

Weight-of-evidence Documentation Form User Manual

Purpose:

State water quality managers can use the Weight-of-evidence Documentation Form (WoE Form) and this User Manual to document planning and use of weight-of-evidence (WoE) methods during numeric nutrient criteria (NNC) development for waterbodies.¹ The WoE Form's function is to prompt documentation of multiple aspects of WoE methods (e.g., who was involved, what methods were selected, justification for methods selected, when methods were carried out). For support in selecting methods, see the *Application of Weight-of-Evidence Methods for Transparent and Defensible Numeric Nutrient Criteria* report (WoE Report). A link to this report is provided in the Resources section below. Information recorded in the WoE Form can be incorporated into technical support documents submitted as part of NNC packages.

The WoE Form includes a section for each phase of the criteria development process. The form may be completely filled out if WoE methods are used in every phase of the criteria development process. If WoE methods are not used in a phase, that section may be skipped.

Abbreviations

Abbreviation	Full Term
WoE	Weight-of-Evidence
NNC	Numeric Nutrient Criteria
N-STEPS	Nutrient Scientific Technical Exchange Partnership & Support

Resources

Resource Name	URL Link to Resource
WoE Report	https://www.epa.gov/system/files/documents/2024-05/woe_nnc_508_final.pdf
WoE Homepage	https://www.epa.gov/water-research/application-weight-evidence-methods-transparent-and-defensible-numeric-nutrient
EcoDIVER	https://www.epa.gov/ecodiver
Ecological Risk Assessment	https://www.epa.gov/risk/ecological-risk-assessment
Nutrients Research	https://www.epa.gov/water-research/nutrients-research
N-STEPS Online	https://nsteps.epa.gov/

¹ Under the Clean Water Act (CWA), 'state' refers to states, territories, and authorized tribes.

Planning Phase

Planning activities should provide a transparent basis for developing NNC. This is a core principle in effective WoE methodology. If diverse evidence needs to be combined, water bodies can be grouped during this phase.

Question	Guidance
A.1	Select “Yes” from the dropdown menu if your state used any WoE methods during NCC development. Otherwise, select “No” from the dropdown menu.
A.2	Provide the name(s), email(s), and phone number(s) of the individuals and/or groups that helped create the plan. If an email or phone number is not available for the listed entity, put “n/a” in the cell. Additional rows can be inserted if needed, and unused rows may be deleted.
A.3	Provide the start date of planning efforts in the Start Date block, and the date planning efforts concluded in the End Date block.
A.4	Processes used to create the plan can include but are not limited to: plan creation by individual expert, expert internal workgroup and/or expert external workgroups. If relevant, include information about how drafts were produced and how comments were incorporated. Section 1.4 of the WoE Report provides additional information.
A.5	Provide the name(s), email(s), and phone number(s) of the individuals and/or groups that helped review the plan. If an email or phone number is not available for the listed entity, put “n/a” in the cell. Additional rows can be inserted if needed, and unused rows may be deleted.
A.6	Provide the start date of reviewing efforts in the Start Date block, and the date reviewing efforts concluded in the End Date block.
A.7	Processes used to review the plan can include but are not limited to: expert workgroup review (internal or external), review by an individual, and/or public or stakeholder engagement processes. Section 1.4 of the WoE Report provides additional information.
A.8	Select “Yes” from the dropdown menu if your state used WoE to group waterbodies. Otherwise, select “No” from the dropdown menu.
A.9	Provide a written explanation for why your state did or did not elect to use WoE to group waterbodies. If waterbodies are already in another natural grouping, please include that in the explanation.
A.10	If you selected “Yes” from the dropdown menu in question A.8, answer questions A.10.1 through A.10.4. If you selected “No” from the dropdown menu in question A.8, you may skip to Section B. Problem Formulation Phase .

A.10.1	Sources of evidence can include, but are not limited to: primary data analyses, published literature, existing syntheses, and expert knowledge.
A.10.2	Methods used to assemble evidence for grouping waterbodies can include but are not limited to: selecting and analyzing data using various modeling and statistical approaches, literature searching, and expert/stakeholder elicitation. Section 4.1 of the WoE Report provides additional information.
A.10.3	Methods used to weight evidence for grouping waterbodies include scoring evidence in terms of its relevance, reliability, and strength. Section 4.2.1 of the WoE Report provides additional information.
A.10.4	Methods used to integrate evidence for grouping waterbodies can include but are not limited to: selecting weightiest evidence and merging evidence. Section 5.1 of the WoE Report provides additional information.

Problem Formulation Phase

Selecting endpoints during Problem Formulation is also a process to which WoE could be applied when diverse evidence needs to be combined. Conceptual models developed during Problem Formulation can help inform what evidence should be assembled in the Analysis Phase.

Question	Guidance
B.1	Select “Yes” from the dropdown menu if your state used WoE methods to select endpoints. Otherwise, select “No” from the dropdown menu.
B.2	Provide a written explanation for why your state did or did not elect to use WoE to select endpoints.
B.3	If you selected “Yes” from the dropdown menu in question B.1, answer questions B.3.1 through B.4. If you selected “No” from the dropdown menu in question B.1, you may skip to Section C. Analysis Phase .
B.3.1	Sources of evidence used to select endpoints can include but are not limited to: primary data analyses, published literature, existing syntheses, and expert knowledge.
B.3.2	Methods used to assemble evidence to select endpoints can include but are not limited to: selecting and analyzing data using various modeling and statistical approaches, literature searching, and expert/stakeholder elicitation. Chapter 3 of the WoE Report provides additional information.
B.3.3	Methods used to weight evidence to select endpoints include scoring evidence in terms of its relevance, reliability, and strength. Section 4.2.1 of the WoE Report provides additional information.
B.3.4	Methods used to integrate evidence to select endpoints can include but are not limited to: selecting weightiest evidence and merging evidence. Section 5.1 of the WoE Report provides additional information.
B.4	Conceptual models visually summarize how nutrients affect selected endpoints. Explain the relationship between the nutrients and the assessment endpoints that is being illustrated by the conceptual model. Section 3.1 and Figure 5 of the WoE Report provide additional information.

Analysis Phase

This phase includes assembling evidence and weighting evidence. Unbiased assembly of evidence is the best practice and can ensure NNC are based on transparent data and information of sufficient amount and quality. Weighting evidence by establishing, objectively evaluating, and documenting qualities of that evidence shows how much influence individual evidence will have on overall NNC conclusions.

Question	Guidance
C.1	Select “Yes” from the dropdown menu if your state used WoE methods to derive NNC. Otherwise, select “No” from the dropdown menu.
C.2	Provide a written explanation for why your state did or did not elect to use WoE to derive NNC.
C.3	If you selected “Yes” from the dropdown menu in question C.1, answer questions C.3.1 through C.8. If you selected “No” from the dropdown menu in question C.1, you do not need to provide any additional information in the form.
C.3.1	Sources of evidence used to derive NNC can include but are not limited to: primary data analyses (eg, reference condition analysis, stressor-response analysis, mechanistic modeling), published literature, existing syntheses, and expert knowledge.
C.3.2	Methods used to assemble evidence can include but are not limited to: conducting and reporting primary data analysis results, searching for and screening published literature, and expert elicitation. Section 4.1 of the WoE Report provides additional information.
C.4	Factors to determine evidence relevance can include but are not limited to: matching abiotic conditions of waters, matching nutrient stressors and/or assessment endpoints. Section 4.2.1.1 of the WoE Report provides additional information.
C.5	Factors to determine evidence reliability can include but are not limited to: study design and execution, minimized confounding, transparency, and peer review. Boxes 3 and 4 in Section 4.2.1.2 of the WoE Report provide additional information.
C.6	Factors to determine evidence strength can include but are not limited to: magnitude, direction, and association. Box 5 in Section 4.2.1.3 of the WoE Report provides additional information.
C.7	Describe how scores for relevance, reliability, and strength were independently assigned, and how these scores were used to weight evidence. Section 4.2.2 of the WoE Report provides additional information.
C.8	Describe visual methods used to communicate evidence weight. Section 4.2.2 and Figure 7 of the WoE Report provide additional information.

Criteria Derivation Phase

This phase includes weighing the body of evidence by integrating and interpreting evidence, as well as communicating conclusions. Methods for integrating evidence to derive criteria can range from simple to sophisticated; selected methods should be logical, informed by evidence availability and stakeholder needs, and communicated clearly.

Question	Guidance
D.1	Select “Yes” from the dropdown menu if your state aggregated pieces of evidence into lines of evidence. Otherwise, select “No” from the dropdown menu. Section 5.1.1 of the WoE Report provides additional information.
D.2	Provide a written explanation for why your state did or did not elect to aggregate pieces of evidence into lines of evidence.
D.3	Methods used for evidence integration can include but are not limited to: selecting weightiest, merging multiple using mean or median (weighted or unweighted), and/or meta-analysis. Section 5.1.2 of the WoE Report provides additional information.
D.4	Methods used to communicate conclusions can include but are not limited to: figures and tables. Section 5.1.2 of the WoE Report provides additional information.
D.5	Challenges resulting in a lack of evidence with sufficient weight to inform criteria development can include but are not limited to: uncertainty, variability, ambiguity, and discrepancy. Strategies used to overcome challenges should be appropriate for each challenge. Section 5.1.2 of the WoE Report provides additional information.