Center for Independent Experts Independent Peer Review Science Review Report of Puget Sound Nearshore Conservation Calculator and the integral Puget Sound Nearshore Habitat Values Model

Dr. Steven J. Cooke

January 2024

Executive Summary

The Nearshore Calculator (and associated documents such as the Biological Opinion and User Guide) provide a comprehensive overview of the need for such a tool, its development, its use, and its limitations. As a journal editor and independent reviewer, I assess over 200 documents/papers annually. I remain in awe at the extent to which the Calculator has been thoughtfully developed drawing upon published literature, grey literature, and expert knowledge. Every time I thought I had identified a major deficiency, it was addressed in a subsequent section. I struggled to find issues that deserved critique. The calculator itself is robust but the potential role of the calculator is overstated in that it is implied that use of the calculator will inherently "ensure" no net loss of valuable habitat. The calculator is certainly a useful tool to inform habitat management but unless there is adequate embrace by users and appropriate compliance monitoring by relevant regulatory bodies, the numbers generated by the calculator are unlikely to be achieved. Some of the real strengths of the calculator are the fact that it will be updated regularly (with encouragement of users to submit feedback) and that there will be a log of changes maintained. I also appreciate that training has been offered for users of the Calculator. The biggest weaknesses are the unknowns – the fact that it is difficult to future proof the tool – or more importantly the decisions that are made based on tool outputs. Climate change and cumulative effects are acknowledged in the report but there is need to further refine the tool to incorporate both uncertainty in inputs as well as recognize that off-sets that work for today may not be relevant for tomorrow. That does not invalidate the tool but is a cautionary reality that needs to be continuously considered. Key research gaps are outlined and I recommend a dedicated and coordinated funding program to help address those gaps in a timely manner. There are elements of the Calculator and the process that are similar to those used in Canada to assess and manage no net loss yet none of that literature is included. There are opportunities to learn and share between jurisdictions. I question the extent to which the Calculator addresses every type of nearshore or on-shore development activity but presume that future iterations of the Calculator could include additional development activities (and forms of mitigation/restoration/off-setting).

Background

Understanding potential loss of aquatic habitat associated with different development activities is important to identify the extent of avoidance, mitigation, and off-setting that is needed. However, in practice it is difficult to ensure that there is no net loss of habitat. The Nearshore Calculator was developed to do just that with a focus on nearshore areas of the Salish Sea in US territory with a focus on Pacific salmonids. This work is nested within a broader series of Endangered Species protection/recovery programs detailed as part of a Biological Opinion.

Description of Role in Review Activities

My role as independent expert was to review the documents provided (Appendix 1) and assess them relative to the Terms of Reference provided (see Appendix 2). I did so through the lens of my experience in fish habitat science, salmon ecology, multiple stressors/cumulative effects, and aquatic conservation. As editor of several journals and as independent reviewer of grants and various science documents, I assess over 200 reports/papers annually. I was unable to join the webinar put on by the NOAA team but I did watch the recorded video.

Summary of Findings for each TOR (describing strengths and weaknesses)

I acknowledge that during my evaluation I recognized that the Nearshore Calculator had to use the best available science, I understood that Endangered Species Act consultations cannot be delayed until better science becomes available, and I appreciated that the Nearshore Calculator could be modified over time as additional science becomes available.

1) Analytically sound process:

a) Are the underlying relationships that Nearshore Calculator and the NHVM are built upon (e.g., duration of aquatic access, functional pathways, indicators/metrics) sufficient and well-founded for evaluating effects of changes to nearshore habitat conditions on salmonids, given the stated goals and objectives? Is the analytical approach based on a valid list of habitat attributes (physical and biological functions)?

Yes – The underlying relationships of the Calculator and the NHVM are based upon foundational relationships that are well studied for coastal systems. That does not mean that knowledge is absolute, but relative to most other coastal ecosystems on the planet, the evidence base on these region/taxa/systems is richer than most by an order of magnitude. Some of my concerns relate to the complexity of unexpected interactions or cumulative effects (notwithstanding the discussion of cumulative effects on page 211 of the Biological Opinion – in the actual Calculator documents the words "cumulative effects" are almost entirely absent). To be clear, complex interactions and cumulative effects are both exceedingly difficult concepts to apply to regulatory and decision-making frameworks. Are there plans to aggregate scores/impacts at a regional scale? In the future (if imperiled species do not achieve recovery targets) and assuming continued development, one could apply more conservative criteria to ensure greater levels of protection over time in an attempt to mitigate cumulative effects.

b) Are there ways to strengthen the functional relationships the Nearshore Calculator is based on?

Beyond the usual "more science would be better", in general the individual relationships between organisms and environment are well understood. However, when these environmental contexts intersect (as they do in nature), it is fair to say that identifying relationships becomes more complicated.

I want to single out "silt" as a nefarious stressor for which in general we lack good relationships. There is some discussion of sediment in the Calculator but silt in the water column arising from poor construction practices or upland construction activities is missing. For good reason there is emphasis on the provision of sediment from key terrestrial features to nourish beaches and maintain suitable gradient habitat, but sediment when suspended can also be deleterious if it is mobilizing at a time of year that interferes with feeding, growth, and even respiration/breathing.

There is little in the Calculator re the fundamentals of dissolved oxygen (and the reality that poor conditions can arise and yield hypoxia which can exclude or kill fish and other aquatic life). Hypoxia is a phenomenon that is becoming increasingly common and with transient algal blooms (and then algal die-offs), considering if and how to include information on dissolved oxygen in the Calculator may be worthwhile. I can imagine that there are some degraded habitats such that there is possibility to make meaningful improvements or alternatively potential for some activities to contribute to hypoxia. There is some literature re hypoxia and Pacific salmon worth investigating – e.g.,

Sergeant, C. J., Bellmore, J. R., Bellmore, R. A., Falke, J. A., Mueter, F. J., & Westley, P. A. (2023). Hypoxia vulnerability in the salmon watersheds of Southeast Alaska. Science of The Total Environment, 896, 165247.

Levy, D. A., Yesaki, I., & Christensen, B. (1990). Impacts of log storage upon epilimnetic dissolved oxygen and juvenile sockeye salmon in Babine Lake, British Columbia. Water Research, 24(3), 337-343.

c) Include in your findings a description of strengths and weaknesses.

An obvious strength is that the tool provides supports for assessing many different forms of development activity with bespoke calculator guidance. A question worth asking is the extent to which all relevant activities are captured.

The use of effect pathways (or pathways of effect) to underpin the Calculator is also rather similar to what Fisheries and Oceans Canada does when thinking about habitat impacts arising from different activities. I share a link in case this is useful to further bolster your work or explore what they have done: See https://www.dfo-mpo.gc.ca/pnw-ppe/pathways-sequences/index-eng.html

The section on adjustment factors in the Calculator (see section 5) reveals care taken to ensure that local knowledge and experience informs the details of the process. I appreciate that over simply relying solely on literature given the inherent gaps that exist. This is also an important way of capturing and including input from practitioners.

The section on uncertainties was particularly strong (pages 106; Section 6 of the Calculator document) and serves as a useful summary of opportunities for improvement in coming years.

d) For weaknesses, please outline possible solutions considering the stated goals and the data availability, and if possible, provide references.

The most obvious weakness from my perspective is the lack of attempts to have the tool designed to future proof decisions. By future proofing I mean the ability of the calculator to consider not just the "now" (or next few years) but to work across decades. There is much concern that habitat off-setting or other habitat management decisions made today will be suboptimal for future conditions (e.g., think climate change). Of course, designing a tool that does calculations for an uncertain future is not easy and count introduce more uncertainty in more immediate temporal windows (e.g., months to years). I don't have any profound wisdom to guide the team but do encourage them to consider if there is need for the addition of any adjustments that could weigh both immediate outcomes with longer-term outcomes given that the environmental context will most certainly change in the future. I acknowledge that there was a 1.25 multiplier used to predict the level of activity but that does not equate to future proofing – that is just accounting for increases in activity. The challenge with future proofing is that the understood relationships for today may simply not apply in 15 years. On Page 118 of the Biological Opinion, it is stated that "As noted throughout this Opinion, future effects of climate change on habitat quality throughout Puget Sound are expected to be negative." Moreover, I acknowledge significant effort put forth to summarize climate science and its impacts on salmonids. However, that alone does not mean that the calculator will yield future proof outputs. On page 206 the Biological Opinion states "All such future non-federal actions, in the nearshore as well as in tributary watersheds, will cause long-lasting environmental changes and will continue to harm ESA-listed species and their critical habitats." I concur and appreciate this perspective but again am unclear about how that specifically informs how

the calculator works or is deployed. The Calculator document itself failed to revisit these topics making it unclear the extent to which they are captured/reflected in the Calculator.

2) Scientifically sound process:

a) Does the Nearshore Calculator systematically and appropriately incorporate and interpret the highest priority and best available scientific information given the stated goals and objectives?

It is very apparent that the Calculator was devised using a thoughtful and science-informed approach. The appendices are many and explore the rationale behind the many decisions or assumptions that needed to be addressed while developing the tool.

I really like the idea that the output includes a temporal aspect and therefore acknowledges the fact that impacts can extend across time and that efforts to enhance/create habitat also have benefits that vary over time. The big question is over WHAT time frame is relevant.

The credit system seems conservative (in a good way) in that it really emphasizes a focus on natural materials and solutions rather than overly engineered structures (this was really emphasized in Appendix A of the Biological Opinion (albeit without referencing) and in the Calculator itself.

b) Indicate if and what relevant information is missing, provide references.

There were several places in the Biological Opinion and Calculator where there was clear evidence that professional engineers were to be engaged in various activities relevant to the calculator and associated efforts to improve aquatic habitat. I was wondering the extent to which engineering professionals were involved in development/testing of the calculator? (I am aware that the USACE was involved at the agency level, but they also employ biologists, ecologists, planners, etc). It would be useful to have an idea of the diverse expertise that was involved in developing and testing the Calculator.

Appendix A – The definition of "Force Majeure" is focused entirely on structures. Is it not possible for the same type of thing to occur in natural systems and serve as a major driver of system structure and function?

Appendix A – Figure 2 – The term "discounting factor" is used in the figure but nowhere else in the documents. I suggest using consistent terminology especially in conceptual diagrams. That sent me in circles for a bit.

Appendix A – Page 11 – Apparently the calculator will be updated for Feb 1st of every year. If a major improvement/flaw were noted, is there a mechanism or intention to update if and when that becomes known or are you restricted to updating at most once per annum? I do acknowledge the use of a "change log" which is great as well as a mechanism for users to propose modifications.

Appendix A – Page 11 and in the Calculator Document – Avoidance and Minimization section – I think it is important to acknowledge that proponents should attempt to overshoot given the high degree of failure noted with some restoration and habitat enhancement measures. As describe below (in 3A), I am concerned that there is too much faith being put in the deployment of the tool in practice. The experience from Canada with respect to no net loss of fish habitat is alarming (references below).

Table 3.1 in the Calculator Document – We are trained to assume that "red is bad" so this table is not intuitive... red means higher/better service values.

General comment – The references in the Calculator document include MANY grey literatures sources... which is fine. However, those references tend to lack the most basic information that would allow

someone to find and read that material. If I sent a reference like "Fresh, K. L. 2006. Juvenile Pacific Salmon in Puget Sound" to my interlibrary loan office they would laugh at me. Each reference needs to be findable or the transparency you are striving for is muddled.

c) Indicate if interpretations need to be refined, and if possible, provide references.

In terms of "interpretation" I was left wondering how the calculator would be viewed by US tribal governments, Elders, and knowledge holders. I noticed that on page 29 of the Calculator document that there was one paragraph where there was mention of such engagement, but it is vague and unclear if and how different knowledge systems informed the development of the calculator. I appreciate the challenges with bridging knowledge systems but that doesn't mean we shouldn't try. Maybe there was extensive engagement... I think that Indigenous world views could inform not only the tool but its interpretation and application.

On Page 12 of the Calculator document I struggled with the concept of "Annual Discount Rate". Quoting the document "HEA uses an annual discount rate based on the concept that habitat today is worth more than habitat in the future. NMFS' Damage Assessment, Remediation, and Restoration Program uses a standard 3% annual discount rate (NRDA 1999). The Nearshore Calculator uses the same 3% discounting factor." This needs more explanation. Is this simply because the organisms are imperiled now so we need habitat ASAP to address that problem or is this a recognition of the fact that habitat is not future proof? Or something else? I am not sure I have ever heard an ecologist muse that habitat today is more important than habitat tomorrow... unless we give up.

3) Useful/realistic output:

a) Does the Nearshore Calculator generate reasonable and well-supported quantifications of the impacts (positive, negative, neutral) to nearshore habitats and salmon?

I will preface this section by raising an important general point. On Page 46 of document WCRO-2019-04086 (the Biological Opinion) it states "SSNP requires projects authorized under this programmatic action do not result in a net-loss of nearshore habitat quality. The NMFS' Puget Sound Nearshore Calculator (Calculator) is an available tool permittees can use to **ensure** (BOLDED BY REVIEWER) no-net loss of nearshore habitat quality." I take issue with the word "ensure". First off, the calculator is a tool but there will be circumstances in which it simply is not as effective as one would hope... Nature is complicated! Moreover, just because a calculator is used does not ensure no-net loss of nearshore habitat quality. For example, issues with improper use of the calculator, failure of developers to follow guidance, lack of monitoring and enforcement, accidents, etc could all lead to net loss. The calculator could be used and provide clarity that no-net loss would be expected to occur YET at the end of the day there could be massive net loss based on disconnects between "paper plans" and field realities related to construction and environmental compliance monitoring. I share this to emphasize that the calculator in itself is not a panacea and needs to be deployed in a broader context that will demand training of developers/construction contractors and require compliance monitoring (and enforcement). This is not paranoia – we have seen this play out before. In Canada there have long been rather strong regulations that protect against the net loss of fish habitat. Yet, reports written by their own staff (see papers by Quigley and Harper referenced below) have revealed that in the majority of cases where the regulatory agency expects no net loss, significant losses occur, and they are often at a spatial scale that grossly underachieves the targets. The reasons are many but, in most cases, can be attributed to failures not in the planning phase but the execution. I think that it is presumptive and misguided to assume that use of the calculator with ENSURE no-net loss given those experiences to the north.

See papers:

Harper, D. J., & Quigley, J. T. (2005). No net loss of fish habitat: a review and analysis of habitat compensation in Canada. Environmental Management, 36, 343-355.

Quigley, J. T., & Harper, D. J. (2006). Effectiveness of fish habitat compensation in Canada in achieving no net loss. Environmental management, 37, 351-366.

Quigley, J. T., & Harper, D. J. (2006). Compliance with Canada's Fisheries Act: a field audit of habitat compensation projects. Environmental Management, 37, 336-350.

The text in the Calculator document on page 108 does to some extent acknowledge the issues raised above (hopefully that literature gives more reason to assess compliance in a rigorous manner). That text is rather candid. Interestingly, similar text acknowledging those issues does not appear in the Biological Opinion.

There is a strong emphasis on identifying off-sets that can be conducted locally. I agree that is a useful strategy and is often optimal. However, habitat banking can also be effective and may provide those responsible for species recovery or overall conservation planning with additional tools or opportunities for achieving major conservation gains. To briefly summarize, habitat banking involves creating opportunities for proponents to financially support larger, high-priority initiatives that are often

conducted by government bodies. I think explicit recognition of this opportunity would be valuable to include (assuming that jives with US regulations). There is no mention of banking in the Biological Opinion but it is mentioned twice in the actual Calculator document. I was expecting more discussion around that concept and how it interfaces with the Calculator.

See: Doka, S.E., C.K. Minns, B.G. Valere, S.J. Cooke, R.J. Portiss, T.F. Sciscione and A. Rose. 2022. An ecological accounting system for integrated aquatic planning and habitat banking with case study on the Toronto Waterfront, Ontario, Canada. Environmental Management. 69:952-971.

b) If warranted, include in your findings a description of where the Nearshore Calculator likely over- or under-estimates impacts or benefits to salmon and their habitat.

Based on my comments immediately above, I have concern that when deployed the tool will inherently lead to a loss in habitat because of poor compliance (and compliance monitoring). That is not the fault of the tool but rather an over-reliance in thinking that the tool alone will yield positive outcomes. I won't flog this more here but simply note that this will be the crux of the success of the APPLICATION of the Calculator.

A key aspect of evaluating the success/utility of the calculator will be getting regulators (those evaluating/reviewing calculator use/outputs) to actually go into the field and assess implementation. The calculator implies a desktop activity, yet learnings and refinements depend on field assessments. This is in addition to the compliance monitoring by enforcement staff. There is often a tendency for desktop activities (such as the calculator) to remove human interaction with field sites which would be a major loss.

c) If warranted, outline possible solutions for better supported quantifications and if possible, provide references.

I appreciate the efforts to continually refine/revise the tool. However, there is also need for science ON the tool. For example, I envision a research program focused on evaluating (using detailed field monitoring) the ability of the Calculator to perform across different projects and across different time scales. Ideally there would be a gradient of impacts, spatial scales, and extent of off-setting rather than purely a case study approach (which is also valuable and needed but that alone will not reveal effectiveness). I also think that there is room for some social science around the use of the tool – interviews of tool users (including developers/proponents) as well as regulators, enforcement/compliance, and monitoring staff. To be clear, I am not suggesting that this not proceed but I don't think that refinements submitted by users of the tool should be sufficient for guiding refinement or assessing long-term success of the tool. There is need for a funded and coordinated research program. There is also value in having researchers and users try to "break" the tool. I read clear examples of where the tool should be applied/not applied but the basis for that guidance was unclear. Work to try and understand in which scenarios the calculator fails would be meaningful. I also strongly encourage long-term monitoring.

Conclusions

Habitat is the foundation for healthy and productive fisheries. That "maxim" is the basis for the calculator and embraces the idea that if it is possible to assess and quantify the impacts of a given development activity it is therefore equally possible to determine the extent of effort needed to off-set those activities. On the surface this makes good sense but in practice there are poignant examples from Canada that reveal that rarely do no net loss plans actually yield no net loss (or better – net gains). I spent significant time trying to find fault with the math/assumptions of the Calculator itself but in the end I conclude that it is a useful tool (presumably with opportunity for future refinement). I provide praise where warranted and also identify some potential opportunities for improvement. Will the Calculator serve as a useful planning tool to identify the consequences of human activities on fish and fish habitat while revealing the extent of off-setting needed? YES. Will the Calculator ensure that there is no net loss in fish habitat, particularly for imperiled species? That is much less clear given that it will require more than just the Calculator. The documents I reviewed shows evidence of considerable thought and intellectual engagement from those responsible for the Calculator and the other materials. I applaud those who did the hard work. I will go one step further wearing my hat as Editor in Chief of the American Fisheries Society journal "Fisheries" and note that I would be thrilled to publish a synthesis of this work (taking all of this down to 4,500 words!). I think that there is merit here in sharing this work with the international community!

In the TOR it was made clear that the Calculator was supposed to meet a series of objectives. These did not fit well within the above review sections so I briefly touch on them here.

Rapid and Efficient – quantify habitat services using data typically provided as part of ESA-consultation packages.

Yes - The term "rapid" is subjective so I won't harp on that but I do think that it provides the user with a framework and direction to make this as plug and play as possible.

Accessible – invite use by biological consultants, agency personnel, and applicants.

Yes – The tool was in fact designed for such individuals and from what I can ascertain they were involved in development through consultation/refinement.

Transparent – allow users to review every element of an assessment.

Yes – There is much detail provided on assumptions with appropriate justification. This gives the user the opportunity to deviate where needed but in doing so they will need to themselves justify their decisions for doing so.

Consistent – produce repeatable results using objective indicators and criteria. Expert opinion is thoroughly developed and reviewed and then frontloaded into the Nearshore Calculator rather than applied by individual biologists.

Presumably Yes – I use the word presumably here because there is need to test to see if this is the case. One could give the same test case (or set of test cases) to a bunch of different users and determine if they come to the same conclusion. How much variance is there?

ESA-based – references PBFs of critical habitat and effects on the survival, abundance, and productivity of listed salmonids.

Yes – The Biological Opinion details the relevance and connection to ESA considerations.

Duration-sensitive – consider the duration of impacts and benefits.

Yes – There are a number of adjustments possible to account for dynamic aspects of impacts and benefits over different time scales.

Scaled to level of effects – evaluate the small difference in common project types, for example, the changes in shading caused by the size of overwater structures and the use of grating.

Yes (but...) – Yes, as stated by the text above but I would argue that cumulative effects are another form of scaling that is not inherently captured by the Calculator.

Adaptable – allow for the incorporation of new science or best available information.

Yes – I love that from the beginning that this is being embraced as a living tool with a plan and mechanism for updates on an annual basis.

Recommendations

- Maintain the "living" aspects of the calculator so it can be updated/refined as new science or evidence is provided.
- Fund a research program intended to explore the effectiveness of the tool across a gradient of project types, impacts, size, and off-setting. This may include a combination of case studies and "big" science spanning many individual projects where the calculator has been used.
- Engage in long-term monitoring to assess effectiveness of the calculator at achieving no net loss over ecologically relevant time scales (decades).
- Ensure that there is sufficient compliance monitoring and enforcement. For example, did proponents actually deliver on what the Calculator output provided? Consult the literature related to some failures in this respect from Canada (references provided above).
- Consider how dissolved oxygen/hypoxia can be included in the Calculator given the fundamental aspect of oxygen for fish and its ability to serve as a limiting (or lethal) factor.
- As the tool is further refined it would be useful to consider how to future-proof the outputs (and decisions) and better include cumulative effects.
- I challenge the authors to consider how the Calculator could be improved by the inclusion of evidence beyond traditional western science. It is unclear if and how Indigenous knowledge systems were considered or included in the Calculator in a meaningful way.

Appendix 1: Bibliography of materials provided for review

Performance Work Statement- 2023 PWS_NHVMcalculator_FINAL.pdf

Puget Sound Nearshore Habitat Conservation Calculator Final 7 22 23.pdf

Puget Sound Habitat Conservation Calculator Appendices Final.pdf

Nearshore Calculator 2023 V1.5b annotated 7 13 23.xlsx - The calculator is locked but let me know if you want the password to unlock it if you'd like to manipulate it.

Nearshore Habitat Values Model July 13 2023.xlsx - unlocked. These are a few background tabs not included in the Calculator and currently not publicly available.

Cereghino et al. 2023. Estimation of Typical High Intertidal Beach-Face Slope in Puget Sound.

Ehinger et al. 2023. Calculator User Guide V1.5

Lambert, M. R., and J. Chamberlain. 2023. Beach nourishment in Puget Sound: status, use, and habitat impacts. https://wdfw.wa.gov/publications/02418

Ehinger et al. 2015. Documentation for NHV & HEA Model Working Draft 2015

Salish Sea Nearshore Programmatic (SSNP) Biological Opinion: 2022_06-29_SSNP_WCRO-2019-04086.pdf

Webinar from late September of 2023 which served as an overview of the Calculator and our duties as Independent Reviewers.

Appendix 2: CIE Performance Work Statement

Performance Work Statement (PWS)
National Oceanic and Atmospheric Administration (NOAA)
National Marine Fisheries Service (NMFS)
Center for Independent Experts (CIE) Program
External Independent Peer Review
Under Contract #1305M219DNFFK0025

CIE Desk Review of the Puget Sound Nearshore Conservation Calculator and the integral Puget Sound Nearshore Habitat Values Model

Background

The National Marine Fisheries Service (NMFS) is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available (BSIA). NMFS science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external scientific peer reviews have been and continue to be essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These expert(s) must conduct their peer review impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards[1].

Scope

NMFS is requesting peer review of the Puget Sound Nearshore Conservation Calculator (Nearshore Calculator) and the integral Puget Sound Nearshore Habitat Values Model to

[1] https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/memoranda/2005/m05-03.pdf

strengthen the quality and credibility of the agency's science, and improve stakeholder's trust that the agency is basing policy decisions on the best scientific information available.

NMFS designated critical habitat for Puget Sound (PS) salmonids in 2005 (70 FR 52629, Sept. 2, 2005). NMFS's designation of salmonid critical habitat describes which physical and biological features (PBFs) support the specific conservation roles of habitat. For estuarine and nearshore marine areas, essential PBFs of habitat for PS Chinook and Hood Canal Summer Run (HCSR) chum salmon include (1) unobstructed rearing and migration corridors; (2) forage including aquatic invertebrates and fish, supporting growth and maturation; (3) natural cover such as submerged aquatic vegetation and large wood;[2] and (4) water quality supporting juvenile and adult physiological transitions. NMFS used these PBFs as a framework for developing the Puget Nearshore Calculator, consistent with how NMFS evaluates effects on critical habitat under ESA section 7.

NMFS West Coast Region (WCR) developed the Nearshore Calculator to assist in analyzing the impact of proposed local development action in nearshore marine habitats within Puget Sound, Washington. The Nearshore Calculator is based on Habitat Equivalency Analysis (HEA) (Described in section 3 of Ehinger et al. 2023). The Nearshore Calculator is an easy-to-use interface for the Nearshore Habitat Values Model (NHVM). NMFS WCR designed the NHVM to consistently determine habitat service values to be used as input parameters in HEA.

For use as an analysis tool for ESA consultations, the Nearshore Calculator is based on evaluation of the PBFs and the conservation roles of those features - survival, growth, and maturation – and likely effects of proposed actions on population level viability (abundance, productivity, spatial structure, and diversity, or "VSP"[3]) for salmonids. The Nearshore Calculator quantifies changes to PBFs of listed salmonid habitat and considers how these changes likely affect salmonid growth, development, and VSP and as a corollary, the relative conservation value of an area of habitat. The formal structure and science-based quantitative assessment results in a more predictable quantification of the impacts of actions during an ESA consultation, which is valuable because it improves consistency, efficiency, and transparency. Finally, the Nearshore Calculator is amenable to revision based on new science.

[2] The description of the estuarine PBFs further outlines "These features are essential to conservation because without them juveniles cannot reach the ocean in a timely manner and use the variety of habitats that allow them to avoid predators, compete successfully, and complete the behavioral and physiological changes needed for life in the ocean." ." https://www.federalregister.gov/d/05-16391

[3] The process NMFS typically uses to evaluate impacts on listed salmonids uses the viable salmonid population (VSP) concept (McElhany et al. 2000). McElhany et al. (2000) identified four parameters to evaluate the viability of a population: abundance, population growth rate, population spatial structure, and diversity. When analyzing the effects of actions on listed species as part of an ESA section 7 consultation, NMFS usually analyzes the effects on each of these parameters.

NMFS requests that the CIE reviewers conduct a peer review of the scientific information and framework of the Nearshore Calculator based on the Terms of Reference (TORs) referenced below.

The specified format and contents of the individual peer review reports are found in Annex 1. The Terms of Reference (TORs) of the peer review are listed in Annex 2.

Requirements

NMFS requests five (5) reviewers to conduct an impartial and independent peer review in accordance with the performance work statement (PWS) and the TORs below. Each reviewer should have working knowledge and recent experience in a minimum of three of the following areas:

(1) Salmon ecology;
(2) Marine nearshore ecology and/or conservation biology;
(3) Development of models preferably in the context of making decisions to avoid, minimize, or mitigate potential impacts;
(4) Science of valuing habitat for fishes based on ecological functions and services;
(5) Quantifying effects of physical changes (like the installation of shoreline armoring) on habitat conditions and functions;
(6) Quantifying effects of changes in habitat condition (structure & functions including vegetation, prey productions, water quality) on fish (preferably salmon) growth and survival.

In addition, knowledge and experience with Habitat Equivalency Analysis is helpful, though not required. Each CIE reviewer's duties shall not exceed a maximum of 10 days to complete all work tasks of the peer review described herein.

Tasks for Reviewers

Each CIE reviewer shall complete the following tasks in accordance with the PWS and Schedule of Milestones and Deliverables herein.

1. Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send by electronic mail or make available at an FTP site to the CIE reviewer all necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE on where to send documents. The CIE reviewer shall read all documents in preparation for the peer review:

Main Documents:

- Nearshore Calculator Scientific rationale (central document providing background and information for quantifications developed for Nearshore Calculator) 145 pages + appendices (Ehinger et al. 2023)
- Nearshore Calculator – Excel Spreadsheet, available on NOAAs web page.
- Annotated and updated Excel Nearshore Habitat Values Model.

Background Documents:

- User Guide (provides instruction on how to populate fields and get impact/benefit results from calculator) – available on NOAAs web page at: https://www.fisheries.noaa.gov/resource/tool-app/puget-sound-nearshore-conservation-calculator, 60 pages.
- Cereghino et al. 2023 – (describes GIS layers developed to identify Highest Astronomical Tide (HAT) lines in Puget Sound) 45 pages.
- Historic document Ehinger et al. 2015 on previous model version.
- Lambert and Chamberlin. 2023. Beach nourishment in Puget Sound: status, use, and habitat impacts - in final review by authors.
- Salish Sea Nearshore Programmatic (SSNP) Biological Opinion

2. Webinar: Approximately two weeks after the CIE reviewers receive the pre-review documents, they will participate in a webinar with the NMFS Project Contact and Nearshore Calculator team members to address any clarifications that the reviewers may need regarding the TORs or the review process. The NMFS Project Contact will provide the information for the arrangements for this webinar.
3. Desk Review: Each CIE reviewer shall conduct the independent peer review in accordance with the PWS and TORs, and shall not serve in any other role unless specified herein. Modifications to the PWS and TORs cannot be made during the peer review, and any PWS or TORs modifications prior to the peer review shall be approved by the Contracting Officer's Representative (COR) and the CIE contractor.
4. Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the PWS. Each CIE reviewer shall complete the independent peer review according to required format and content as described in **Annex 1**. Each CIE reviewer shall complete the independent peer review addressing each TOR as described in **Annex 2**.

Place of Performance

Each CIE reviewer shall conduct an independent peer review as a desk review, therefore no travel is required.

Period of Performance

The period of performance shall be from the time of award through September 2023. The CIE reviewers' duties shall not exceed 10 days to complete all required tasks.

Schedule of Milestones and Deliverables

The contractor shall complete the tasks and deliverables in accordance with the following schedule.

Within two weeks of award	Contractor selects and confirms reviewers
No later than two weeks prior to the review	Contractor provides the pre-review documents to the reviewers
September 2023	Each reviewer conducts an independent peer review as a desk review
Within two weeks after review	Reviewers submit draft peer-review reports to the contractor for quality assurance and review
Within three weeks of receiving draft reports	Contractor submits five (5) final independent Peer-Review reports to the Government

Applicable Performance Standards

The acceptance of the contract deliverables shall be based on three performance standards:

(1) The reports shall be completed in accordance with the required formatting and content; (2) The reports shall address each TOR as specified; and (3) The reports shall be delivered as specified in the schedule of milestones and deliverables.

Travel

Since this is a desk review travel is neither required nor authorized for this contract.

Restricted or Limited Use of Data

The contractors may be required to sign and adhere to a non-disclosure agreement.

Project Contact:

Kim Kratz
kim.kratz@noaa.gov
NMFS, West Coast Region
1201 NE Lloyd Blvd, Suite 1100, Portland, OR 97232

Annex 1: Peer Review Report Requirements

1. The report must be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specifically whether the Nearshore Calculator represents the best available science and if not, what specific improvements you recommend.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each TOR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the TORs.

3. The reviewer report shall include the following appendices:
    1. Appendix 1: Bibliography of materials provided for review
    2. Appendix 2: A copy of the CIE Performance Work Statement

Annex 2: Terms of Reference (TOR) for the Peer Review

The reviewers will provide input on the following questions. During your evaluation, please keep in mind that the Nearshore Calculator must use the best available science, Endangered Species Act consultations cannot be delayed until better science becomes available, and the Nearshore Calculator can be modified over time as additional science becomes available.

1) **Analytically sound process:**
   a) Are the underlying relationships that Nearshore Calculator and the NHVM are built upon (e.g. duration of aquatic access, functional pathways, indicators/metrics) sufficient and well-founded for evaluating effects of changes to nearshore habitat conditions on salmonids, given the stated goals and objectives? Is the analytical approach based on a valid list of habitat attributes (physical and biological functions)?
   b) Are there ways to strengthen the functional relationships the Nearshore Calculator is based on?
   c) Include in your findings a description of strengths and weaknesses.
   d) For weaknesses, please outline possible solutions considering the stated goals and the data availability, and if possible, provide references.
2) **Scientifically sound process:**
   a) Does the Nearshore Calculator systematically and appropriately incorporate and interpret the highest priority and best available scientific information given the stated goals and objectives?
   b) Indicate if and what relevant information is missing, provide references.
   c) Indicate if interpretations need to be refined, and if possible, provide references.
3) **Useful/realistic output:**
   a) Does the Nearshore Calculator generate reasonable and well-supported quantifications of the impacts (positive, negative, neutral) to nearshore habitats and salmon?
   b) If warranted, include in your findings a description of where the Nearshore Calculator likely over- or under-estimates impacts or benefits to salmon and their habitat.
   c) If warranted, outline possible solutions for better supported quantifications and if possible, provide references.

Objectives for the Nearshore Calculator

In summary, the Nearshore Calculator is designed to be:

- Rapid and Efficient – quantify habitat services using data typically provided as part of ESA-consultation packages.
- Accessible – invite use by biological consultants, agency personnel, and applicants.
- Transparent – allow users to review every element of an assessment.
- Consistent – produce repeatable results through the use of objective indicators and criteria. Expert opinion is thoroughly developed and reviewed and then frontloaded into the Nearshore Calculator rather than applied by individual biologists.
- ESA-based – references PBFs of critical habitat and effects on the survival, abundance, and productivity of listed salmonids.
- Duration-sensitive – consider the duration of impacts and benefits.
- Scaled to level of effects – evaluate the small difference in common project types, for example, the changes in shading caused by the size of overwater structures and the use of grating.
- Adaptable – allow for the incorporation of new science or best available information.