2022 Scientific Consensus Statement | Process

Approach to the Development of Methods for the Synthesis of Evidence

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Citation

Pineda M-C, Waterhouse J, Richards R (2024) 2022 Scientific Consensus Statement: Approach to the Development of Methods for the Synthesis of Evidence. C_2O Consulting, Townsville, Queensland. 47pp.

The 2022 Scientific Consensus Statement was led and coordinated by C_2O Consulting coasts | climate | oceans.

Cover image: Mulgrave-Russell, Wet Tropics, Queensland.
Photo credit: Dieter Tracey

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1. Introduction

The 2022 Scientific Consensus Statement (SCS) brings together the latest scientific evidence to understand how land-based activities can influence water quality in the Great Barrier Reef (GBR), and how these influences can be managed to improve water quality outcomes for the GBR. The SCS is updated periodically and is used by policymakers as a foundational evidence-based document for making decisions about managing GBR water quality. It is one of several projects that provide supporting information for the design, delivery and implementation of the Australian and Queensland government's Reef 2050 Water Quality Improvement Plan (WQIP). The WQIP defines objectives and targets related to water quality improvement, identifies spatial management priorities and describes actions for improving the quality of the water that enters the GBR from the adjacent catchment area.

C_2O Consulting coasts|climate|oceans was engaged by the Australian Government (Department of Climate Change, Energy, the Environment and Water, DCCEEW) and Queensland Government (Department of Environment, Science and Innovation, DESI) to coordinate and deliver the 2022 SCS, supported by a multidisciplinary group of over 70 scientists with expertise in GBR water quality and evidence synthesis. An evidence synthesis expert (Evidentiary) was engaged to support the development and delivery of methods to synthesise the evidence. Oversight and quality assurance of the 2022 SCS process was provided by Australia's Chief Scientist. The Reef Water Quality Independent Science Panel (ISP) and the Reef 2050 Independent Expert Panel (IEP) had technical advisory (ISP and IEP) and review (ISP only) roles for specific steps in the process. Several expert working groups were established to support the development of methods to ensure best practice was followed for the synthesis of the evidence, peer review and consensus processes. Policy and management representatives and stakeholders, including the Reef 2050 Advisory Committee (RAC), were kept informed throughout the process.

The **primary outputs** of the 2022 SCS are shown in Figure 1 and are:

- The 2022 SCS Conclusions
- The 2022 SCS Summary
- The 2022 SCS Synthesis of the Evidence and high-level Evidence Statements.

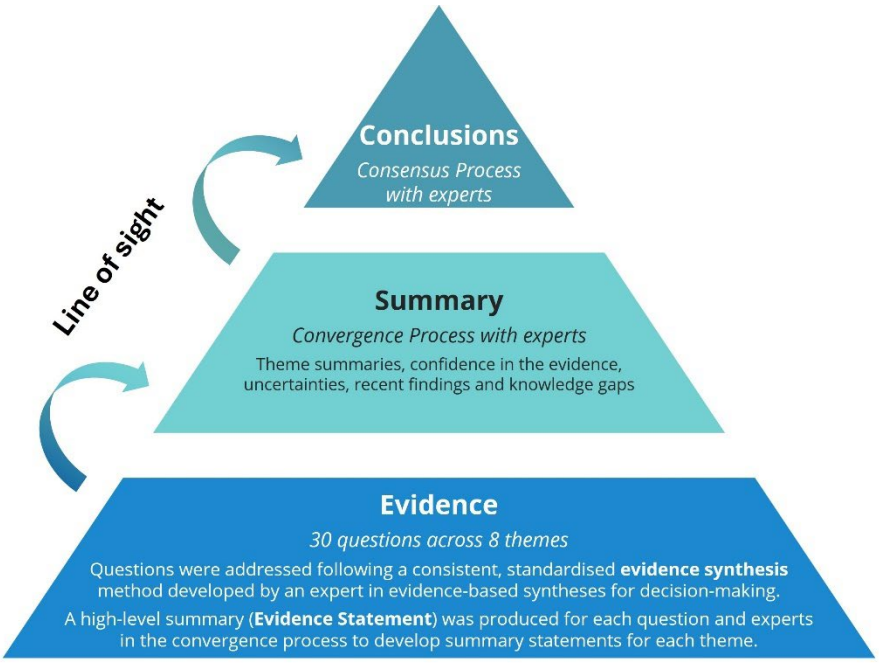

Figure 1. Main outputs and hierarchy of the 2022 Scientific Consensus Statement.

The **synthesis of evidence** is structured as a series of 30 questions about the influence of land-based runoff on the GBR, including the drivers, pressures and management responses. The Summary and Conclusions are higher-level documents aimed at a target audience of management and policy makers and provide the overarching summary and conclusions of the scientific findings developed through the synthesis of evidence, agreed by a range of experts.

Following a scoping exercise in 2021 (Thomas & Waterhouse, 2021), a number of key features required for the 2022 SCS were identified by policy and management representatives, scientific experts and potential additional users of the SCS. This included specific discussion of the approach to evidence synthesis and it was recommended that the 2022 SCS adopt '***a more systematic approach of evidence synthesis that minimises author bias, critically appraises quality and relevance of the evidence and provides an indication of confidence in the evidence'.***

The purpose of this document is to describe **the approach used to develop a fit for purpose method for synthesising the evidence for the 2022 SCS**. There is a Glossary at the end of this document to explain the terms used in the context of the 2022 SCS.

1.1 Summary of the process for developing the synthesis of evidence methods

An independent expert in evidence synthesis methods was appointed to lead the development of 'fit for purpose' methods for the 2022 SCS, supported by the SCS Coordination Team (C_2O Consulting). Development of the methods focused on: adopting best practice approaches using evidence that met a high scientific standard; broadening accessibility; increasing transparency and repeatability in the methods used to synthesise the evidence; minimising the potential for bias in the review and appraisal of the evidence; identifying an approach to assess and present a level of 'confidence' in the evidence; and evaluating the relevance of the evidence to the GBR at spatial and temporal scales. A Methods Working Group was established and provided input to the 2022 SCS Methods for the Synthesis of Evidence (hereafter referred to as 'synthesis method'). In addition, the DCCEEW and DESI Contract Managers were consulted throughout the process to ensure that the methods were fit for purpose and met the needs of the policy, management and other end users.

This iterative process resulted in the development of three initial synthesis methods that were subsequently refined to two synthesis methods – an Evidence Review and an Evidence Summary. The two methods were largely consistent with each other but differed in the level of appraisal required, reflecting end user needs and priorities. The draft synthesis methods were formally peer reviewed by three independent evidence synthesis experts working in environmental policy/management including two experts from international organisations. Following revisions by the SCS Coordination Team and evidence synthesis expert, the Methods Working Group **endorsed** the final methods. Once Lead Authors had been appointed and began working through the synthesis methods, additional minor refinements were required to clarify some sections and simplify the additional Quality Assurance step required for Evidence Reviews (see Table 1). These revisions were discussed and supported by Contract Managers, the ISP and the Methods Working Group. Authors were provided extensive training in the methods and offered ongoing support throughout the delivery process.

The steps to develop the methods are shown in Figure 2 and detailed in **Appendix 1**. The final method templates are presented in **Appendix 2 and 3**. The full 2022 Scientific Consensus Statement: Methods for the synthesis of evidence[1] document is available on the 2022 SCS website.

[1] Richards R, Pineda M-C, Sambrook K, Waterhouse J (2023) 2022 Scientific Consensus Statement: Methods for the Synthesis of Evidence. Published by C_2O Consulting, Townsville, Queensland. 52pp.

1.2 2022 SCS guiding principles

A set of guiding principles were developed that underpin the delivery and implementation of all aspects of the 2022 SCS process. These principles were supported and endorsed by a variety of audiences, stakeholders and end users including Australia's Chief Scientist, the ISP, IEP and the RAC. Steps to align the development of the method for the synthesis of evidence with the guiding principles are described below.

1. **Demonstrated independence from end users in the synthesis of the evidence and review of the outputs**.
   - Coordination by a non-governmental independent organisation, C_2O Consulting, with an independent evidence synthesis expert (Rob Richards, Evidentiary) appointed to develop the methods.
   - Policy and management representatives not involved in the evidence synthesis process, or review of the outputs.
2. **Increased transparency and robustness in design and delivery.**
   - The rationale for the approach and processes used within the method has been recorded in several documents including planning documents, guidelines, templates and this document.
   - Documentation of the evidence and the evidence management process is captured in three primary outputs:
     i. The methods and template document which covers each step of the evidence synthesis process.
     ii. The Data Extraction spreadsheet which is used to: 1) document the information extracted from each evidence item, and 2) generate the evidence synthesis.
     iii. A standardised reference database which is used to store all studies included in the synthesis.
   - The final methods were externally peer reviewed by three independent experts in evidence synthesis.
   - The final synthesis of the evidence is publicly available.
3. **Establish and use fit for purpose methods and processes, and engage fit for purpose people.**
   - The methods were derived from a combination of existing published methods and expert input and provide a consistent and robust approach to capturing the responses to questions using published, peer reviewed literature. The method description and the associated template ensure a standard and documented approach was used by all authors.
   - The methods adopted several criteria characteristic of formal Rapid Review approaches including: consideration of the 'confidence' required in the findings of the review; documentation and analysis of 'contextual variables' for relevant questions; the inclusion of a conceptual diagram/map/visual to frame the evidence search; synthesis and presentation; and the inclusion of an explicit method for assessing the spatial and temporal relevance of studies and the associated limitations in interpreting findings.
   - A modified approach of a single method was developed to meet two different levels of rigour in the reviews: the SCS Evidence Review and the SCS Evidence Summary.
4. **Minimise the potential for bias in reviewing outputs and synthesis.**
   - Processes to reduce the potential for author bias or perceived author bias in the SCS evidence synthesis methods included:
     - Implementation of a transparent and systematic search of online literature to avoid authors using their 'standard' sources of information.
     - Development of pre-defined search terms and search strings that were clearly documented and applied, and search results that were recorded in a consistent manner (template).

- As an additional quality check, authors went through several 'check points' during the process to enable the SCS Coordination Team to ensure the methods were being followed.
- The SCS Evidence Reviews had an additional quality assurance step which involved assessing the reliability of individual evidence items, by using a checklist of key areas of potential bias that can be found in studies.

5. **Assess and present levels of confidence in the evidence.**
   - Definition of a process to assess the concept of 'confidence in the body of evidence' that was achievable for authors within the time constraints using assessable criteria. The approach enabled a rapid assessment of these criteria by authors which was used to demonstrate the overall confidence in the body of evidence and included:
     - The relevance of individual studies (i.e., spatial, temporal and overall relevance of findings in relation to the SCS question being addressed).
     - The number and diversity of studies.
     - Consistency of findings within the body of evidence.
     - The quality of individual studies within the body of evidence (additional quality assurance step for SCS Evidence Reviews only).
6. **Ensure inclusive, genuine and timely engagement with end users, stakeholders, and audiences.**
   - Early and continued engagement with Contract Managers and policy teams to ensure the synthesis methods were fit for purpose and met their needs.
   - Engagement with the Methods Working Group and international peer reviewers to ensure the synthesis methods met international best practice for **rapid reviews**.
   - Engagement with Lead Authors and contributors of the 2022 SCS to ensure the applicability of the synthesis methods given the resources available, and to provide training and support through continued coordination, and question and answer sessions throughout the development of the syntheses.
7. **Improve accessibility to the science underpinning the SCS.**
   - The synthesis methods specify the use of peer reviewed and published studies as a core inclusion criterion. Non-peer reviewed material or material that was not accessible was not included.
   - While the synthesis methods were developed by an evidence synthesis expert, additional review of the documentation was undertaken to simplify the language and make it accessible to a wide audience. A glossary of terms used in the methods was developed and is located at the front of the Methods document (Richards et al., 2023).
   - All methods and reference material used to generate the 2022 SCS Synthesis of the Evidence are available on request. The completed 30 syntheses (populated templates) are publicly available.

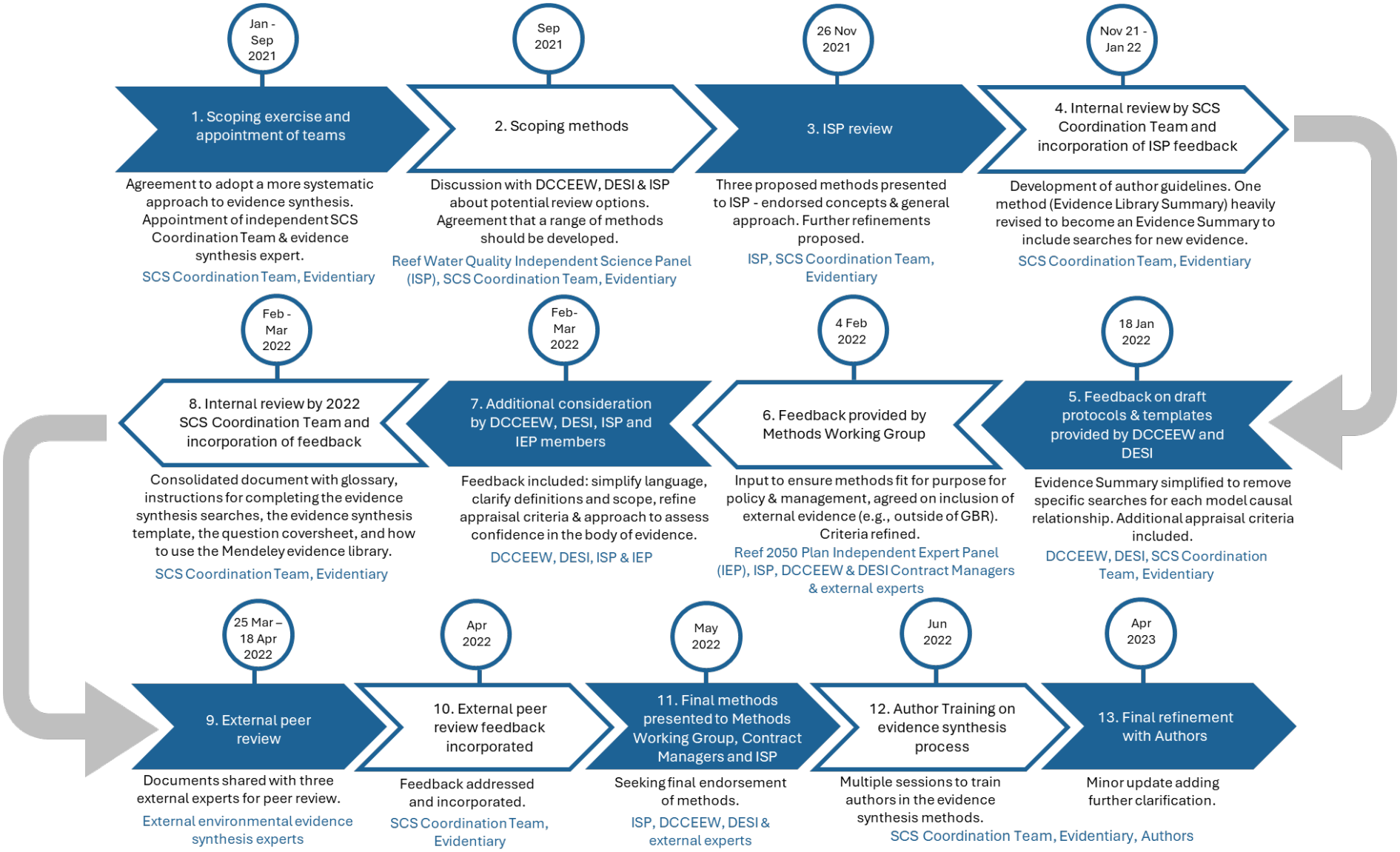

Figure 2. Steps involved in the development of the evidence synthesis methods for the 2022 SCS.

2. The 2022 SCS Methods for the Synthesis of Evidence

2.1 Scope of evidence synthesis needs for the 2022 SCS

The **2022 SCS methods for the synthesis of evidence** (hereafter referred to as the 'synthesis method') were developed to meet the following needs:

- Demonstrated independence from end users in the synthesis of the evidence.
- Increased **transparency** and robustness in the design and delivery of the synthesis process and evidence used.
- Establish and use **fit for purpose** and relevant methods for GBR policy and management, including in the context of the time and resource allocations.
- **Minimise the potential for bias** in the review and appraisal of evidence and synthesis of findings.
- Assess and present levels of '**confidence'** in the evidence.
- Evaluate the **relevance** of evidence, both spatially and temporally, to the GBR.
- Meet a **high scientific standard**, for example, through the use of peer reviewed published (publicly available) evidence.
- Instructions are **clear and can be interpreted** by authors and end users.

These principles were further developed into the set of guiding principles described in Section 1.3. The preparation of synthesis methods and outputs in accordance with these principles presented several challenges. In particular, the influence of land-based pollutants on GBR ecosystems is often described as a 'wicked problem'; that is, the problem is multi-faceted, with multiple stakeholders and governance groups (see Eberhard et al., 2017 for a description of GBR management as a wicked problem). As a result, the evidence required to manage degraded water quality in the GBR covers a broad scope and involves a range of scientific disciplines including chemical, physical, biological, ecological, and social sciences, as well as economics. This broad scope is also reflected in the Reef 2050 WQIP, for which the SCS provides the foundational scientific information base.

To define the scope of evidence required, a list of 30 questions was developed in consultation with policy and management representatives, scientific experts and stakeholders. This large scope presents a unique challenge in formal evidence synthesis practice, and therefore, in the development of methods to suit the process. In particular:

- The questions cover a range of topics that include environmental and social values, ecological condition, sources of pollutants, their impacts, and management. This requires evidence that covers multiple biophysical and social science disciplines.
- Scientific understanding is well developed for some topics, but newer and more limited for others.
- Some questions were considered high priority to aid decision-making while others were identified as necessary to provide foundational understanding and/or contextual information.
- Some questions were considered as high priority for stakeholders, but not necessarily for policy and management.
- The evidence for some questions is debated within the scientific community.
- The timeframes (initially approximately 12 months in total) and resources were based on past SCS iterations where topics were synthesised into four major chapters, using a narrative synthesis approach.
- There was interest in having a 'hierarchy' of rigour in the method (particularly the confidence assessment), that could be applied to individual questions depending on the policy needs.

2.2 Evidence synthesis options

Evidence review and synthesis methodology is increasingly used where science can inform decision making and has become a recognised standard for accessing, appraising and synthesising scientific information. **Evidence synthesis** is the process of identifying, compiling and combining relevant knowledge from multiple sources so it is readily available for decision makers (Pullin et al., 2016). It uses formal explicit and rigorous methods to examine what is and isn't known about a research question and is used to provide a statement about an evidence base (Gough et al., 2017).

To ensure that the synthesis process can provide a high level of confidence in the conclusions drawn, the method needs to adhere to clear standards on how evidence is collected, assessed and synthesised. These standards aim to reduce possible sources of bias in the selection of evidence and standardise how the evidence is treated in the synthesis process.

There are many forms of evidence synthesis that vary in their comprehensiveness and rigour. The most rigorous approach is a **Systematic Review**. A Systematic Review is a formal review of literature using systematic, explicit and accountable methods (Gough et al., 2017). The pre-defined methods are applied to a clearly defined question and require definition of inclusion and exclusion criteria, rigorous and systematic searches of the literature, critical appraisal of included studies, data extraction and management, analysis and interpretation of results and reporting for publication. The methods identify risks of bias in the evidence and minimise bias in the way evidence is identified and selected (Gough et al., 2017). However, Systematic Reviews are very resource intensive and can take years to complete.

In recent years there has been an emergence of evidence synthesis methods that still apply most of the same processes as Systematic Reviews but are conducted in a more timely and cost-effective manner. These systematic **Rapid Reviews** are designed to provide timely outputs that can be tailored to meet the specific needs of policy and management (Collins et al., 2015), however, there is no formally adopted definition or standard to conduct Rapid Reviews. The methods typically adopt similar principles to Systematic Reviews but have fewer or less intensive steps, for example, reduced search effort, adjustment of the rigour of the quality assessment, modification of the level of detail for data extraction and/or alterations to the documentation of the process. Rapid Reviews are a significant improvement from traditional narrative-based (non-systematic) reviews and provide standardised synthesis methods, minimise potential of bias in the selection of evidence, have defined methods to assess the level of confidence in the evidence base and can also be tailored to accommodate relatively short timeframes. Based on these characteristics, **a formal systematic Rapid Review methodology was recommended for the 2022 SCS.**

2.3 Characteristics of the synthesis methods

For the development of the methods, it was necessary to combine steps from different approaches to meet the specific needs of the 2022 SCS, but where possible, published definitions and methods were used and cited. In addition, where appropriate, some flexibility was built into the methods for authors to tailor the approach to meet certain question needs.

The 2022 SCS methods for the synthesis of evidence were supported by a Guide, the *'2022 Scientific Consensus Statement: Methods for the synthesis of evidence*' (Richards et al., 2023), containing detailed guidance and requirements for every step of the synthesis process.

Authors were asked to follow the methods to complete a standard template (the '2022 SCS Template for the synthesis of evidence', **Appendix 2**), and extract data from literature in a standardised way (using the 'Data Extraction & Appraisal spreadsheet, **Appendix 3**) to maximise transparency and ensure that a consistent approach was applied to all questions. Additionally, all evidence items were stored in a shared reference database.

Two **specifically defined Rapid Review methods** were developed: the **SCS Evidence Review** and the **SCS Evidence Summary**, with different levels of rigour in the search and quality assessment of evidence to address different policy and management priorities (Table 1). In summary:

- The **SCS Evidence Review** was assigned to those questions where policy and management indicated the highest priority and hence were seeking the highest confidence in the conclusions drawn from the evidence. It included an assessment of the reliability of all individual evidence items as an additional quality assurance step.
- The **SCS Evidence Summary** was used for all other questions, and whilst still providing a high level of confidence in the conclusions drawn, some constraints were applied to the searches and quality assessment of evidence.

Table 1. Summary of key characteristics for the 2022 Scientific Consensus Statement methods for the synthesis of evidence.

Criteria	Rapid Review Methods	
Method	**SCS Evidence Review**	**SCS Evidence Summary**
Primary purpose	To understand how something works (causality) and what contextual factors influence this. The synthesis of evidence is largely a qualitative narrative and presented with the aid of a visual framework such as a conceptual diagram as an evidence frame. Includes an assessment of the relevance, consistency and confidence of evidence and an additional quality assurance step (i.e., reliability) to assist policy and management decisions with some caveats on how the findings should be used.	To provide a structured summary of evidence for a specific question. The synthesis of evidence is largely a qualitative narrative and presented using a diagram or conceptual framework as an evidence frame where possible/relevant. Includes an assessment of the relevance, consistency and confidence of evidence to assist policy and management decisions with some caveats on how the findings should be used.
Question type most suited to approach *& Examples*	Variable – Descriptive (status and trend, spatial and temporal), Analytical (cause and effect, methods, economic) *3.2 What are the measured impacts of increased sediment and particulate nutrient loads on GBR ecosystems, what are the mechanism(s) for those impacts and where is there evidence of this occurring in the GBR?* *5.1 What is the spatial and temporal distribution of pesticides across GBR ecosystems, what are the (potential or observed) ecological impacts in these ecosystems and what evidence is there for pesticide risk??*	Variable – Descriptive (status and trend, spatial and temporal), Analytical (cause and effect, methods, economic) *1.2/1.3/2.1 What is the extent and condition of Great Barrier Reef ecosystems and what are the primary threats to their health?* *4.1 What is the spatial and temporal distribution of nutrients and associated indicators within the GBR?*
Transparency of process	Very high	High
Search strategy	2 peer reviewed publication databases + Google Scholar + additional expert input	2 peer reviewed publication databases + Google Scholar + additional expert input to

Criteria	Rapid Review Methods	
Method	**SCS Evidence Review**	**SCS Evidence Summary**
	to fill up gaps + stakeholder-suggested peer reviewed material if relevant. Limit searches to 1990 where possible. Searches external to the GBR if required, depending on the availability and consistency of GBR search findings.	fill up gaps + stakeholder-suggested peer reviewed material if relevant. Limit searches to 1990 where possible. Searches external to the GBR if required, depending on the availability and consistency of GBR search findings.
Rigour of approach	High Evidence Appraisal includes: - the relevance of studies - the consistency of the body of evidence - the quantity and diversity of studies - a confidence rating based on the above criteria - an additional quality assurance step (reliability of individual evidence items).	Medium-High Evidence Appraisal includes: - the relevance of studies - the consistency of the body of evidence - the quantity and diversity of studies - a confidence rating based on the above criteria.
How is conflicting evidence handled?	Narratively described and considered in the assessment of evidence consistency and the conclusions drawn.	Narratively described and considered in the assessment of evidence consistency and the conclusions drawn.
Published guidance	Drawn from several published methods.	Drawn from several published methods.
Author requirements	Preferably a scientist with direct experience in systematic style evidence synthesis and a lead expert in the primary field(s) of research relevant to the question.	Lead expert in the primary field(s) of research relevant to the question.
Effort to produce	Two authors including a lead author and contributing author. Consultation between authors to occur during the development of the search strategy, screening of evidence, data extraction and final report development. Consultation with SCS Coordination Team at “check points” indicated in the method and template. Peer review of final products (final report and data extraction spreadsheet). Initially estimated at 25–30 days to complete (although question dependent).	Two authors including a lead author and contributing author. Consultation between authors to occur during the development of the search strategy, screening of evidence, data extraction and final report development. Consultation with SCS Coordination Team at “check points” indicated in the method and template. Peer review of final products (final report and data extraction spreadsheet). Initially estimated at 15–20 days to complete (although question dependent).

2.4 Method development to meet the needs of policy and management

Table 2 explains how the methods address each of the needs of policy and management identified in Section 2.1. Note that these needs complement and expand on the guiding principles for the 2022 SCS listed in Section 1.3.

Table 2. High level explanation of how the synthesis methods and outcomes meet the needs described by policy and management. The table focuses primarily on the '2022 SCS: Methods for the synthesis of evidence' (the methods) and accompanying template, (the template) and the 'Data Extraction and Appraisal spreadsheet' (Data Extraction spreadsheet).

Policy needs	Considerations	Method response to meet policy needs and outcomes
Demonstrated **independence** from end users in the synthesis of the evidence	Independent coordination of the process for developing the evidence synthesis methods (in addition to delivery of the outcomes) was identified as an important characteristic in the SCS Planning Project 2021.	Coordination by an independent organisation, C_2O Consulting, with an independent evidence synthesis expert (Rob Richards, Evidentiary) appointed to develop the methods. Policy and management representatives not to be involved in the evidence synthesis process, or review of the outputs.
Increased **transparency** and robustness in the design and delivery of the synthesis process and evidence used	Transparency is important for demonstrating robustness and repeatability of the process. Transparency and repeatability come through documented methods that outline critical elements such as the search strategy, inclusion and exclusion criteria, quality assessment and how a body of evidence has been assessed to provide confidence in the conclusions drawn from it.	All methods and reference material used to generate the SCS 2022 Synthesis of Evidence will be available on request (upon completion of the process). The completed reviews (populated templates) are publicly available. The rationale for the approach and processes used within the method has been recorded in several documents including planning documents, guidelines, templates and this document. For example, the report by Thomas & Waterhouse (2021) states: "*The outcome should be a guidance document – either nomination of an existing reputable framework or a custom-built one – outlining the systematic processes of collating and screening the evidence as the minimum, along with systematic processes for evidence appraisal when required"* Documentation of the evidence and the evidence management process was captured in three primary outputs: (i) **The methods and template** document which covers each step of the evidence synthesis process including: • The primary question and its structured components (S/PICO type structure) • Where searches were conducted – which academic databases and search engines • Which organisational websites • What search terms and search strings were used • What the inclusion and exclusion criteria were • What the search results were – both in statistical summary form and recorded in the evidence library • How the relevance, consistency and confidence of evidence was determined • What the final body of evidence was that informed the review (ii) **The Data Extraction spreadsheet** which was used to: 1) document the information extracted from each evidence item, and 2) generate the evidence review. (iii) **A standardised reference database** which was used to store all studies included in the search and synthesis. The reference database being used is Mendeley and is already established with references from the 2008, 2013 and 2017 SCSs.
Establishes and uses **fit for purpose** and	The SCS captures the primary scientific evidence base relevant to the design and implementation of the Reef 2050 WQIP. This	Evidentiary recommended adoption of the principles of systematic Rapid Review methods to meet the needs of the questions in the SCS, with a modified approach of a

Policy needs	Considerations	Method response to meet policy needs and outcomes
relevant methods for GBR policy and management, including in the context of the time and resource allocations. ***Fit for purpose: Custom-built approach to meet needs of policy and management relevant to the SCS***	is a broad evidence base in terms of scope and coverage of disciplines. Existing and published systematic review methods do not meet the needs of this unique review requirement for the GBR. Therefore, it was necessary to develop methods that could achieve the desired outcomes expressed in 2022 SCS planning documents to meet the needs of policy and decision makers. Given that there is no published approach that specifically addresses these requirements, and in the context of the available resources, it was necessary to develop a fit for purpose approach to evidence synthesis for the 2022 SCS. This required knowledge of, and reference to, a very broad range of review approaches to select the most appropriate processes to meet these needs. The approach also needed to facilitate consistency between question responses, and integration of findings across questions and themes.	single method to meet two different levels of rigour in the reviews: the SCS Evidence Review and the SCS Evidence Summary. The SCS evidence synthesis methods were derived from a combination of existing published methods and expert input, and provided a consistent and robust approach to capturing the responses to questions using published literature. Specifically, the methods drew on processes from a number of approaches from Australia and the UK (Anderson et al., 2011; Collaboration for Environmental Evidence, 2013; Collins et al., 2015; Cook et al., 2017; Norton & Schofield, 2016; UK Department for International Development, 2014) and over 45 reviews completed between 2008–2021 by Environmental Evidence Australia Pty Ltd and Evidentiary Pty Ltd.
Fit for purpose: Adopts a range of criteria characteristic of formal evidence synthesis methods	Evidence synthesis is the process of identifying, compiling and combining relevant knowledge from multiple sources so it is readily available for decision makers (Pullin et al., 2016). Formal Rapid Review evidence synthesis methods were identified as the preferred process for the 2022 SCS on the basis that these methods: • Follow standardised and pre-defined methods and facilitate transparency, replicability, objectivity, reliability and reduced bias. • Aim to summarise, appraise, and communicate the results and implications of a body of primary research and information to support management decisions. • Can increase the explanatory power through combining findings from multiple studies. • Aim to minimise bias in the evidence and the process used to collect and synthesise evidence. • Can be in several forms.	In addition to offering the standard benefits of systematic Rapid Review methods (listed adjacent), the SCS evidence synthesis methods have adopted several criteria characteristic of formal Rapid Review approaches including: 1. Consideration of the 'confidence' required in the findings of the review (Cook et al., 2017). 2. Documentation and analysis of 'contextual variables' for relevant questions (Evidentiary, unpublished). 3. The inclusion of a conceptual diagram/map/visual to frame the evidence search, synthesis and presentation (Anderson et al., 2011; Norton & Schofield, 2016). 4. The inclusion of an explicit method for assessing the spatial and temporal relevance of studies and the associated limitations in interpreting findings (Collaboration for Environmental Evidence, 2013).

Policy needs	Considerations	Method response to meet policy needs and outcomes
Fit for purpose: To meet time and resource allocations	The SCS is being developed to support the review of the Reef 2050 WQIP, which is occurring in 2025. There was a period of approximately 16 months to complete the evidence synthesis, and associated Summary and Conclusions documents. The resource allocation also reflected this time restriction. The following specific considerations were relevant: • Contractual project milestone and deliverable dates. • Estimated time required to complete the two different review methods (see Table 3 for more details). • Total budget. • Cost allocation to each method based on estimated time for completion.	Several risks were identified in keeping with the time and resource considerations for the SCS: 1. With the number of questions to be answered, current allocations to complete the evidence synthesis might have to rely on in-kind contributions from authors. 2. The capacity of authors to complete the review within the given timeframe and collaborate with other experts. 3. The capacity of individual authors to understand and comply with the guidelines and templates. 4. The amount of evidence and the nature of the evidence (study type and quality) across most questions. These potential risks were addressed as much as possible within the methods by: 1. Iterative revision of the methods to simplify the process as much as possible without jeopardising the rigour and credibility of the methods. 2. Specification of capacity to meet timelines and collaboration in the selection criteria through the Author Selection Process. 3. Provision of clear guidance and instructions in the methods document. 4. Working with a sub-group of experts throughout the question setting process to remove the questions that were not answerable due to insufficient evidence in the application of the methods. 5. Establishment of 'check points' throughout the completion of the template to provide progressive review and input by the SCS Coordination Team and evidence synthesis expert.
Minimises the potential for bias in the appraisal of evidence and synthesis of findings.	Feedback from the SCS Planning Project 2021 identified some potential improvements for minimising bias in the process, both through adopting open and transparent processes for author selection (not covered here) but also in the evaluation of the evidence.	Several processes were incorporated to reduce the potential for author bias or perceived author bias in the SCS evidence synthesis methods: • Implementing a transparent and systematic search of online literature to avoid authors using their 'standard' sources of information. • Pre-defined search terms and search strings which are clearly documented and applied, and search results are recorded in a consistent manner (template). • As an additional quality check, several 'check points' were included in the template during the process to enable the SCS Coordination Team to ensure Authors were following the process specified in the methods. • The SCS Evidence Reviews had an additional quality assurance process which required the assessment of the reliability of individual evidence items, by using a checklist of key areas of potential bias that can be found in studies.
Assesses and presents levels of	Confidence relates to how well the findings can approximate the 'truth' and how transferable the findings are to a particular	For the SCS evidence synthesis, there were challenges in defining a process to assess the concept of 'confidence in

Policy needs	Considerations	Method response to meet policy needs and outcomes
'confidence' in the evidence.	context. It is important to know what the synthesised evidence will be used for, i.e., what decisions or actions will occur from the evidence and what the potential risks are from making a decision from weak, untrustworthy or low amounts of evidence, as this will influence the level of confidence required.	the body of evidence' that was achievable for authors within the time constraints. As a result, the concept of confidence in evidence was applied at the collective level to a body of evidence using assessable criteria such as relevance of studies to the question being addressed and consistency of the body of evidence. The selected approach enabled a rapid assessment of these criteria by authors which could be used to demonstrate the overall confidence in the body of evidence. The evidence appraisal included: • The relevance of individual studies (i.e. spatial, temporal and overall relevance of findings in relation to the SCS question being addressed). • The reliability of individual studies (additional quality assurance for SCS Evidence Reviews only). • The number and diversity of studies. • Consistency of findings within a body of evidence.
Evaluates the **relevance** of evidence, both spatially and temporally, to the GBR.	It is critical to spatially and temporally assess the relevance of the evidence given the large scale of the GBR, the high degree of regional variation in biophysical, social and economic characteristics and the breadth of studies available. The extrapolation (up scale or down scale) of individual studies or generalising the extent of a particular condition or circumstance, can present risks to the quality of the evidence base.	An explicit process was integrated into the SCS evidence synthesis methods to enable authors to assess the relevance of the evidence to their question in three areas: • Relevance of the study approach and results to the context of the question. • Spatial relevance of the study to the question. • Temporal relevance of the study to the question. These processes are transparent and documented in the template.
Meets a **high scientific standard.**	Previous SCSs have covered a very broad evidence base of independently peer reviewed research including biophysical science, governance, economic dimensions, social dimensions etc. In this context, peer review means: *Documents are reviewed by external independent experts and the feedback is addressed by the authors to generate a revised document. The document must also be publicly available.* Evidence items can vary from journal articles to technical reports.	The SCS evidence synthesis methods specified the use of **peer reviewed and published studies** as a core inclusion criterion. **Non-peer reviewed material was not included**. In keeping with this high standard of evidence, the development of the methods drew on published scientific methods, or processes within methods where available and appropriate (refer above). The method description and the associated template also ensured a standard and documented approach was used by all authors. The synthesis process also integrated points of testing the science to demonstrate the quality of the evidence. Firstly, in the assessment of 'reliability' of studies (i.e., did studies provide alternative explanations for outcomes) and secondly a discussion of the consistency of findings within the body of evidence.
Instructions are **clear and are able to be interpreted** by authors and end users.	The outputs of the SCS evidence synthesis will be used by a wide audience of policy, management and stakeholders. To assist in interpretation and application of the findings, consistent use of terms was requested by policy, management and the ISP. Adopting and communicating a common set of terms, phrases and definitions relevant to the approaches being developed was critical, especially given that there are very	While SCS evidence synthesis methods were developed by an evidence synthesis expert, additional review of the documentation was undertaken to simplify the language and make it accessible to a wide audience. A glossary of terms used in the methods has been developed and is located at the front of the methods document. Definitions have been provided for: • Bias • Body of evidence • Candidate studies

Policy needs	Considerations	Method response to meet policy needs and outcomes
	few agreed or standard published definitions in the literature.	• Confidence in the evidence • Consistency • Contextual variable (or effect modifier) • Diversity of study types ('Multiple lines of evidence') • Evidence and evidence item • Mendeley evidence library • S/PICO terms and variations • Quantity of evidence • Peer reviewed literature • Rapid Review • Relevance of evidence • Reliability of evidence • Search strategy • Synthesis • Systematic Review

2.5 Review of the synthesis methods

A small expert working group was established in February 2022 to provide input to the development of the draft synthesis methods prior to formal peer review by independent evidence synthesis experts. The Methods Working Group included members from ISP (Roger Shaw and Andrew Ash) and IEP (Kerrie Wilson[2]), and one independent expert with experience in previous SCS iterations (Britta Schaffelke, AIMS). Additional input from the DCCEEW and DESI Contract Managers was sought throughout the process to ensure that the methods were fit for purpose and met the needs of the policy, management and other end users.

The finalised methods were formally peer reviewed in April 2022 by three external evidence synthesis experts working in environmental policy/management (Professor Bob Pressey, Australia; Dr Neal Haddaway, Sweden; and Professor Mike Acreman, United Kingdom). A semi-structured peer review template, including general instructions and a package of supporting materials (see **Appendix 4**), was prepared by the SCS Coordination Team and shared with reviewers, who had three weeks to complete the review. The SCS Coordination Team and evidence synthesis expert considered all feedback provided and modified the methods accordingly. The Methods Working Group was responsible for **endorsing** final methods following peer review including evaluating whether the SCS Coordination Team had adequately addressed reviewer feedback (May 2022).

3. Implementation and delivery of the synthesis methods

3.1 Steps for delivering the synthesis of the evidence

Once the synthesis methods were finalised following the peer review process, Lead Authors started the evidence synthesis process, as per the following steps:

1. Initial discussions with Lead Authors to clarify questions including definitions required, key question emphasis, likely types and sources of evidence, approaches to handling the evidence appraisal and other requirements.
2. Formalisation of sub-contracts for individual Lead Authors and institutions.
3. Step-by-step online training sessions for Author Teams on evidence search and synthesis methods and completing templates.

[2] Kerrie Wilson's involvement in the IEP and Methods Working Group was in 2022, prior to her appointment as Queensland's Chief Scientist in November 2023.

4. Templates tailored to reflect specific question needs and discussed with Lead Authors, to specify: i) the relevance of a conceptual diagram, map or other visual tools; ii) the need for and the scope of external searches (i.e., studies from outside of the GBR) and justification; iii) specific key inclusion/exclusion criteria and evidence appraisal criteria relevant to the question.
5. Creation of Lead Author 'sub-groups' within Themes (i.e., values and threats to the GBR, sediments, nutrients, pesticides and other pollutants, human dimensions and emerging science) to allow for internal review processes, to minimise question overlap and to ensure efficiencies in the process. Meetings to coordinate related topics across Themes (e.g., pollutant transport, management practice effectiveness and costs) were also convened as needed.
6. Overall support from the SCS Coordination Team and the evidence synthesis expert to provide guidance throughout the drafting process, including regular meetings to coordinate Authors within the Themes, and fortnightly or monthly question and answer sessions to clarify methods, discuss and address common issues.
7. Authors developed conceptual diagrams to represent their specific questions. After internal review of the conceptual diagrams by the Lead Author's sub-group, all conceptual diagrams within a theme were reviewed by the SCS Coordination Team and validated by the independent evidence synthesis expert (Rob Richards, Evidentiary).
8. Authors defined the search strategy for their specific questions, followed by internal (sub-group) review. Further assistance or clarification was provided by the SCS Coordination Team if needed, before proceeding with the actual searches.
9. Authors carried out the searches and summarised the evidence to address the 2022 SCS questions. Draft evidence synthesis products (completed report based on template and Data Extraction & Appraisal Spreadsheet) were submitted for peer review.
10. Authors updated the Mendeley evidence library with all literature used to address their specific questions (or to provide the .bib or .ris files alternatively).
11. Peer review of all 2022 SCS syntheses. Authors addressed feedback and resubmitted revised materials (including detailed response of how the comments were addressed) to the Editorial Board for sign off.
12. SCS Coordination Team collated and prepared all peer reviewed outputs and submitted for endorsement by ISP.
13. Authors addressed any additional feedback from the ISP.

3.2 Approach to scientific consensus

Following completion of the syntheses of evidence, a consensus process was conducted to identify the points of scientific consensus agreed by experts across multiple fields of research and disciplines. The consensus process also highlighted the strength of the evidence, and areas where further knowledge was needed.

A parallel process to the development of the methods for the synthesis of evidence outlines the approach to the consensus process for the 2022 SCS (refer to Pineda & Waterhouse, 2024). The consensus process used the **Evidence Statements** that were developed as part of the synthesis of evidence for each question. These 1–2-page statements presented the summary of findings relevant to policy or management action along with supporting points and were prepared by the author teams with support from the SCS Coordination Team. The Evidence Statements are part of the method template (**Appendix 2**) and were reviewed as part of the external peer review process (refer to Sambrook & Waterhouse, 2024). Each Evidence Statement was also reviewed and endorsed by all members of the 2022 SCS Editorial Board. The ISP also reviewed these statements as part of their technical review role in the consensus process.

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Appendix 1: Key steps in the SCS Method Development

Table 3. Steps undertaken in the process of developing the 2022 SCS methods for the synthesis of evidence.

Steps	Description
1. Scoping Exercise (Jan – Sep 2021) (Thomas & Waterhouse, 2021) & appointment of teams	Specific discussion of the approach to evidence synthesis and recommended '***Adoption of a more systematic approach of evidence synthesis that minimises author bias, critically appraises quality and relevance of the evidence and provides an indication of confidence in the evidence'.*** Appointment of independent SCS Coordination Team and evidence synthesis expert.
2. ISP Workshop (24/09/21)	Rob Richards (Evidentiary) presented an overview on evidence synthesis methods and options to ISP. The idea of developing a range of approaches was suggested, based on specific policy needs (rigour, confidence, etc.). Proposed methods were: Eco Evidence, Rapid Review, Evidence Summary (to summarise only 'settled science' based in past SCSs), accompanied by the preparation of conceptual models and structure of the evidence base (Mendeley evidence library).
3. ISP Meeting (26/11/21)	ISP members were provided with an overview of the proposed methods (as above). Draft protocols and templates (working versions) for each method were submitted to ISP for feedback. ISP endorsed the concepts and general approach. The feedback provided by ISP contributed to refinement of the template for Rapid Reviews: i) conceptual model iterative development and internal review; ii) new definitions added; iii) inclusion of temporal relevance of evidence items during critical appraisal. The 'Evidence Library Summary template' (and mock example) was also discussed, although this method was later superseded (see next point) due to its limitations in minimising potential bias.
4. Internal review by 2022 SCS Coordination Team and incorporation of all feedback provided to date	'The Guide for undertaking a systematic search for evidence' was developed to use across all three methods. The 'Evidence Library Summary' method was replaced by the new 'Evidence Summary' method, to include searches for new evidence. The new 'Evidence Summary template' was developed, including steps to search evidence across the conceptual model relationships and the inclusion of contextual variables (i.e., effect modifiers) when required.
5. Feedback provided by DCCEEW and DESI (18/01/22)	DCCEEW and DESI provided additional feedback on the draft protocols and templates. Accordingly, the 'Evidence Summary template' was simplified to remove the specific searches for each model causal relationship. Additional appraisal criteria were included at this stage.
6. Feedback provided by Working Group (04/02/22)	A working group including representatives from the ISP, IEP and an external expert was established to further discuss key concepts and provide feedback on specific aspects of the Evidence Summary template, including on the strength of evidence required, need for inclusion of evidence outside of the GBR, and how to ensure the methods developed were 'fit for purpose' for the SCS and met the desired criteria (guided by policy and management), among others.
7. Additional consideration by DCCEEW, DESI, ISP and IEP members (21/02/22)	After incorporating previous feedback, the materials were presented again to DCCEEW and DESI to revisit policy priorities and the resources needed to meet them. Further feedback was received from ISP members Andrew Ash and Roger Shaw. Some of the feedback received included: 1) the need to simplify language and terminology to make the methods more accessible to non-technical audiences; 2) clarifications on the use of external evidence (optional, outside of GBR-based studies) and use of non-peer reviewed literature (excluded from scope); 3)

Steps	Description
	potential alternatives to the use of SICO/PICO tables for the search of evidence; 4) suggestions to modify the evidence appraisal criteria and communication of the overall level of confidence in the body of evidence across the different methods; and 5) some additional minor comments on the template.
8. Internal review by 2022 SCS Coordination Team and incorporation of all feedback provided to date	The SCS Coordination Team and evidence synthesis expert considered all feedback provided and modified the methods accordingly, where appropriate. As a result, a consolidated document was prepared with a new introduction, glossary, steps to perform the evidence synthesis searches, and specific instructions to complete the template (Methods Appendix 1), the Author Contribution (Methods Appendix 2) and on how to use the Mendeley evidence library for the purpose of the SCS (Methods Appendix 3). The need for the Eco Evidence method was reconsidered, as none of the questions suited to the requirements of the method. Hence, all questions were re-assigned to the two methods developed for the 2022 SCS (SCS Evidence Review and SCS Evidence Summary).
9. External peer-review (April 22)	The finalised methods were sent for external peer review to: 1) Professor Bob Pressey (Australia), 2) Dr Neal Haddaway (Sweden), and 3) Professor Mike Acreman (UK) for their expertise in the fields of evidence synthesis for environmental policy/management.
10. External peer-review feedback incorporated (May 22)	The SCS Coordination Team and evidence synthesis expert considered all feedback provided and modified the methods accordingly, where appropriate. Major changes to the methods based on external peer review included: • Term 'synthesis' removed from the final products and replaced by 'review' (SCS Evidence Review and SCS Evidence Summary). The overall approach is still called the 'synthesis of evidence' but it has been clarified that it uses **rapid review methods** and a **narrative synthesis** approach. • Section 3.4 changed from *Performing the searches* to *Eligibility and searching.* Inclusion/exclusion criteria for literature moved from Section 3.3 into this section. • Section 3.5 originally *Data extraction and appraisal* separated into two sections. Section 3.5 called *Data coding and extraction* and included new section on data coding. • Information on the *Evidence Appraisal* process was separated and moved to Section 3.6. • New section *Evidence Synthesis* (Section 4) added to describe the synthesis approach in more detail.
11. Final materials presented to the Methods Working Group, Contract Managers and ISP	Final methods presented to the 'Methods Working Group' to obtain final expert input on the responses to reviewers, to Contract Managers, and to ISP for endorsement.
12. Authors Training on the methods and synthesis process starts (May/October 22)	Author training on the SCS synthesis of evidence processes with sessions on the 26 and 31 May, and 21 June, for authors selected during the initial round of Expression of Interest. Subsequent training sessions were organised for authors selected through rounds two and three (September to October 2022).
13. Final refinement of Methods based on Authors feedback (Jan/Apr 23)	Minor changes adding further clarification in some sections and simplifying the Additional Quality Assurance step (for Evidence Reviews), following Authors feedback while completing the process. Final (updated) methods were discussed with Contract Managers and sent to the 'Methods Working Group' for endorsement.

2022 Scientific Consensus Statement: Synthesis of the evidence

Number and title of Question (for example.): 1.1 What are the ecological, social, cultural, economic and non-economic values of the Great Barrier Reef?

Author 1 (name and last name)[1], Author 2 (name and last name)[2], Author 3 (name and last name)[2]

[1]Affiliation 1, [2]Affiliation 2

Contents

Acknowledgements

Executive Summary (2-4 pages)

Question:

Question number and title

- (Secondary questions – where applicable)

Background

Summarise the background from Section 1.0 (in the Template), including what is the geographic scope and context of the question.

Methods

Summarise the methods from the Methods Section 2.0 (in the Template):

- A formal Rapid Review approach was used for the 2022 Scientific Consensus Statement (SCS) synthesis of evidence. Rapid Reviews are a systematic review with a simplification or omission of some steps to accommodate the time and resources available[3]. For the SCS, this applies to the search effort, quality appraisal of evidence and the amount of data extracted. The process has well-defined steps enabling 'fit for purpose evidence to be searched, retrieved, assessed and synthesised into final products to inform policy. For this question a <Evidence Summary/Evidence Review> method was used.
- Search locations were xxx.
- Main source of evidence: Studies undertaken in the GBR vs. studies undertaken in the GBR and external (and provide justification).
- Summary statistics of search results (total number of evidence items initially identified as relevant, *versus* number of items incorporated into the synthesis, etc.).

Method limitations and caveats to using this review

For this <Evidence Summary/Evidence Review>, the following caveats or limitations should be noted when applying the findings for policy or management purposes (for example, if applicable):

- Only studies written in English were included.
- Only two academic databases were searched.
- Only GBR derived studies were included.
- The review was restricted to peer reviewed journal publications as well as publications of the major government programs.
- Only studies published from 1990 onwards were included.
- Any other limitations/restrictions on the evidence used.

Key Findings

Summary of evidence to 2022

Provide a summary of key research findings to 2022 for the primary question (and secondary questions, if relevant) including describing the number of studies and the key contextual variables including climate change. Please dot point the key findings and then provide further detail under the dot points.

Recent findings 2016-2022

Provide a summary of any new research findings from 2016-2022 (since the last SCS) and what these new findings represent. Please dot point the key findings and then provide further detail under the dot points. Include a description of the number of studies and the key contextual variables (including climate change).

[3] Cook CN, Nichols SJ, Webb JA, Fuller RA, Richards RM (2017) Simplifying the selection of evidence synthesis methods to inform environmental decisions: A guide for decision makers and scientists. *Biological Conservation* 213: 135-145 https://doi.org/10.1016/j.biocon.2017.07.004

Significance for policy, practice, and research

Provide a summary of the significance of these findings for **GBR policy and management,** consider if/how these findings have added to or changed previous understandings, are they established or emerging, and what other considerations might be important (e.g. identified contextual variables).

Key uncertainties and/or limitations

Provide a summary of the key uncertainties and/or limitations in the evidence base that should be considered.

Evidence appraisal

Summarise overall evidence appraisal results (i.e. relevance, consistency, quantity and diversity of evidence), including the confidence level (from Table 8 in the template). For the SCS Evidence Reviews, the additional quality assurance results of the body of evidence should be included.

1.0 Background (1-2 pages)

Describe the background to the topic that the question relates to and describe why the topic is important in the context (including policy context) of water quality issues in the Great Barrier Reef and its management.

1.1 Question

To complete this section, refer to Section '**3.1 Define primary question elements**' above.

Primary question	
Secondary questions (where relevant)	

Brief description of Lead Author's **final interpretation of the question** (i.e. context, constraints, emphasis) informed by consultation feedback provided by the SCS Coordination Team from liaison with policy, management and stakeholder representatives, and your expert knowledge of the topic area.

Check point 1: Please check in with the SCS Coordination Team when you have finalised your proposed interpretation of the question.

1.2 Conceptual diagram/map or visual

To complete this section, refer to Section '**3.2 Conceptual diagram/map or visual**' in the Methods.

Paste your conceptual diagram/map or visual here and provide a general description on how it relates to the primary question and secondary questions. The diagram/map/visual must be reviewed and evaluated during the evidence review process and revised if necessary.

Figure 1. Conceptual Diagram legend.

1.3 Links to other questions

This synthesis of evidence addresses one of 30 questions that are being addressed as part of the 2022 SCS. The questions are organised into eight themes: values and threats, sediments and particulate nutrients, dissolved nutrients, pesticides, other pollutants, human dimensions, and future directions, that cover topics ranging from ecological processes, delivery and source, through to management options. As a result, many questions are closely linked, and the evidence presented may be directly relevant to parts of other questions. The relevant linkages for this question are identified in the text where applicable. The broad nature of this question links it to many other questions within the SCS but the primary question linkages are listed below.

Links to other related questions?	

Check point 2: It is important that the visual construct used is valid, appropriate, and agreed by expert peers. For this, and to minimise overlap between authors, consult with the lead author sub-group for your specific theme (as per Figure 2 in the Methods) as an internal review step. Once all individual draft diagrams have been reviewed and accepted within the authors sub-group, submit to the SCS Coordination Team for final discussion. As the models are being refined through the process, major revisions (if relevant) would have to be discussed within the sub-groups and with the SCS Coordination Team to ensure relevance and minimise overlap.

2.0 Method (3-4 pages)

A formal Rapid Review approach was used for the 2022 Scientific Consensus Statement (SCS) synthesis of evidence. Rapid Reviews are a systematic review with a simplification or omission of some steps to accommodate the time and resources available[4]. For the SCS, this applies to the search effort, quality appraisal of evidence and the amount of data extracted. The process has well-defined steps enabling fit for purpose evidence to be searched, retrieved, assessed and synthesised into final products to inform policy. For this question, an Evidence Summary method was used.

2.1 Primary question elements and description

To complete this section, refer to Section '**3.1 Define primary question elements'** above.

The primary question is: "XXXXXXX"

The secondary questions are (if relevant[5]): "XXXXXXX"

S/PICO frameworks (Subject/Population, Exposure/Intervention, Comparator, Outcome) can be used to break down the different elements of a question and help to define and refine the search process. The S/PICO structure is the most commonly used structure in formal evidence synthesis methods[6] but other variations are also available.

- **Subject/Population:** Who or what is being studied or what is the problem?
- **Intervention/exposure:** Proposed management regime, policy, action or the environmental variable to which the subject populations are exposed.
- **Comparator**: What is the intervention/exposure compared to (e.g., other interventions, no intervention, etc.)? This could also include a time comparator as in 'before or after' treatment or exposure. If no comparison was applicable, this component did not need to be addressed.
- **Outcome:** What are the outcomes relevant to the question resulting from the intervention or exposure?

Table 1. Description of question elements for Question <x.x>.

Question S/PICO elements	Question term	Description
Subject/Population		
Intervention, exposure & qualifiers		
Comparator (if relevant)		
Outcome & outcome qualifiers		

Table 2. Definitions for terms used in Question <x.x>.

Definitions	
Term 1	Definition
Term 2	Definition
Term 3	Definition

[4] Cook CN, Nichols SJ, Webb JA, Fuller RA, Richards RM (2017) Simplifying the selection of evidence synthesis methods to inform environmental decisions: A guide for decision makers and scientists. *Biological Conservation* 213: 135-145 https://doi.org/10.1016/j.biocon.2017.07.004

[5] Secondary questions were formally defined as part of the 2022 SCS Question Setting process.

[6] https://libguides.jcu.edu.au/systematic-review/define and https://guides.library.cornell.edu/evidence-synthesis/research-question

2.2 Search and eligibility

To complete this section, refer to Section '**3.3 Search strategy**' and '**3.4 Eligibility and Searching'** above.

The Method includes a systematic literature search with well-defined inclusion and exclusion criteria.

Identifying eligible literature for use in the synthesis was a two-step process:

1. Results from the literature searches were screened against strict inclusion and exclusion criteria at the title and abstract review stage (initial screening). Literature that passed this initial screening step were then read in full to determine their eligibility for use in the synthesis of evidence.
2. Information was extracted from each of the eligible papers using a data extraction spreadsheet template. This included information that would enable the relevance (including spatial and temporal), consistency, quantity, and diversity of the studies to be assessed.

a) Search locations

Searches were performed in:

- (Insert your selected academic database(s))
- (Google Scholar)
- (Insert any additional databases or sources)

b) Search terms

Table 3 shows a list of the search terms used to conduct the online searches.

Table 3. Search terms for S/PICO elements of Question <x.x>.

Question element	Search terms
Subject/Population	
Exposure or Intervention	
Comparator (if relevant)	
Outcome	

c) Search strings

Table 4 shows a list of the search strings used to conduct the online searches.

Table 4. Search strings used for electronic searches for Question <x.x>.

Search strings

d) Inclusion and exclusion criteria

Table 5 shows a list of the inclusion and exclusion criteria used for accepting or rejecting evidence items.

Table 5. Inclusion and exclusion criteria for Question <x.x> applied to the search returns.

Question element	Inclusion	Exclusion
Subject/Population		
Exposure or Intervention		
Comparator (if relevant)		
Outcome		
Language		
Study type		

Check point 3: Once authors have defined search terms, search strings and inclusion/exclusion criteria (and after an initial test to ensure they are effective), internal consultation must be done with the lead author sub-group within each theme. Authors could also check with the SCS Coordination Team if further assistance is needed in optimising the search strategy.

At this stage, refer to the information above to complete Sections '**3.4 Eligibility and searching'**, '**3.5 Data coding and extraction' and '3.6 Evidence appraisal'** before proceeding with the template.

3.0 Search Results (2 pages)

To complete this section, refer to Sections '**3.4 Eligibility and Searching'** above and the '**Data Extraction & Appraisal**' spreadsheet.

A total of xx studies were identified through online searches for peer reviewed and published literature. xx studies were identified manually through expert contact and personal collection, which represented a xx% of the total evidence. xx studies were eligible for inclusion in the synthesis of evidence (Table 6) (Figure 2). xx studies were unobtainable.

Table 6. Search results table, separated by A) Academic databases, B) Search engines and C) Manual searches. The search results for A and B are provided in the format X (Z) of Y, where: X (number of relevant evidence items retained); Y (total number of search returns or hits); and Z (number of relevant returns that had already been found in previous searches).

Date /time	Search strings	Sources	
A) Academic databases		Database 1	Database 2
	Search string 1: (wetland OR floodplain OR riparian OR pond) AND (constructed OR rehabilitated OR artificial) AND (nutrient OR sediment OR pesticide OR herbicide OR insecticide OR fungicide) AND (removal OR retention OR trap OR 'water quality')	*50 of 1,320*	*22 (8) of 985*
	Search string 2		
	Search string 3		
B) Search engines (e.g. Google Scholar)			
	Search string 1: (wetland OR floodplain) AND (tropical OR "sub-tropical") AND (constructed OR artificial) AND (nutrient) AND (removal OR retention) AND 'water quality'	*64 of 28,240 (first 250)*	
	Search string 2		
	Search string 3		
	Total items online searches	*xxx (xx %)*	
C) Manual search			
Date/time	Source	Number of items added	
	(e.g. author personal collection)		
	(e.g. Mendeley – SCS database)		
	Total items manual searches	*xx (xx %)*	

Please add new lines for separate search strings.

Comment on any relevant points of note experienced during the search including the effectiveness of particular search strings or the way the search was conducted.

Complete Figure 2 with the final search results.

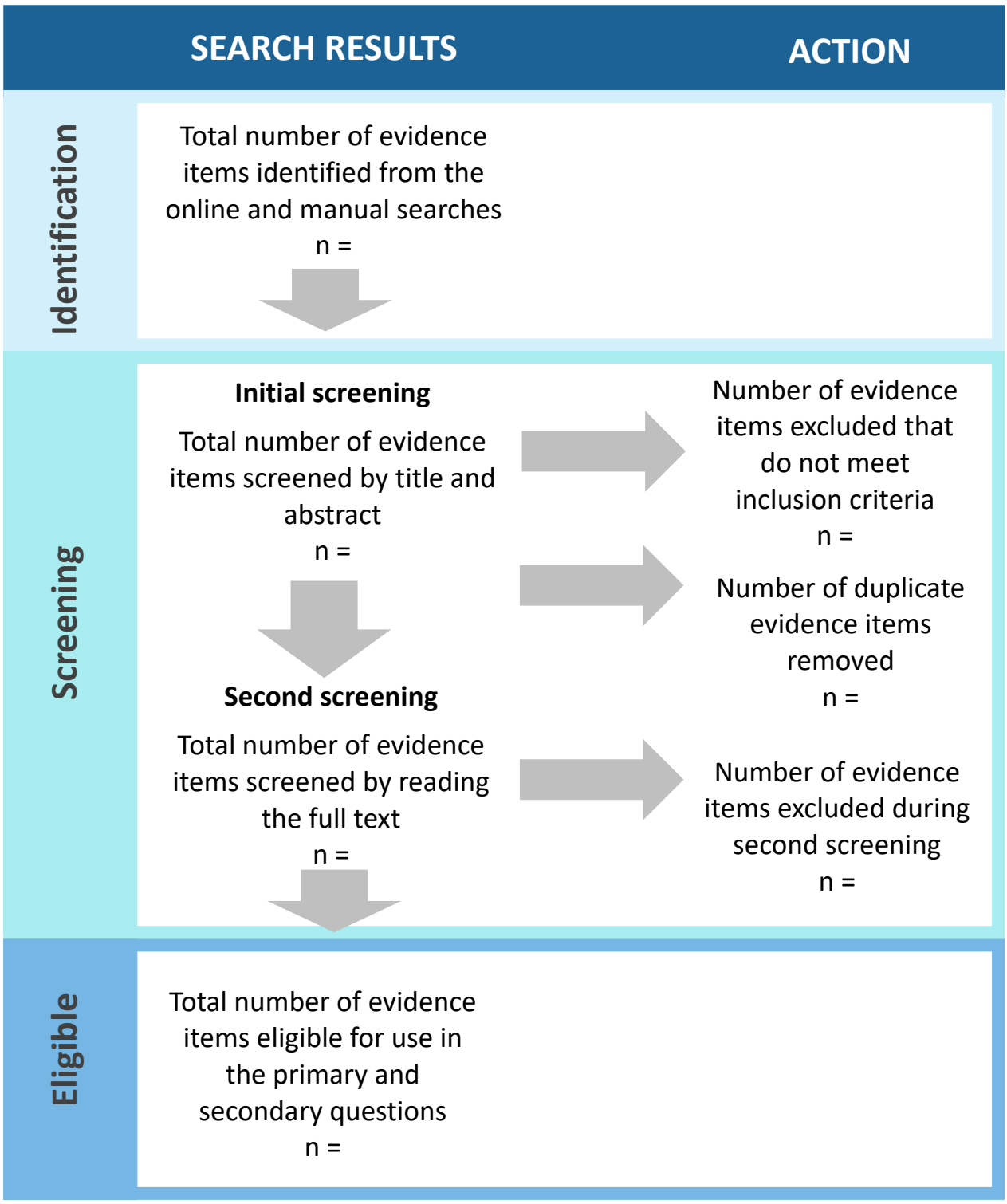


Figure 2. Flow chart of results of screening and assessing all search results for Question <x.x>.

<u>Check point 4:</u> The SCS Coordination Team can assist authors through the evidence appraisal process to ensure the appropriate indicators/rating systems are selected and to discuss the validity of the confidence matrix based on the specifics of the question. Once Authors have conducted the searches, screening, data extraction and evidence appraisal, contact the SCS Coordination Team to validate the process.

4. Key Findings (4-10 pages)

This section relates to the information and evidence extracted from the final list of studies (body of evidence) that will be used to answer the primary and secondary questions. To complete this section, refer to Section '**3.5 Data coding and extraction', '3.6 Evidence appraisal' and '4 Evidence synthesis'** above and the '**Data Extraction & Appraisal**' spreadsheet.

A worked exampled for this section (narrative synthesis) has been prepared for the 2022 SCS and is accessible here.

4.1 Narrative synthesis

The narrative synthesis of evidence will be conducted using guidance provided in Section 4 noting that there will be variation in the approach used between questions. The SCS Coordination Team can also provide support if required.

The sub-headings below (4.1.0 to 4.1.5) have been provided to guide the structure of the synthesis, as part of the worked example and the revised template (v1.4), noting that the content they cover was already included as dot points in previous versions of the template. For additional information, refer to Section 4.3 in the Methods document.

A summary of this section will be used in the Executive Summary.

4.1.0 Summary of Study Characteristics

Based on information collected in the Data Extraction spreadsheet, describe the key characteristics of the evidence base. This may include information such as:

- The total number of studies included in the synthesis.
- A breakdown of study designs.
- A breakdown of locations of studies (countries if international studies were used).
- Other key characteristics relating to the question (i.e. ecosystem types, land use types, management practice types, impact types etc).

The support of tables is an effective way of representing this information.

4.1.1 Summary of evidence to 2022

Description of key findings in relation to the conceptual diagram/visual in Section 1.2, including synthesis of secondary questions (if relevant). Sub-headings can be added to this section if required. It mat also include:

- A description of the underpinning processes and contextual variables where relevant to the question.
- Trends or patterns in observed outcomes or effects.
- Consistencies or heterogeneity between study findings and reasons why.
- Synthesis of secondary questions (if relevant).

4.1.2 Recent findings 2016-2022 (since the 2017 SCS)

Summary of findings from the period 2016-2022.

4.1.3 Key conclusions

Succint conclusions (i.e. dot points) that will form the basis of the Evidence Statements (Section 5). Include dot points for all components of the question (e.g. land use, ecosystem type, etc.) and/or sub-questions.

4.1.4 Significance of findings for policy, management and practice (if applicable)

Consider if/how these findings have added to or changed previous understandings, and are they established or emerging. This section does not aim to provide policy prescriptions but evidence-based findings directly relevant to policy and decision making.

4.1.5 Uncertainties and/or limitations of the evidence

Consider any uncertainties or limitations of the body of evidence.

4.2 Contextual variables influencing outcomes

Provide a few key referenced points summarising the influence of each contextual variable (**including climate change or climate variability** and episodic events) on the question outcomes or causal relationships. This may include site *in situ* factors (biophysical or human) or other external variables.

Table 7. Summary of contextual variables for your specific question (and secondary questions, if relevant).

Contextual variables	Influence on question outcome or relationships (referenced)
Climate change (or climate variability)	

4.3 Evidence appraisal

Relevance

Make a statement for all aspects of the relevance being assessed, and for the overall relevance of studies used to answer the question including any limitations (e.g. study approach/results relevance to the question, spatial or temporal relevance to the question).

For example: The relevance of the overall body of evidence was High. The relevance of each individual indicator was High for relevance of the study approach and reporting of results to the question, High for spatial relevance to the question, and Moderate for temporal relevance to the question. Of the 25 articles included in the review of <primary question>, all were given a 'High score for overall relevance to the question, while 20% (5 of 25) had a Moderate spatial relevance score, and 80% (20 of 25) had a 'Moderate temporal relevance score. In the context of this question, this means that… (e.g. explain caveats around the extrapolation of temporal results and the limitations of the evidence).

Consistency, Quantity and Diversity

Make a brief statement of the overall consistency, quantity and diversity of the body of evidence used to answer the question including any limitations or highlights, such as inconsistent/consistent findings, reduced/high number of studies or limited/good representation of study types.

For example, a high number of modelled or laboratory studies may impose some limitations regarding the application of results to 'in field' contexts (obviously depending on the question).

For example: Twenty-five studies were used as evidence for the primary question. This is considered to be a Moderate representative sample of studies (from the total pool of available evidence) in answering the question. The body of evidence used represents multiple lines of evidence ('experimental', 'observational' and 'modelling' study types), with High consistency based on the agreement of findings within the studies.

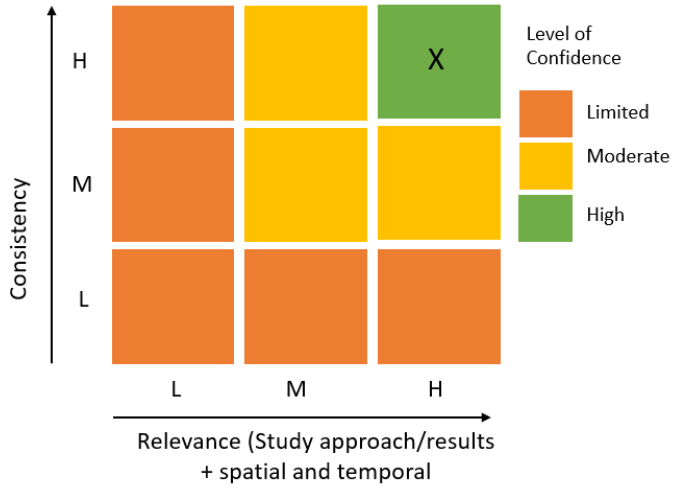
Additional Quality Assurance (Reliability) [SCS Evidence Review method only]

Provide a brief narrative description about the overall reliability of studies (i.e. number of studies that raised authors' concerns in relation to the quality of the study in regards to any obvious potential biases in the experimental design, conclusions drawn or other aspects of the study that may cause the study findings to be unreliable) and a brief justification if relevant. Indicate as well how the assessment of reliability of studies may have influenced the emphasis authors have placed on more 'reliable' studies than others. Add a brief summary on this additional quality assurance step in the final row of the appraisal summary table below (Table 8) for the questions using the SCS Evidence Review method.

Confidence

Describe the overall confidence in the body of evidence used to answer the primary question (and secondary questions if appropriate) using the evidence appraisal results (i.e. relevance, consistency, quantity and diversity of evidence) and the (prototype) confidence matrix (Table 8).

Table 8. Summary of results for the evidence appraisal of the whole body of evidence used in addressing Question <x.x>. The overall measure of Confidence (i.e. Limited, Moderate and High) is represented by a matrix encompassing overall relevance and consistency. The final row summarises the additional quality assurance step needed for questions using the SCS Evidence Review method.

<table>
<tr><th>Indicator</th><th>Rating</th><th>Overall measure of Confidence</th></tr>
<tr><td>Relevance (overall)</td><td>L/M/H</td><td rowspan="6">Insert final matrix. For example:
 
</td></tr>
<tr><td>-To the Question</td><td>L/M/H</td></tr>
<tr><td>-Spatial</td><td>L/M/H (or N/A)</td></tr>
<tr><td>-Temporal</td><td>L/M/H (or N/A)</td></tr>
<tr><td>Consistency</td><td>L/M/H</td></tr>
<tr><td>Quantity</td><td>L/M/H
(relative to the nature of the question; add total number of items for context)</td></tr>
<tr><td>Diversity</td><td>L/M/H
(relative to the nature of the question; add proportion of main study types)</td></tr>
<tr><td>Additional QA (Reliability)
[SCS Evidence Reviews only]</td><td colspan="2">Narrative of reliability, for example:
Of the xxx studies reviewed, there were concerns regarding the reliability of xx studies (xx%) to address the question.
The common causes of reliability concerns were due to xx (e.g. biases, lack of model validation)..
Studies with reliability concerns were identified during the synthesis stage, with less emphasis being placed on those findings.</td></tr>
</table>

4.4 Indigenous engagement/participation within the body of evidence

Describe the level of Indigenous engagement and/or direct participation within the body of evidence.

4.5 Knowledge gaps

Describe any key research gaps and what the potential outcomes could be for policy/management if these research gaps were addressed. Knowledge gaps can be identified by authors for the full body of evidence for a question (not for individual studies).

Table 9. Summary of knowledge gaps for Question <x.x>.

Gap in knowledge (based on what is presented in Section 4.1)	Possible research or Monitoring & Evaluation (M&E) question to be addressed	Potential outcome or Impact for management if addressed

5. Evidence Statements (1 page)

Based on the outcome of this evidence review and your expertise, suggest a key evidence statement that summarises the question (plus key supporting points), to be considered in the preparation of the 2022 SCS Conclusions and overall points of consensus. If the question has multiple elements (i.e. secondary questions, ecosystems or land uses), include one key supporting point for each element.

Use the following **syntax** to create the Evidence Statement and key supporting points:

Evidence Statement:

The synthesis of the evidence for **Question <x.x>** was based on <number of studies>, undertaken in <location of studies used> and published between <period of studies used>. The synthesis includes a <*Diversity rating*> diversity of study types (<type of studies used / lines of evidence>), and has a <*Confidence rating*> confidence rating (based on <*Consistency rating*> consistency and <*overall Relevance rating*> overall relevance of studies).

Summary findings relevant to policy or management action

<summary of finding addressing the question>.

Supporting points

- <Points to substantiate text above, covering variability relevant to policy and management such as between regions, land uses, ecosystems and reference to multiple lines of evidence >
- <Point of key recent findings/new knowledge, if applicable>

<u>Check point 5:</u> The SCS Coordination Team can assist authors through the narrative synthesis section (Section 4) and preparation of Evidence Statements (Section 5), to ensure the appropriate narrative synthesis approaches are selected and that the Evidence Statements address the question and provide the right level of detail. Once these sections have been completed, authors should contact the SCS Coordination Team to validate the process.

6. References

Send a .ris or .bib file with all final references used in the synthesis to the SCS Coordination Team so they can be introduced into the Mendeley library.

Insert final reference list using Mendeley (or another reference manager) to ensure correct formatting.

Appendix: 2022 Scientific Consensus Statement author contributions to the Question <x.x>

Theme xx

Question <x.x> *Insert question number and title*

Author team

List all contributing authors, their expertise and the section/topics to which they have contributed.

Name	Organization	Expertise	Role in addressing the Question	Sections/Topics involved
1.			*e.g. Lead Author*	*e.g. All Sections*
2.			*e.g. Contributor*	*e.g. Searches and data extraction*
3.			*e.g. Expert advice (wetlands)*	*e.g. Conceptual model, wetlands section within the narrative synthesis and final revision of overall report*
4.				

Appendix 3: 2022 SCS Data Extraction & Appraisal Spreadsheet

Sheet: How to Use

	A	B
1	**Guidance for completing each sheet**	
2	Examples or tips are given in blue text	
3		
4		
5	**1.Data Extraction**	
6	This data will be used to assist you to populate Sections 4.1, 4.2, 4.3 and the Executive Summary of the template.	
7	**Individual study information** - this is information taken from each individual study that will be summarised in answering Section 4 of the template. The individual fields of information to be extracted will be based on each specific question. -To be tailored with the SCS Coordination Team as part of Check point 1	
8	When extracting key findings of evidence items, use **verbatim copies** (e.g. copying directly from the abstract) if possible to minimise the bias risk associated with personal interpretations of findings.	
9	**Other individual study information** - Information on contextual variables, knowledge gaps and indigenous involvement (if available) should be extracted from individual studies and will be summarised in answering	
10	**Summary information** - These information fields are a summary of all the studies used (Column A) and will be directly transferable to Section 4 of the template. If it helps, notes for individual studies can be placed in these cells to assist in developing the summary after all studies have been added.	
11		
12	**2.Evidence Appraisal**	
13	This data will be used to populate Section 4.4 and the Executive Summary of the template	
14	The list of references (Column A) will be the same as for the Data Extraction sheet	
15	level. Make sure to update/drag formulas if adding/deleting rows.	
16	**Body of evidence** -	
17	This will be your summary of the quantity, diversity and consistency from all the evidence and your assessment of the overall confidence rating for the evidence (see Section 3.6 of the Methods document). The confidence rating for the body of evidence will be used to assist in completing Section 4 of the template.	
18	**Additional Quality Assurance (i.e. Reliability) (for SCS Evidence Reviews only)**	
19	Columns B and C are to be used to record any key biases or limitations that would influence the reliability/quality of the study findings. Select ONLY if serious concerns are raised, but leave blank otherwise. These are part of the additional quality assurance step (for SCS Evidence Reviews only), to accompany the overall confidence rating (see Section 3.6 of the Methods document).	
20		
21		
22	**3.Studies excluded**	
23	This sheet is to record any studies, that after full text assessment are rejected based on your exclusion criteria (Section 3.4.2 and Table 4) or other reasons why you think that the study is not eligible for inclusion (e.g. a very low reliability due to multiple major biases identified during the appraisal stage).	
24		

Sheet: 0. Consistency Checks

	A	B	C
1	**Authors consistency checking** **Registry of disagreements and how they've been resolved between authors**		
2	**Reference (Author, date)**	**Disagreement**	**Resolution / Agreed Criteria**
3	**Initial Screening**		
4	Smith et al 2022	Author 1 would exclude based on exclusion criteria xxx, or other potetnial biases but author 2 considers it should pass initial screening	Both authors clarify the meaning of exlcusion criteria xx or other potential biases and decide to exlcude the item
5	Author, date		
6	Author, date		
7	Author, date		
8	Author, date		
9	Author, date		
10	Author, date		
11	Author, date		
12	Author, date		
13	Author, date		
14	Author, date		
15	Author, date		
16	Author, date		
17	Author, date		
18	Author, date		
19	Author, date		
20	Author, date		
21	Author, date		
22			
23			
24			
25	**Second Screening**		
26	Author, date		
27	Author, date		
28	Author, date		
29	Author, date		
30	Author, date		
31	Author, date		
32	Author, date		
33	Author, date		
34	Author, date		
35	Author, date		
36	Author, date		
37	Author, date		
38	Author, date		
39	Author, date		
40	Author, date		
41	Author, date		
42	Author, date		

Sheet: 1. Data Extraction

	A	B	C	D	E	F	G	H	I	J	K
1	**Primary question:** What is the effectiveness of restoration works (riparian and streambank) in reducing sediment and particulate nutrient loss from GBR catchments, does this vary spatially or in different climatic conditions?							**2022 Scientific Consensus Statement - Data extraction**			
2		**Individual study information**						**Other individual study information**			
3	**Reference (Author, date)**	**Study name and location** *(country, region, site)*	**Lat/long** *(if provided)*	**Primary study type** *(observational, experimental, modelled) or Secondary study (review, theoretical or conceptual*	**Question need 1** *(use verbatim text where possible)*	**Question need 2** *(use verbatim text where possible)*	**Question need 3** *(use verbatim text where possible)*	**Contextual variables observed** *(including climate change variables)*	**Indigenous participation** *(Yes/No, and provide a comment about it)*	**Any potential new monitoring and evaluation indicators identified**	**Any knowledge gaps or uncertainities identified**
4	Smith et al 2022	Location in GBR (used to answer if there is variation across space)		Observational design using 15 sites across 5 locations.	Type of riparian or streambank restoration works undertaken	Study results - effectiveness in reducing sediment and/or particulate nutrients (statistics and/or narrative description)	Climatic conditions	What variables were observed to influence the effectiveness of restoration works?			
5	Author, date										
6	Author, date										
7	Author, date										
8	Author, date										
9	Author, date										
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11	Author, date										
12	Author, date										
13	Author, date										
14	Author, date										
15	Author, date										
16	Author, date										
17	Author, date										
18	Author, date										
19	Author, date										
20	Author, date										
21	Author, date										
22											

Sheet: 2. Evidence Appraisal

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1		**2022 Scientific Consensus Statement Evidence Appraisal**																	
2		Individual Studies								Body of evidence				Body of evidence (all studies)					
3	Primary question: *What impact does fluvial sediment have*	**Additional Quality Assurance**		Relevance of studies										Quantity	Diversity	Consistency		Confidence	
4	**Reference (Author, d**	**Rating** - No concerns, some concerns, Exclude (sufficient concerns to exclude)	**Justification** (required if orange or red)	**Relevance of the study approach/ reporting of results to the primary question**	**Rating 1-Low 2-Mod 3-High**	**Spatial generalizability of the study to the primary question (if relevant)**	**Rating 1-Low 2-Mod 3-High N/A -not relevant**	**Temporal generalizability of the study to the primary question (if relevant)**	**Rating 1-Low 2-Mod 3-High N/A - not relevant**	**nce to the Q (body of evidence)** 1-Low 2-Mod 3-High	**Relevance (body of evidence)** 1-Low 2-Mod 3-High	**al Relevance (body of evidence)** 1-Low 2-Mod	**evidence)*** Low: 1-3 Mod: 4-6 High: 7-9 *Categories to be adjusted if spatial/temporal relevance does not apply to the Q (e.g. Low 1-2, Mod 3-4, High 5-6)	*[ANMH based on author expertise; plus narrative]*	*[Based in column "Primary Study Type" from "1.Data extraction" tab] [ANMH based on author expertise; plus narrative]*	*[Transferred from column "Consistency of findings" in "1.Data Extraction" tab]*	**Rating** High (Consistent) Med (Mixed) Low (Inconsistent/Emerging evidence)		**Rating** High confidence Moderate confidence Limited confidence
5	Example:Parker et al 2020	e.g. Concerns	Underlying assumptions about the influence of external impacts are not valid, but	A longitudinal study from 2010-2022 measuring turbidity and changes in seagrass density and species diversity at 10 sites to determine the impact of fine sediments on seagrass meadow health. The method and metrics used to report the results (seagrass health) is directly relevant to the primary	3	The study locations are representative of seagrass meadows for southern inshore areas with less relevance to the northern reef.	2	Sites are measured at regular intervals 3 times per year hence capturing a range of temporal variations over the last 12 years.	3	3.0	2.0	3.0	8	24 studies have been used to answer the primary questions.			High	There is high confidence in the body of evidence used to make statements in the synthesis key findings. This is due to the high consistency and relevance rating within the multiple study types (experimental, observational and modelling) used.	High
6	Author, date																		
7	Author, date																		
8	Author, date																		
9	Author, date																		
10	Author, date																		
11	Author, date																		
12	Author, date																		
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41																			

Sheet: 3. Studies Excluded

	A	B	C	D	E	F
1		**Reasons for study exclusion (after full text review)** *-select from drop down lists-*				**Edit Criteria below as per Table 4 (Exclusion criteria)**
2	**Study (Author, date)**	**Due to Exclusion Criteria**	**Due to Evidence Appraisal**	**Further explanation**		Exclusion Criteria 1
3	*Example:*	*Exclusion Criteria 2*	*No internal reliability*			Exclusion Criteria 2
4	Author, date					Exclusion Criteria 3
5	Author, date					Exclusion Criteria 4
6	Author, date					Exclusion Criteria 5
7	Author, date					Exclusion Criteria 6
8	Author, date					Exclusion Criteria 7
9	Author, date					Exclusion Criteria 8
10	Author, date					Exclusion Criteria 9
11	Author, date					Exclusion Criteria 10
12	Author, date					Exclusion Criteria 11
13	Author, date					Exclusion Criteria 12
14	Author, date					Exclusion Criteria 13
15	Author, date					Exclusion Criteria 14
16	Author, date					Exclusion Criteria 15
17	Author, date					Exclusion Criteria 16
18	Author, date					Exclusion Criteria 17
19	Author, date					Exclusion Criteria 18
20	Author, date					Exclusion Criteria 19
21	Author, date					Exclusion Criteria 20
22	Author, date					Exclusion Criteria 21
23	Author, date					Exclusion Criteria 22
24	Author, date					Exclusion Criteria 23
25	Author, date					Exclusion Criteria 24
26	Author, date					Exclusion Criteria 25
27	Author, date					Exclusion Criteria 26
28	Author, date					Exclusion Criteria 27
29	Author, date					Exclusion Criteria 28
30	Author, date					Exclusion Criteria 29
31	Author, date					Exclusion Criteria 30
32	Author, date					
33	Author, date					
34	Author, date					
35	Author, date					
36						

Appendix 4: 2022 SCS Methods Peer Review Template

Review Details	
Name of reviewer:	
Institution/Organisation of reviewer:	
Date of review:	

1. General Instructions

In undertaking the review of the '2022 Scientific Consensus Statement Evidence Synthesis Methods', reviewers must consider the key points below and use this document as the template for such purpose.

A package has been prepared for reviewers including several background documents about the Scientific Consensus Statement (SCS) process, including:

- SCS 2022 Purpose and Approach
- SCS 2022 Approach to Question Setting
- SCS 2022 Approach to Methods Development
- SCS 2022 Question List

Among those documents, the most relevant for the purpose of this review, is the **SCS Approach to Methods Development**, as it describes the requirements, challenges and process to develop the 2022 SCS evidence synthesis methods.

The following documents include the actual methods that require peer review:

- **SCS 2022 Rapid Review Methods** (.doc)
- **Data Extraction & Appraisal** (.xlsx)

The focus of the review should be:

1. To ensure the methods meet international best practice for **rapid reviews** (considering the methods have been tailored to the SCS needs and resources).
2. To provide a general review of the document (including the template within) and data extraction and appraisal spreadsheet, with a special focus on the data appraisal and evaluation criteria.

Reviews must be completed and submitted back to the SCS Coordination Team by Tuesday 19 April 2022. Review fees will be paid by direct invoice to C_2O Consulting coasts|climate|oceans in submission of the review materials.

2. Review

2.1 General comments

-
-
-

2.2 Specific comments

-
-
-
-
-

2.3. Additional recommendations

-
-
-
-
-

3. References

Glossary

Note that the Terms highlighted in italics in the Meaning are also defined in the glossary.

Term	Meaning
Bias	A preference for or against one idea, thing or person. In scientific research, bias is a systematic deviation between observations or interpretations of data and an accurate description of a phenomenon[7].
Body of evidence	All *evidence items* used to address a specific question.
Candidate studies	*Evidence items* identified through the *search strategy* that are retained for further assessment.
Confidence	Level of trust in the *body of evidence* used for each question. For the 2022 Scientific Consensus Statement, the 'overall confidence' of a *body of evidence* is determined by the *relevance* of studies that constitute it and by the *consistency* of the body of evidence' (UK Department for International Development, 2014).
Consistency	Level of convergence or agreement of findings between *evidence items*. This may be assessed as being consistent both in the direction and magnitude of effect.
Contextual variable	Any variable that modifies the magnitude or direction of an intervention or exposure. Contextual variables are one cause of heterogeneity in the outcome of interventions and are also known in the evidence synthesis literature as 'effect modifiers' (Collaboration for Environmental Evidence, 2013).
Diversity of study types	The type of studies being used as sources of *evidence* i.e. observational, experimental, modelling, theoretical or conceptual, and secondary studies such as reviews or summaries. In the context of the 2022 Scientific Consensus Statement, also associated with 'multiple lines of evidence'[8].
Evidence	Relevant information used in answering a question or hypothesis.
Evidence item	An individual piece of *evidence* which may be a study, data or other documented evidence used to address a specific question.
Mendeley evidence library	An electronic reference database, using Mendeley bibliographic management software, for storing all *evidence items* used in the current and previous Scientific Consensus Statements.
S/PICO and variations	The Subject/ Population/ Intervention/ Comparator/ Outcome framework and variations are used to determine the key elements of a review question[9]. **Subject/Population**: Who or what is being studied or what is the problem. **Intervention/exposure**: Proposed management regime, policy, action or the environmental variable to which the subject populations are exposed10 **Comparator**: What is the intervention/exposure compared to? (e.g. other interventions, no intervention, etc.). This may also include a time comparator as in 'before or after' treatment or exposure. This can be optional if no comparison applies. **Outcome**: What are the outcomes relevant to the question resulting from the intervention or exposure?

[7] How bias affects scientific research
[8] Deriving guideline values using multiple lines of evidence
[9] Systematic reviews: Defining the question
[10] Identifying the need for evidence, determining the evidence synthesis type, and establishing a Review Team

Term	Meaning
Quantity of evidence	A relative assessment of the size of the *body of evidence* used to address each Scientific Consensus Statement question based on the total number of *evidence items*. While it is not possible to quantify the number of studies that is adequate for answering specific questions, authors must use their topic expertise to suggest whether the number of studies used is 'high', 'medium' or 'low'.
Peer reviewed published literature	Any *evidence item* that has undergone a review by external independent experts in the same field and the feedback is addressed by the authors to generate a revised document. In the context of the Scientific Consensus Statement, this includes traditional academic literature, but also grey literature (e.g. reports, theses) as long as it has been independently peer reviewed and is publicly accessible.
Rapid review	A form of knowledge synthesis that follows the formal *Systematic Review* process (defined below), but parts of the process are simplified or omitted to produce information within specified resources, in a timely manner and to meet specific user needs (Khangura et al., 2012).
Relevance of evidence	The extent to which the *evidence* is relevant to the question being asked. Relevance is often referred to as the 'external validity' of the study (i.e. whether it can be generalised from the original study to address the review question).[2] For the 2022 SCS two aspects of relevance were assessed: 1) the relevance of the study approach and results to the question and 2) the spatial and temporal relevance to the question.
Reliability of evidence	The extent to which a study is free from *bias* or confounding elements (also referred to as 'internal validity').[2]
Search Strategy	An a priori description of the methods used to find *evidence items* relevant to a question. When conducting a systematic search for evidence this would include a list of the S/PICO elements, search terms, search strings, search sources and inclusion/exclusion criteria.
Synthesis	Synthesis occurs when disparate data, concepts, or theories are integrated in ways that yield new knowledge, insights, or explanations (Pickett et al., 2007). Synthesis creates emergent knowledge in which the whole is greater than the sum of the parts. By engaging experts with multiple perspectives, synthesis is capable of vetting a vast body of information for use by other disciplines or by society in general (Carpenter et al., 2009).
Systematic Review	A formal review of literature using systematic, explicit and accountable methods (Gough et al., 2017).