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Natural England Evidence Reviews: guidance on the development process and methods

Dave Stone

Natural England

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Contact details

Dave Stone
Deputy Chief Scientist
Natural England
Suite D
UNEX House
Bourges Boulevard
Peterborough
PE1 1NG
dave.stone@naturalengland.org.uk

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Cover photograph

Library bookshelves in the old **Macquarie University Library** building. Released under the **GNU Free Documentation License**. February 2010.

Foreword

Our Evidence Strategy (2012) states that 'Natural England depends upon sound and quality assured evidence on the natural environment to meet its needs as an environmental delivery organisation and as a statutory adviser'. Our Evidence Standard (2012) sets out the principles for the use and gathering of evidence which includes 'drawing on a wide range of expert advice sources' and commit us to undertake evidence reviews to ensure that our advice is based on robust objective evidential conclusions.

In 2012 we set about developing a structured programme of reviews enabling Natural England to target resources into reviews that meet priority business needs; ensure the quality of review work; use the most appropriate approach; and embed evidence review outputs so that they inform our advice and delivery.

Undertaking reviews develops and maintains skills, expertise and currency of knowledge in our staff, and contributes to our reputation as an expert evidence-based environmental organisation.

Our approach to reviewing evidence enshrines transparency, objectivity and rigour, and engages stakeholders and independent experts throughout to arrive at robust evidential conclusions to inform delivery and advice.

This first edition of guidance on evidence review process and methods is a step forward in making explicit our approach, and in providing a framework for the review and synthesis of environmental evidence.

Dr. Tim Hill

Chief Scientist, Natural England

April 2013

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1 Introduction

1.1 What is an Evidence Review? An Evidence Review is a systematic and transparent bringing together of the best available evidence relating to an intervention issue or concern, then drawing conclusions based on that evidence that can inform advice, action or policy.

1.2 Evidence Reviews are focussed on a discrete set of questions relating to a particular intervention or issue. The review process tries to identify and appraise the best available evidence relevant to the question(s) and draw evidence-based conclusions. These may inform the development of recommended approaches in respect of the intervention or issue examined.

1.3 The purpose of this document is to provide a framework and outline process for undertaking Evidence Reviews in respect of natural environment interventions and issues that come within the remit of Natural England as determined by our statutory purposes and duties.

1.4 The approach set out in this document is informed by and draws upon the approach used to produce evidence-based advice for public health interventions for health deliverers in England (NICE, 2009). The approach developed by NICE has undergone several iterations and has been subject to scrutiny.

1.5 The approach set out in this document embodies the following principles:

- The importance of transparency.
- The importance of considering the full range of evidence including expert opinion.
- The importance of engaging with stakeholders throughout the process.
- Basing conclusions and recommendations on the available evidence.

1.6 This guidance sets out a default position for evidence reviews. From time to time, where there is a good scientific or practical reason (for example, novel area, a lack of evidential material) we may deviate from this guidance and do things a bit differently. However, in doing so, the core principles will be stuck to and deviations and their justification will be reported in the review.

1.7 The approach to producing an evidence review essentially has four stages scoping; development; validation; and publishing. An overview of the process is shown in Figure 1.

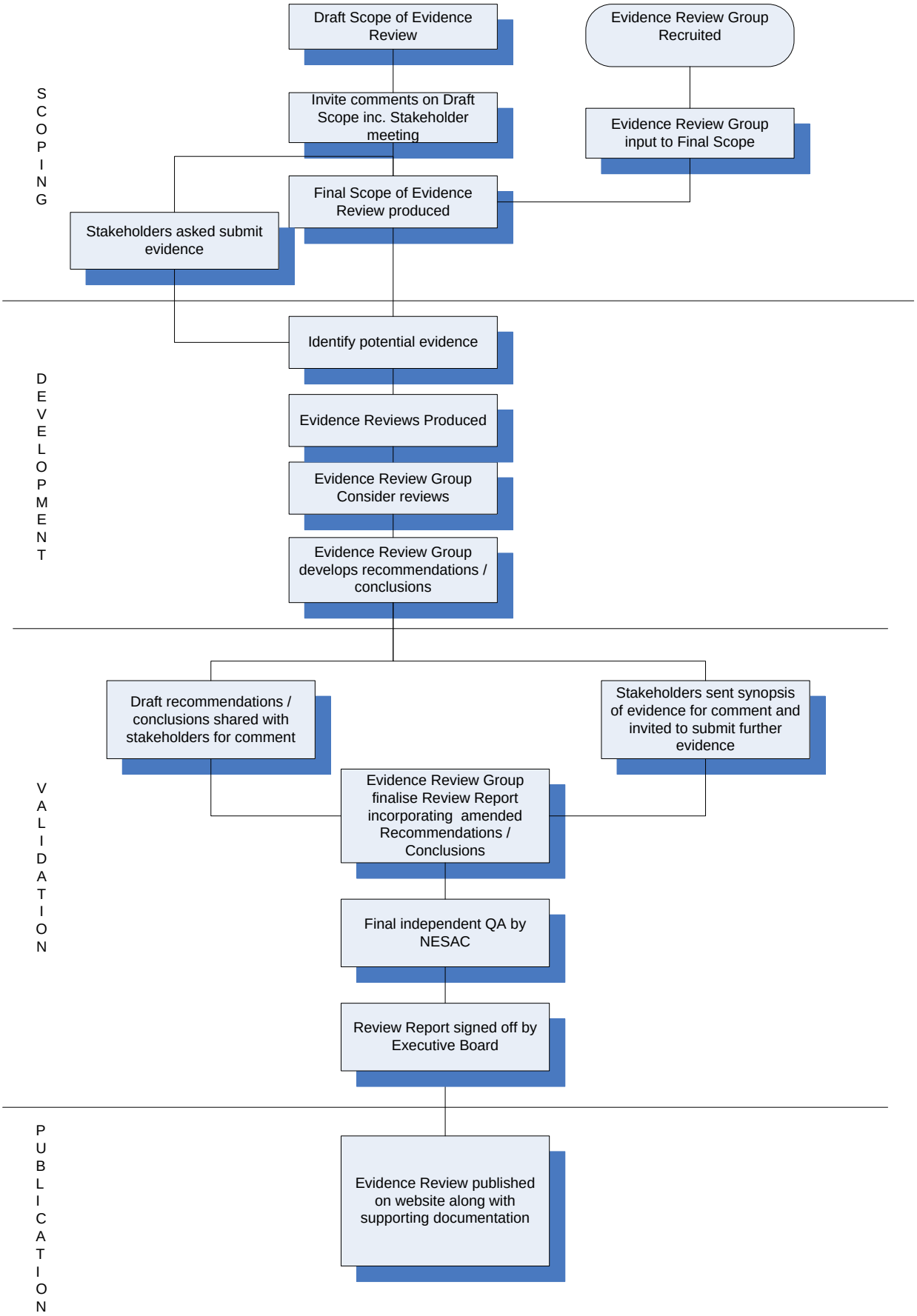


Figure 1 Overview of the Evidence Review process

2 Commissioning the review

2.1 A review of evidence will usually be commissioned by Natural England's Chief Scientist acting on behalf of the Executive or one its sub-groups.

2.2 The commissioning document will often be short, but should provide sufficient detail to enable a scope to be drafted (see Section 3). Typically a commissioning document should outline:

- the issue that has prompted the need for the review;
- the particular current outcomes that are of concern;
- specifics of populations/habitats/species if appropriate;
- the overarching question that is trying to be answered; and
- any specific limiting parameters of the review, for example, the review will not examine the cost effectiveness of interventions.

2.3 When a review is commissioned a Review Manager will usually be assigned. It is their responsibility to bring together the specialist review team, and collectively they will work with the Chief Scientist to clarify the commission before starting to draft the scope document (see Section 3).

2.4 Clarification of the review commission also presents an opportunity to initiate recruitment of the Evidence Review Group (see Section 4).

3 Scoping

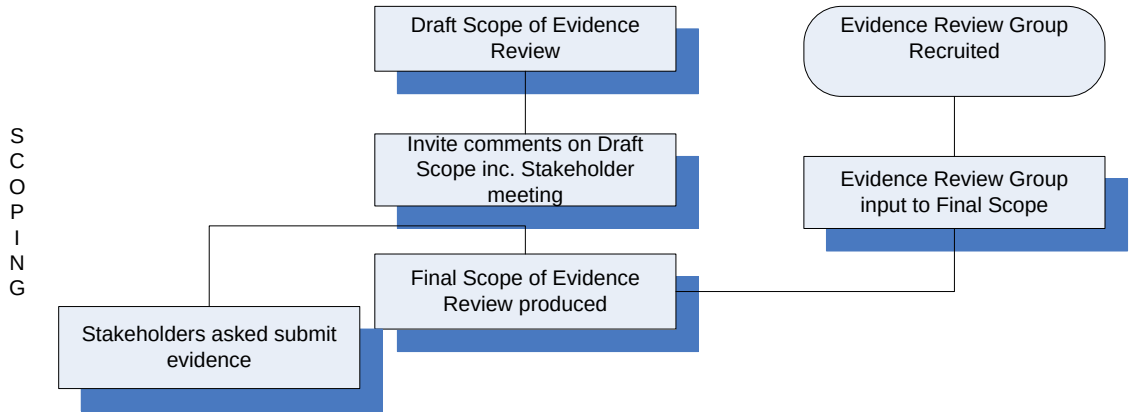


Figure 2 Outline scoping phase

3.1 The purpose of the review scope is to specify precisely the intervention(s) covered by describing them in some detail. The scope of an issue-based review should describe the issues and specify what types of interventions/ strategies/activities are covered, and may include examples.

3.2 The scope should include:

- a clear definition of the intervention(s) or issue(s) to be addressed, and where appropriate the relationship between them (this can include a logic model);
- background information on the issue(s) / intervention(s);
- describe the assumed mechanism/mediator/link between the action(s) and the outcome(s) / causal pathways;
- identify the settings involved; for example, places, geography, species, habitat;
- an overview of what the review will exclude; and
- set out key questions for the evidence review.

Typically, a single intervention scope would be 5-6 pages long. An issue-based scope is longer depending on the number of sub-issues identified, but should be no more than 20 pages. If a scope is larger than this it suggests that more than one review is needed.

3.3 The scope is critical to:

- keep the review within agreed parameters;
- ensure clarity; and
- enable completion within agreed time scales.

3.4 From the review commission a draft scope document should be developed by the specialist review team. You should include draft questions structured on the Population-Intervention-Comparison-Outcome (PICO) framework (see Section 5 Framing review questions).

3.5 At the start of the scoping phase you should ask stakeholders to register their interest in the topic. This could be done through a targeted communication and an open call on the website.

3.6 Once a draft scope has been developed you should invite registered stakeholders and members of the Evidence Review Group to submit comments on the draft to help refine the:

- definition of the intervention / issue;
- description of mechanisms and pathways;
- mechanisms/interventions/actions and settings within the scope of the review (this may include logical models of causal relationships; and
- draft questions (see Section 5 Framing review questions).

3.7 You should capture stakeholder comments in a structured manner. Consider how the comments and feedback influence the elements of the scope, and briefly record your reflections.

Appendices 1 and 2 show example forms for recording comments and responses.

3.8 Having finalised the scope document, ensure that the commissioner is content and that the refined review will meet its intended purpose.

3.9 You should share the final scope. You should invite registered stakeholders to submit evidence relevant to the questions asked. This is a good opportunity to capture 'grey' literature that not be picked up in normal database searches.

3.10 **Timescales** - Investment in this stage of the review process is important as the scope is the bedrock on which the review sits. Initial engagement of stakeholders can also be time consuming but it is a worthwhile investment. It is suggested that up to 2 months elapsed time is allowed to gather and respond to stakeholder comments on the scope; followed by an intensive 2 week period to produce the final scope documentation.

Key documentation products from scope phase

Contact list of interested / registered stakeholders
Stakeholder comments and responses - should form part of review archive
Final Scoping document - publish as part of review background material

4 The Evidence Review Group

4.1 Once the commission is clarified the Evidence Review Group (ERG) is recruited. For example, this could be done by approaching known experts, stakeholder organisations or through a professional body such as the Institute of Ecology and Environmental Management (IEEM).

4.2 Independent experts could be recruited from a cross-section of academic, stakeholder and practitioner communities. The composition of independent experts to ERG(s) will need to be considered in light of the type of review that is being done.

4.3 Members of ERG should be able to offer a range of perspectives and expertise but are expected to bring an objective perspective and draw conclusions based on the available evidence. Early recruitment of the ERG will enable members to input to the final scoping document for the review.

4.4 The ERG(s) considers the evidence reviews on questions within the scope. They will draft recommendation / conclusions based on their analysis of the evidence, experience, and knowledge around the specific subject (see Section 11). Where the ERG(s) identify significant evidence gaps through the review process they will also draft recommendations for further research.

4.5 A larger issue-based review may have discrete groups of topic-based questions, for example a review of Upland management with a sub-topic of livestock management and stocking rates. If this is the case sub-ERGs may be established to consider individual topics.

4.6 The (sub)ERG(s) will comprise a senior Natural England specialist, such as Head of Profession, plus independent experts.

4.7 Once the sub-ERGs have reviewed the evidence and agreed conclusions, their report will go to the overall Evidence Review Group for quality assurance. The overall ERG will have an independent chair, independent experts, and the Chief Scientist.

4.8 In the case of large topic based reviews the overall ERG assures quality of the sub-ERG review reports and brings them together to produce an overarching final report.

4.9 Declarations of Interest - by the very nature of their expertise and experience there is a possibility that ERG members may have interests in the outcomes of a review. ERG members must be objective in their analysis of evidence. Having an interest is not a reason for exclusion as they are recruited for different reasons. In the interests of transparency, all ERG members should sign a Declaration of Interests. These will be taken account of by the ERG Chair.

Appendix 3 shows an example completed Declaration of Interest.

Key documentation products from Evidence Review Group recruitment

Declaration of Interests - should form part of review archive
Listing of Evidence Review members and their affiliation - for inclusion in final review document

5 Framing review questions

5.1 It is hard to overstate the importance of the questions in a review. In essence the questions define the evidence that will be considered within the review. Questions should largely focus on effects of interventions. Questions, such as 'what are the species that form the characteristic flora of .....? , better lend themselves to a structured literature review and should not form part of a review of intervention effects.

5.2 At least one review question, often more, will be needed for each intervention/issue to be considered. The specialist review team must ensure that these questions are precise, clear and focused.

5.3 It is the responsibility of the specialist review team to frame the review questions.

5.4 The Population-Intervention-Comparison-Outcome (PICO) framework is a helpful structured approach to formatting review questions and should certainly be used as a starting point. Other approaches or questions may be used but you should expect to see the basic PICO elements in most questions.

5.5 The PICO framework contains four elements. These are:

- Population - the population/species/habitat/issue of interest. How can they best be described? Do any sub-groups need to be considered?
- Intervention - the intervention, activity or approach to be used.
- Comparison - the main alternative to the intervention.
- Outcome - what outcomes should be considered?

5.6 Example questions:

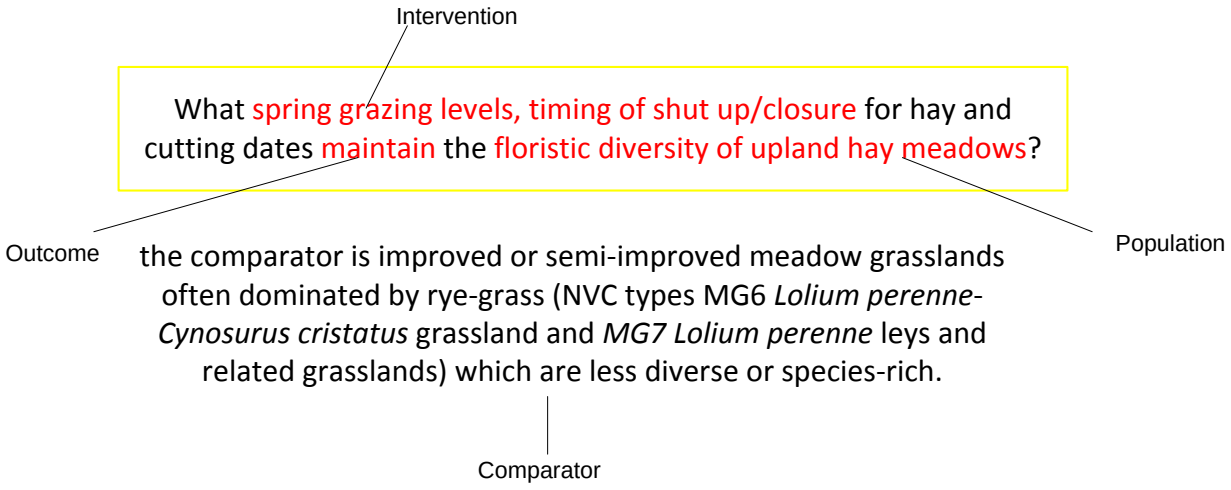


Figure 3 Example PICO question

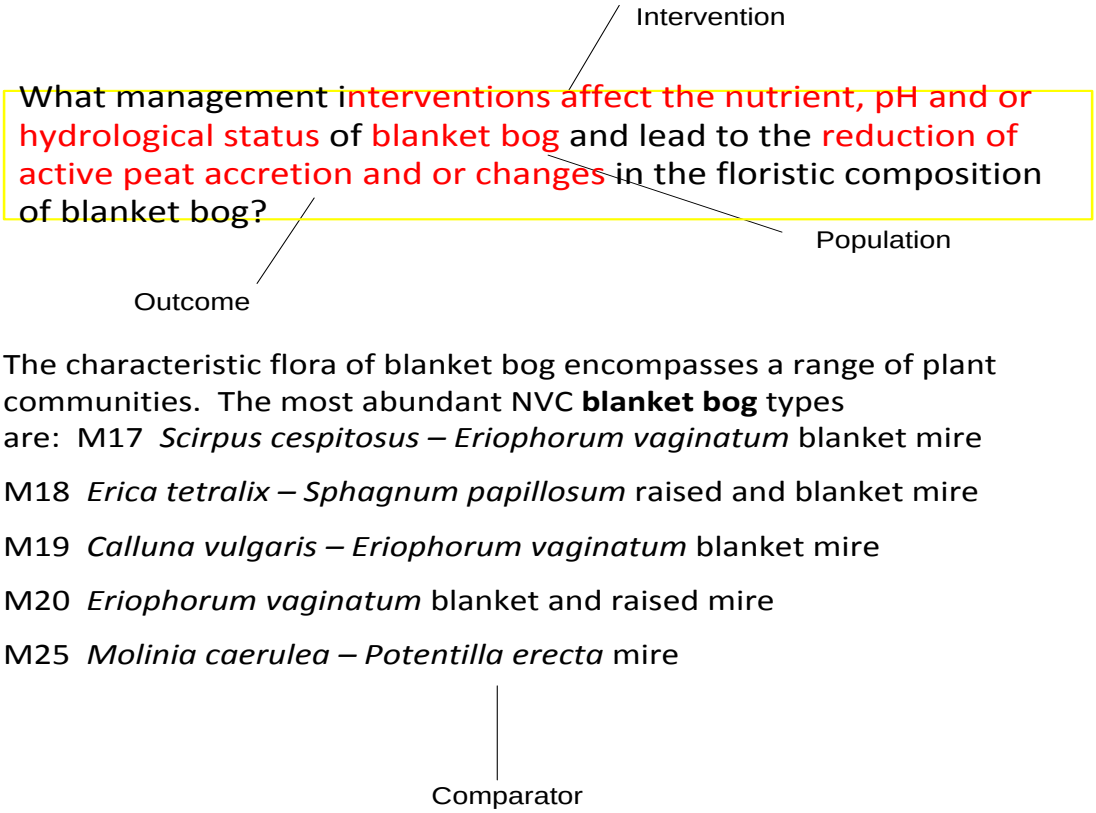


Figure 4 A second example PICO question

5.7 The process of disaggregating or unpicking the broad question posed in the commission to frame reviewable questions will normally lead to:

- The reframing of the broad commission question to generate a high level review question.
- The identification of specific topics / themes that will form the core of the review each of which will have an overarching review question.
- Within a topic / theme it is likely that a number of components will be identified each of which may require a review sub-question.

5.8 For example, for Natural England's Upland Evidence Review some of the questions were:

- Commissioning question: *What is the impact of defined activities in relation to specific ecosystems?*
- Reframed commission question: *What are the effects of land management interventions on biodiversity and ecosystem services in the uplands?*
- Five critical topics were identified to focus the review one of which was upland hay meadow management. The overarching question for this topic was: *What management regime maintains the diversity of the flora and fauna of upland hay meadow priority habitat?*
- A number of sub-questions were identified within the hay meadows topic to address the core elements of the overarching question. For example: *What spring grazing levels, timing of shut up/closure for hay and cutting dates maintain the floristic diversity and breeding bird populations of upland hay meadows?*

6 Identifying potential evidence

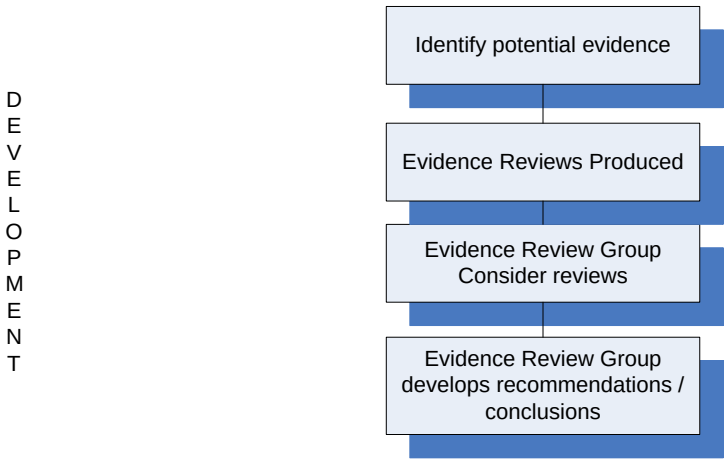


Figure 5 Evidence development stage

6.1 Reviewing is an explicit, systematic and transparent process that can be applied to qualitative and quantitative evidence. Presentation and interpretation of evidence will always involve some degree of expert judgement by the specialist review team. Evidence reviews will differ and flexibility may be needed, but the specialist review team should follow the steps set out below to the best of its ability.

6.2 Sections 6 – 11 set out the key steps you need to follow in order to produce an evidence review that will provide the Evidence Review Group (ERG) with the information they need to draw conclusions and/or make recommendations. The steps ensure that the review process is transparent and repeatable.

6.3 The ERG will need absolute (scientific) and context specific evidence about effects, what works generally, why it works, and what might work in specific circumstances. Evidence will usually be from multiple sources, extracted for different purposes and through different methods, depending of the question(s) being addressed.

6.4 The steps in producing an Evidence Review are:

- identify the potential evidence;
- select the relevant evidence;
- assess the quality of evidence;
- extract, synthesize and summarise the evidence;
- produce evidence statements and applicability; and
- develop the evidence review conclusions and/or recommendations.

6.5 This section of the guidance covers the stages involved in identifying the potential evidence for the review.

6.6 The aim is to identify the best available evidence to address the natural environment review question(s) without producing unmanageable volumes of data. This involves a forensic search that includes:

- Creating precise search questions and identifying the study types required to answer those questions.

- Matching key databases and loan peer review sources to the questions being asked.
- Adopting a pragmatic and flexible approach which allows a continual review of how best to find the evidence and where. Ensuring that changes / developments / sources are recorded.
- Having an understanding of the existing evidence base.

The review team and specialist librarians need to work closely. Specialist librarian staff will work with the review team to identify then gather the potential evidence. They will lead on the independent searches of databases and any other sources. They take the lead in implementing the search strategy.

6.7 Identifying the potential evidence consists of four phases:

- key words and search terms;
- constructing search plans;
- developing the search strategy; and
- gathering the evidence, conducting searches and documenting the process.

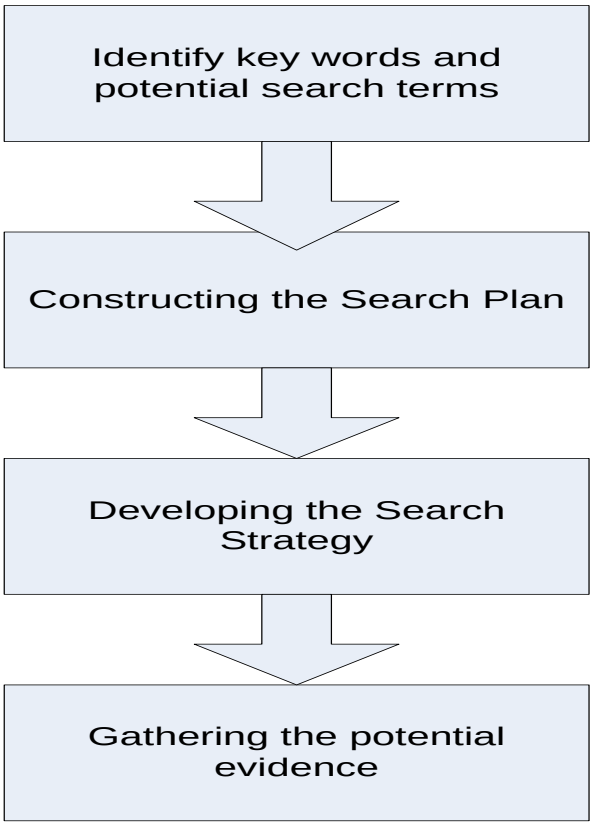


Figure 6 Stages of potential evidence identification

Search plan

6.8 The specialist review team should identify an initial list of key words and potential search terms prior to constructing the search plan in collaboration with the specialist librarians.

6.9 The review questions, key words and terms are important in determining the type of evidence that each question review should include, for example quantitative, correlative, qualitative, ecological.

6.10 Constructing the search plan: Each question to be reviewed should have a search plan. In practice, constructing the search plan around the overarching topic/theme question should provide a robust inclusive approach.

6.11 The search plan should clearly state the:

- search question;
- search approach taken(for example emergent) and rationale for the approach;
- electronic sources that will be searched and known / peer-approved sources;
- plans for any additional searches (for example, citation, hand-searching of external hard-copy libraries);
- main study types that will be identified (for example, primary, review-level);
- inclusion and exclusion criteria (for example date of publication, English language publications only; UK studies only); and
- restrictions (if any) (for example limited database indexing).

6.12 At this stage the review team needs to ensure that has access to target resources, for example, urls, user ids and passwords, British Library secure electronic delivery.

See Appendix 4 provides hints and tips for literature searching.

See Appendix 5 for an example completed search plan.

Search strategy

6.13 Developing the search strategy: the review team and specialist librarians translate the concepts from the search plan into a search strategy. This process includes:

- identifying the synonyms (thesaurus terms and free-text keywords) used in the database searches; and
- the review team briefing librarians and explaining anomalies.

6.14 The review team and librarians should use their discretion to decide if multiple strategies are needed ie one for each review question. For questions within a sub-topic the search plans might have a high degree of overlap of terms etc, in which case a single search strategy could cover more than one question.

6.15 The specialist review team may wish to consult with members of the Evidence Review Group who may be able to provide pointers to particular sources of potential evidence such as non-biological journals and grey literature of which they are aware.

6.16 The search strategy needs to be summarised in a narrative form with sufficient detail to enable the search for evidence to be replicated. Appendix 6 shows three examples of search strategy summaries.

Gathering the potential evidence

6.17 Gathering the potential evidence, conducting searches and documenting the process can be time consuming, but the thoroughness with which it is done is the corner stone of objectivity through the review. This phase might require 6 - 8 weeks to complete.

6.18 The librarian and review teams search databases and other sources they have identified for possible evidence. The search results should be captured in reference management software such as Endnote Web (preferable), a spreadsheet or word document. Evidence from non-database sources such as that submitted by stakeholders, grey literature (from external bodies and websites of proven value), or expert opinion must also be documented. Duplicate

references should be removed from the reference management documentation. It is important that the evidence gathering process is transparent and replicable. For these reasons, as well as quality assurance, it is important to document it.

6.19 On a pragmatic note, it would be time effective to identify a member(s) of the review team who have experience of literature searching and can lead on behalf of the review team to provide:

- librarians with a dedicated contact and back-up contact to avoid delay where queries may arise; and
- ensure timely, regular feedback between reviewer and librarians to avoid wasting time on irrelevant results.

6.20 It also needs to be recognised that to some degree this is an iterative process. Initial searches should be regarded as exploratory enabling search terms, inclusion exclusion criteria to be refined etc so that only evidence that potentially addresses the review questions is gathered. This will mean some adjustment to search plans and strategies which must be documented.

Key documentation products from identifying the evidence

List of key search words and terms for each question - should form part of review archive
Search plan(s) for review questions - should form part of review archive
Search strategies - summary should form part of final review documentation
Reference management document - should form part of review archive

7 Selecting the relevant evidence

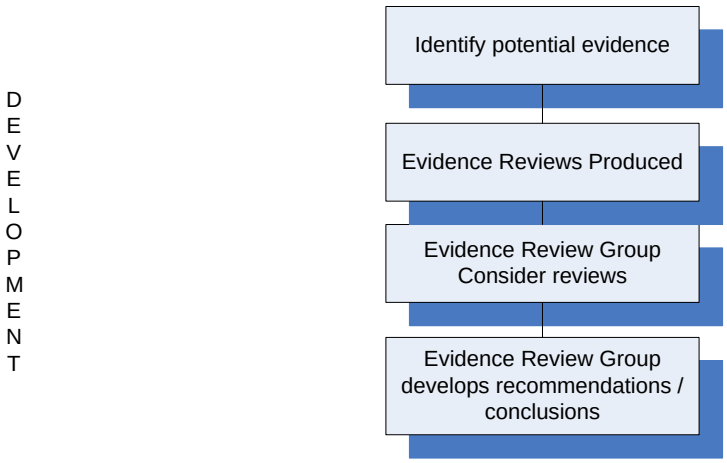


Figure 7 Evidence development stage

7.1 The steps in producing an Evidence Review are:

- identify the potential evidence;
- select the relevant evidence;
- assess the quality of evidence;
- extract, synthesize and summarise the evidence;
- produce evidence statements and applicability; and
- develop the evidence review conclusions and/or recommendations.

7.2 This section of the guidance covers the selection of evidence relevant to the review.

7.3 The selection of evidence is an explicit, systematic and transparent process that can be applied to qualitative and quantitative material.

7.4 Essentially three main types of evidence can be used to answer review questions:

- Experimental studies and observational studies that relate to effectiveness.
- Correlation studies that look at the relationship between exposure and outcome.
- Qualitative studies.

7.5 Usually the best available evidence to address review questions concerned with effects will be primary studies where there is an explicit intervention. Non-intervention potential evidence material should only be included if it specifically addresses elements of the review question(s).

7.6 Selecting the relevant evidence is a critical stage in the evidence review process. Prior to undertaking screening the review team should discuss and work through examples of studies that meet the inclusion criteria to ensure inter-reviewer reliability. The inclusion/ exclusion criteria will include those identified in the scope document and the search plans but may be amended in light of experience from gathering the potential evidence. Inclusion / exclusion criteria must be documented and applied objectively to all potential evidence regardless of its source.

7.7 Studies meeting the review inclusion criteria should be selected using a three-stage approach:

- title screening;
- abstract screening; and
- full paper screening.

These stages are usually undertaken at the overarching question (topic) level but giving due consideration to the key elements of sub-questions. Figure 8 is a graphical representation of the evidence selection.

7.8 **Title / abstract screening**: titles/abstracts should normally be screened independently by two reviewers using the question inclusion criteria. Where reviewers disagree about a study's relevance this should be resolved by discussion or by recourse to a third reviewer. If there is still doubt about whether the study meets the inclusion criteria it should be retained.

7.9 **Full paper screening**: once title/abstract screening is complete the review team should assess full-papers/documents for the selected studies, using a full-paper screening tool developed for the purpose. This should normally be done independently by two people. Any differences should be resolved by discussion between the reviewers or by recourse to a third reviewer.

7.10 You should clearly document the evidence selection process. A flow chart or tabulation is a useful way of capturing the number of studies included and excluded at each stage. It is advised that evidence excluded at the full paper stage is listed in an annex along with the reason for exclusion. This should form part of the final review report.

See Appendix 7 for an example full-paper screening tool.

See Appendix 8 for an example inclusion-exclusion tabulation.

Key documentation products from selecting the relevant evidence

Inclusion-exclusion criteria - should form part of the review archive
Full paper exclusion tabulation - should form part of final review documentation
Full-paper screening assessments - should form part of review archive

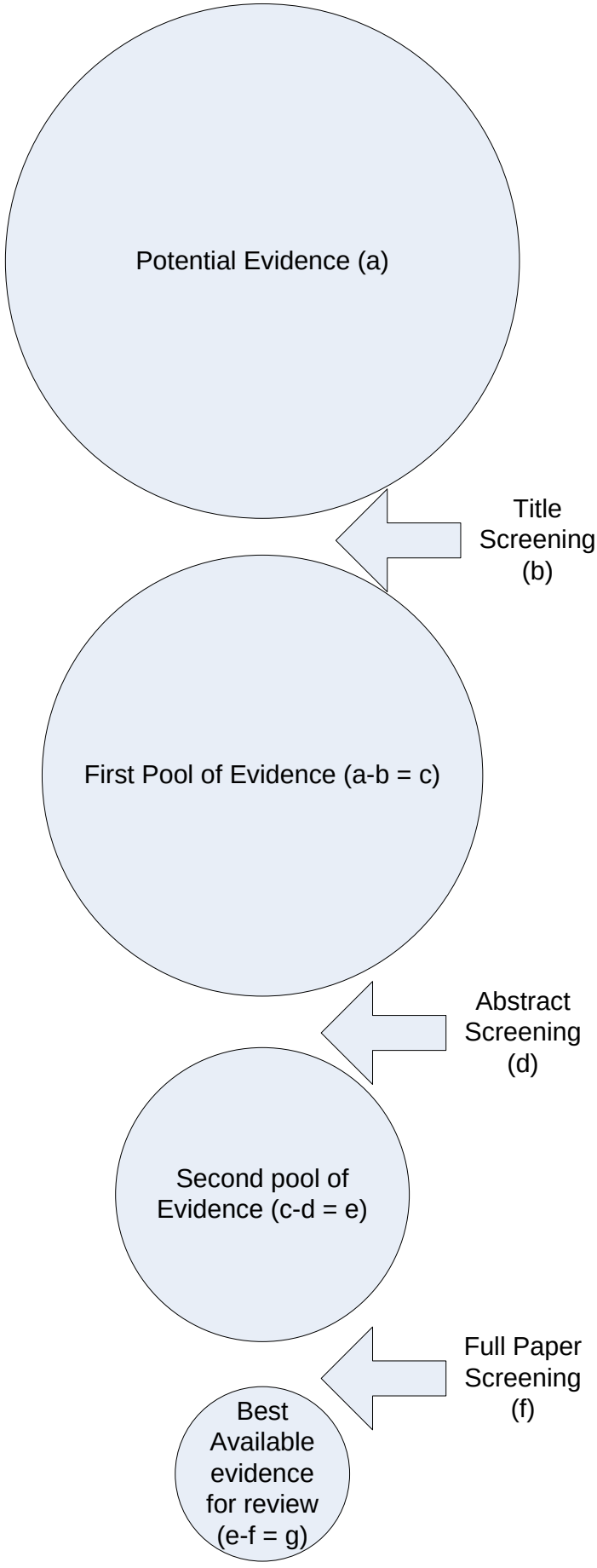


Figure 8 Screening potential evidence to evidence for review

8 Assessing the quality of evidence

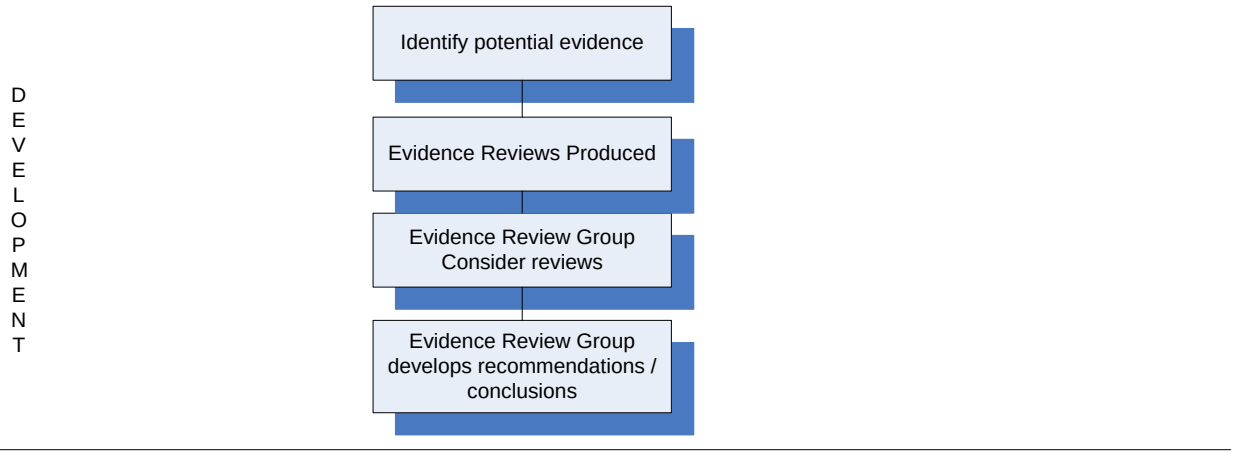


Figure 9 Evidence development stage

8.1 The steps in producing an Evidence Review are:

- identify the potential evidence;
- select the relevant evidence;
- assess the quality of evidence;
- extract, synthesize and summarise the evidence;
- produce evidence statements and applicability; and
- develop the evidence review conclusions and/or recommendations.

8.2 This section of the guidance covers the assessing the quality of evidence relevant to the review.

8.3 The results produced by the thorough search for potential evidence need to go through a selection process using a graduated filtering approach. This will give the specialist review team a body of evidence material that directly addresses the review questions.

8.4 Not all evidence is equal; therefore it is important to assess the quality of the included evidence. The assessment of quality is not a judgement of whether a study is good or bad. The assessment of quality is a structured approach to identifying if potential sources of study bias have been minimised (internal validity).

8.5 Additionally the external validity of the study is assessed. In essence this is asking the question: *Are the study results applicable / generalisable to the wider 'population' that is the focus of the review?*

8.6 The specialist review team must assess the quality of the evidence using the appropriate quality appraisal checklist. This is a key stage in the evidence review development process since the quality rating of studies will be reflected in the evidence statements. These in turn inform the weight that the Evidence Review Group should give to a particular piece of evidence in drawing their review conclusions.

8.7 There are three steps in assessing the quality of evidence:

a) categorising the evidence type;
b) assessing internal validity; and
c) assessing external validity.

Categorising the evidence type

8.8 Almost inevitably, the selection of evidence will have included different types of study in the review. For ease of understanding, particularly by the Evidence Review Group, these should be categorised by type using the standard nomenclature shown in Table 1. The study type should be recorded against the extraction in the evidence table (see Section 9).

Table 1 Study type categories

Type Category	Study Type
1	Meta-analyses, systematic reviews of Randomised Control Trials (RCTs), or RCTs (including cluster RCTs).
2	Systematic reviews of, or individual, non-randomised controlled trials, case-control trials, cohort studies, controlled before-and-after (CBA) studies, interrupted time series (ITS) studies, correlation studies.
3	Non-analytical studies, for example; case reports, case series studies.
4	Expert opinion, formal consensus.

Assessing internal validity

8.9 To re-emphasise, this assessment of quality is a structured approach to identifying if potential sources of study bias have been minimised (internal validity) and to determine if its conclusions are open to any degree of doubt. This assessment can only be based on the presented documentary evidence.

8.10 The assessment of quality is done in relation to overarching topic / theme review question bearing in mind specific sub-question components. Some studies may present the results of multiple investigations where a range of approaches have been used. In these instances it is particularly important that the assessment of quality focuses on the documentary evidence that relates only to the review question.

8.11 The review team should use the relevant quality appraisal checklist to assess a study's internal validity. Three quality appraisal checklists can be found in Appendix 12: quantitative studies – experimental; quantitative studies – observational; and qualitative studies. Appendix 10 shows examples of the commonly used study types and which appraisal checklist to use.

8.12 The quality checklists essentially ask a series of questions about the study on four broad areas: the population; the methods of allocation to the intervention; the outcomes; and the approach to analysis. This varies between the different checklists. The series of questions are intended to focus the Specialist Reviewer on potential sources of bias in the study. Each question requires a response in one of five categories (see Table 2).

Table 2 Quality assessment checklist responses

Response	
++	Indicates that for a particular aspect of study design, the study has been conducted / designed in such a way as to minimise bias.
+	Indicates that either the answer to the checklist question is not clear from the way the study has been reported, or that the study may not have addressed all potential sources of bias for that particular aspect.
-	Should be reserved for those aspects of study design in which significant sources of bias may persist.
NR (not reported)	Should be reserved for those aspects in which the study fails to report how they might / have been considered.
NA (not applicable)	Should be reserved for those study design aspects which are not applicable given the study design under review.

8.13 Based on the balance of checklist responses an overall assessment of the study needs to be made. Each study should be rated (++, + or -) to indicate its quality in relation to the review question. This is a quality assessment in relation to the risk of study bias. Table 3 details the explanation of the quality ratings.

Table 3 Quality assessment ratings

Rating	Rating description
++	All or most of the methodological criteria have been fulfilled. Where they have not been fulfilled the conclusions are thought very unlikely to alter (low risk of bias).
+	Some of the methodological criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are thought unlikely to alter the conclusions (risk of bias).
-	Few or no methodological criteria have been fulfilled. The conclusions of the study are thought likely or very likely to alter (high risk of bias).

See Appendix 10 for examples of the commonly used study types and which appraisal checklist to use.

See Appendix 12 for examples of quality appraisal checklists.

Assessing external validity

8.14 The review team should also use the quality appraisal checklist to assess the external validity of quantitative studies. In other words, the extent to which the findings are generalisable to the whole source population (for example, habitat, species). Using the prefix EV, each study should be rated (++, + or -) to indicate its quality in relation to the review question. The external validity rating may be used when citing documents (see below) but its key purpose is to inform the statement of applicability (see Section 10).

8.15 Studies should be categorised and independently assessed by at least two reviewers to minimise any potential bias or subjectivity in the assessment.

See Appendix 12 for examples of quality appraisal checklists.

8.16 Once the assessment is done, evidence should be cited in review documents with its assessment rating. For example:

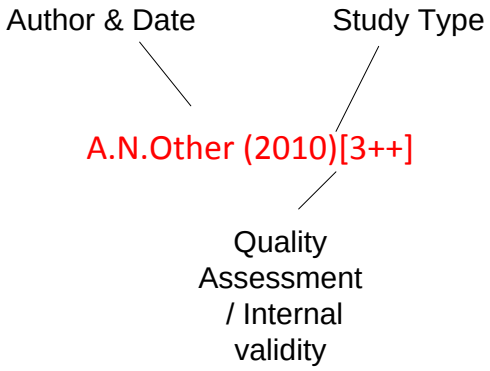


Figure 10 Format for reference citations

8.17 **Timing**: Quality Assessment is often done in parallel with extracting and synthesising data (see Section 9). Clearly the number of studies will influence the time that is required for these stages. As a process it is resource intensive and adequate time needs to be allowed.

Key documentation products from assessing quality of evidence

Completed quality appraisal checklists - should form part of review archive

9 Extracting, synthesising and summarising the evidence

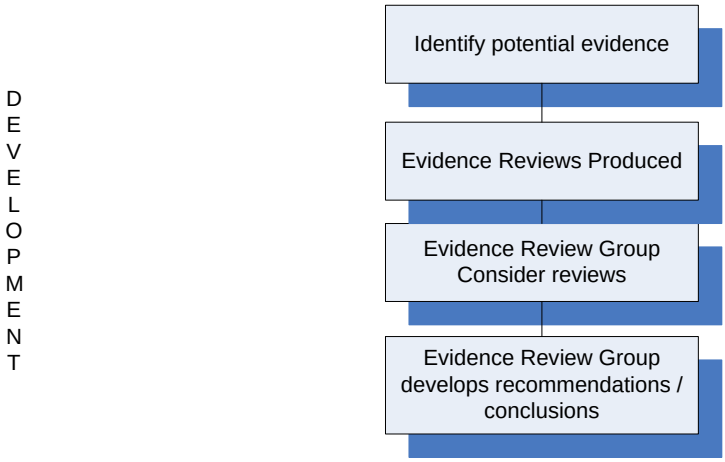


Figure 11 Evidence development stage

9.1 The steps in producing an Evidence Review are:

- identify the potential evidence;
- select the relevant evidence;
- assess the quality of evidence;
- extract, synthesize and summarise the evidence;
- produce evidence statements and applicability; and
- develop the evidence review conclusions and/or recommendations.

9.2 This section of the guidance covers the extracting, synthesising and summarising evidence relevant to the review.

9.3 The purpose of this step is to capture the salient evidence from the studies and to present it in a way that will allow a rapid assimilation of the evidence base by the Evidence Review Group and users of the final report.

9.4 For each review (sub)-question, or rationale grouping of questions, you must produce a summary of the synthesised evidence related to that question, preferably in a tabular format. The summary should contain concise detail about:

- populations;
- the interventions, inc controls, allocation;
- settings;
- outcomes;
- measures and effects; and
- results / conclusions of the study.

Where quantitative data is extracted, for example the size of an intervention effect, the p-value should be cited whether it was significant or not.

The quality assessment rating for the study should also be recorded in the evidence table.

9.5 Extracting, synthesising and summarising presenting the evidence will require the specialist expertise of the review team. In some instances expert or value judgements will have to be made about particular pieces of evidence. These must be made explicit in the reported review.

9.6 The real challenge of extraction is to crystallise the key points of evidence from a study that directly address the review questions.

Appendix 13 shows an example of an evidence table and a template.

Key documentation products from extracting, synthesising and summarising the evidence

Completed evidence review tables should be part of the final review report

10 Producing evidence statements and applicability

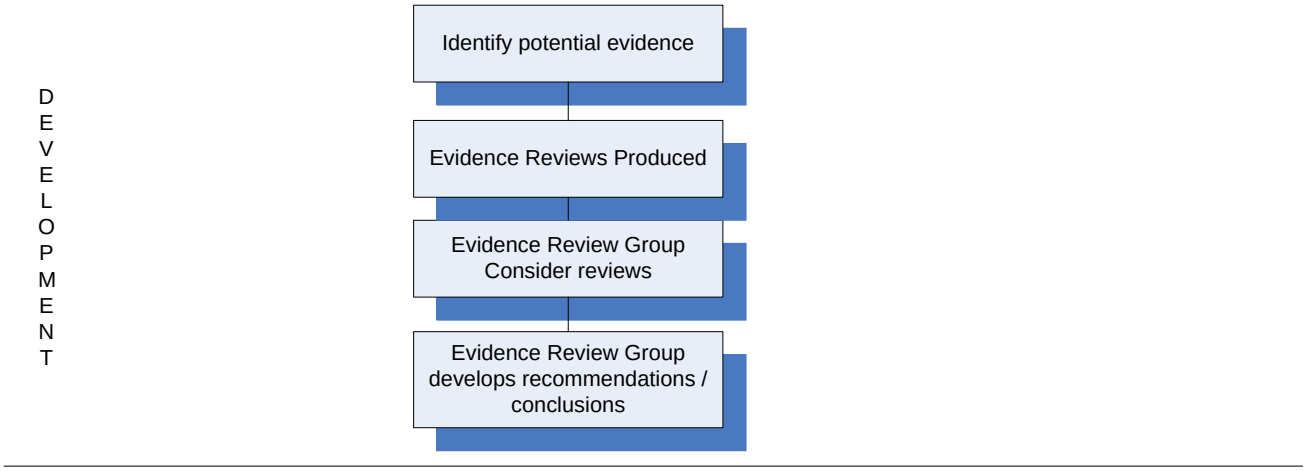


Figure 12 Evidence development stage

10.1 The steps in producing an Evidence Review are:

- identify the potential evidence;
- select the relevant evidence;
- assess the quality of evidence;
- extract, synthesize and summarise the evidence;
- produce evidence statements and applicability; and
- develop the evidence review conclusions and/or recommendations.

10.2 This section of the guidance covers producing evidence statements and applicability for the review report.

10.3 A narrative summary of the evidence related to each review question must produced by the specialist review team. This is called the evidence statement. It is an objective summary of the evidence table. It should be a clear statement reflecting the:

- The content of the intervention.
- The strength of evidence (reflecting the appropriateness of the study design to answer the question, the quality and quantity of the evidence).
- Direction and size of effect (if applicable) positive and negative.
- The applicability of the evidence to the question / population/setting.

10.4 Evidence statements are a critical part of the process of formulating and prioritising conclusions/recommendations. They reflect what is plausible given the available evidence and what has worked in similar circumstances. They should help the Evidence Review Group to form a judgement about:

- Whether or not there is sufficient evidence to form a judgement.
- Whether, on balance, the evidence demonstrates that the intervention is effective, ineffective or the evidence is equivocal.
- Typical size of the effect where there is one.

10.5 Evidence statements could comprise an overarching summary statement supported by various subsidiary statements. They should refer to the sources of evidence and its quality in brief descriptive terms. Collectively they should provide a clear and self-contained summary.

10.6 Wherever possible standard terms should be used to relay this information in the evidence statements. For example, statements about the strength of evidence should use the following terms:

- no evidence;
- weak evidence;
- moderate evidence;
- strong evidence; and
- inconsistent evidence.

See Appendix 14 for suggest standard terminology for evidence statements.

10.7 The following are hypothetical examples of developed evidence statements that you would expect to present in the review report to the Evidence Review Group.

Example A: an evidence statement of a correlates review

There is moderate evidence from three cross-sectional studies about the correlation between young people's access to green space and an increase in pro-environmental behaviours. The evidence about the strength of this correlation is mixed. One study (Jones *et al*. 2007 [2+]) found that weekly visits to green space with family members was associated with an increase in behaviours such as recycling (OR 2.67 [95% CI 1.55-4.57]). Another study (Buston *et al*. 2007 [2-]) found that weekly visits with other young people (not family) had a negative association with pro-environmental behaviours (OR 1.67 [1.03-2.72]). However, another study (DiLorio *et al*. 2000 [2+]) found small positive correlations between visiting local spaces, pro-environmental behaviours ($r=0.0072$, $p<0.01$) and attitudes towards nature ($r=0.204$, $p<0.01$).

Example B: an evidence statement about effectiveness of an intervention

There is strong evidence from four studies to suggest that non-organic fertilizer application reduces the floristic diversity of hay meadows. Two randomised control trials (RCTs) and one non-randomised control trial (NRCT) showed increased risk (RR (95% CI)) in the intervention plots: 0.75 (058-0.94) (Jelley *et al*. 2004 [1++]); 0.66 (0.57-0.78) (Lake *et al*. 2003 [1++]); 0.42 (0.18-0.84) (Wagner *et al*. 2004 [1+]). Another RCT showed increased risk but was not statistically significant: 0.96 (0.84-1.09) (Blake *et al*. 2005 [1+]). However, one NRCT found reduced risk of floristic loss in the intervention plots 1.40 (1.21-1.74) (Jenson *et al*. 2002 [1-]).

Statement of applicability

10.8 The narrative summary and evidence statements should also have a statement of applicability. In essence this is a narrative summary of the assessment of external validity done during the quality assessment phase (see Section 8.14 – 8.17). It is very likely that the reviewed evidence will have a range of external validities and the narrative statement should reflect this variability.

10.9 There are three standard terms that you should use:

- directly applicable;
- partially applicable; and
- not applicable.

10.10 The following is an example of an applicability statement.

> ‘The evidence is partially applicable to fertilizer application in upland hay meadows in England. That is because all these studies were conducted in countries where spring and summer precipitation is substantially higher than in England’.

10.11 The review team must bring together the analyses of the evidence along with other key material in to the evidence review report. As a minimum the evidence review report should set out the review question(s), the relevant evidence statements, and the summary tables of synthesised evidence.

Key documentation products from evidence statement

Completed evidence statements for each review question: should form part of the final review documentation for consideration by the Evidence Review Group
Evidence review report

11 Developing the evidence review conclusions / recommendations

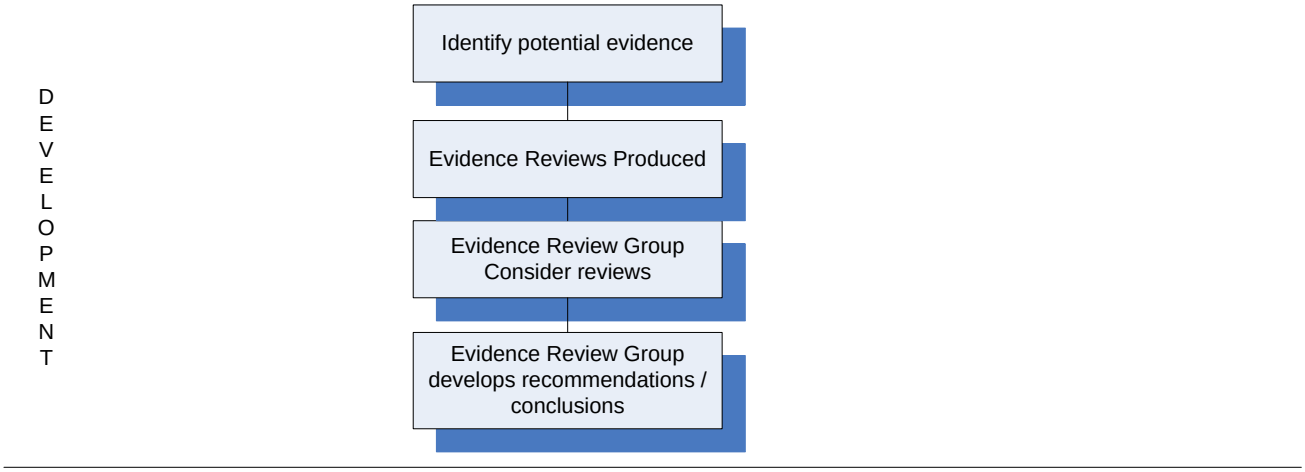


Figure 13 Evidence development stage

11.1 The steps in producing an Evidence Review are:

- identify the potential evidence;
- select the relevant evidence;
- assess the quality of evidence;
- extract, synthesize and summarise the evidence;
- produce evidence statements and applicability; and
- develop the evidence review conclusions and/or recommendations.

11.2 This section of the guidance covers developing the evidence review conclusions and or recommendations.

11.3 Developing conclusions and or recommendations is at the heart of the work of the Evidence Review Group (ERG). It is not a straightforward task and it may not always be easy to reach agreement.

11.4 In taking this task forward the ERG must consider each review question. The ERG must have available a report setting out the review question(s), the relevant evidence statements and the summary tables of synthesised evidence.

11.5 The specialist review team should be present at meetings of the ERG in an advisory capacity. The review team may also need to provide clarification of summaries, exclusions and inclusions, as well as additional contextual information.

Developing conclusions

11.6 Firstly the ERG develops conclusions. These are conclusions based on an agreed interpretation of the presented evidence, plus additional expert knowledge within the ERG that is presented as part of group debate.

11.7 There should be a conclusion for each review question or rational grouping of questions (consider the PICO model). For example:

- It was concluded that there was strong evidence in relation to '(review question)' that X had Y effect on Z.
- It was concluded that the evidence for ..... was inconsistent.
- It was concluded that there was strong evidence in relation to '(review question)' that X did not have Y effect on Z.

11.8 It is suggested that conclusions use the standard evidence statement terminology (Appendix 14) to reflect the strength of evidence.

11.9 While the process of developing conclusions may look straightforward it can be challenging for the Evidence Review Group (ERG) to reach consensus. As well as the evidence review report they may need ready access to other documentation, such as full-paper copies of evidence, to help them in their considerations. Table 4 illustrates some of the possible challenges that the group may face in trying to draw conclusions and ways to overcome these challenges.

Table 4 Interpreting the evidence - possible challenges and ways to overcome them

Challenge	Possible approach
No evidence, weak evidence or it is only partially applicable.	Consider the 'direction of travel' of the available evidence. Make a tentative conclusion and develop a 'consideration' that explains why weak or partially applicable evidence has been used. Consider evidence from practice (see below).
Only evidence of a similar type and quality is available and the findings conflict (inconsistent or mixed evidence).	Consider the reasons for conflict. For example, is it because a habitat responds differently across its geographical range due to different confounders. Identify evidence that is most applicable to the target population or setting, and, where appropriate use that as the basis for conclusions and develop a 'consideration'.
Evidence not directly applicable to the target population.	Consider the degree to which the findings can be extrapolated to the target population based on a logical model.
Evidence conflicts with existing policy and / or practice.	Consider the reason(s) for conflict. For example, is conventional practice evidence based? Has the evidence changed substantially since the policy was developed? Were the goals of practice different?
Unclear how to make best use of the different types of evidence from practice (including evidence provided by ERG members, expert witnesses, stakeholders etc..).	Consider how evidence from practice can help answer the questions. Consider what weight should be given to evidence from practice compared to evidence from the review. Consider whether it is possible to record the conclusions drawn from practice in a consistent and transparent way. Specifically, can the conclusions be developed into evidence statements with considerations?

Developing recommendations

11.10 The commission for most Natural England evidence reviews will generally require the ERG to arrive at evidential conclusions based on the best available evidence as the output of the review. These conclusions are a statement about the knowledge base. In some instances the ERG may also be asked to develop recommendations.

11.11 Recommendations: these are not the same as conclusions. They pertain to advice or operational guidance to internal and external actors in the management of the natural environment. Recommendations are about who should do what and why. They must be based on the evidential conclusions but are nuanced by consideration of context and practicality.

11.12 It isn't necessary to always publish conclusions and recommendations in the same document as they serve different purposes. Conclusions are the knowledge base. Recommendations are about interventions in response to the knowledge. Recommendations may be taken forward in other formats such as operational guidance.

11.13 If recommendations are to be taken forward outside of the finalized review report, it is suggested that ERG may still produce initial drafts based on their in-depth knowledge of the evidence.

11.14 Where the evidence was either inconclusive or the ERG have identified significant gaps recommendations for further research should also be developed. These will be played in to Natural England's Evidence Programme and should also be shared with the wider research community including the research councils.

11.15 Recommendations should answer the readers' main question: 'What does it mean for me?' In addition they should clearly specify the intervention / action to be taken (what, how often and for how long), the context / circumstance (where and when), and, where appropriate, who should take the action. There should be a clear link to the evidence statement and conclusion (usually by reference).

11.16 The strength of a recommendation should not necessarily reflect the strength of the evidence available to support it. Other important factors (for example, principles, potential outcomes, ethics, and extant policy) all need to be considered. Table 5 provides a guide to terms for reflecting the strength of recommendations.

Table 5 Reflecting the strength of recommendations

Level of certainty	Wording
Interventions that must be used.	'Must' should only be used when, for example, the recommendation links to enforceable legislation. It can also be used if it is believed there will be serious repercussions if the recommendation is not followed – the rationale for this should be set out.
Interventions that should be used.	'Should' – use for recommendations when there is confidence that the intervention will do more good than harm. Word recommendations of this type as direct instructions.
Interventions that could be used.	When the intervention is effective, but other options may be similarly effective. Or the choice of intervention is likely to vary depending on values and preferences. Word recommendation of this type as direct instructions but add 'consider' or 'could'.
Interventions that should not be used.	State explicitly if a particular action / intervention should not be carried out or should be stopped.

Key documentation products from developing the evidence review conclusions / recommendations

The draft report of 'X' Evidence Review: this should include the review documentation plus the conclusions and recommendations (if appropriate). This is necessary for the validation phase of the review process.
Statement draft recommendations (if appropriate) - for consideration in the development of operational guidance

12 Validation

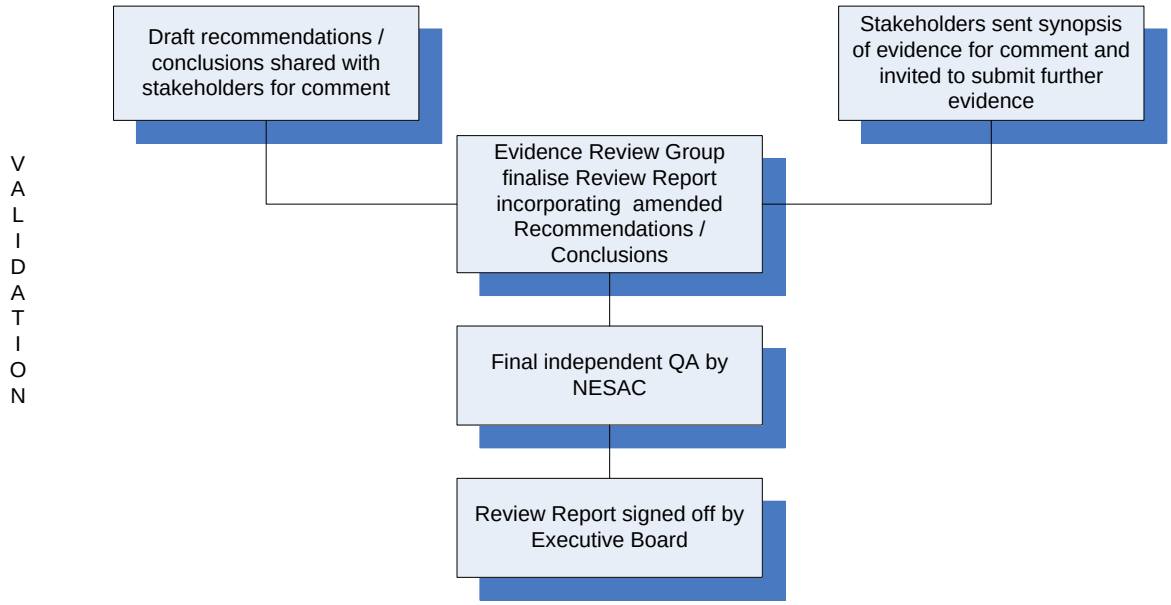


Figure 14 Outline validation process

12.1 Validation provides the opportunity to share the draft review and its conclusions, and gather additional perspectives and evidence, before the report is finalised.

12.2 Figure 15 shows the generalised flow of validation which takes the draft review report through finalisation, including the consolidation of topic review reports.

12.3 The initial stage is to share the draft review report with stakeholders. They should have available the scope document, evidence summary tables and evidence statements. They should be invited to comment on the draft conclusions in light of the scope and other supplementary material.

12.4 Stakeholders may be aware of evidence that was not picked up by the search strategy such as new research in press or grey literature. They should be invited to submit this for consideration by the ERG if they feel it will substantially strengthen or alter a draft conclusion.

12.5 A standard pro-forma provides a structured way of capturing feedback (see Appendix 1). The pro-forma also enables the review team to sort and analyse comments, facilitating refinement of background material and draft conclusions.

12.6 Stakeholder comments, as well as iterated background material (new evidence, revised evidence statements etc) and re-drafted conclusions must be shared with the ERG.

12.7 ERG is responsible for incorporating new evidence into its deliberations. The ERG is responsible for agreeing and finalising conclusions.

12.8 Once the ERG have finalised their deliberations the specialist review team bring together the final report presenting:

- summary of the scope including the research questions;
- evidence statements; and
- conclusions / recommendations.

12.9 A list of ERG members and members of the review team.

12.10 This needs to be signed-off by the chair of the ERG. In the case of large programme level review where an overall assurance group is in place, the final topic report goes forward to that group for incorporation into the final review report.

12.11 The final report should be presented to the Natural England Science Advisory Committee (NESAC) for consideration and independent quality assessment before being signed-off by the Natural England executive.

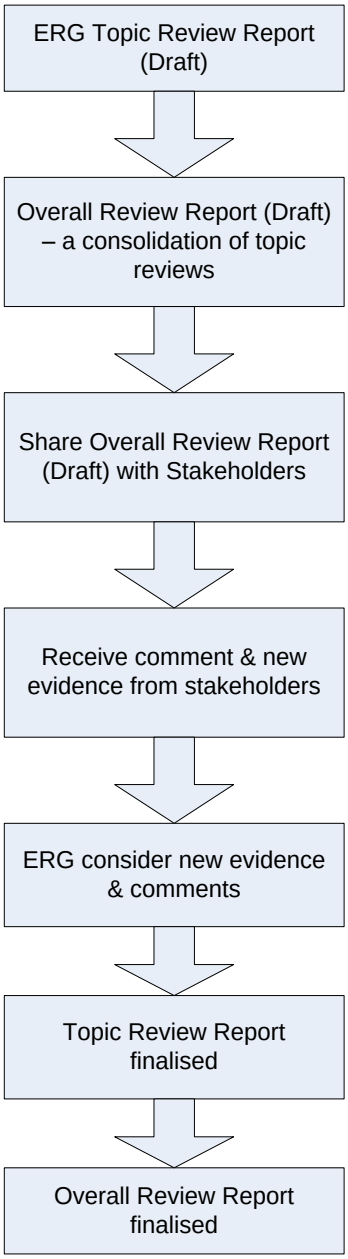


Figure 15 Stages of the validation process

13 Publication

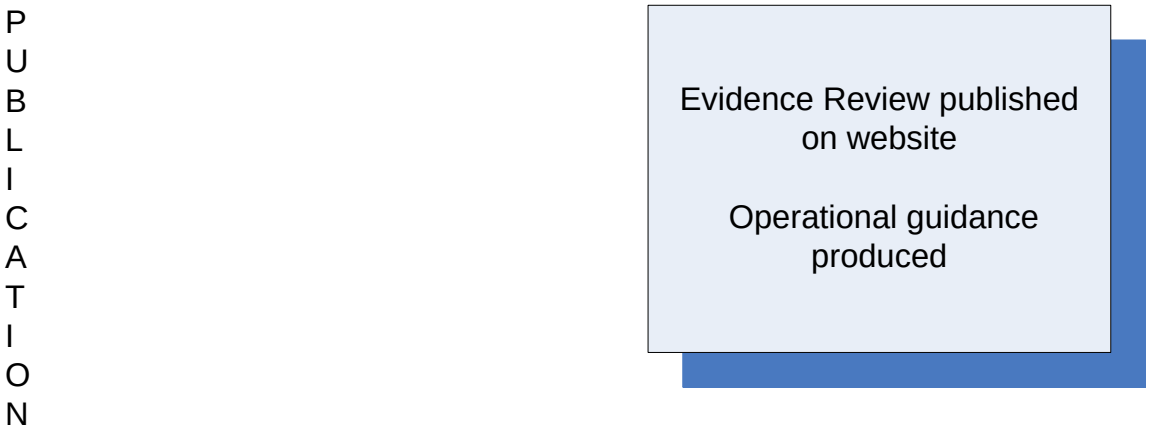


Figure 16 Publication stage

13.1 The final review report should be published in-line with Natural England's publication standard. The text of the report must not undergo any further editing.

13.2 To maintain transparency and repeatability the additional background material underpinning the review should also be made readily available. This should include:

- the agreed review scope;
- the search protocol;
- evidence summaries;
- stakeholder feedback proforma; and
- topic review reports.

13.3 All published review documents should have authorship attributed.

14 Glossary

Term	
Assurance group	See Evidence Review Group
Conclusion	An agreed interpretation of the presented evidence in relation to the review question. A statement of what the evidence is saying (see also recommendation)
Evidence Review Group (ERG)	This refers to group of independent experts (for example,. academics, stakeholders, and practitioners), Natural England Heads of Profession, plus others as appropriate. An independent expert chairs the group. This group is responsible for objectively appraising the evidence, drawing conclusions, and if required making recommendations. For larger reviews, smaller topic- based sub-groups may appraise particular bodies of evidence.
NESAC	Natural England Scientific Advisory Committee
Recommendation	Pertain to advice or operational guidance to internal and external actors in the management of the natural environment. Recommendations are about who should do what and why. They must be based on the evidential conclusions but are nuanced by consideration of context and practicality (see also Conclusions)
Specialist review team	The group of Natural England specialists or specialist charged with retrieving and synthesising evidence for consideration by the Evidence Review Group.

15 References

BOWLER, D., BUYUNG-ALI, L., KNIGHT, T. & PULLIN, A. 2008. Systematic Review No. 41: How effective is 'greening' of urban areas in reducing human exposure to ground level ozone concentrations, UV exposure and the 'urban heat island effect'?

DALRYMPLE, S.E., STEWART, G.B. & PULLIN, A.S. 2011. Systematic Review: Are reintroductions an effective way of mitigating against plant extinction?

NICE. 2009. Methods for the development of NICE public health guidance (second edition).

Appendix 1 Example stakeholder comment form

Please use this form for submitting your comments to Natural England.

1) Please put each new comment in a new row.
2) Please insert the **section number** in the 1st column. If your comment relates to the document as a whole, please put **'general'** in this column.

Name:	
Organisation:	
Section number Indicate **section number** or **'general'** if your comment relates to the whole document	**Comments** Please insert each new comment in a new row

A Microsoft Word version of the stakeholder comment form is available for modification and use on Natural England's publication website.

Appendix 2 Example stakeholder comment response form

Response to stakeholder comments on .....

Organisation	**Section number** Indicate **section number** or **'general'** if your comment relates to the whole document	**Comments** Please insert each new comment in a new row	**Natural England response**

A Microsoft Word version of the stakeholder comment response form is available for modification and use on Natural England's publication website.

Appendix 3 Example of declaration of interest completed for a planning and health review

Contract reference number	XXXXXXXXXX
Contract title	Spatial planning and health review

I hereby declare the following interests in the environmental sector and those organisations with whom Natural England may have a contractual relationship.

Personal pecuniary interest
Description (if you have no interests in this category, state 'None')
None
Personal family interest (if you have no interests in this category, state 'None')
Description
None
Non-personal pecuniary interest (if you have no interests in this category, state 'None')
Description
None
Personal non-pecuniary interest (if you have no interests in this category, state 'None')
Description
1: I have expressed opinions on spatial planning and health impacts in the following papers and conferences: **Stone D.A.** (2006). Health and nature: critical elements for sustainable developments, proceedings of the IEEM Sustainability Conference 2005, IEEM. **Stone D.A.** (2006). Sustainable Development: convergence of public health and environmental agenda. Journal of Public Health 120, pp1110-1113. **Stone D.A.** (2009). Economic downturn in Europe – opportunities for sustainability and the environment – starting hypotheses. Royal Society of Medicine seminar meeting. *Unravelling the paradoxes: economic recession, sustainable development and health.* 2: I am employed by Natural England, an organistaion that is a statutory consultee on planning matters, and which has policy positions on green infrastructure and spatial planning that includes health outcomes. 3: I am an Executive committee member of Health & Environment Alliance (HEAL) a environment & health advocacy NGO. HEAL has a position on spatial planning as it relates to EU Environment & Health Action Plan Regional Priority Goals.

Signature:……

Name (*please print*):Dave Stone…… Date:12 May 2009……..

A Microsoft Word version of the Natural England declaration of interests template is available for modification and use on Natural England's publication website.

Appendix 4 Literature search tips

Literature searching hints and tips	
Planning your research	
What is the **purpose** of your research? List important **key terms, phrases and concepts**. Very specific terms will focus your search, yet may restrict the results. Try to think of →	• synonyms • acronyms • alternative spellings (try UK and US) • broader and narrower terms • related terms • 'unofficial' or out-of-date terms • terms that are not required • look at the Natural England corporate vocabulary
What is the **scope** of your research? Do you want to **restrict or limit it**? It can be just as important to make a note of what you don't want. →	• date ranges – for example, recent references only or any relevant material? • geographical limits • geophysical limits • demographics • language – you may not want to pay for translations, but most titles and abstracts are translated into English
List highly **relevant references that you already know of**. You can use key terms, phrases or concepts from known: →	• published material • databases • websites • wikis or blogs
What **type of information/publication** are you looking for? Which databases or websites should you use? Perhaps start with the links on the **ILS intranet pages** for a variety of: →	• journal articles / books / reports / government papers / official documents • statistics • conference proceedings etc.
Different databases use **different search methods:** →	• always look at the search tips when using unfamiliar databases
Achieving your goals: →	• be realistic about time constraints; ring fence time for searching, for following up the references and for reading them • record your search strategy and the resources you use as you progress, to avoid duplication • be realistic about the volume of information that you require
Want to **keep up with new research** on your topic? →	• some databases allow you to save your search strategy and run it regularly

Table continued…

Basic search tips

Truncation / wildcard searching. Different databases use different symbols, so always check the search tips; when in doubt, use an asterisk: →	• truncating a word allows you to find variations – for example, **coast*** will retrieve *coast, coasts, coastal, coastline(s)* • wildcards replace letters within the word – for example, **organi*ation** will retrieve *organisation* or *organization*
Boolean logic (devised by George Boole) uses common words to link keywords in your search: →	• **AND** searches for documents which contain all the specified keywords – for example, wildlife AND garden* AND fruit • **OR** broadens the search to find any of the keywords – for example, trail* OR path* OR way* • **NOT** excludes documents containing a specific keyword – for example, deer NOT muntjac. (Use NOT with care – you may omit valuable results)
Phrase searching is useful when looking for a specific title or commonly used phrase. Depending on the search engine you may need to use: →	• (parentheses) • “speech marks” • ‘single quotation marks’ for example, (wild boar) AND (mortality rate*)

Reviewing the results

Quality not quantity. How can you assess the value of what you have retrieved? You should use criteria applicable to the purpose of your research: →	• peer-reviewed papers • papers cited in review articles • reputable authors / specialists in a discipline • reputable journals / research units / websites • newspaper commentary • a balance of viewpoints
Are you satisfied with the references that you’ve retrieved? If not: →	• go back to the beginning of this process and revise your search strategy • review the resources that you have used and think about alternatives

Appendix 5 Example of evidence search plan

Name of Evidence Review: Lowland Calcareous Grassland

Name of review sub-topic (if any): Orchid management

Period of search: Date search started 01-06-2009 Date search completed 16-06-2009

1: Review question

What is the effect of fertilizer application on localised populations of lowland calcareous grassland orchid species?

1a: review sub-question (if required)

N/A

2: Consider how the following four categories apply to your review question.

Population / Species / Habitat/ Problem	Intervention	Comparison / control (if applicable)	Outcomes (or effect)
Orchids	Fertilizer application	No fertilizer application	Population change
Alternative words			
	Nutrient Nitrogen phosphate		Leaf size Fecundity Density Numbers
Antonyms			

3: What approach should be taken to the evidence search and why?

A systematic approach will be used using specified database search terms. This approach is being used because the focus of the review is primary peer-reviewed experimental study literature in order to quantify the size of effect.

4: What are main electronic sources should be searched?

Science citations; British library; OLib

5: Are additional searches planned (for example, citation, hand-searching)? If so what?

Grey literature – Natural England library

6: What are the main study types that will be identified (for example, primary, review-level)?

Primary studies

7: Inclusion and exclusion criteria

Inclusion criteria: control or comparison plot required

Exclusion criteria: orchid species from other habitats; non-European; studies before 1980; atmospheric deposition

8: Any other search restrictions

N/A

Search Plan Completed by: A.N.Other

Date Completed: 1 May 2009

A Microsoft Word version of the search plan template for modification and use is available for modification and use on Natural England's publication website.

Appendix 6 Examples of search strategy summaries

Example 1: taken from Bowler *et al*. (2008)

Databases

Searching for relevant research data was conducted using a range of databases of different disciplines (environmental, ecological, public health) and document types (peer-reviewed, theses, grey literature) to ensure a comprehensive and, as much as possible, unbiased sample of the relevant literature was obtained. In each case, no time, or document type restrictions were applied. The following databases were used: Medline, Science and Social Science Citation Index , ISI Proceedings, Geobase, Environmental Sciences and Pollution Management sub-files (CSA), Science Direct, CAB, Directory of Open Access Journals, Copac, Index to Theses Online, Knowledge Network for Biocomplexity and National Library for Public Health.

Search terms

In each database, combinations of the following environment and climate change search terms, using wild card terms when appropriate, were applied: Urban greening words: Urban and each of the following: green; vegetation; tree; open space; park or parks; wood; forest or garden.

Outcome-related words: Climate; “Climate change”; “Heat island”; Temperature; Ultraviolet/UV; Ozone/O3; “Heat wave” / Heatwave; “Volatile organic compounds”/VOC; “Nitrogen oxide”/NOx/NO2.

For instance, the search string for Web of Science was: (urban AND (green* OR vegetat* OR tree* OR "open space*" OR park OR parks OR wood* OR forest* OR garden*) AND (climate OR "climate change" OR "heat island*" OR temperature* OR ultraviolet OR "UV" OR ozone OR "O3" OR "heat wave*" OR "heatwave*" OR "volatile organic compounds" OR "VOC*" OR "nitrogen oxide*" OR "NOx" OR "NO2")).

Web sites

Combinations of the above search terms were also used to search the internet using different search engines (**www.dogpile.com**; **www.google.com**; **www.scirus.com**). The first 50 hits from each search were checked for relevance, as a compromise between the amount of time spent searching and the efficiency of retrieval of relevant articles. Websites of specialist organisations were also searched.

Example 2: Dalrymple *et al*. (2011)

Search strategy

The literature search strategy used the following electronic databases: ISI Web of Knowledge including ISI Web of Science (Science Citation Index expanded 1945-present) and ISI Proceedings (Science and Technology Proceedings 1990-present), JSTOR, Index to Theses Online (1970-present), Digital Dissertations Online, Dogpile Meta-search (internet search), Google Scholar (internet search), COPAC, Scirus, Scopus and ConservationEvidence.com. The following search terms were used (an asterisk denotes a wild card search term allowing for several permutations of each intervention type): plant* AND re-introduc*, plant* AND reintroduc*, plant* AND introduc*, plant* AND translocation*, plant* AND establish*, plant* AND re-establish*, plant* AND restor*, plant* AND reinstat*, plant* AND regenerat*, plant* AND assisted migration.

The libraries of Natural England, Scottish Natural Heritage, the Countryside Council for Wales, and the Joint Nature Conservancy Council were searched, by sending the search terms to the libraries" curators. In the case of the Countryside Council for Wales the authors were given remote access and conducted the search using the search terms described above before requesting any relevant literature. The (re-) introduction records of the Botanical Society of the British Isles (BSBI) and Plantlife were also kindly made accessible to the authors and were incorporated into the literature search.

Example 3: Showler *et al*. (2010)

Search strategy

Relevant studies were identified through computerised searches of the following 12 electronic databases:

- ISI Web of Knowledge
- Science Direct
- Directory of Open Access Journals (DOAJ)
- Copac
- Scirus
- Scopus
- Index to Theses Online (1970-present)
- Digital Dissertations Online
- Agricola
- Europa
- English Nature's "Wildlink"
- JSTOR

The search terms used were:

- Bird* AND access*
- Bird* AND trampling*
- Bird* AND recreation*
- Bird* AND walk*
- Bird* AND disturbance*
- Human AND disturbance*
- Human AND activity

Publication searches were undertaken on conservation and statutory organisation websites: Agricultural Development and Advisory Service (ADAS); Countryside Council for Wales (CCW); Department of Agriculture and Rural Development (DARD); Department of Environment, Food and Rural Affairs (DEFRA); English Nature (EN); Joint Nature Conservation Committee (JNCC); National Trust (NT); Royal Society for the Protection of Birds (RSPB); and Scottish Natural Heritage (SNH). Google searches for reports for some species and families were also undertaken.

Bibliographies of articles accepted into the systematic review at the full text stage and traditional literature reviews were searched for studies that had not yet been identified by any other means. Recognised experts and practitioners were contacted and asked to recommend any additional sources of potentially relevant information. Foreign language searches were not conducted. However, the search identified studies on a global scale, all of which were included in the systematic review process.

Appendix 7 Example full-paper screening tool

Name of Evidence Review: _____

Name of review sub-topic (if any): _____

1: Review question

2: Study citation

3: Consider if the study meets any of the review exclusion criteria.

Exclusion Criteria	Does study meet this criteria Y/N	Action
Ex Criteria 1		If any criteria are met exclude study from review
Ex Criteria 2		
Ex Criteria 3		
Ex Criteria 4		

4: What is the minimum number of inclusion criteria that must be met for the study to considered in next stage of the review? [INSERT No OF CRITERIA].

5: Consider if the study meets any of the inclusion criteria.

Inclusion Criteria	Does study meet this criteria Y/N	Action
Inc Criteria 1		Does the study meet sufficient of the criteria for extraction and synthesis stage of review?
Inc Criteria 2		
Inc Criteria 3		
Inc Criteria 4		

6: This study should be INCLUDED / EXCLUDED from the review.

Full paper screening Completed by: [INSERT NAME(S)]

Date completed: [INSERT DATE]

A Microsoft Word version of the full paper screening tool for modification and use is available for modification and use on Natural England's publication website.

Appendix 8 Example study inclusion-exclusion tabulation

Review stage	No. of studies
Studies captured using search terms in all sources (inc duplicates)	14717
Studies captured using search terms in all sources (excluding duplicates)	4904
Studies remaining after title filter	419
Studies remaining after abstract filter	173
Studies remaining after full text filter	85

Appendix 9 Categorising evidence by type

Each study is categorised by study type (types 1 – 4).

Type category	Study type
1	Meta-analyses, systematic reviews of RCTs, or RCTs (including cluster RCTs).
2	Systematic reviews of, or individual, non-randomised controlled trials, case-control trials, cohort studies, controlled before-and-after (CBA) studies, interrupted time series (ITS) studies, correlation studies.
3	Non-analytical studies for example, case reports, case series studies.
4	Expert opinion, formal consensus.

Appendix 10 Quality appraisal checklist for some commonly used study types

Quantitative studies: experimental checklist

- Before-and-after study.
- Non-randomised controlled trial (NRCT).
- Randomised controlled trial (RCT).

Quantitative studies: observational checklist

- Before-and-after study.
- Case-control study.
- Cohort study.
- Correlation study.
- Cross-sectional study.
- Interrupted time series (ITS).

Qualitative studies checklist

- Document analysis.
- Focus groups.
- Interview study.
- Observation and participant observation.

Economic studies checklist

- Cost-benefit analysis.
- Cost-consequence analysis.
- Cost-effectiveness analysis.
- Cost-utility analysis.

Appendix 11 Quality assessment responses

Quantitative checklist items are worded so that one of five responses is possible:

++	Indicates that for a particular aspect of study design, the study has been conducted / designed in such a way as to minimise bias
+	Indicates that either the answer to the checklist question is not clear from the way the study has been reported, or that the study may not have addressed all potential sources of bias for that particular aspect
-	Should be reserved for those aspects of study design in which significant sources of bias may persist
NR (not reported)	Should be reserved for those aspects in which the study fails to report how they might / have been considered
NA (not applicable)	Should be reserved for those study design aspects which are not applicable given the study design under review.

Study quality:

++	All or most of the methodological criteria have been fulfilled. Where they have not been fulfilled the conclusions are thought very unlikely to alter (low risk of bias)
+	Some of the methodological criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are thought unlikely to alter the conclusions (risk of bias)
-	Few or no methodological criteria have been fulfilled. The conclusions of the study are thought likely or very likely to alter (high risk of bias).

Appendix 12 Quality assessment checklists

A Microsoft Word version of the quality assessment quantitative experimental checklist template for modification and use is available for modification and use on Natural England's publication website.

A Microsoft Word version of the quality assessment quantitative observational-correlative checklist template for modification and use is available for modification and use on Natural England's publication website.

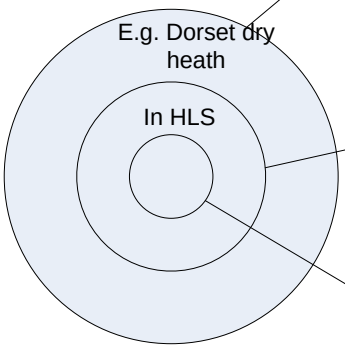
A Microsoft Word version of the qualitative quality assessment checklist template for modification and use is available for modification and use on Natural England's publication website.

Quality assessment checklist: Quantitative study experimental

Name of Evidence Review: _____

Name of Review Sub-topic (if any): _____

Review Question	
Study Citation	
Study Design Category	
Assessed by & when	[INSERT REVIEWER NAME & DATE]



Section 1: Population		
1.1 **Are the source population(s) or area(s) well described?** e.g. Were habitat(s) and biodiversity of the area(s) well described.	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
1.2 **Are the eligible population(s) or area(s) (the sampling frame) representative of the source population(s) or area(s)?** Were important groups under-represented?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
1.3 **Are the sampled habitats/flora/fauna or area(s) representative of the eligible population(s) or area(s)?** Was the method of selection well described? Were there any sources of bias? Were the inclusion / exclusion criteria explicit and appropriate?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:

Source refers to the whole biotype/species/ ecosystem resource in the area of investigation e.g. upland area, geological substrate or county

Eligible refers o the 'recruited' study population which is a sub-set of the whole source population.

Sampled refers to the sub-set of the eligible population that subject to experimental intervention and analysis

Section 2: Method of allocation to intervention(or comparison)		
2.1 Method of allocation of samples to management intervention(s) (treatments) (and/or comparison(s)). How was selection bias minimised? Was allocation randomised (++)? If not randomised was significant confounding likely/not likely?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.2 Were management intervention(s) / treatments (and/or comparison(s)) well described and appropriate? Sufficient detail to replicate? Was comparison appropriate?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.3 Was the exposure to the management intervention(s) (and/or comparison(s)) adequate? Was lack of exposure sufficient to cause important bias? Consider consistency of implementation (for example,. was there unplanned variation in timing of exposures)	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.4 Was contamination acceptably low? Did any of the comparison population receive the management intervention(s) or vice versa? Was it sufficient to cause important bias?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.5 Were any other intervention(s) received and, if so, were they similar in both groups? Did either group receive additional interventions (for example, management not part of the experimental interventions, for example, plots with unplanned burning)? Were groups treated equally?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.6 Were the wider/eligible/sample population(s)/area(s) representative of the England/UK Resource.	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.7 Did the intervention(s) or control comparison(s) reflect the usual UK practice(s)?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:

Section 3: Outcomes		
3.1 Were outcome variables/measures reliable? Were outcome variables/measurements subjective or objective. How reliable were the outcome measures (for example,. inter- or intra- reliability scores, observer bias?)? Was there any indication that measures had been validated/other QA?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
3.2 Were all outcome measurements complete? Were outcome variables/measurements completed across all/most of the study population(s)/area(s) (that met the defined study outcome definitions)?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
3.3 Were all important outcomes assessed? Were all important positive and negative effects assessed by the variables/measurements used?	☐++ ☐+ ☐- ☐NR ☐NA	Comments: Was it possible to determine the overall balance of benefits and or harms versus comparisons? This is in relation to the study objectives and design.
3.4 Were outcomes relevant? If surrogate outcome variables/measurements were used, did they provide a reliable indication of the scale and direction of the important effect(s)?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
3.5 Were there similar post-treatment time intervals in exposure and comparison groups?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
3.6 Was the post-treatment time interval meaningful? Was the interval long enough to assess long-term effects?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:

Section 4: Analyses		
4.1 Were exposure and comparison groups similar at baseline? If not, were they adjusted [in the analyses]? Were there any differences between groups in important confounders at baseline?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
4.2 Was the study sufficiently powered to detect an intervention effect (if one exists)? A power of 0.8 is the conventionally accepted standard. Is a power calculation present? If not, what is the expected effect size? Is the sample size adequate?	☐++ ☐+ ☐- ☐NR ☐NA	Comments: Is there an explicit calculation of the power of the study to detect any effect? Is there a statement about anticipated / expected size of effect which the intervention would bring about - the expected difference from the control / comparison? Does the sample size seem to be adequate to allow the effect to be detected?
4.3 Were the estimates of effect size given or calculable?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
4.4 Were the analytical methods appropriate? Were any important differences in post-treatment time and likely confounders adjusted for? Were any sub-group analyses pre-specified?	☐++ ☐+ ☐- ☐NR ☐NA	Comments: Where sub-group analyses pre-specified or explanatory? Explanatory sub-group analyses provide valuable information but can be underpowered and shouldn't be over emphasised.
4.5 Was the precision of the intervention effects given or calculable? Were they meaningful? Were confidence intervals and or p-values for the effect estimates given or calculable?	☐++ ☐+ ☐- ☐NR ☐NA	Comments: This is asking if confidence intervals or p-values were given. If they were are they wide or precise enough to aid decision-making? If they were wide it suggests the study was under-powered.

Section 5: Summary		
5.1 Are the results of the study internally valid (i.e. unbiased)? How well did the study minimise sources of bias (i.e. adjusting for potential confounders)? Were there any significant flaws in the study design?	☐++ ☐+ ☐-	Comments:
5.2 Are the findings generalisable to the wider source population(s)/area(s) and nationally (i.e. externally valid)? Are there sufficient details given to determine if the findings can be generalised across the population(s)/area(s) and nationally (i.e. habitat, species)?	☐++ ☐+ ☐-	Comments:

Quality assessment checklist: Quantitative study observational / correlative

Name of Evidence Review: _____

Name of review sub-topic (if any): _____

Review question	
Study citation	
Study design category	
Assessed by & when	[INSERT REVIEWER NAME & DATE]

Section 1: Population		
1.1 Is the source population or source area well described? For example, was the country, habitat and biodiversity of the area well described.	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
1.2 Is the eligible population or area representative of the source population or area? For example, is the floristic diversity representative of the habitat? Were important groups under-represented?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
1.3 Do the selected habitats/flora/fauna or area represent the eligible population or area? Was the method of selection well described? Were there any sources of bias? Were the inclusion / exclusion criteria explicit and appropriate?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:

Section 2: Method of allocation to intervention(or comparison)		
2.1 Selection of exposure (and comparison) group. How was selection bias minimised?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.2 Was the selection of explanatory variables based on a sound theoretical basis?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.3 Was the contamination acceptably low? Did any of the comparison group receive the exposure? If so, was it sufficient to cause important bias?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.4 How well were likely confounding factors identified and controlled? Were there likely to be other confounding factors not considered or appropriately adjusted for? Was this sufficient to cause bias?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
2.5 Is the setting applicable to the UK?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:

Section 3: Outcomes		
3.1 Were outcome measures and procedures reliable? Were outcome measure subjective or objective. How reliable were the outcome measures (for example,. inter- or intra-rater reliability scores)? Was there any indication that measures had been validated?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
3.2 Were all outcome measurements complete? Were all/most of the study population that met the defined study outcome definitions likely to have been identified?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
3.3 Were all important outcomes assessed? Were all important positive and negative effects assessed?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
3.4 Were outcomes relevant? Where surrogate outcome measures were used, did they measure what they set out to measure?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
3.5 Were there similar follow up times in exposure and comparison groups?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
3.6 Was the follow up time meaningful? Was the follow-up long enough to assess long-term benefits / harms?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:

Section 4: Analyses		
4.1 Was the study sufficiently powered to detect an intervention effect (if one exists)? A power of 0.8 is the conventionally accepted standard. Is a power calculation present? If not, what is the expected effect size? Is the sample size adequate?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
4.2 Were multiple explanatory variables considered in the analysis? Were sufficient explanatory variables considered in the analysis?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
4.3 Were the analytical methods appropriate? Were important differences in follow-up time and likely confounders adjusted for? Were sub-group analyses pre-specified?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:
4.4 Was the precision of the intervention effects given or calculable? Is association meaningful? Were confidence intervals and or p-values for the effect estimates given or calculable?	☐++ ☐+ ☐- ☐NR ☐NA	Comments:

Section 5: Summary		
5.1 Are the results of the study internally valid (i.e. unbiased)? How well did the study minimise sources of bias (i.e. adjusting for potential confounders)? Were there significant flaws in the study design	☐++ ☐+ ☐-	Comments:
5.2 Are the findings generalisable to the wider source population (i.e. externally valid)? Are there sufficient details given to determine if the findings of can be generalised across the population (i.e. habitat, species)?	☐++ ☐+ ☐-	Comments:

Quality assessment checklist: Qualitative study

Name of Evidence Review:_____

Name of review sub-topic (if any):_____

Review question	
Study citation	
Study design category	
Assessed by & when	[INSERT REVIEWER NAME & DATE]

Section 1: Theoretical approach		
1.1 Is a qualitative approach appropriate? For example: - Does the research question seek to understand processes or structures, or illuminate subjective experiences or meanings? - Could a quantitative approach better have addressed the research question?	☐ Appropriate ☐ Inappropriate ☐ Not Sure	Comments:
1.2 Is the study clear in what it seeks to do? For example: - Is the purpose of the study discussed - aims/objectives/research questions? - Is there adequate / appropriate reference to literature? - Are underpinning values / assumptions discussed?	☐ Clear ☐ Unclear ☐ Mixed	Comments:

Section 2: Study design		
2.1 How defensible / rigorous is the research design / methodology? For example: - Is the design appropriate to the research question? - Is a rationale given for using a qualitative approach? - Are there clear accounts of the rationale for sampling, data collection and data analysis techniques used? - Is the selection of cases / sampling strategy theoretically justified?	☐ Defensible ☐ Indefensible ☐ Not Sure	Comments:

Section 3: Data Collection		
3.1 How well was the data collection carried out? For example: - Are data collection methods clearly described? - Were the appropriate data collected to address the research question? - Was the data collection and record keeping systematic?	☐ Appropriately ☐ Inappropriately ☐ Not Sure / inadequately reported	Comments:

Section 4:Trustworthiness		
4.1 Is the role of researcher clearly described? For example: - Has the relationship between the researchers and intervention group been adequately considered?	☐ Clearly described ☐Unclear ☐ Not described	Comments:
4.2 Is the context clearly described? For example: - Were observations made in a sufficient variety of circumstances? - Was context bias considered?	☐Clear ☐ Unclear ☐ Not Sure	Comments:
4.3 Were the methods reliable? For example: - Was data collected by more than one method? - Is there justification for triangulation or for not triangulating? - Do the methods investigate what they claim to?	☐ Reliable ☐ Unreliable ☐ Not Sure	Comments:

Section 5: Analyses		
5.1 Is the data analysis sufficiently rigorous? For example: - Is the procedure explicit? - How systematic is the analysis, is the procedure reliable? - Is it clear how the themes and concepts were derived from the data?	☐ Rigorous ☐ Not Rigorous ☐ Not Sure / not reported	Comments:
5.2 Is the data 'rich'? For example: - How well are the contexts of the data described? - Has the diversity of perspective and content been explored? - Are responses compared and contrasted?	☐ Rich ☐ Poor ☐ Not Sure / not Reported	Comments:
5.3 Is the analysis reliable? For example: - Did more than one researcher theme and code data? - If so how were differences resolved? - Were negative / discrepant results addressed?	☐ Reliable ☐ Unreliable ☐ Not sure / not reported	Comments:
5.4 Are findings convincing? For example: - Findings clearly presented? - Finding internally coherent? - Extracts from original data included? - Data appropriately referenced? - Reporting clear and coherent?	☐ Convincing ☐ Unconvincing ☐ Not Sure	Comments:
5.5 Are the findings relevant to the aims of the study?	☐ Relevant ☐ Irrelevant ☐ Partially relevant	Comments:
5.6 Conclusions For example: - How clear are the links between data interpretation and conclusions? - Are the conclusions plausible and coherent? - Have alternative explanations been explored and discounted? - Does this enhance understanding of the research topic? - Are the implications of the research clearly defined? - Is there adequate discussion of the limitations encountered?	☐ Adequate ☐ Inadequate ☐ Not sure	Comments:

Section 6: Ethics		
6.1 How clear and coherent is the reporting of ethics? For example: - Have ethical issues been taken into consideration? - Are they adequately considered? - Have the consequences of the research been considered? - Was the study approved by an ethics committee?	☐ Appropriately ☐ Inappropriately ☐ Not Sure / not reported	Comments:

Section 7: Overall Assessment		
As far as can be ascertained from the paper, how well was the study conducted? For example: - Are data collection methods clearly described? - Were the appropriate data collected to address the research question? - Was the data collection and record keeping systematic?	☐++ ☐ + ☐ -	Comments:

Appendix 13 Evidence table examples

Example 1:

Name of Evidence Review: Restoration of grasslands

Name of review sub-topic (if any):

Review question: What translocation techniques maintain the floristic diversity of herb-rich swards?

Study details	Population and setting	Methods of allocation to intervention / control	Outcomes and methods of analysis (inc effect size, CIs for each outcome and significance	Results	Notes
Authors: Year: Aim of study: Study design: Quality score: External validity:	Source population: Eligible population: Inclusion & exclusion criteria: Setting:	Methods of allocation: not described Intervention description: Control / comparison description: Sample sizes: Baseline comparisons: Study sufficiently powered:	Primary outcome measures: Secondary outcome measures: Follow-up periods: Methods of analysis:		Limitations identified by author: Limitations identified by review team: Evidence gaps and/pr recommendations for further research: Sources of funding:

Table continued…

Authors: Good *et al*. (2009) Translocation of herb-rich grassland from a site in Wales prior to opencast coal extraction. Aim of study: To test 2 methods of reinstating grassland vegetation on a recipient site. Study design: Case-control Quality score: - External validity: +	Source population: MG5c / M24c & CG10 grassland mosaic on donor site – comprising 72 species overall. Setting: South Wales Donor site and recipient site within 1km of each other. Both sites similar aspect, slope and history of traditional farm mamangement i.e. hay cuts and grazing.	Methods of allocation: Sample turves identified as representative of donor site. Intervention description: Donor turves removed and translocated to prepared ground on recipient site. 2 treatments – whole turf transfer and turf transfer with rotivation. Comparator and treatments managed by annual hay cut post translocation Control / comparison description: Turves remaining at donor site; and pre-post vegetative composition of transplanted turves. Sample sizes: Transplanted turves n = 8. Baseline comparisons: Species composition inc DOMIN score prior to intervention. Study sufficiently powered: No power given. Low sample number study likely under-powered.	Primary outcome measures: Restoration of turves with floristic communities. Secondary outcome measures: Re-establishment of species. Follow-up periods: Annual measures for 4 consecutive years. Methods of analysis: Species richness comparison. Detrended Correspondence Analysis	Floristic communities: All translocated plots shoed drift from host / comparator communities. This was deemed significant in the multivariate analysis – no Eigen values presented. Species richness: After 4 years all plots showed a loss of at least 50% of species. Relative abundance varied markedly (not statistically testable). Evidence of ruderal species establishing plots indicating further draft.	Limitations identified by author: Limitations identified by review team: Analysis statistically weak – not even Eigen values presented for multivariate analysis. Sample size very small. Evidence gaps and/pr recommendations for further research: Sources of funding: British Open Cast Executive

A Microsoft Word version of the evidence table template for modification and use is available for modification and use on Natural England's publication website.

Example 2:

Name of Evidence Review:

Name of review sub-topic (if any):

Review question:

Study details	**Authors**	
	Year	
	Aim of study	
	Study design	
	Quality score	
	External validity	
Population and setting	Source population	
	Eligible population	
	Inclusion and exclusion criteria	
	Setting	
Methods of allocation to intervention/control	Methods of allocation	
	Intervention description	
	Control/comparison description	
	Sample sizes	
	Baseline comparisons	
	Study sufficiently powered	
Outcomes and methods of analysis (inc effect size, CIs for each outcome and significance)	Primary outcome measures	
	Secondary outcome measures	
	Follow-up periods	
	Methods of analysis	
Results		
Notes	Limitations identified by author	
	Limitations identified by review team	
	Evidence gaps and/pr recommendations for further research	
	Sources of funding	

Appendix 14 Evidence statement terminology

Strength of evidence may be summarised as:

- **No evidence:** be clear about the sources and inclusion criteria. For example, state: 'No evidence was found from English-language trials published since 1990 ....'.
- **Weak evidence:** For example, 'there was weak evidence from one before-and-after study (Jones, 1990 [2-] ....'.
- **Moderate evidence:** for example, 'there was moderate evidence from two case-control studies (Smith 1992 [2+]; Brown 1995 [2+])'.
- **Strong evidence:** for example, ' there was strong evidence from two random control trials (Green 2002 [1++]; Black 2005 [1+]).
- **Inconsistent evidence:** further commentary may be needed on the variability of the findings in different studies. For example, when results of (++) and (+) quality studies do not agree. In such cases the review team may qualify an evidence statement with an explanatory sentence or section that gives more detail.

Direction of effect or correlation, if appropriate, should be summarised using one of the terms:

- positive;
- negative;
- mixed; or
- non-existent.

Natural England is here to secure a healthy natural environment for people to enjoy, where wildlife is protected and England's traditional landscapes are safeguarded for future generations.

Catalogue Code: NEER

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