

Science & Technical Advisory Committee
of the
Ocean Policy Advisory Council

Review of the Draft Oregon Marine Reserves University Assessment Report
prepared for the Legislative Assembly by Will White, Kelly Biedenweg, Jess Hopf, and Brian Erickson

Background

In 2012 the Oregon Legislative Assembly passed marine reserves legislation in [Senate Bill 1510](#) that included a requirement for this committee to:

“...submit a draft report to the interim committees on environment and natural resources of the Legislative Assembly no later than October 1, 2022, and a final report to the Legislative Assembly in the manner provided by ORS 192.245 no later than March 1, 2023, regarding the establishment, study, monitoring, evaluation and enforcement of the pilot marine reserves, marine reserves, marine protected areas and seabird protection area described in ORS 196.540.

(2) The reports described in subsection (1) of this section shall:

- (a) Be researched and prepared, within existing resources and without additional appropriation, by a public university listed in ORS 352.002 chosen by the scientific and technical advisory committee; and
- (b) Include:
 - (A) An assessment of social, economic and environmental factors related to the reserves and protected areas;
 - (B) Recommendations for administrative actions and legislative proposals related to the reserves and protected areas; and
 - (C) Any other scientifically based information related to the reserves and protected areas that the public university described in this subsection deems relevant or material.”

The Science and Technical Advisory Committee (STAC) received [the draft Oregon Marine Reserves Assessment report](#) (hereafter referred to as the “draft report”) from the public university team on July 15, 2022, [a presentation](#) on the draft report by Dr. Will White and colleagues on July 19, 2022 and [review guidance](#) from the STAC Chair, Dr. Karina Nielsen. The STAC review comments that follow are intended to assist the university team in providing a *clear and comprehensive, evidence-based* report for the State Legislature.

Review

General Comments:

STAC reviewers were asked to assess whether or not the university team had adequately addressed the three overarching questions they were charged with answering in the report:

- Were the Marine Reserves (MRs) and associated Marine Protected Areas (MPAs) effectively designed and implemented to achieve the goals and objectives set forth in [Ocean Policy Advisory Committee's 2008 Oregon Marine Reserve Policy Recommendations](#)?
- Did ODFW successfully execute the legislative mandates set forth regarding Marine Reserve implementation (summarized in the [STAC Request for Proposals](#) (RFP) on p. 5)?
- Do the recommendations for administrative actions and legislative proposals related to the reserves and protected areas reflect the scientific insights gained from the report's determinations and the principles of *adaptive management* as defined in the [STAC RFP](#) (see glossary p.21).

Overall the STAC finds that the draft report is thorough and well organized and that it addresses all the major questions and issues included in the STAC request for proposals. We also find that the draft report has adequately provided evidence-based answers of “yes” to each of the three overarching questions above. In addition, the STAC agrees with the finding of the university team that, consistent with the marine reserve legislative mandates, the planning, implementation, and monitoring was reasonably well designed and consistent with the goals set forth in the Ocean Policy Advisory Council's (OPAC) policy recommendations.

The draft report provides a relatively detailed and reasonably scholarly review of the Oregon Department of Fish and Wildlife (ODFW) Marine Reserves Synthesis Report 2009-2021 (hereafter referred to as the ODFW synthesis report) and a general assessment of the social, economic, and environmental factors associated with Oregon's Marine Reserves. The report included summaries for each major question (some quite detailed) and provided numerous recommendations for improving the Oregon marine reserves monitoring and evaluation approach. For some issues it offered other ideas and information which it deemed relevant. For selected questions the university team also provided detailed analysis and recommendations (e.g., for implementing monitoring and evaluation to evaluate resilience) and suggested ideas and concepts that other entities involved in providing guidance on goals, planning, implementation of the marine reserves may have overlooked. The STAC found the draft report to be a balanced, nuanced, qualified analysis and interpretation of the ODFW synthesis report. Both the draft report and the underlying ODFW synthesis report contain valuable scientific and technical information to inform the evaluation of Oregon's marine reserves after the first 10-year period and to inform adaptive management and monitoring into the future, if adequate resources are made available.

The STAC has also identified four areas where the assessment report was lacking or could be more effective and provides the following recommendations for improvement:

- 1) The primary audience for the executive summary is the Legislative Assembly, other stakeholders, and the public. They will want to know what's working, what's not and what is actionable. STAC recommends developing a more concise executive summary (2 pages) focused on the answers to overarching questions of interest and the university team's recommendations for Administrative Actions and Legislative Proposals. These should be framed in the context of what is needed to achieve the policies and goals established for Oregon's Marine Reserves. Overarching questions include those posed by the Legislative Assembly and the STAC, AND a) Are there any noticeable effects from the marine reserves? and b) What should Oregon do differently, if anything, with

the marine reserve system into the next 10 years? The current executive summary is a very useful technical summary of the full report. We recommend retaining and revising it as a separate “technical summary”.

- 2) The STAC recommends that the university team clarify whether the methods to assess biodiversity are sufficient to address the OPAC recommended goal for the marine reserves to conserve biodiversity. We note in our detailed comments below that while measurements of particular taxa and assemblages have been made, biodiversity as defined by OPAC and others (including the scientific community) have not been adequately measured.
- 3) The STAC agrees it is not possible to assess the “significance of socioeconomic impacts,” adverse or otherwise, because this was not defined by OPAC in their 2008 policy recommendations¹ and it was not clarified through legislation either. We suggest the university team should recommend development of an environmental policy framework to define “significance” in the context of “socioeconomic impacts.”
- 4) The STAC recommends that the university team indicate their confidence level in the robustness of the ODFW findings. For example, it did not appear that the university team actually reviewed the research conducted by ODFW, in particular the Human Dimensions (HD) team and their partners, to determine whether the findings were credible and reasonable. They often just listed the ODFW findings and used phrases such as “ODFW findings indicate...” This recommendation applies to the full report (e.g., biodiversity findings noted in (2) above).

Lastly, we note that ODFW has provided a [response](#) to the university team’s report plus an [addendum](#) submitted after the STAC meeting on August 9, 2022. These include valuable information such as ODFW’s engagement with Tribes. ***We recommend that the university team consider the points raised and evidence provided by ODFW in addition to the comments provided here by the STAC.***

Specific Comments:

Regarding questions posed in the General Comments (2)

Regarding the noticeable effect question (a) posed above under general comments, the university team agrees with ODFW that any noticeable effects may not come until 10-15 years after marine reserve creation. The university team rephrases the question as “whether the expected effects of reserve protection in Oregon are large enough to detect using appropriate comparisons.” They recommend “collaborations with researchers to evaluate the detectability of reserve effects in Oregon’s marine reserves.” We note that some members of the university team are authors on such studies and it would

¹ OPAC’s overarching marine reserves goal (see OPAC [2008 Oregon Marine Reserve Policy Recommendations](#)) is to “Protect and sustain a system of fewer than ten marine reserves in Oregon’s Territorial Sea to **conserve** marine habitats and **biodiversity**; provide a **framework** for scientific research and effectiveness monitoring; and avoid significant adverse **social and economic impacts** on ocean **users** and coastal communities.” However, it did not offer a definition of what *significance* means in this context. Furthermore, they provide definitions of all the other bolded terms in the goal, but the definition for social and economic impacts was left as: “Scope and content to be defined.”

be very helpful if they could apply their methodology to the Oregon marine reserves situation to determine the answer to that question as part of their review. This would be preferable to just calling for more research to be conducted in the future.

Regarding the ‘should Oregon do anything differently’ question (b) that paraphrases SB1510 (2)(b)B “Include Recommendations for administrative actions and legislative proposals related to the reserves and protected areas,” the report makes no recommendations other than potential administrative actions for how ODFW might run the marine reserves program differently. STAC encourages the university team to include some recommendations regarding legislative proposals, for example those related to size and spacing (see next paragraph).

Regarding the “Size and spacing considerations” (pg 54), the university team should make some recommendations instead of just stating the facts about whether the five marine reserves meet or fail to meet the size and spacing requirements. What are the implications for resilience - [OPAC recommended](#) an objective for the marine reserves to “Protect key types of marine habitats in multiple locations along the coast to enhance resilience of nearshore ecosystems to natural and human-caused effects.” For example, should Otter Rock and Redfish Rocks Marine Reserves be extended farther in the along-shore dimension? Should all the marine reserves be extended westward to the state waters boundary? Should estuaries and other marine habitats be represented in the system? How are Oregon’s reserves impacted by the marine reserve system in California? Regarding the criteria “Sites distributed along the full Oregon coast and in each biogeographical region,” four out of the five marine reserves are in one biogeographic region north of Cape Blanco. If Redfish Rocks is adversely affected by some event and/or stressor, say a catastrophic heat wave or hypoxic event, there would be no marine reserve in the southern biogeographic region south of Cape Blanco. The university team should point this out and make a recommendation for what new policy changes Oregon might develop to address these risks.

Executive Summary

The STAC regards the clarity of the executive summary as especially important. This is what most people will read. The primary audience for the executive summary is the Legislative Assembly and the public, not the STAC. The current version of the executive summary is more of a technical summary. We recommend adding a new executive summary that is much shorter (2 pages) and focuses on addressing the overarching questions of interest from the Legislative Assembly and the STAC, and the university team’s recommendations for Administrative Actions and Legislative Proposals. We also recommend that the university team revise the current version of the executive summary as a technical summary.

Some of the summaries to the questions seem poorly worded and don’t really say anything that is a take home message. The questions about adaptive management are good examples of this but there are others. In most cases it is because they have copied the exact summaries from the full report. There they make sense as they are connected to the information that supports the summary, but when they are moved out of context, they lose that support and don’t stand well on their own. There are some statements that have no sensible content and thus will not be useful for those making decisions on next steps. One example of this, but not the only one is, “However, there are equity and accessibility issues.” Page 23.

The MPAs are mentioned (page 8), “Following ODFW’s Synthesis Report, this report focuses primarily on the marine reserve portion of the five sites, although Marine Protected Areas are implicitly included in the Marine Reserve Design, Level of Community Engagement, Governance, and Enforcement sections.” We note that there is no mention of the seabird protection area at Cape Perpetua. It needs to be recognized that nothing has been done there by ODFW as far as we are aware. There is nothing in the ODFW report about it. It is a weird anomaly in the MR designation, resulting from a community process of designation. This is a Marbled Murrelet hotspot and Audubon has a forest sanctuary adjacent to this area, and a sanctuary manager who is vocal about seabirds.

It would be helpful to have subtitles for the sections of the executive summary in the table of contents. When tables in the main report are referenced in the executive summary, page numbers would be useful.

Page 10, top: is compliance and enforcement within the MR program or outside in the State Police instead? I think it is outside the MR program so should not be included in the list of ODFW MR program responsibilities.

Page 10, 2.c: “This will likely require...” strike ‘likely’

Page 11 (top) C.2.c: Wherever the word resilience is used it should be clarified with examples, e.g. to ecological and social economic resilience, or something to that effect. Explain/define what “ecologically significant as a whole” means. The [2008 OPAC policy recommendations](#) provide guiding definitions ecological terms, but punts on defining social and economic impacts:

- **Ecologically Significant:** contributing to biodiversity, resilience of the system and its populations and ecological communities.
- **System:** a collection of individual sites that are representative of marine habitats and that are ecologically significant when taken as a whole.
- **Resilience:** the amount of natural or manmade disturbance an ecosystem can absorb while retaining the same function, structure, and feedbacks (Walker and Salt, 2006).
- **Social and Economic Impacts:** Scope and content to be defined.

Page 11, top, C.3: Definite “SMART” (or reference, defined above).

Page 11, top, C.4: Does fully support mean 1 full time position? (1 FTE)? Then say so.

Page 11: It would be helpful to have some bridging text, a paragraph, before moving into the section responding to the STAC questions.

Page 11, 1.1, Recommendation: Not applicable seems contrary to the finding that proxies were used in the planning process and we still don’t know the answer to this question. What about a recommendation to do a biodiversity survey and assess as part of the adaptive management plan?

Page 11, 1.2: Which features were omitted? List them here. Perhaps a recommendation to consider adding missing features in the adaptive management plan.

Page 11, bottom: drop the sentence “There is insufficient information to assess fully whether ODFW’s approach adequately incorporated community interests” because the question doesn’t ask about “adequacy” and defining what level is “adequate” is problematic. The question only asks if it was done or not.

Page 12, section 2: delete: “... one set for each monitoring program.” Replace with, “... for the ecological and human dimensions monitoring programs.”

Page 12, 2.1: Define abbreviations/acronyms - the executive summary should stand alone.

Page 12, bottom: which one of these was most impactful, for example, "funding, logistical, and COVID-19 in that order"?

Page 13, section 2.6: “Not applicable” is inconsistent with the statement above, “While substantial data collection occurred, it is not clear which data will be monitored on an ongoing basis.” Should the recommendation reflect the ongoing monitoring concern?

Page 15, top: can’t the university team do their recommendation 2 “Compare observed biodiversity in reserve sites to the rest of the Oregon coast, if there is a desire to confirm that the reserves are in higher-than-average biodiversity locations?”

Page 15, recommendation 1 at the top of the page: explain what this means in language suitable for the public.

Page 15, 3.2b: regarding the sentence about not including estuaries add the two caveats here that are in the full report: “however, the mouth of the Salmon River is located within the Cascade Head MPA though not within the marine reserve;” “We speculate that omission of estuarine habitat from any of the reserves may be due to the high economic impact of prohibiting fishing within these habitats.” This is a place where the university team should consider making a recommendation for expanding the understanding of ecological connectivity between estuaries and marine reserves².

² In the STAC meeting on August 9, 2022 there was a discussion of whether the legislature had excluded estuaries (or other habitats) from consideration for inclusion in Oregon’s Marine Reserve system. The relevant legislative language comes from the 2009 [House Bill 3013](#) establishing marine reserves. It does not directly name key habitats to be included or excluded but it does reference the [November 29, 2008 recommendations from the OPAC on marine reserves](#) where key habitats are designated in a table included in footnote 4 at the bottom of page 3 of Appendix C. The key habitats listed were: Rocky Intertidal (extreme high to extreme low tide lines), Rocky Subtidal with Canopy Forming Kelp (from extreme low tide line(to depths greater than 25 meters), Rocky Subtidal without Canopy Forming Kelp (from extreme low tide line(to depths greater than 25 meters), and Soft Bottom Subtidal (from extreme low tide line(to depths greater than 25 meters).

Page 15, 3.3: explain these terms/phrases for the public: “hypothesized resilience mechanism” and “addressing resilience in Oregon”

Page 16, 3.4, Recommendation: The rationale for when ODFW should take on a recommendation versus work with collaborators is unstated. It would be helpful to clarify what work should be under the purview of ODFW versus done with or by external collaborators.

Page 16, 3.5: this section is a good example of where there is a good explanation for a non-technical reader.

First sentence at the top of page 17: “We agree...” needs a follow-on statement explaining why.

Page 17, 3.6, Recommendation: Is there a role for eDNA in biodiversity assessments?

Page 17, 3.7a: Here's the place to talk about combining ecology and oceanography, e.g., the marine heat wave of 2015 and forward.

Page 17, 3.7.a, Summary: “This is due to a lack of a clear definition of “resilience”...” This is also the case for how the authors have also used the word resilience throughout the executive summary.

Page 17, bottom: that’s an interesting suggestion to focus the research and monitoring in 1-2 reserves. Which 1-2? The university team could make a recommendation ... for example, Redfish Rocks and Cascade Head (most former fishing pressure)

Page 17, 3.9: “other stressors”; which stressors? Could give an example like the heat wave

Page 20, 5.1, Summary: “However, it is unclear whether those involved represent the most vulnerable or knowledgeable.” Why is this called out? Are there other characteristics of populations involved not represented? What is meant by vulnerable or knowledgeable?

Pg 20, bottom: the level of indigenous involvement could/should be detailed/verified by ODFW, then added to the university report.

Pg 21, top, 5.9: what about ecotourism like in Redfish Rocks?

Page 21, Recommendation 2 at the top of the page: “Use the stakeholder analysis...” This implies there is a stakeholder analysis in place (the use of “the stakeholder”). I am assuming there is not, so reword this to make it clearer what you mean for a general audience.

Page 21, 5.2, Recommendation: “...Communication Needs Assessment...” I searched for this term in the synthesis report and did not find that ODFW included this assessment. Rewrite this recommendation to make it clear that it is not a continuation and what you suggest it entails. Every few years is vague.

Page 21, section 5.4.a.3: This seems like a general recommendation for the summary rather than explicit for this question.

Page 22, 5.7: "...about half the population or fewer..." - Population of what? fisherman, coastal Oregon, Oregon, USA, World?

Page 23, 5.9, Summary: "However, there are equity and accessibility issues." This type of statement does not give the reader any information on what the issues are. Either remove or clarify.

Page 23, 6.1 Recommendation: "Not applicable", should this be none?

Page 23 6.2 Summary: "...have been used on management decisions, including some beyond the state." Relevance to this report, and specifically to the executive summary?

Also: "More time is needed..." True, but is the case for all of these questions - seems irrelevant here.

Page 24, 6.4, Summary: This section could be reorganized to flow more clearly.

Page 24: "..., but there are no long-term funding plans." This is true for more than just this part of the marine reserves management plan - remove or clarify.

6.5, Summary, This summary does not answer the question well. Have they or have they not - saying 'could' implies they might have been but this needs to be clearer.

Chapter 1: Marine Reserve Design

[No specific comments]

Chapter 2: Marine Reserve Baseline Assessment

Ecological Monitoring

[No specific comments]

Human Dimensions Monitoring

- Conclusion, pg 38, 2nd paragraph: This is confusing given the phrase "contemporary context". Authors should clarify.
- Section 2.6: Good summary of time trend of studies, good understanding of limitations, and good critique of lack of developing a baseline assessment strategy early on.
- Section 2.7: UAR team emphasizes that studies conducted by multiple authors using different approaches and language makes it difficult to compare study results. A major critique for the HD team (but also a function of the limited research budget and only one staff member which the UAR team recognizes).

- 2.7 (pg 43); UAR team notes that research cannot be internally duplicated by HD team. Consequently, the continued ability to replicate past studies and to detect change in social and economic dimensions requires maintaining the capacity for human dimensions research within ODFW and fostering ongoing collaborations with external partners. Important recommendation.

Chapter 3: Ecological Factors

Planning/Site Evaluation

3.1: We agree that habitat type is not a perfect surrogate for biodiversity. The evaluators question whether the predominantly rocky sites chosen can be assumed to be the highest diversity sites in Oregon without sampling other regions or other kinds of habitats. There is a good chance that some soft-sediment sites have higher species diversity if small infaunal organisms are sampled. However, if the focus is entirely on megafaunal invertebrates and fishes, then the selections are probably appropriate. The first recommendation suggests that ground-truthing may be possible with the current data collected. Probably not, since the data were only collected in the reserves and comparison areas. The second recommendation is to compare reserve sites to random areas sampled along the coast. A large sample size would be required for this, as many of the sites randomly chosen would be sandy sites.

3.2: The university team provides useful comments on key habitats.

3.4: The university team is correct that size and spacing was not adequately addressed from an ecological standpoint because many of the ultimate criteria for selection were based on community input and political considerations.

Program Evaluation

Assessing Diversity

The university team accepts the approach taken by ODFW for assessing diversity using Hill numbers and rarefaction. However, as STAC members have pointed out repeatedly over the years, the sampling of invertebrate diversity is inherently flawed because the sampling is limited only to the large, easily identified fauna. See detailed comments in section 3.5

The university team notes correctly that genetic and functional diversity have not been addressed. However, I take exception to their speculation that functional diversity could be assessed with the data in hand. Because the species lists consisted of only a few large taxa, many functional groups would probably not be included in such an analysis.

3.5: The university team feels that diversity was quantified using appropriate metrics and they also note correctly that various sampling methods have unique limitations. However, I do not believe that the methods used for assessing invertebrate diversity were used appropriately.

In the SCUBA surveys, divers were given a predetermined list of species and no “write-ins” were permitted in the surveys. Thus, rarefaction curves and Hill numbers were forced to asymptote at the arbitrarily chosen maximum species number on the species list. Working from a predefined list works o.k. for regional and inter-annual comparisons of abundances, but not for species richness.

The same applies to the ROV surveys, where only large animals were counted and anything that was not identified could not be included in the analysis. The rarefaction curves presented demonstrate the problem perfectly. ROV species lists had 40 species. The asymptotes never exceed this number, and many of the curves reach asymptotes at exactly 40 species. In measuring species richness, it is not necessary to put a name on each organism observed, but it is important to record each different type of organism (e.g. as a morphotype); as presented here, diversity cannot be estimated because the upper limit is artificially constrained by the method.

Another problem with the ROV data is that the species list contains only common names. Not all of these are unambiguously attached to any particular species. The intertidal surveyors, to their credit, used scientific binomials.

Consider hypothetically what would happen if ODFW were to take the advice of the university team and compare the diversity of the rocky reserve sites to the diversity of randomly chosen sites along the Oregon coast. None of the species on the list would likely appear in the soft bottom sites because such sites have completely different species assemblages. Would this mean that species richness on mud is zero?

The university team recommends that diversity sampling be continued and suggests increasing sampling frequency. This would be good advice for obtaining better resolution of temporal patterns in the few species studied. However, more sampling using the same flawed methods already employed would give no additional information on species diversity. Such sampling would produce more graphs with artificial asymptotes, but would not increase our knowledge of how many species are actually present in these habitats.

On page 57 the university team states, “For pooled data, rarefaction and extrapolation curves (number of species vs number of sampling units) for each site by method are at an asymptote, or closely approaching one. This partially suggests that enough sampling was undertaken across sites and methods to provide an accurate estimate of diversity (as measured by Hill numbers) at this level of analysis.” This is incorrect. As explained above, this would only provide an accurate estimate of diversity if the rarefaction curves were not constrained by an artificial asymptote.

We were surprised to see no mention of considering new methods for assessing biodiversity such as eDNA and metabarcoding.

3.6. The university team has provided a nice discussion of the limitations of using focal species.

3.11. While it would appear to be wise to limit future changes in methodology, it is also important to recognize (as explained above) that some of the prior methodology was seriously flawed, especially for the estimation of species richness. These methods should be changed going forward.

Chapter 4: Socioeconomic Characteristics

On the question of socioeconomic characteristics and criteria for measuring impacts, the report correctly points out that criteria were not clearly established. The draft report goes on to note that:

“Assessing whether ‘significant’ socioeconomic impacts occurred based on statistical significance may lead to understating the importance of impacts on stakeholders based on their valid perspectives and experiences.”

This statement would appear to present a challenge: for some types of measurable impacts, statistical significance is the standard way to establish whether an impact is due to chance or due to some factor of interest. But then in the case of impacts involving stakeholders “valid perspectives and experiences”, how does one establish that these perspectives and experiences (or changes in perspectives and experiences) are also not due to chance, but are related to a factor of interest? The statement needs some clarification; some explanation for how the distinction might be addressed that involves some way of determining for both kinds of impacts that which may be due to chance versus that which can reasonably be attributable to the factor of interest.

On page 19 in the executive summary, the draft report states:

“Adverse economic impacts include increased perceived and recorded fishery operating and travel costs, increased displacement of recreational and commercial fisheries, and no realization of suggested economic benefits such as increased ecotourism, increased fishery productivity, or equitable distribution of research contracts.”

More detail and nuance is presented in section 4.2, but the first part of the statement in the summary seems to include as an economic impact “perceived costs.” It would be good to clearly separate out what is measurable as an economic impact and what is a perception or opinion. The current wording seems to blend the two. The second part of the statement, referring to the lack of benefits, needs to be qualified to indicate that there was no evidence in the data for these kinds of changes. One cannot state that no such benefits occurred. Something like “based on the evidence compiled...” would convey that qualification.

In the paragraph (also on page 19):

“There was also no change in several socio-economic areas where there was concern that the reserves would have adverse impacts, suggesting that there was no impact these areas. These included reliance, engagement, and employment in the fishing industry, shifts in recreational or commercial fishing effort, charter CPUE and demand, and fisheries landings, earned income, and profitability.”

The "... suggesting that there were no impact(s) (to) these areas" overlooks the problem of not knowing what the counterfactual situation would have been. This is a concern for interpretation of the detailed evidence provided on pages 79-81. The statement needs to recognize that limitation for interpreting the result.

The university team conducted a fairly detailed review of the socioeconomic issues. Overall they were somewhat critical of the approach used by the HD team which they argued prevented them from determining significance or magnitude in analyzing whether ODFW avoided "significant adverse impacts" -- a core legislative goal for designing and managing the marine reserves. Their key concerns included:

- Concepts of "unit of analysis" and "significance": The university team argued that the "unit of analysis" technique used by the ODFW team (unit of analysis refers to relative scale for the analysis e.g., statewide versus local), and the vague definition of "significance" (intensity and context) made it impossible for them to determine whether there were significant adverse (or positive) impacts. Instead they commented on direction of "change" (or whether there was no change – summarized in Table 4.2.1). Because "significant" is derived from federal law (NEPA) there is federal guidance for interpreting the concept of significant (see Dr. Sylvia's [review for STAC from last year](#)). And while a few states have provided their own definition, the state of Oregon has not.
- The Council of Environmental Quality's list of context and intensity items ([section 1508.27](#)) may be a useful framework in considering the environmental policy significance of socioeconomic impacts. Ironically the concept of "context" fits perfectly well with the concept of "unit of analysis" as well as heterogeneity since "significance" can apply to small locales and small groups as well, for example, as an entire state. It should be noted that ODFW also did not consistently use the concept of significantly adverse (or positive) impact and used substitute words such as "small" or "non-discernable". We agree with the university team, that ultimately the concept of "significant" is a legal term and unless well- defined is not useful in the context of this review.
- However, the criticism of "unit of analysis" and "aggregation" and therefore not determining magnitude is unwarranted. Analyzing at different scales is a common and useful technique. I believe the university team is confusing this concept with their more valid criticism of ODFW's lack of consistent use of a well-defined system of economic and social indicators. If the same indicators were applied across different scales or groups (like nesting dolls) one could look at aggregate measures as well as non-aggregate at local levels or local groups.
- Rather than a set of questions to be researched, the university team suggested that ODFW should develop a strategic human dimensions research plan using consistent indicators and metrics within a larger heterogeneous framework such as STE (which they diagrammed in their review (Figure 1, page 75). Even though the budget for the socioeconomic work was relatively small and the ODFW team had to rely on outside researchers using different metrics and techniques, it would be useful in future work to develop consistent metrics and to the extent possible use these to standardize monitoring and methods of analysis across scales and groups.
- The university team correctly argued that many negative and positive potential impacts of reserves could not be determined since cause and effect could not be isolated. Conversely, the university team listed ten findings from the work by the HD technical team (pages 80-82) that "suggests that reserves had not had potentially adverse impacts". With respect to economic domains, particularly those related to fisheries they make a relatively strong statement that

“because robust design approaches (before/after, affected/non-affected) were used, we conclude that the monitoring team can be relatively confident that there were minimal positive or adverse economic impacts for most fishermen (but not all) due to the establishment and management of the reserves.” This could be interpreted that for most fishermen there were “no significant adverse impacts”. This is an important conclusion and needs to be highlighted more prominently. It would have been useful if the university team besides a single comment about “robust designs” had undertaken a more scholarly review of the ten research projects and attest to their credibility.

4.1 Conclusions: both impacts *and benefits* may have been overlooked, not just impacts, no? See last sentence of first paragraph: “Furthermore, by aggregating the findings, it is possible that important impacts were obscured or overlooked.”

Page 83: In the Hudson et al. 2018 report, the data are mis-represented. The responses were not only yes and no, but there were also ‘I don’t know’ responses. The report authors seem to lump ‘I don’t know’ into the yes, there was an effect category. This is a misrepresentation and should be re-examined.

Chapter 5. Level of Community Engagement

Page 93, 5.1. Conclusion: We note that ODFW has responded to clarify their engagement with Tribes.

Chapter 6. Governance

- 6.3: An important recommendation—the university team recommends that clear, explicit links between monitoring actions and the reserve objectives be included in the monitoring plans to support assessments of whether reserve objectives are being addressed.
- 6.3: the university team notes that given “lack of defined indicators for ‘social’ impacts and a definition for ‘significance’, the full extent to which this monitoring plan can address this objective is left to subjective interpretation”. The university team may not have realized that concepts of “significance” are open for interpretation and must be defended by showing that the work was reasonable and not capricious and arbitrary.

Chapter 7. Enforcement

[No comments]