide recommendations on adjusting management actions to the SWGC and Tributary/Delta Governance Entities.

To realize the purpose of the Science Program as described in Section 10 of the Term Sheet, the Science Committee will have the following core responsibilities:

- Identify and develop deliverables, plans, and schedules as necessary to support the Science Committee's ability to fulfill its responsibilities;
- Coordinate and implement peer-review of relevant Science Program products, including plans, reports, and periodic science syntheses; and
- Develop and oversee implementation of a cohesive framework and collaborative platform for gathering data on and understanding outcomes of Flow and Non-flow Measures, including coordinated monitoring approaches.

2 Representation

Participation in the Science Committee is expected to generally mirror representation on the SWGC. However, participation from other organizations that hold valuable information and/or perspectives to inform a comprehensive understanding of how Flow and Non-flow Measures are supporting benefits to target species and ecosystems may be invited to participate in the Science Committee by established

members. Participating organizations will nominate their own technical representation for participation in the group to best meet the goals of the Charter and are expected to keep their representatives as consistent as possible and to balance adequate representation with the size of the group. Approximately every six months, the Science Committee will review its list of participants and add or remove individuals and/or organizations as necessary, at the direction of the lead person for each entity.

Participants agree to abide by the participation principles described in Section 3.

3 Participation Principles

The Science Program will be guided by the principles of best available science, efficiency, forward-looking perspective, shared risk in addressing uncertainty, transparency, collaboration, and timeliness. Participants in the Science Committee agree to fully support these principles.

Use of Best Available Science and Technical Information

The Science Program will provide the SWGC and the Tributary/Delta Governance Entities with the best available science[1] and technical information to inform choices on how to implement Flow and Non-flow Measures, monitor progress and reduce critical scientific uncertainties.

Efficiency

The Science Program will strive to maximize learning and minimize the cost of scientific activities through incorporating science done elsewhere and leveraging existing science programs and resources wherever possible. This includes other science plans and collaborative groups, further articulated in more detail throughout the Science Plan. The Science Program will leverage existing programs and protocols, as appropriate, given the multiple spatial scales, measures, species, and life stages. The adoption and application of those existing protocols can be found in the Charter appendices. The Science Program will also integrate new tools, such as the refinement and development of decision support models and contribute to their enhancement with monitoring and data comparability improvements. The adaptive management framework further ensures that external science activities will continue to contribute to the Science Program through the term of the Healthy Rivers and Landscapes Program.

Forward-looking to Advance Learning

The Science Program will strive to anticipate the learning opportunities that natural conditions and events provide (e.g., very wet or very dry years), and will establish plans and maintain resources to take advantage of these opportunities to serve the science priorities outlined in the Strategic Plan.

"Safe to Fail" Approach to Shared Risk-taking for Reducing Uncertainty

The Science Program will undertake innovative experiments and studies to reduce uncertainties that have the potential for large benefits for greater understanding, but that may also come with risks. The Science Committee will support informed, shared risk-taking to advance adaptive management of Flow and Non-flow Measures. The process for making informed recommendations on risk-taking may include structured decision-making and/or eliciting external expert opinion and adopting a weight of evidence approach to developing recommendations for investment in experiments. These risks could include some likelihood that Flow and Non-flow Measures will fail to create the intended benefits, and/or some likelihood that the action will require substantial resources and not significantly improve our understanding. Recommendations to pursue these experiments will weigh those risks against the possible benefits. The

[1] This term is defined in Appendix B of the Healthy River and Landscapes Science Committee Charter and used here in a manner consistent with *Improving the Use of the "Best Scientific Information Available" Standard in Fisheries Management* (National Research Council 2004) and Appendix 1A of the *Delta Plan* (Delta Stewardship Council 2013).

Science Program will strive to create a space where some risk-taking is supported and no single Party is blamed if Flow and Non-flow Measures fail to create the intended benefits. Collaboration among the participants will help create the support needed for the Science Program to take reasonable risks with large potential benefits.

Transparency and Communication

The Science Program's data and analyses will be open and accessible to the public in accordance with the mandate for Open and Transparent Data under Assembly Bill 1755, and the findings and achievements of the Science Program will be communicated in plain language summaries. More details are provided in Appendix D.

Collaboration

The design of monitoring and studies through the Science Program will engage all participants to maximize the acceptability, applicability, comparability, and utility of the results to support decision making by Tributary/Delta Governance Entities and the SWGC. This includes taking advantage of the local knowledge in Tributary/Delta Governance Entities and other available expertise and working together on science of interest across the system. The extent of this engagement will need to be balanced with achieving efficiency and timeliness. More details are provided in Appendix B, Section 1.3.

Timeliness

The information generated through the Science Program will be communicated to the SWGC in a regular and timely manner to facilitate responsive decision making.

4 Science Committee Procedures

The Science Committee will meet as required to fulfill its responsibilities as described above in Section 1.

The Science Committee recommendations to the SWGC will be made using a consensus-seeking approach. Consensus means that all Science Committee participants endorse or accept a recommendation or a course of action.

The following steps will be used as a tool for resolving issues:

- clarify the issue
- clarify the concerns, perspectives, and interests
- identify and evaluate potential solutions
- deliberate on trade-offs and seek agreement
- implement and commit to ongoing learning.

Non-consensus issues will be elevated to the SWGC with options.

The Science Committee will be supported by a Science Program Manager (currently the California Department of Water Resources Lead Scientist) whose responsibilities include:

- Support the SWGC to carry out their responsibilities and meet agreed to schedules;
- Support the Science Committee in adherence to established schedules, including schedules and deliverables of the working groups;
- Liaise with the SWGC, State Water Resources Control Board, and the Governor's Office on needs and priorities;
- Work with the planning and facilitation team to respond to SWGC requests and direction;
- Elevate issues as needed.

The Science Committee is supported by an independent and neutral planning support and facilitation team with the following responsibilities:

- Support the Science Committee in resolving key issues that arise related to their areas of responsibility;
- Develop Science Committee meeting agendas and other supporting materials based on Science Committee direction and in coordination with the Science Program Manager;
- Support the development of key Science Committee products, based on Science Committee direction and in coordination with the Science Program Manager;
- Manage the distribution list for Science Committee meetings in coordination with the Science Program Manager.

5 Process to Adopt and Update this Charter

This Charter will be adopted through approval by the SWGC. In accordance with the intent that the Science Committee continues to fill the roles described in this document as the Healthy Rivers and Landscapes Program moves into implementation, this Charter will be updated through periodic reviews.

The process to update this Charter is:

- Any Science Committee participant, SWGC participant, the Project Manager, or facilitator can propose updates;
- A periodic review may be instigated by the joining of a new Party or new Science Committee member or an engagement opportunity, such as a public workshop or Tribal Meeting;
- Proposed updates will be collated by the facilitator for consideration at the periodic review or raised at the next SWGC meeting as necessary;
- The group seeks consensus on the proposed updates;
- The facilitator updates the Charter and issues a new version upon direction from the SWGC.

References

Delta Stewardship Council. 2013. The Delta Plan. Sacramento: State of California, USA. Available at https://deltacouncil.ca.gov/pdf/delta-plan/2015-appendix-1a.pdf

National Research Council, Committee on Defining the Best Scientific Information Available for Fisheries Management. 2004. Improving the use of “Best Scientific Information Available” Standard in Fisheries Management. National Academy Press, Washington D.C. Available at http://www.nap.edu/catalog.php?record_id=11045#toc

Appendix A. Oversight and Development of Science Committee, Tributary and Delta-specific and project-specific Science Plans

The Strategic Plan set multi-year direction for the deployment of Flow and Non-flow Measures. The Science Committee Science Plan (hereafter Science Plan) is the framework that identifies specific scientific activities to track progress relative to Healthy Rivers and Landscapes Program. The Science Plan will be implemented by the Science Committee with support from the Program Office (a neutral entity responsible for the ongoing implementation and administration of the Systemwide Governance Program). The information contained in the Science Plan will also enable the Science Committee to provide technical support to the structured decision-making process and other planning and decision processes. The Draft Science Plan was submitted to the State Water Board in September 2023, in advance of the "Public Hearing: Sacramento/Delta Draft Staff Report" in November and December 2023. The Science Plan content was then presented in April 2024 at the "Board Workshop on proposed Voluntary Agreements related to Sacramento/Delta update to the Water Quality Control Plan for the San Francisco Bay/ Sacramento-San-Joaquin Delta Estuary". Science Plan revisions based on public and State Water Board comments occurred in the summer of 2024.

The Science Plan will be peer reviewed in the first year of implementation (see Appendix C), and project-specific and Tributary and Delta-specific science plans will be provided as appendices to the Science Plan as they become available. Tributary and Delta-science plans are preferred, however there may be instances where project-specific science plans are most appropriate.

Project-specific and Tributary and Delta-specific science plans will include:

- Conceptual descriptions of the links between applicable Flow and Non-flow Measures and their anticipated biological and environmental effects;
- Descriptions of the existing or additional monitoring and studies necessary to track progress relative to the Healthy Rivers and Landscapes Program and to address relevant hypotheses, including monitoring and studies that anticipate opportunities for learning based on unique situations;
- Identification of existing and new models to be reviewed by the Science Committee, information needs to improve the predictions of these models, and if appropriate and mutually acceptable, used in assessing expected outcomes of implementation of Flow and Non-flow Measures;
- Explicit opportunities for coordination with other groups and initiatives;
- Procedures for updating the Science Plan as new information becomes available regarding conceptual models, evidence to support or refute current hypotheses, or changes to other major Science Plan components; and,
- Description of and timeline for anticipated Flow and Non-flow Measures.

To implement the Science Plan, the Science Committee and the Program Office will follow a logical process to ensure efficient implementation of each science activity identified in the plan. For any specific science activity, the Program Office, in coordination with the Science Committee, will work to identify whether the relevant data is already being collected by an existing science program, and if it is not, then inquire with the appropriate existing science program if they would be willing to undertake an additional monitoring or study activity. Where existing science programs are not able to fill the needs of the Healthy Rivers and Landscapes Program, the Program Office will work with hired consultants, through academic partnerships, and/or other entities as appropriate, to fill the need.

For any of the avenues above, a key role of the Program Office's Science Manager will be to help coordinate with existing entities and contracting and permitting (e.g., fish take permits).

Appendix B: Use of Best Available Science and Technical Information

1 Defining and Using Best Available Science for the Healthy River and Landscapes Program

The Science Program will provide the SWGC and the Tributary/Delta Governance Entities with the best available science and technical information to inform choices on how to implement Flow and Non-flow Measures, monitor progress in relation to Healthy Rivers and Landscapes Program, and reduce critical scientific uncertainties.

As described in the Term Sheet, the State Water Board will, in Year 8 of the Healthy Rivers and Landscapes Program, consider potential amendments to the Program of Implementation under the "green"-"yellow"-"red" structure, which will be informed by the consideration of the scientific analysis and information submitted by the Science Committee. Information collected by the Science Program on the biological and ecological outcomes of the Flow and Non-flow Measures will be instrumental to supporting the State Water Board's assessment of the effects of the Healthy Rivers and Landscapes Program.

1.1 Definition of Best Available Science

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:

- Well stated objectives
- Clear statements of assumptions and limitations
- Use of conceptual, mathematical, statistical, or spatial models
- Experimental design with standardized methods for data collection
- Statistical rigor and sound logic for analysis and interpretation
- Clear documentation of methods, results, and conclusions
    - Sources of data used are cited
    - Analytical tools used in analyses and syntheses are identified

Best available science changes over time, and different decisions may be made regarding specific Flow and Non-flow Measures and desired outcomes 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.

There are several sources of scientific information and tradeoffs associated with each (Sullivan et al. 2006, Ryder et al. 2010, Delta Stewardship Council 2013). The primary sources of information include the following:

- Independently peer-reviewed publications including scientific journal publications and books
- Other scientific reports and publications
- Unpublished results
- Knowledge: Science expert opinion, Indigenous Knowledge and Practices, Place-based knowledge

Each of these sources of information contributes to the best available science at a given time and contains varying levels of understanding and uncertainty. These limitations should be clearly documented when information is used as the basis for decisions. The Science Committee will use a weight of evidence approach to incorporate these sources of best available science. Weight of evidence refers to a systematic approach to evaluate the totality of scientific evidence to assess if the science supports a particular conclusion. When the body of knowledge on a topic is inconclusive, independently peer-reviewed publications will be the preferred source of scientific credibility for informing decisions. Emerging science, synthesis of existing data and results (published and unpublished), and knowledge may also be integrated to determine the relative support for decisions, as applicable. The application and expected documentation of best available science within the Science Program for each source is outlined below. In the case when a lack of consensus on best available science to support conclusions within the Science Committee occurs on the development of a time sensitive product, the use of expedited review may be required (Appendix C: Science Program Commitment to Peer Review).

1.2 Guidelines and Criteria for identifying the Best Available Science

Best available science for use in the Science Program such as Flow and Non-flow Measures, study plans, data collection, data management, analytical tools, results analysis, decision-making, and adaptive management will be consistent with the guidelines and criteria below. These criteria were adapted from the National Research Council (2004) and Delta Stewardship Council (2013).

Relevance – Scientific information used will be relevant to the tributary, Delta, or Central Valley 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 tributary or Delta ecosystem and/or biological and physical components may be the most relevant when Central Valley-specific scientific information is nonexistent or insufficient. The quality and relevance of the data and information used will be clearly addressed.

Inclusiveness – Scientific information used will 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) (McGarvey 2007).

Objectivity – Data collection and analyses considered will 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 will be clearly identified and reproducible. Limitations of research used will be clearly identified and explained. If a range of uncertainty is associated with the data and information used, the uncertainty will be clearly identified, described, and documented.

Timeliness – Timeliness has two main elements: (1) data collection will occur in a manner sufficient for adequate analyses before a management decision is needed, and (2) scientific information used will 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 (NRC 2004). 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. Rigorous independent external scientific review of science is most important because it ensures scientific objectivity and validity. More detail about the peer review process is discussed in Appendix C: Science Program Commitment to Peer Review.

Parties implementing Flow and Non-flow Measures will document how the criteria above are applied. This language will be referenced within all required reporting documents, detailed in Section 2, as a scientific rationale demonstrating how best available science is applied.

1.3 Commitment to Inclusion of Other Sources of Information

Key Science Charter participation principles that guide the Healthy Rivers and Landscapes Science Program are transparency, communication, and collaboration. Similarly, the Governance Principles state that values of inclusiveness, collaboration, and transparency are key tenets of this Program. As such, the ability to learn and apply new knowledge to how the Healthy Rivers and Landscapes Program approaches Flow and Non-flow Measures is fundamental to the Science Program. The Science Committee will undertake efforts to promote inclusion and engagement that will likely lead to additional sources of relevant information. Additionally, the California Natural Resources Agency, Department of Water Resources, and Department of Fish and Wildlife are currently engaging in a series of meeting with California Tribes to provide information and identify opportunities for engagement.

The Science Program acknowledges that Indigenous Knowledge is a best available science equal to prevailing scientific methods (2023 Draft California Water Plan Update) and is committed to Tribal engagement on Healthy Rivers and Landscapes science activities. Therefore, expert opinion from science professionals, Indigenous Knowledge, and Place-based knowledge (e.g., different sources of knowledge and possible overlap in the identity of experts) needs to be included to a be a truly comprehensive Science Program.

2 Anticipated Needs for Best Available Science in the Science Program for Healthy Rivers and Landscapes

All recommendations and contributions to reports from the Science Committee, including the Triennial Synthesis Reports and Ecological Analysis Outcome Report, will provide a scientific rationale describing how best available science was applied to the activities covered within the report. Application of best available science will be demonstrated by use of the definitions, guidelines, and criteria outlined in this document. The scientific rationale will provide a narrative overview of how Flow and Non-flow Measures and science activities applied the best available science criteria of relevance, inclusiveness, objectivity, transparency and openness, timeliness, and peer review.

All proposed Flow and Non-flow Measures are subject to ongoing adaptive management through the Science Program (see Draft Science Plan section 1.2). The Annual Reports prepared by the Tributary/Delta Governance Entities along with the Triennial Synthesis reports prepared by the Science Committee will inform adaptative management. The Science Program will include structured decision-making processes to refine Flow and Non-flow Measures, direct science efforts, and incorporate outcomes of the hypotheses to continue to inform decision-making.

2.1 Development of Science Committee Recommendations

2.1.1 Design, Implementation, and Accounting of Flow and Non-flow Measures

The Science Committee will provide recommendations to the SWGC and Tributary/Delta Governance Entities on designing, implementing, and accounting of Flow and Non-flow Measures. These recommendations will be based on best available science, as outlined within this document. The Science Committee will include a written scientific rationale for each recommendation, describing how best available science was applied to development of the recommendation.

Examples of recommendations which will provide a scientific rationale include, but are not limited to:

- Recommended deployment of Flow Measures (see Strategic Plan section 2.1.3), such as the timing of spring pulse flows within flow flexibility brackets based on juvenile presence and distribution.
- Alternative Non-flow Measure Design Criteria (see Review Process in Strategic Plan section 3.1.4), such as changes to water depth, water velocity, and other criteria.

These recommendations provided by the Science Committee will inform adaptive management decisions made by the SWGC and Tributary/Delta Governance Entities related to tributary scale actions such as Flow and Non-flow Measure implementation.

2.1.2 Potential Modifications to the Healthy River and Landscapes Program in Year 8

Prior to Year 7 of the 8-year term of the Healthy Rivers and Landscapes Program, the Science Committee will contribute to the Ecological Outcomes Analysis to be submitted to the State Water Board to assist with their determination to continue, modify, or discontinue the Healthy Rivers and Landscapes Program. The Ecological Outcomes Analysis will be based on best available science, as outlined within this document. The Science Committee will include a written scientific rationale within the Ecological Outcomes Analysis, describing how best available science was applied to development of the analysis and its findings.

The Ecological Outcomes Analysis will inform adaptive management decisions made by the State Water Board related to system-wide scale actions. Specifically, the Ecological Outcomes Analysis will inform the State Water Board's proposed pathway for Healthy Rivers and Landscapes Program implementation beyond year 8 using the Green/Yellow/Red system (see Term Sheet section 7.4.B).

2.2 Triennial Synthesis Reports

Upon Year 3 and 6 of the 8-year term of the Healthy Rivers and Landscapes Program, the Science Committee will contribute to Triennial Synthesis Reports submitted to the State Water Board to report on the scientific data and information, analyzes the ecological outcomes of the Healthy Rivers and Landscapes Program Flow and Non-flow Measures, and examines whether continuation of the Healthy Rivers and Landscapes Program beyond Year 8 would help improve species abundance, ecosystem conditions, and contribute to meeting the narrative objectives. The Triennial Synthesis Report will be based on best available science, as outlined within this document. The Science Committee will include a written scientific rationale within the Triennial Synthesis Report, describing how best available science was applied to the development of the analysis, its findings, and its recommendations.

The Triennial Syntheses Report will inform adaptive management decisions made by the Systemwide Governance Committee and the State Water Board on a system-wide scale by addressing information gaps and how they should be addressed, specifying areas of uncertainty which should be prioritized to best inform decisions making processes, and providing recommendations to inform future management actions.

References

Delta Stewardship Council. 2013. The Delta Plan. Sacramento: State of California, USA. Available at https://deltacouncil.ca.gov/pdf/delta-plan/2015-appendix-1a.pdf

McGarvey, D. J. 2007. Merging precaution with sound science under the Endangered Species Act. Bioscience 57: 65-70.

National Research Council, Committee on Defining the Best Scientific Information Available for Fisheries Management. 2004. Improving the use of "Best Scientific Information Available" Standard in Fisheries Management. National Academy Press, Washington D.C. Available at http://www.nap.edu/catalog.php?record_id=11045#toc.

Ryder, D. S., M. Tomlinson, B. Gawne, and G. E. Likens. 2010. Defining and using "best available science": a policy conundrum for the management of aquatic ecosystems. Marine and Freshwater Research 61: 821-828.

Sullivan, P. J., J. M. Acheson, P. L. Angermeier, T. Faast, J. Flemma, C. M. Jones, E. E. Knudsen, T. J. Minello, D. H. Secor, R. Wunderlich, and B. A. Zanetell. 2006. Defining and implementing best available science for fisheries and environmental science, policy, and management. American Fisheries Society, Bethesda, Maryland, and Estuarine Research Federation, Port Republic, Maryland. Available at http://www.fisheries.org/afs/docs/policy_science.pdf.

Appendix C. Science Program Commitment to Peer Review

1 Role of Peer Review in the Healthy River and Landscapes Program

1.1 Commitment to Independent Evaluation

Peer review is a quality assurance process, a mechanism for evaluating the merits of scientific research, monitoring, and assessment programs, and is the best available tool for identifying and supporting the accumulation of knowledge (National Academies of Sciences, Engineering, and Medicine 2004). The Science Committee is committed to the use of independent evaluation of key products to increase transparency and ensure rigor of the Healthy Rivers and Landscapes Program.

1.2 Anticipated Peer Review Processes for Healthy River and Landscapes Products

The Science Committee products will undergo three alternative applications of review: (1) independent scientific review, (2) advice by independent subject matter experts and (3) expedited review. There is a trade-off between independence, scope, and the duration for these types of reviews that will need to be navigated for each individual application. The Science Committee is expected to document their use of best available science within responses to reviews, where applicable.

Independent scientific reviews employ independent experts to evaluate completed or near-complete scientific and technical processes, programs, plans, and products. Independent scientific reviews typically follow two formats 1) public meeting with a consensus panel report, or 2) a "letter review" with either (a) a consensus panel report, or (b) individual reviewer reports (DSC 2019, Appendix H). Reviewers respond to a set of questions and produce a report. The duration of reviews varies with the complexity and scope, but generally require one year to complete. Additional considerations include funding, staff capacity and alignment with the review body's mission and objectives.

Advice by independent subject matter experts is intended for ongoing, early-stage work or science-based products (e.g., models, study designs, plans, analyses), and to be an iterative process. Advisors typically give input on the development of processes, programs, plans, or products. Similar to independent scientific reviews, advisors respond to a set of questions and produce a report. There may be several meetings or correspondences among the panel, requesting party, and product authors or a draft report may be discussed at a public workshop (DSC 2019, Appendix I). The processes of iterative communication between the panel and the requesting party often takes longer than one year.

External peer review bodies that may be available to the Science Program include the Delta Science Program, Delta Independent Science Board programmatic reviews, California Science and Technology, California Sea Grant, National Oceanic and Atmospheric Administration's Office of Science and Technology Center of Independent Experts, National Academies of Sciences, Southern California Coastal Water Research Project, and Cal Engineering & Geology. Each independent scientific review and advice service has a distinctive process, cost, availability, timeline and other considerations that will need to be navigated for each application.

An expedited review refers to an application of peer review which requires an accelerated timeline. The Science Program may use an expedited review in response to rapidly developing science actions proposed to evaluate Flow or Non-flow Measures or in cases of a lack of consensus on a Science Committee product or recommendation. For example, expedited reviews are currently used by the National Science Foundation ("Rapid Response Grants") and Delta Science Program (Directed Actions, DSC 2019, Appendix K) as a mechanism for reviewing proposals when scientific research or advice is needed quickly, and/or an important opportunity would be lost if the proposal waited for the standard process. Rapid response may

be necessary or justified when an unusual event occurs that provides an opportunity for learning and advancing the state of knowledge, such as an extreme natural event, human caused disaster, or an adaptive management action that may serve as a controlled large-scale experiment with high probability of generating one or multiple measurable signals to test key hypotheses. An expedited review may also be needed to refine and implement Flow and Non-flow Measures, similar to the Expert Regional Technical Group (ERTG) (Krueger et al. 2017) process utilized in the Columbia River estuary.

The expedited review would be facilitated by the Science Committee and include two external reviewers: a discipline-relevant scientist and an agency scientist or manager (similar to the Directed Action review process). The Science Committee would summarize the outcome of those reviews and advise the implementing entity, Tributary/Delta Governance Entities and SWGC, as appropriate.

The application of peer review on the Science Committee's major products is outlined in the following subsections. Peer review may also be applied to other specific elements, as required.

1.2.1 Science Plan

The Science Plan provides the framework and specific approach for evaluating the outcomes of the Flow and Non-flow Measures and for addressing several important and broad-scale ecosystem management questions. The Science Committee will develop a charge, select a venue, and submit the 2024 Final Draft Science Plan for independent peer review within one year of implementation of the Healthy Rivers and Landscapes Program. The Science Committee will revise the Science Plan while also reviewing system-specific Science Plans (to be attached as appendices). This completed product will be posted on the California Natural Resources Agency website in a similar process as the Draft Science Plan in September 2023 (https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Voluntary-Watershed-Agreements/Draft_VA_Science_Plan.pdf) prior to Year 3.

1.2.2 Triennial Synthesis Reports

As described in Term Sheet 9.4.B, in Years 3 and 6, the SWGC will prepare a Triennial Report to analyze progress across the Delta watershed and, in coordination with the Tributary/Delta Governance Entities, will submit these reports to the State Water Board. The State Water Board will hold a public information workshop following the receipt of each Triennial Report. These syntheses will inform recommendations to the SWGC on outstanding information gaps and how they should be addressed, specifying the areas of uncertainty that the Science Committee would prioritize to better inform the decision-making process. Upon submission to the State Water Board, the SWGC, in coordination with the Science Committee, will prepare the Year 3 Triennial Synthesis Report for review by independent subject matter experts. The outcomes of the advice and correspondences with the panel of subject matter experts will inform the Year 6 Triennial Synthesis Report.

1.2.3 Ecological Outcomes Analysis

Prior to year 7 of the Healthy Rivers and Landscapes Program, a report from the SWGC will be submitted to the State Water Board synthesizing the scientific data and information generated by the Science Program, primarily based on the Years 3 and 6 Triennial Reports. In addition to the submission to the State Water Board, the Ecological Outcomes Analysis will be peer reviewed. This peer review may take several forms, including as a series of published peer reviewed synthesis articles, similar to the State of the Bay-Delta Science collections published in the San Francisco Estuary and Watershed Science journal.

References

Delta Stewardship Council, Delta Science Program. 2019. Delta Science Plan: Vision, principles, and approaches for integrating and coordinating science in the Delta. Sacramento: State of California, USA. Available at https://deltacouncil.ca.gov/pdf/2019-delta-science-plan.pdf

Krueger KL, Bottom DL, Hood WG, Johnson GE, Jones KK, Thom RM. 2017. An expert panel process to evaluate habitat restoration actions in the Columbia River estuary. Journal of Environmental Management. 2017 Mar 1:188:337-350. https://doi.org/10.1016/j.jenvman.2016.11.028

National Academies of Sciences, Engineering, and Medicine. 2004. Strengthening Peer Review in Federal Agencies That Support Education Research. Washington, DC: The National Academies Press. https://doi.org/10.17226/11042.

Appendix D. Data Management in the Healthy River and Landscapes Program

Data collection for addressing hypotheses and information needs in the Science Plan, and the monitoring and assessments of Flow and Non-flow Measures will include a data management plan, which is a written document that describes the data that will be acquired or generated during the course of a project, how those data will be managed and stored, and what mechanisms will be used to share and archive the data. The Science Committee will produce a detailed data management plan within the first year of adoption of the Healthy Rivers and Landscapes Program (see Science Plan, section 4.3).

The implementing entity, in coordination with the Science Committee, is expected to use reproducible workflows (e.g., script-based analyses in R; documentation of coding or Quality Assurance procedures), follow FAIR (Findable, Accessible, Interoperable, Reusable) and CARE (Collective benefit, Authority to control, Responsibility, and Ethics) data principles, publish model code, and when applicable, publish journal articles using open-access services. Coordination with the Science Committee is intended to ensure consistency and increase the feasibility of system-wide analyses required for reporting.

1 Standards for Data Collection, Management, and Access, and Analysis

1.1 Standards for Data Collection

The Science Committee will collaboratively develop data collection standards, metadata procedures and monitoring protocols for each data type relevant to the Science Plan. Consistency in data collection and documentation will enhance trust and data quality, as well as address Healthy Rivers and Landscapes Program needs relative to the spatial scale of reporting requirements, timestep (weekly or daily) and pace of decision-making (e.g., increase efficiency and adaptability within the eight-year horizon). Addressing hypotheses in the Science Plan, meeting reporting requirements and within season resource allocation/adaptive decision-making (e.g., flow brackets in the Strategic Plan) will require quick access to data and data synthesis.

1.2 Standards for Data Management

Data management should be consistent with the following principles (adapted from the Delta Stewardship Council. 2024. Delta Research Awards: 2025 Proposal Solicitation Notice):

- Data are understandable to general users.
- Data are interoperable (machine readable).
- Standard data and metadata formats are used for similar data types.
- Quality Assurance/Quality Control (QA/QC) procedures are documented and followed.
- Appropriate steps have been taken to protect human subjects data (e.g., Institutional Review Boards, IRB review).
- For data based on or indigenous knowledge, the implementing entity will prepare a data sharing agreement that defines how results and deliverables will be used, in alignment with the CARE data principles, which respects the sovereignty of Tribes and does not disclose sensitive or confidential information.
- Open and transparent data and metadata are accessible to the public. All data generated are required to be made publicly accessible no later than one year after the end date, except where prohibited by law, regulation, or policy or security requirements.

Table 1: Available data management resources for use in implementing the above principles.

Data Management Resource	Description/Use	Relevant Templates/Additional Details
California Department of Fish and Wildlife's Minimum Data Standards	Minimum metadata requirements for creating metadata in ArcGIS ArcCatalog	Metadata Guidelines
Interagency Ecological Program Data Utilization Working Group	Recommending and implementing shared standards	Data Management Plan Template, Metadata template, Synthesis Data Management and QAQC guidelines, Publishing to EDI
Central Valley Project Improvement Act	Guidance for CVPIA funded and/or authorized work	Data Guidance and Assets, Monitoring Guidance
Spring-Run Juvenile Production Estimate (SR JPE)	Data management strategy for monitoring efforts and special studies to meet the data requirements for annual production of a SR JPE	Data Management Strategy for the Sprin-Run Chinook Salmon Juvenile Production Estimate (ca.gov)
California Water Quality Monitoring Council Data Management Workgroup	Data-sharing strategy to modernize public data distribution	Open Data Fact Sheet, Data Management Plan Fact Sheet
State Water Board Water Data Resources	Collection, storage, analysis, and communication of water data and information	Data Management Handbook, Open Data Handbook, Open Source Code Handbook

1.3 Standards for Data Access

Publication in public data repositories supports timely annual reporting. Public repositories allow implementing entities to provide open and accessible data, facilitating the development of automated data pipelines which integrate and align new data into the existing database. These data workflows then automatically integrate into models, forecasts and summaries as new data are collected and uploaded. Desirable features when selecting data publication portals include (adapted from the Data Management Strategy for the Sprin-Run Chinook Salmon Juvenile Production Estimate (ca.gov)):

- Data is publicly viewable, downloadable and machine-readable
- Metadata is publicly viewable, downloadable and machine-readable
- Repository has robust search and discovery

- Repository is accessible through a representational state transfer (REST) architectural style application programming interface (API) or query-able urls (web address or Uniform Resource Locator)
- Repository includes data access documentation
- Repository has an intuitive user interface

1.4 Standards for Integration and Analysis Methods

The Science Committee will develop, document and conduct robust analyses. Much of this has been outline in the Science Plan, including priority monitoring and information gaps and available analytical decision-making tools. The Science Committee's robust analyses process will involve; (1) stated hypotheses (see Science Plan, section 2), (2) the organization of available information (see Science Plan, section 3), (3) assessing the robustness and comparability of that information (both data and metadata), and (4) evaluating data quality by performing data diagnostics (such as methods in Zuur et al. 2010). The outcome of this process will be used to determine the most appropriate data integration approach and statistical technique(s). The data diagnostic, analysis selection and model testing procedures will be publicly available and clearly annotated with corresponding code. Derived data, produced through data integration, will be published according to the Standards for Data Access (section 1.1.3) and maintained by supporting documentation and reproducible functions.

The scope of the data integration and synthesis needs will be determined by the metric (Science Plan, Table 1) and tier (Science Plan, Figure 2) of hypotheses, but generally, will include a standardized way of organizing data tables that allows users to manage and analyze data efficiently, such as a straightforward way to understand the corresponding variable and observation of each value (e.g., a relational database). The synthesis of available data will follow the steps outlined by the Interagency Ecological Program (IEP) Synthesis Coordination Committee (Synthesis quality assurance and data management best practices) and will be made transparent with the Science Committee GitHub organization (https://github.com/Healthy-Rivers-and-Landscapes-Science) and data visualization platforms, such as Delta Science Program shiny apps. The GitHub repositories produced by the Science Program will remain 'public' and employ a 'pull request' framework for documenting and incorporating changes, such that any changes can be discussed and reviewed with collaborators, including the opportunity to add follow-up commits before changes are merged into the base branch. For elements that may not be well suited for GitHub, such as geospatial data and analysis, other platforms may be used to ensure the documentation and transparency of data integration and analysis methods.

References

Zuur, A.F., Ieno, E.N. and Elphick, C.S. 2010. A protocol for data exploration to avoid common statistical problems. Methods in Ecology and Evolution, 1: 3-14. https://doi.org/10.1111/j.2041-210X.2009.00001.x