

Comment #	Reviewer	Line #	Priority	CMER/ISAG Reviewer Comment	ISAG Subgroup Response To CMER/ISAG Reviewer	Addressed?
1	PL	26	Green	Really? That's unfortunate. How can they be used to make mods currently if they don't have enough good info regarding fish/habitat?	Yes, unfortunate. Relevant information may have been gathered but is not kept on the WTMFs. We are not using those data for this study, so not relevant to this study design.	Addressed
2	JK	58	Yellow	<p>What is the level of uncertainty (as determined through the evaluation of "effectiveness") associated with using PHBs to correctly identify EOF?</p> <p>This is the science question: How accurately can EOF be predicted based on a set of PHB criteria? That answers the policy question regarding "risk." How often is it wrong and by how much?</p>	<p>PHBs are used to identify the end of fish habitat (EOFH), not EOF. Protocol surveys establish EOF.</p> <p>The accuracy of EOFH prediction by a set of PHBs is Study Question #10 (p. 3) but is not the overarching question. The analysis that is proposed specifically will address the issue of where PHBs exist relative to the EOF and those distances will be recorded and reported.</p>	Addressed
3	MM	93	Green	you could add NVO and DPC; is EOF different than EOF habitat or EOF/H?	Added to acronym list	Addressed
4	JK	96	Green	<i>Add: (RCW 76.09)</i>	Accepted text addition	Addressed
5	PL	103	Green	suggest clarifying- rules regarding timber harvest	Sentence modified to read "Specific road and riparian buffering prescriptions ...", and added a reference to the F&F report.	Addressed
6	PL	106	Green	Administered?	Revised text	Addressed
7	PL	115	Yellow	I don't see what these criteria are anywhere. Should be listed	Cite WAC and add complete description in appendix (E?) or put in a hyperlink to avoid addition of appendix	Addressed
8	PL	107	Green	suggest adding a blurb about why rules differ between Type F and N	No text added but cited F&F Report instead.	Addressed
9	JK	118	Green	<i>Delete: as</i>	Accepted text revision	Addressed
10	PL	117	Yellow	<p>Should touch more on the background, i.e. the WAC directs DNR to lead development of a GIS-based water typing model. The WAC is pretty specific about what is supposed to happen, so it should be included.</p> <p>Also, should describe the current physical habitat criteria being used to make breaks. Somebody at some point thought that the interim system had tolerable accuracy regarding channel width, gradient, basin size. What made them think those were acceptable interim criteria? Please explain.</p>	The GIS-based water typing model was completed 17 years ago but was never adopted for regulatory use due to accuracy issues. See preceding sentence in document.	Addressed
11	PL	122	Green	Who verifies their accuracy?	No additional language added.... Unnecessary.	Addressed
12	PL	130	Yellow	Partially based on guidance in the WAC. And what other information/knowledge? should describe	We think the sentence as written is clear and complete. There is nothing in WAC about PHBs.	Addressed

13	PL	134	Green	<p>Overall, this study design is commendable. There's a lot of good technical elements. But I think it's not quite done yet.</p> <p>I'm worried about this PHB study and broader water typing effort having an unclear vision and goals, and ending up with unusable data as discussed on page i, or a system that folks apparently think doesn't work well like the current interim system, or something that is not accurate enough to replace the current system. I think we need to reconsider how we got to this point and have a more clear vision and plan for how to fix whatever is broken. Otherwise we are tinkering in a piecemeal fashion and may overlook some of the critical structural and functional elements/processes that are needed to develop a functional, reliable system. Not sure how to say it better than this.</p>	No changes necessary.	Addressed
14	MM	135	Green	A definition of PHB would be most welcomed at a location of your convenience.	Agreed. Citation and some additional language added for clarity.	Addressed
15	MM	136	Yellow	Will these results for PHBs be used to revise DPC to be used in the FHAM?	For discussion with reviewers... address confusion about DPCs vs. PHBs/FHAM/Protocol surveys. Remind MM that this PHB work will be linked to the DPC study (to follow) which will address this question. PHB results may inform development of a barrier/NVO element to DPCs, but that is TBD. No changes to document.	Addressed
16	MM	138	Green	<i>Delete: of gradient, channel width, barriers to migration, and other</i>	Our language is consistent with the Board directive. No changes to document.	Addressed
17	PL	142	Green	The WAC says we need 95% accuracy	That was the standard established for WAC 222-16-030 (Permanent Water Typing Rules), which have never been implemented. The Board has not yet determined whether this standard will also apply to WAC 222-16-0302. No changes to document.	Addressed
18	MM	144	Yellow	Is this the EOF habitat from a FHAM or EOF as determined by the last fish?	EOFH determined from FHAM. Language added to clarify.	Addressed

19	JK	139	Yellow	<p>With Decision Criteria in mind... Is the goal of this study to be descriptive (informative) or actionable (establish one or more decision points)?</p> <p>Either way, I strongly suggest a sentence or two that clearly addresses the "what next?"</p> <p>I see something in the next paragraph.</p>	Expanded plan and description of end products from this study. The goal of the study is to provide information to the Board. The Board decides what is actionable. Added sentence to the end of the paragraph describing the subsequent process: "The Board is expected to use the study findings to inform which PHB criteria to use in FHAM."	Addressed
20	MM	146	Yellow	<p>How does this study fits into the AMP's goal of improving the management of streams. How will these results inform the management of Washington streams? Will the Board manual or WAC need updated? How does this study inform the Type F/N stream typing?</p>	See previous response (to comment 19) and Board Manual Section 23 (in development).	Addressed
21	JK	147	Green	<p>Replace: "or" with "nor"</p>	Changed to "nor is it intended ...". Text revised.	Addressed
22	MM	147	Yellow	<p>Are you not addressing this with questions 5 and 10?</p>	<p>No, this study just addresses the PHBs for use in FHAM. FHAM is used to determine F/N breaks. See revised text. "It is important to note that this study is not intended to evaluate the current water typing system or the FHAM; nor is it intended to describe the process by which the regulatory Type F/N break should be determined."</p>	Addressed
23	PL	146	Yellow	<p>This is somewhat confusing. We are going to assess physical attributes that are associated with fish presence and that are part of the current system, but we aren't evaluating the current system? Still not getting the problem with the current system. How could we know that the current interim system of physical criteria isn't the best alternative or good enough if we don't evaluate it?</p> <p>In the first sentence above it is stated that one purpose is to "evaluate the utility of PHB criteria selected by the Board". These parameters are more or less the same than what is in the current system. I'm not seeing a clear demarcation line between the stated purpose and the statement of scope. The current system isn't totally irrelevant to the purpose of this study, so I don't understand why it's barely mentioned.</p>	<p>The Board directed us to investigate PHBs for use in the FHAM. This is not water typing effectiveness monitoring or water typing validation monitoring. See study purpose.</p> <p>The "current system" includes DPCs and the survey protocols and the process for evaluation of proposed water type changes, but does not include PHBs. The DPC study <i>will</i> include evaluation of the current DPCs.</p>	Addressed
24	MM	148	Green	<p>Anthropogenic and natural disturbances as well</p>	Added to our list. Text revised...	Addressed

25	MM	150	Red	I'm not sure about this one. The degree in which a PHB is influenced by all these covariates varies in time and place. In addition, there is the error in missing fish in headwater streams using electrofishing. I may be missing your reasoning here and happy to discuss.	Added language in text to this sentence that reflects the fact that we are focusing analysis on metrics/variables that are actually being considered as PHBs.	Addressed
26	JK	154	Green	These are all very descriptive and exploratory – there are no hypotheses officially presented in these research questions. There are, however, strongly implied expectations.  My comments are forward thinking to address how this research can be translated into action, what is the applicability (not to be confused with relevance) of the knowledge. Setting it up here in the design helps to build an understanding of what the results and analysis may mean when it is all finished.	The 3 sets of proposed PHB criteria accepted by the FPB are essentially the hypotheses that will be tested. Basically, how well do they 'perform' as PHBs. The questions listed represent the key uncertainties that must be addressed to assess the performance of the proposals. Some text added to the document to help with clarity here.	Addressed
27	JK	156	Yellow	these are descriptive question that, when answered, can help define a “problem” or a hypothesis. Already, the initial assumption is that there is variability, so are these questions really about “how much?”	Lack of variability or "no change" is a potential outcome even when asking "How does something vary...?". In short, "zero" is a potential answer here. We also look to characterize other aspects of variability, not just the question of 'how much?'. No changes to document.	Addressed
28	MM	160	Green	Yes, such as eastside from westside	Yes, we intend to look at variability by east/west region. However we will also have capacity to look at finer geographic scales (ecoregion) if warranted, just not being done apriori. No changes to document.	Addressed
29	MM	162	Yellow	at the PHB? Basin characteristics such as GIS-derived? or at the PHB since EOF habitat isn't PHB, yes?	No this characterization of habitat at uppermost fish location per line 161 in the study design. Yes, some basin scale characteristics will be GIS derived... but not necessarily all of them. Depends on specifics. Offer to provide MM with FHAM doc(s) for his review if needed. Goal is to identify PHB(s) that function as EOH. See attribute table. No changes to document.	Addressed
31	MM	165	Yellow	...with repeated measures either seasonally or interannually,	Yes... interested in both potential types of variability (changes based on season or sampling at a different time of year and/or changes based on annual (different year) sampling. No changes to document.	Addressed
32	MM	165	Green	Delete: (seasonally or interannually)	Keep as is. No changes to document.	Addressed

33	JK	165	Red	<p>This is worded in a manner that the PHB is subject to influence, suggesting that the permanent feature (e.g. the gradient, stream size, geomorphic feature) is actually more malleable.</p> <p>Suggested change “..how does that correlate with the PHB criteria associated with the F/N break and how often are the same PHB criteria associated with such a change?”</p> <p>*separate question: How frequently does the location of the last detected fish change (interannually or seasonally)?</p>	<p>Changed language to read, "how does that influence WHICH PHB would be associated...".</p>	Addressed
34	JK	168	Green	<p>Replace: "in" with "over"</p>	<p>Change made.</p>	Addressed
35	MM	169	Yellow	<p>Well it is a stream....LOL...and you have measurement error (you'll need to define what constitutes a meaningful difference).</p>	<p>Revised text to distinguish between 'detectable' and 'relevant/meaningful' changes. In the end we are interested in change in habitat character/features that influence changes in fish distribution.</p>	Addressed
36	JK	168	Green	<p>good question. In the Intro there is a notion of “permanence” in nature. Some features are likely to remain long after us, however it really only takes one good quake or landslide to remind us to not get too comfortable with our surroundings staying the same. Similarly to the comment above, perhaps the more accurate question is “how much do ..... change over time?”</p>	<p>Lack of variability or "no change" is a potential outcome even when asking "How does something vary...?" Language updated.</p>	Addressed
37	JK	170	Green	<p>Replace: "Do" with "How often do"</p>	<p>Change made.</p>	Addressed
38	MM	170	Yellow	<p>Yes! An important component to this is, how does the upstream and downstream barriers compare within a stream?</p>	<p>Not sure there is anything to respond to here. Did we cover this in the conversation we already had with Mark? Recall discussion about isolated populations upstream from barrier features, differences in flow at different points in the watershed, the fact that fish are upstream from a feature does not necessarily mean that the feature is 'passable' in its current form, etc.</p>	Addressed

39	JK	173	Yellow	<p>Here are potentially actionable questions. Ultimately it is a policy type choice based on social tolerance of certainty. So given these questions, what kind of results will this study report when it is all finished?</p> <p>8. Frequency of specific combinations of physical channel features and basin characteristics that best...</p> <p>9.*working on quantifying this one... because the answer is Yes but How Often are does this happen? Maybe this is a probability question so that if it is &gt;90% or &lt;80% the FPB can use it for a decision based on their tolerance of "failure"</p> <p>10. same concept – the "How well" is perhaps good in this case as long as the expected analysis provides a quantitative answer.</p>	Addressed with response to Comment #26 and with additional analysis language provided by Leigh Ann.	Addressed
40	MM	174	Green	Delete: (for example, gradient, channel width, barriers to migration)	Keep this language as they are specifically the characteristics associated with FHAM. (rejected deletion)	Addressed
41	MM	175	Yellow	basin area at PHB?	We agree and plan to include that as a variable (noted other places in the design document). However, decided it is not necessary to add it to this example list within the study questions.	Addressed
42	MM	176	Yellow	I suggest you are assessing the multivariate response of the three PHB types – each with well-defined variables to characterize them (suggested in a separate comment).	We agree, see revisions to analysis methods section "Performance Evaluation of Board-Accepted PHB Criteria". Note, each of the (3) sets of potential PHB criteria (caucus proposals) include elements that include gradient, size and obstacles.	Addressed
43	PL	174	Red	Most accurate may not be accurate enough. Should have decision criteria for what will be deemed accurate or not.	We can provide information RE the accuracy of each proposed criteria, etc., however, deciding what level of accuracy is acceptable or not is not our decision but instead a Board decision. Leigh Ann provided additional language for the SD that speaks to the 'accuracy' piece.	Addressed

44	PL	177	Yellow	<p>Important QA/QC element. Not clear from the document how consistency will be evaluated. I only saw description of formal training and repeated measures by different crews. But not how consistency will be assessed. Should be decision criteria for this too. For example, a protocol will be determined to be consistently applied if repeated measurements by separate crews differ by less than 10%, on average.</p>	<p>We are not specifically testing this question but the findings from the crew variability testing will inform this. This could also be addressed through follow up work to the initial study. Reviewer's suggested method could be used in the implemented field crew QA plan. Threshold for "consistently applied" tbd based on each type of measurement. Added text to Crew Variability method section.</p>	Addressed
45	PL	179	Yellow	<p>Need to translate into decision criteria to define "how well" and "accurately"</p> <p>WAC 222-16-030 sets an accuracy objective of 95%.</p>	<p>We will provide information on "how well." In the end the decision of what is "accurate enough" is a policy decision not a technical one.</p>	Addressed
46	MM	191	Yellow	<p>I suggest that explicitly stating the relevant WAC language when applicable such as the legal definition of a fish from WAC 222-16-010: "Fish" means for purposes of these rules, species of the vertebrate taxonomic groups of Cephalospidomorphi (lampreys) and Osteichthyes (bony fish). I think you can explicitly state that all fish species must be considered, but the PHB criteria from this report will be primary derived from cutthroat trout, which are known to be the upper most species. I suggest you limit the analysis to either just cutthroat or separate out cutthroat from all other species. If the last fish species is not cutthroat, then factors other than PHB are likely responsible. The issue is related to resident species that don't have to migrate from the main channel every year.</p> <p>The exception to this is non-anadromous lamprey species. It will be interesting to see where you find them but eDNA might be a better way to sample them. This may be a topic for a future study.</p>	<p>Added definition from the WAC as a footnote with the WAC reference.</p> <p>We do not agree with limiting analysis to any particular species but species at LF will be a variable that is collected and could be used to differentiate analysis if warranted.</p>	Addressed
47	JK	193-203	Green	<p><i>Insert parantheses around scientific names</i></p>	<p>Change made.</p>	Addressed
48	JK	206	Green	<p>Are flow and channel size considered together?</p> <p>Makes sense, I wonder if there is a way to better articulate that and remove the / so that it is more clear.</p>	<p>Either one can limit movement; revised text</p>	Addressed

49	PL	205	Yellow	Sometimes there are seasonal temperature barriers such as for an outlet stream to a wetland or pond that warms up in the summer. May not find fish in these areas depending on time of year that you look. Also, sometimes there are low DO barriers, such as just below low DO groundwater inputs. These are technically physical barriers. I know it's not part of the Board's criteria, but it seems like it should still be acknowledged. If not acknowledged we may encounter a fishless reach due to temp/DO with no other barriers, which could add noise to the data.	The study acknowledges other potential factors that may influence fish distribution, however, they are not part of FHAM. We are hoping to address influence of these other variables through repeated surveys in different seasons and/or years, and via survey timing optimization (through consult with local 'experts') in a given season. For purposes of this work and for FHAM 'barriers' refer to physical obstacles that potentially limit fish 'access' and not physical water variables such as temperature that may impact habitat suitability.	Addressed
50	MM	211	Green	<i>Delete: steep</i>	Accepted deletion	Addressed
51	JK	212	Green	<i>Replace: "and /trench/chutes" with "and trenches or chutes"</i>	Change made.	Addressed
52	MM	214	Green	How does a steep cascade differ from a cascade? LOL!  In my view, the three categories are Permanent Natural Barrier (falls and chutes), stream gradient (or channel slope barrier), and minimum stream size.	Deleted "steep" in comment #50. Minimum stream size can also be an obstacle but not what is being described in this section. All three categories you describe are elements of the three proposed sets of PHB criteria that will be evaluated.	Addressed
53	MM	214	Yellow	Note that the height of the fall is not measured correctly – the top of the falls should be measured at bed elevation. I realize this is not the place to present the details of how you measure the stream characteristics. I would suggest that the methods must be through a “fish-eye” perspective (which differ from standard unit measuring protocol) to reduce the variability around potential barriers of given characteristics is passable. For example, not all waterfalls of a given maximum height present the same resistance to migration at a given flow. For example, the falls might be passable in a side channel that skirts the falls – the measured vertical height is the minimum distance the fish must traverse to pass.	Figure 1 is accurate, per Powers and Orsborn. Obstacles (and all habitats) will be measured at bed and water surface elevation (see Field Methods for habitat surveys). Where split/side channels exist, both channels will be measured.	Addressed
54	JK	281	Green	<i>Insert parantheses around scientific name</i>	Change made.	Addressed



55	MM	287	Green	Nice figure. This seems like a good place to mention that from a fish-eye view, "A" is easier to navigate than "B", because of the resting places in the first are lacking in the second (referring to the swimming ability argument above). Therefore, the two reaches - although of the same length and gradient - will differ in passing fish – a source of the variability in determining PHB.	This is exactly the point that the figure and associated text (above figure in document) are making (already included).	Addressed
56	MM	293	Yellow	I wanted to make a suggestion on methods. An easy way to accommodate the variable roughness (step pool or cascade) is to measure the minimum grades over a given distance. So, for "A", the minima at 4 locations would be much less than the overall gradient, which is what is measured in the field. The steps in A are the potential barriers not the overall gradient. In "B", you just need the overall gradient for a given minimum distance. The PHB variables for stream gradient PHB that could be explored are length of the unit at a given slope after accounting for substrate (e.g., bedrock vs boulder).	Agreed. Detailed habitat survey data will allow us to distinguish between step-pool and non-step-pool habitats by adding 'step pool' as a habitat (segment) type. We are using variable length segments to help identify these features/characteristics. Stand-alone vertical steps of two feet and greater will be broken out as unique habitat segment. This level of detail will be included in the 'methods manual'.	Addressed

57	PL	297	Yellow	<p>Bankfull width seems like highly unreliable indicator of fish presence. I've seen fishless streams of 20ft+ bfk width, and 1ft bfk width streams with fish. Even found fish in a small pool in a nearly ephemeral stream where there was no other water for hundreds of yards up or downstream. There's not enough science here to justify using it as an indicator.</p> <p>Is there any literature addressing variability in flow as a fish barrier? For example, have there been any observations of high flow events temporarily flushing fish out of a stream reach or seasonal, localized stream intermittency affecting distributions, e.g. localized channel aggradation that results in a gap in surface flow connectivity during summer?</p> <p>To my surprise in Oregon I once found fish upstream of a section of a very small channel (&lt;2ft bfk width) that several times in a row flowed a subsurface (like 2-3ft below the surface) for several meters beneath duff and soil and buried logs. Depending on the observer, if one were walking upstream and reached the subsurface section, they might assume that was the end of fish and stopped looking. Although a rare occurrence, I recommend that the protocols be able to address odd situations like this in a consistent manner.</p>	<p>Physical variables being investigated as potential PHBs are based on literature and also FHAM. Barriers, gradient and size (bankfull width). See literature cited in study design. The study will help determine the relative importance of stream size as a predictor of EOF. In terms of where to terminate survey... study design (Methods) already recommends surveying up to DPC point (or above in case of finding fish up to end of DPC), not terminating survey at a point of subsurface flow.</p>	Addressed
58	MM	321	Green	<p>Will mean Q be one of the basin characteristics used in the analysis?</p>	<p>We are not measuring flow. We are relying on surrogates like BFW and basin size, which are more consistent. This is consistent with the requirement for criteria to be repeatable, implementable and enforceable.</p>	Addressed
59	MM	326	Green	<p>Food availability is a secondary effect on PHB. That is, the persistence of a resident population after seeding a reach may be a limiting factor but it certainly isn't directly related to impeding upstream movement. It also may limit the population size resulting in low capture efficiencies from electrofishing. You could delete.</p>	<p>Agree... it is secondary and not being considered as a PHB. However, provides good context helpingn characterize systems we are working in.</p>	Addressed

60	MM	340	Green	And there is no way around that – statistical models provide a good estimate, but they can't replace surveys. You need to make defensible calls based on legally defined DPC, which I assume is a goal of this study.	Yes... the intent here is to provide consistency in the process based on empirical criteria. This is consistent with the requirement for criteria to be repeatable, implementable and enforceable. As a reminder to the reviewers, DPC does not equate to PHB.	Addressed
61	JK	341	Green	<i>Moved: (F/N)</i>	Change made.	Addressed
62	MM	343	Red	I suggest that there are three issues that need to be addressed in this proposal inserted in places in the document as you see fit. First, the reason that there may not be fish there is in part, that the fish distribution expands and contracts seasonally and annually, which is driven in part by size and duration of storm flow. The legal definition of Type F is the maximum expanded distribution. Second, there may be transient barriers that block upstream fish passage. Third, electrofishing in headwater streams can have a low capture efficiency because of typically low abundances and the reaches can be very difficult to shock effectively. In short, electrofishing answers the wrong question – “is there a fish there today”-versus “could there be a fish here”. This study can inform all three of these issues.	We address most of this with current sampling scheme (season/annual resurveys, etc.). Transient (deformable) barriers aren't PHBs and the distinction between them and permanent obstacle features is part of the study. RE capture probability that is also partially addressed through repeated sampling. We cannot definitively say whether changes in location of uppermost fish are due to fish movement or previous false negative... both can result in "variability". Large sample size will also help to address this concern	Addressed
63	MM	353	Green	An FYI. In most cases, especially in steep headwater streams (e.g., gradient), electrofishing is not necessary as potential fish habitat become even more unlikely as you move upstream (lower stream profile to the left. The judgement comes with the top stream profile where it could be at either arrow, but certainty increases with the upstream arrow if the stream bench is habitat.  If the electrofishing is optional, then the FHAM can be done any time of the year.	This is not our task here. We are tasked with identifying PHB criteria to inform FHAM (which relies on e-fishing). Absent e-fishing, DPCs are used rather than FHAM.	Addressed
64	MM	354	Green	Are these PHB from table 1?	Potentially yes... or an alternate based on study results. The PHB in the figure here is hypothetical and not tied to specific metrics. No changes to document.	Addressed
65	MM	356	Green	<i>Insert diagram</i>	Thank you but the group disagrees with this addition and feels like Figure 4 adequately captures this issue.	Addressed

66	PL	361	Red	<p>How will we distinguish between fish absence due to natural barriers vs. non-natural barriers?</p> <p>Fish presence may be affected by things associated with timber harvest such as culverts, slash accumulations, mass wasting. If this isn't accounted for, it seems like it can become a confounding factor. For example, the last detected fish may be located below an impassable culvert, but the habitat immediately upstream of the culvert doesn't have any natural barriers. If the F/N break isn't flagged in the database with the culver metadata, then it would look like the F/N break was associated with the natural physical habitat rather than the non-natural barrier, which would influence the analysis of PHB accuracy. Maybe I'm missing something, but I think more clarification is needed.</p>	<p>These specific issues are addressed in the 'Site Rejection Criteria' section of the study design and so won't be an issue. No changes to document.</p>	Addressed
67	MM	379	Yellow	<p>What about "permanent natural barriers such as falls and chutes (vs a transient barrier such as wood jams and debris flow plugs).</p>	<p>Non-deformable obstacles (as referenced in the study design) are falls, chutes, cascades, etc. Permanent natural barriers are a subset of these. PHBs are not meant to include deformable obstacles and/or transient barriers such as wood jams, debris steps, etc., however, these features will be identified and measured in the habitat survey if they meet minimum size threshold. No changes to document.</p>	Addressed
68	PL	379	Yellow	<p>please define somewhere</p>	<p>Language in the study design is consistent with language in FHAM and that used by the Board and authors believe it is self-explanatory.</p>	Addressed
69	MM	380	Green	<p><i>Insert: .</i></p>	<p>Done</p>	Addressed
70	JK	381	Green	<p><i>Delete: ,</i></p>	<p>Done</p>	Addressed
71	MM	391	Yellow	<p>Seems theses should be labeled Permanent Natural Barrier, Stream gradient barrier, and minimum stream size. Permanent Natural barrier refers to falls and chutes and require measurements of plunge pool depth and height (both measured from BFW elevation). Stream gradient is the minima over a given distance (e.g. 20% over 30 ft). Stream size, also called lack of living space, is the most difficult and BFW depth could be added (e.g., pools 1 foot deep at BFW elevation) and can sometimes be combined with stream gradient to make PHB from 2 of the criteria.</p>	<p>Language in the study design is consistent with the language in FHAM and that has been used to describe potential variables throughout this process. Review of document completed to ensure consistent language throughout.</p>	Addressed

72	MM	392	Green	I have the distinct advantage of not knowing the convoluted history behind this project but operationally, these would not be simple, objective, or accurate. It appears you are obliged to assess these PHBs. A paragraph explaining these would be helpful. I read them and am not sure what the PHB criteria mean let alone apply them in the field. I interpret this as if 1 or more of the three met, it is a PHB. Scaling it to BFW is an odd choice.	We believe the language you are looking for here is included in the current study design leading up to the reference to Table 1 (lines 382-385). No changes to document.	Addressed
73	MM	392	Green	No clue what this is.	This is consistent with the language presented by the board. Discussed with Mark at 6/22/22 meeting.	Addressed
74	MM	392	Green	So BFW <2'? And what about BFW depth?	BFW depth is not a part of the proposed criteria being considered nor is it a primary PHB criteria associated with FHAM. Depth will be considered as a covariate as part of the analysis. No changes to document.	Addressed
75	WDFW	395	Yellow	<b>Study Design:</b> There are three primary components of the study design: 1) survey design (i.e., when and where samples are collected), 2) sampling methods (i.e., how fish occurrence and habitat samples will be collected), and 3) analytical methods and model assessment. Unfortunately, it appears that each study design component was developed without regard to the other components. Having a survey design and analytical methods that are commensurate is essential to study success.	Based on consultation with statistician, authors believe that updates to text throughout document and additions of analytical language (appendices) address this issue.	Addressed

76	WDFW	396	Red	<p><b>Sampling Methods:</b> Fish occurrence (and habitat data to some extent) are important. However, the accuracy of the fish occurrence data is of paramount importance. There is a vast literature on electrofishing survey sufficiency and discontinuities in fish geographic distributions that can help address errors, especially false absences. We can be very certain we are underestimating the geographic distribution of suitable fish habitat (at least potentially, in time) and we're certainly failing to sample fish where they occur due to many reasons, but we almost never have a false presence. Given that false absences will be much more abundant than false presences, a discussion of fish sampling errors/efficiency seems vital, but is barely discussed. How much effort should we expend to be sufficiently sure an absence should be ok for the model? Given the small annual sample sizes, failing to detect fish at even a few sites can dramatically change the results, and while we know the most likely errors (false fish absences) and their effects (underestimating geographic distributions), the proposal does not address those errors.</p>	<p>The authors recognize that detection probability is not 100%. The optimization of survey timing (based on consultation with regional experts) to target timing of likely peak fish abundance in the vicinity of upper extent of fish distribution will help compensate for this. Additionally, the repeat sampling approach (2 seasons over 3 years) is meant to address both 'false negatives' (missing fish) AND actual fish movement.</p>	Addressed
77	WDFW	396	Red	<p>Once you've built a model and made predictions into real space (at one time in a variable environment where geographic distributions differ among years due to fish abundance – consider that 10 fish can only occupy 1 – 10 locations, but 1,000 fish can occupy 1 – 1,000 locations), many of those predictions will be incorrect and errors will differ among years. How do we best use those predictions? Which predictions should you verify and how?</p>	<p>Board accepted proposals are three of the predictions we are testing. We are not building a 'fish model', and for the purposes of this study we will be classifying all segments of our study reaches downstream of the last fish as 'fish habitat'. We address this by sampling over three years and two seasons to help address fluctuation in populations. In addition, we are not assessing abundance but are focused on the uppermost fish in a population.</p>	Addressed

78	WDFW	396	Red	Perhaps identify stable, substantial barriers to upstream movement first, then other habitat predictors, then fish, because we know that a lot of suitable habitat is not occupied but almost no unsuitable habitat is occupied. Make sure you do a decent job of describing fish habitat (occupied or not) and then surveying for fish at all sites where there is any uncertainty.	Barriers will be identified within the intensive habitat survey (660 ft/200 m upstream and downstream of LF point) during the first (and potentially subsequent) sampling event(s). The inclusion of segment attributes (change in gradient from downstream segment and maximum surveyed downstream gradient) will help Random Forest identify the important barrier features. We are already doing this (describing fish habitat and surveying for fish) and sampling all stream habitat between the uppermost detected fish up through (and in some cases beyond) the extent of DPC. We are surveying for fish at ALL sites whether there is perceived "uncertainty" or not.	Addressed
79	WDFW	396	Yellow	<b>Survey design:</b> The concepts of spatial balance, randomness (representativeness), and especially rotating panels seem disconnected to the proposed analytical methods. Identifying and agreeing on a sampling frame, locations where we do not know if a PHB exists, is vital to the design – much more important than spatial balance - but is not clearly addressed. Importantly, rotating panel designs can improve efficiency in long-term monitoring surveys intended to detect trends, whereas this study is short term and intended to collect data for a model. That design is not optimal. I'm aware of the very limited use of repeated measures data in random forest models, but those analyses have relatively few samples with many repeated measures of those samples. I strongly suspect such a complicated model will require much more data than you propose to collect, and the sample size estimates provided in Appendix B do not address the proposed analyses.	Rotating panel in the study design represents an economic and logistical compromise to make the study feasible. Language in WEST Memo (Appendix B) addresses this comment (sample size), as well. Minor addition of language RE 'target population' made to document.	Addressed
80	MM	397	Green	Table 1? You are referring to the three PHB types yes?	In part, yes... but also possible 'other' criteria that the study helps to identify as being more 'accurate'. In this context, "PHB Criteria" is used as a general term and not specific only to metrics outlined in Table 1. No changes to document.	Addressed

81	MM	410	Green	Your justification in combining them is that you have identified small headwater streams with known or assumed fish. The statistical inference of the sample to the closed population, ideally requires that each sample in the population has an equal chance of being selected.	All F/N points that exist in the current DNR hydrolayer DO have an equal chance of being selected for inclusion in the study (this includes modeled and survey based F/N break points). Unclear of concern here. No changes to document.	Addressed
82	MM	418	Green	I assume you are combining them to encompassing a broader set of potential sites (a well-defined closed population) that you are randomly selecting from. If you want to not compromise the statistical inference of the sample to the closed population, then each site must have equal chance of being sampled.	See reviewer response to Comment #81. Assumption is correct.	Addressed
83	MM	419	Green	Stratified random sampling by HUC 12?	No...We are doing apriori stratification by east/west WA, but that is it. We will also have the capability to assess/analyze data by ecoregion and the authors believe this plan is appropriate and see no basis for statifying at the HUC 12 scale. No changes to document.	Addressed
84	MM	435	Yellow	I mentioned at the CMER meeting that I had issues with this. I have no problem not knowing F/N for a given site – if it doesn't fit your sample criteria select another from your spatially balanced design.  The issues to me are: 1) there are a lot of headwater streams that are obvious N (e.g., gradients >40%?) – should they be included? 2) I agree that characterizing EOF for these “Lateral” streams is essential but that is an entirely different barrier criteria because it is related to main stem flood flows. Are defining them separately so that you can do separate analyses on them?	We are not selecting 'stream reaches' per se, but instead sites are selected by F/N break locations 'points' within the DNR hydrolayer. The authors don't believe that many (if any) of these points would fall within a 40% gradient headwater reach (for example) and don't believe this is something to be concerned with. No changes to document.	Addressed
85	JK	437	Green	<i>Italicize: a priori</i>	Change made.	Addressed



86	MM	453	Red	<p>Seems arbitrary. Why not do a rapid assessment of PHB starting from known fish to the last detected fish? It seems the most valuable information you will gather is characterizing the set of PHBs that are downstream of the last fish. This is the set of potential barriers that you know were passable. You might find that going above the last fish for 200 m might put the crew crawling up 60% gradient with a backpack shocker – which is a waste of sample time, not to mention a potential safety issue.</p> <p>You may also find more extreme PHB downstream of fish than upstream of the last fish 😊</p>	Discussed with MM during CMER meeting. Addressed.	Addressed
87	PL	453	Yellow	That's a lot of feet above and below in potentially challenging terrain. There should be some rationale for why this is the right distance.	Rationale explained (and cited) in Protocol E-Fishing and Habitat Survey' section of methods. No changes made to document in this location.	Addressed
88	MM	459	Green	<i>Insert line in Figure 5</i>	Discussed with MM. This is a figure that is pulled from another peer reviewed publication so authors are choosing to leave the figure as originally portrayed. No change to document.	Addressed
89	MM	461	Green	Added the main stem to the terminal. This was the point I was trying to make (ever so poorly) at the CMER meeting. Now that I have had time to think about it a little more, I could see the value of separating lateral and terminal in the analysis.	Glad that the conversation helped your understanding. This is a figure that is pulled from another peer reviewed publication so authors are choosing to leave the figure as originally portrayed. No change to document.	Addressed
90	MM	503	Red	It is critical that the last fish sampled got there on their own and were not planted. Although rare, it is possible. If there is evidence that fish were planted, then the site should be excluded from the analysis.	Regardless of stocked or not or species at LF still good information on what is limiting those fishes from moving further upstream. Also, no difference in how these sites are treated from a regulatory perspective. No changes to document.	Addressed
91	PL	504	Yellow	<p>I'm a little concerned about not distinguishing between sites where there has been recent timber harvest (upstream or downstream) and sites where there hasn't been recent harvest since that has the potential to affect fish distribution.</p> <p>How will the influence of land use be addressed?</p>	Broad scale land use/type will be collected for each survey location (industrial timberland, federal forest, ag land, etc.) and can be included as a possible covariate during the analysis. See data table appendix.	Addressed
92	MM	508	Green	<i>Delete: three to</i>	Change made.	Addressed
93	PL	517	Green	should add approx. dates	Date ranges are flexible based on input from (consultation with) regional experts and may vary based on geography, species, etc. No changes to document.	Addressed

94	PL	524	Yellow	fish distribution in some places may be affected by max temperatures by mid-July	This should be handled through input from (consultation with) regional experts to ensure that we are sampling at the appropriate times when fish are most likely to be present given local conditions. No changes to document.	Addressed
95	MM	533	Green	You may also be limited by the weather; shocking after a storm is preferred to shocking during one!	This is true. Safety will be paramount, as well, and survey crews should not be put in harms way to be sampling during (dangerous) flow events. No changes to document.	Addressed
96	PL	543	Yellow	Should probably be discussing potential mortality, just for the sake of acknowledging that studies like this, and electroshocking for water typing are not entirely benign.	Mortality will be noted when it occurs. One point of the study is to help reduce the amount of e-fishing that occurs during water typing surveys.	Addressed
97	PL	556	Yellow	but what if the segment with the largest contributing area is steeper and more likely to have a shorter distance to a barrier?	That is likely to be the result in some cases. The protocol is consistent and the intent is not to always end up at the highest point in each individual watershed. We want sampling to be representative and objective. No changes to document.	Addressed
98	MM	564	Yellow	I assume single pass and skipping pools when appropriate? A little more detail on your shocking protocol would be welcomed or provide a reference to the modified DNR protocol.	Yes single pass. See BM 13 for current protocols. Current protocols don't call for 'skipping pools'. Additional language will be included in the methods manual RE what exactly we mean by "modified protocols".	Addressed
99	JK	565	Green	<i>Change font size to 12 pt</i>	Change made.	Addressed
100	MM	566	Yellow	Are these necessary? This will just slow the crew down and these data will not be that meaningful for defining PHB. You could use the conductivity to check your shocker settings or simply put your finger in the water!	These are standard metrics that are collected at the front end of every e-fishing survey and should not slow down crews much as these are only collected once per survey. No changes to document.	Addressed

101	MM	570	Yellow	<p>This is a fish/no fish binary variable so at a minimum, all you really need is species to confirm presence – e.g. don't even have to net it -a flash of a fish will do. You might determine fish presence without the need of using the shocker, in which case, you can just keep walking upstream.</p> <p>At the next level, relative count might be useful to say something about relative abundance (so then need to measure the pool width and depth. Size categories might be as simple as . &lt;50, &gt;50, &gt;100 mm. Fish abundance and size would be most critical at or near for EOF. You could probably get all the information you need without the need of putting them in a bucket. In addition, since you will be repeat sampling, it might be good to have the voltage just enough to turn them so minimize your morts.</p>	<p>Yes a visual observation is sufficient for confirming fish presence... just be certain that it's a fish. There will be no 'abundance' estimates based on our survey protocols, however, general characterization of fish 'size' or 'age-class' will be made. This takes no additional time for surveyors and could be useful or at the very least interesting data to have. Reference to this is included in the data table (see Appendix).</p>	Addressed
102	MM	571	Yellow	<p>Are these defined in this document? If not, please include either a table or a brief discription.</p>	<p>Reference to DPC WAC is already included earlier in the document.</p>	Addressed
103	MM	578	Yellow	<p>Is this necessary? I don't see how this time consuming effort contributes to describing PHBs.</p> <p>The most important channel measurements are associated with the three types of PHB and the gradient features as you measure from the start of the surey: Permanent Natural barrier refers to falls and chutes and require measurements of plunge pool depth and height (both measured from BFW elevation). Stream gradient barrier is the minima over a given distance (e.g. 20% over 30 ft) and substrate. Minimum Stream size, also called lack of living space, can be characterized by presence of pools (count, BFW width, and maximum BFW depth). Sometimes the PHB will be a combination of stream gradient and minimum stream size.</p>	<p>Collecting the habitat data at this level of detail reduces subjectivity in measurements and allows us to generate a profile that reflects true streambed character. Note, our approach already has reduced the level of intensity from the oringal study design which proposed collecting data every 1 meter. No changes to document.</p>	Addressed

104	PL	579	Yellow	I think that valley gradient should also be determined at some point, and perhaps distinguish between valley confinement and channel confinement.	Valley gradient could be calculated using remotely sensed data after surveys are completed. Check to see if this is in data table... and potentially add. Authors are not sure that they think valley gradient is useful for this purpose. Channel confinement is a metric that would potentially be collected during survey by field crews while valley confinement would be assessed via GIS after surveys are completed. Reference to this is included in the data table (see Appendix).	Addressed
105	MM	579	Yellow	What about bank undercut? A flag for an unshockable section? Weather conditions? These are issues that reduce electrofishing success in these small but complex streams.	It is true that e-fishing effectiveness from site to site may vary depending on these (or other) conditions but that will hopefully be addressed through multiple site visits. Survey crews will include a habitat classification for obscured channel, etc. (included in a methods manual). In cases where e-fishing simply can't be done effectively at all these sites can be dropped and the reason for exclusion noted.	Addressed
106	MM	583	Yellow	But isn't this one of your objectives? It seems circular to modify your protocol assuming you'll reach the same conclusion. I've seen it where there was 500' between fish presence with poor (transport reach!) between good habitats, well outside of this range.	As a reminder... the 660 ft upstream and downstream of the LF is the distance over which the intensive habitat survey is conducted once the last fish point has been identified. E-fishing surveys extend from this point up to (and sometimes beyond) end of DPC. No changes to document.	Addressed
107	PL	580	Green	This is what I was looking for earlier, might want to move it earlier in the doc.	Addressed with response to Comment #87.	Addressed

108	MM	589	Red	I would suggest that the intensive measurements are not necessary to achieve your objectives. Collecting the data used to create Figure 7 is really all that is essential to answer your questions, no? The intensive would make hundreds of beautiful graphs but how would this intensive sampling contribution to the analysis? If there is anything that would benefit with intensive sampling, it would be the three categories of PHB and it is essential that they be measure from a fish-eye perspective, which is different than standard stream habitat methods that measure contiguous units. I stress this because this will potentially reduce your variability in associating the PHBs with EOF – the fundamental goal of this study.	Collecting the habitat data at this level of detail reduces subjectivity in measurements and allows us to generate a profile that reflects true streambed character. Note, our approach already has reduced the level of intensity from the original study design which proposed collecting data every 1 meter. No changes to document.	Addressed
109	MM	594	Green	This is the essential component that should be measured from the beginning of the survey.	Agreed, that is the plan. No changes to document.	Addressed
110	MM	595	Green	I am sympathetic to the crew dragging around this equipment with a shocker and extra battery, staff or tape, and an iPad. This could be done by giving each crew member a range finder and putting a reflector on their helmets. Part of the difficulty is that site distances can be limited so the segments might be rather short (e.g., 5 m) in places, and not associated with any inflection point.	The e-fishing survey has to be completed prior to starting the intensive habitat survey, so cannot do that simultaneously. No changes to document.	Addressed
111	MM	598	Green	Do you think you could get away with the GPS in an iPad (with a signal booster such as a Garmin Glo) with some mapping program such as Avenza (tracking mode, add points for survey points associated with a custom survey form)? I think that the methods described here are fairly time intensive (that's 66 points to the EOF) to obtain a level of detail that might not be necessary.	We believe we need higher precision than our experience and knowledge of GPS, especially that in an iPad, can provide. We will use GPS to collect bottom of survey, top of survey, and last fish locations. No changes to document.	Addressed

112	PL	599	Yellow	<p>I think that fish presence is partially controlled by channel hydraulics. Pool availability and characteristics are important I think, i.e. the lower the “quality” of pool habitat, the lower the likelihood of fish presence. For example, is it a pool where fish can readily persist in in high and low flow, or are water velocity and/or turbulence at high flow volumes too great for fish to persist in those pools? And at low flows, are pools too shallow to provide enough resting/hiding cover?</p> <p>So I think there should be measurements that get at pool frequency, morphology and hydraulics. I suggest estimating pool volume, residual pool depths, and hydraulic radius (cross sectional area of flow/wetted perimeter). I say hydraulic radius because pool volume by itself probably isn’t enough; there can be a wide shallow pool with the same volume as a deep, narrow pool, but the hydraulics will be very different. Not sure how to accurately estimate high flow velocity and turbulence at high flows, but an attempt should be made.</p> <p>I didn’t see that discharge will be measured. Shouldn’t that be measured?</p>	<p>Good suggestions. We will add pool frequency and spacing above and below each segment as attributes; see data table (appendix). We will not be measuring discharge.</p>	Addressed
113	PL	599	Yellow	<p>What can realistically be done with this qualitative information? If it may be influencing fish distribution, it should be quantified, if not, or if it can’t be used in an analysis later on, then why waste the time?</p>	<p>These are categorical variables that random forest is particularly well-suited to incorporate. Even factors that don't end up being used in a model can help us as explanatory information.</p>	Addressed
114	PL	601	Yellow	<p>Is there going to be a quality assurance plan to address protocols, accuracy, precision, bias, representativeness, comparability, completeness? Probably should since the overall accuracy of the analysis of the predictive physical parameters will hinge upon the quality of the data.</p>	<p>We agree, and there will be a QAPP. That is a standard CMER study component. No changes to document.</p>	Addressed
115	MM	604	Yellow	<p>Please consider “transient natural barrier” and an important topic to teach the crew.</p>	<p>We agree and "deformable" was meant as a general term to include "transient." This will definitely be included as an important topic in the methods manual and crew training. Changed wording to "deformable obstacles." via find/replace for "Barriers".</p>	Addressed

116	MM	610	Green	I would prefer to say that you will document overwinter changes by repeat sampling in the spring of each year.	We considered this but believe the current wording better allows for the possibility of changes at any time of year. No changes to document.	Addressed
117	MM	620	Green	35 sites? Could you do this at the end of the training session? If you have 4 crews, take 4 days and do a round robin. Then assess if the variability among the crews is acceptable. This is another reason to simplify your protocol.	We have done this type of test in previous studies, and it is useful. However, that type of test in this study would make it difficult to account for the geographic range. Also, previous studies have demonstrated that "mid-season drift" occurs and needs to be accommodated. The 10% resample rate is a standard and generally accepted QA percentage. No changes to document.	Addressed
118	MM	642	Yellow	What about regional weather data such as precipitation - especially prior to sampling? Also, the severity of the summer drought. Even the nearest flow records might prove useful. Ideally it would be discharge but on a practical basis, regional trends in expansion / contraction might correlate with extremely wet or extremely dry weather patterns.  The regional geology (parent material) might influence stream response to storm – e.g., flashy streams.	We agree with all of these factors. We do plan to collect and consider precipitation and flow pattern for each year on regional levels. Also, the decision to sample in multiple seasons for three years is an attempt to capture those annual and seasonal variabilities. See data table (Appendix). The regional geology factor is captured, to some degree, with the (GIS-derived) competent/incompetent classification for each site.	Addressed
119	JK	662	Green	I am excited by the use of the Random forest methods and am curious if this method will also shed some new light on the suggested criteria for PHB.	So are we! No changes to document.	Addressed
120	WDFW	662	Red	<b>Analytical Methods:</b> Methods such as Random Forests will likely be appropriate, but I'm confused by the very limited number of predictors proposed, a priori east-west stratification, and training-testing data splitting. These choices make very poor use of the strengths of methods such as Random Forests.	We have many predictor variables and this is addressed in the 'Data Prep' section of the study design. We need to add in a table that shows all of these variables (table in development). See updated analytical language include in WEST Memos (Appendices)... this has been updated significantly since original version.	Addressed

121	WDFW	662	Red	<p><b>Analytical Methods:</b> Different models for east and west and splitting data into training and testing data practically ensures that none of the models will work well. We were glad to hear that you had consulted with a statistician to provide input on statistical design and analysis, and agree that this approach will benefit study design and outcome. Can you develop specific questions for the statistician, rather than prescribing (sometimes inappropriate) methods (as appears was done here)? Given the data and methods, and since the fish assemblages and types and nature of PHB are more similar than different, perhaps it would make sense to include in the model an East-West (i.e., location dummy predictor) and other similar predictors (such as surface geology, ecoregion, an index of fish abundance, etc. if you cannot develop a reasonable conceptual model to identify predictors). This approach would result in a larger sample size and improved statistical power.</p>	<p>Study is split east vs west based on regulatory and policy issues. See updated analytical language include in WEST Memos (Appendices)... this has been updated significantly since original version. Subgroup, in consultation with statisticians, have made several changes in line with what is suggested here.</p>	Addressed
122	WDFW	662	Red	<p>Can we use cross-validation methods to assess the model(s), rather than training-testing data splitting? I strongly suspect you can and should, given the iterative methods proposed (e.g., random forests, etc.). Do you really need to be selective about which predictors work best, since the modeling methods sort that out for you? I suggest using cross-validation assessments provided by the analytical program because that's a primary reason to use methods such as Random Forests – they cross-validate as the models are built. But, again, perhaps posing some question to the statistical consultant (rather than prescribing methods, as we believe was done here) could provide improvements.</p>	<p>See updated analytical language include in WEST Memos (Appendices)... this has been updated significantly since original version.</p>	Addressed



123	WDFW	662	Yellow	I'm confident that the predictions of PHB can be substantially improved relative to those currently used. However, I'm not sure the current effort will result in much improvement. Moreover, much of the uncertainty in PHB locations and effects is complex. Geographic distribution of fish is driven largely by temporally variable fish abundances. Also, fish habitat suitability and even the locations and permeability of many barriers to upstream movement differ among years. Addressing uncertainty while meeting our conservation and restoration goals might be more important or more successful than addressing the limitations of the PHB models.	We don't currently have standardized PHBs; this study is meant to establish them. Sampling in multiple seasons for three years is intended to capture those annual and seasonal variabilities in extent of occupied habitat. No change to document.	Addressed
124	MM	670	Green	Stream gradient	General channel gradient and non-vertical (steep) obstacles are different. No changes to document.	Addressed
125	MM	681	Yellow	Again, the most valuable information obtained will be the PHB downstream of the EOF and how they compare with PHB upstream of EOF for a given stream.	Agreed; that is one of the things we will be analyzing. No changes to document.	Addressed
126	MM	687	Yellow	Sure, it's a multivariate response – each of the 3 barrier types has multiple variables needed to describe it. However, I would suggest avoiding a data mining exercise. Rather, the barrier types and the variables to characterize them are known (please see previous comment).	The random forest analysis is not the only analysis we are doing. Mining the data to see if there are better PHB factors is exactly the purpose of the random forest analysis. No changes to document.	Addressed
127	PL	715	Red	I would like to see a priori decision criteria established for the evaluation.	We can provide information RE the accuracy of each proposed criteria, etc., however, deciding what level of accuracy is acceptable or not is not our decision but instead a Board decision. Leigh Ann provided additional language for the SD that speaks to the 'accuracy' piece.	Addressed
128	MM	718	Yellow	One of the simplest but most directly relevant metric is simply the difference in slope distances of the EOF seasonally, and annually. Assessing the magnitude of the seasonal and annual change in terms of PHB characteristics (e.g., lateral sites that were never breached; fall >10 ft etc., slopes with >25% minima over 10 m, etc.) would seem to be very informative. It would also be interesting if you could discern a year effect or a seasonal effect and relate that to precipitation. Also, was an expansion /contraction observed – how strong was it and where did it expand / contract the most and the least?	These are the things we intend to investigate in the inter-season and interannual location variability investigation. Language that speaks to this is included in the 'Data Preparation' section of the SD. Analysis will assess absolute distance movements and probabilities of passage past obstacles, etc.	Addressed

129	PL	726	Red	<p>This is where non-measured variables have the potential to cause trouble, which is why I would like to see a better accounting for non-measured factors that may influence fish distribution.</p> <p>The document addresses it a little on page 22 where it says “Crews will also note whether flow is continuous or intermittent, the presence of beaver dams, groundwater inputs, and any other unusual features (e.g., tunneled or sub-surface flow) that could influence fish distribution.” However, I’m not seeing how the evaluation will address other natural and non-natural factors that may influence the evaluation of the accuracy of the selected physical factors as predictors of fish distribution</p>	<p>Explanatory variables that we are currently focused on are those that are parts of FHAM. Transient barriers, beaver dams, etc. will all be identified and quantified in the habitat survey... and the presence of these types of features can be identified as a factor within the random forest analysis.</p>	Addressed
130	MM	740	Yellow	<p>A little more here would be welcomed. Like comparing gradient profiles? Changes in Transient natural barriers size, abundance, and distribution?</p> <p>A few suggestions (not sure where to put them) If you are going to count the fish captured, maybe a comparison of relative fish abundance and /or their distribution pattern.</p> <p>Do you anticipate any differences between eastside and westside streams? I would suspect that the eastside has a lot more seasonal Type F streams, which influences which fish are found at the upper extent?</p> <p>Where there a difference in PHBs by EOF species?</p>	<p>Agreed. See revised text in this location/section, as well as revision to Study Question 6.</p>	Addressed
131	PL	742	Yellow	<p>how will this be done?</p> <p>Also, what if it is found that some parameter has wide variability among observers? What will you do with that data... treat it as normal, or discard it, or...?</p>	<p>Change(s) made. See document revision</p>	Addressed

132	PL	749	Yellow	Is it possible for access to bias the evaluation? In other words, is it possible that land ownership can influence land use, which in turn may influence fish distribution—and so where the sites are located may influence the results of the evaluation? I have seen where landowners have denied access for a study, then when the results come out, the landowners have said that the study results are not representative of their lands because they did not include their lands. I think it should be acknowledge upfront whether or not access issues have the potential to influence the results (beyond just reducing the # of sites).	This study is targeted at identifying the <i>features and channel characteristics</i> that limit upstream extent of fish distribution, which should not be strongly dependent on particular land uses or ownership types. Therefore we can argue that results have broad applicability despite any site selection biases that may occur. We will, however, be documenting reasons for exclusions in the sites used. This is also addressed through use of GRTS sample selection protocol which preserves unbiased sample when sites have to be replaced in the sample population (see Methods section). In addition, text added, "This study is targeted at identifying the <i>features and channel characteristics</i> that limit upstream extent of fish distribution, which should not be strongly dependent on particular land uses or ownership types. Therefore results should have broad applicability despite any site selection biases that may occur".	Addressed
133	MM	760	Green	Absolutely. And I think you could reduce the cost, increase the crew's accuracy, and providing all the data you need with a streamlined protocol.	We have reduced costs and achieved efficiencies by limiting the intensive channel habitat survey to the 200m up and downstream of the end of fish point after it is established through the electrofishing survey (as opposed to surveying the entire electrofishing reach). We also reduced the regular survey stations by 2/3 by going from 1-m segments to 3-m segments and also by reducing the seasonal surveys from three to two times of year. Sharing of study sites (and likely some data) between the PHB and DPC studies will add further efficiency and savings to the program. No changes to document.	Addressed
134	PL	760	Green	I think there's higher risk of underestimating the amount of time and cost to collect the data at each site since they are going to be 400m long. Better to overestimate than to underestimate for this study.	Good point. No changes to document.	Addressed
135	MM	780	Green	Or flow conditions or low population densities	Agreed. No changes to document.	Addressed
136	MM	789	Green	But it does over short interval and over the landscape. So it has a bit of a substitute space for time if the year effect is not strong and there are regional differences.	Okay. No changes to document necessary.	Addressed

137	DK	792	Yellow	Will you be able to put sideboards on the kinds of stream morphologies/geologies that are appropriate for PHB testing based on your sampling and call out any that may not meet some of the assumptions (e.g. stream systems that originate with headwater wetlands capable of supporting fish does not meet the assumption that the water is diminishing). Or will the rarer stream system types that are tough to put into an apples-to-apples statistically valid study (and rightly so) go into this category of unexplored information?	We believe this study design accomodates all types of morphology or geology, including wetland headwaters, in the analysis of the features or characteristics that limit fish distribution. We won't be excluding sites that have wetlands at the channel head or for other morphological reasons. No changes to document.	Addressed
138	PL	789	Green	True, but doesn't this make an argument for delineating an uninhabited stream reach as Type F, instead of N, if it appears to be habitable?	Agreed. FHAM is intended to account for that variance between end of fish and end of fish habitat, where they differ. No changes to document.	Addressed
139	MM	793	Yellow	I would expect that the characteristics of the three PHB types - Natural permanent Barrier (vertical distance, plunge pool depth), Stream gradient (slope minima, length), and minimum stream size (BFW, and BF depth) would be evaluated with suggested metrics to use for DPC possibly by region but at least by westside vs eastside.	Agreed. To be addressed further in DPC study design. No changes to document.	Addressed
140	PL	796	Green	out of the ones chosen to be measured, right?	Yes... No changes to document.	Addressed
141	MM	801	Yellow	It is worth repeating - I would suggest that "gradient, channel width, and barriers" are actually the three PHB types that you are assessing: channel slope barrier is "gradient", minimum stream size is "channel width", and Natural permanent barriers are "barriers"	All three of the proposed PHB combinations contain elements of each of these types, as would any proposed alternatives. All three elements need not be present simultaneously to function as a PHB. No changes to document.	Addressed
142	PL	819	Yellow	Yes, but then need to build a formal process in for evaluating protocols and so that knowledge can be appropriately applied to future protocol edits, e.g. what info will be collected on whether the protocols are adequate and how will that be done?	Our findings will <i>inform</i> FHAM protocols, but are not intended to <i>establish</i> protocols for FHAM or any other water typing methodology. No changes to document.	Addressed
143	DK	824, 827	Green	<i>Moved: "may also be able to assess variability at longer time scales"</i>	REJECT (accidental?) change	Addressed
144	DK	824	Green	do you know how long you are hoping for?	It depends on the age of water type modifications available for our selected sample sites. No changes to document.	Addressed

145	PL	824	Green	Why not monument randomly selected sites, so that our children's children can go back and see if fish are still there (or not there)? Or create a geodatabase of reaches or whatever.	The End of Fish points, as well as the top and bottom survey points will all be in a geodatabase. We are monumenting the End of Fish points for each survey as well as the up- and downstream extents of habitat surveys. No changes to document.	Addressed
146	MM	834	Yellow	are you sure these are described on page 22? It would be nice to have a brief description of them.	Reference to DPC WAC is already included earlier in the document. Slight change to text in SD to help resolve issue, as well.	Addressed
147	MM	838	Green	What is EOF/H?	End of Fish/Habitat. Added to acronym list.	Addressed
148	MM	843	Green	what's an NVO?	Non-vertical Obstacle. Added to acronym list.	Addressed
149	MM	845	Red	I'm not following your logic here since the absence of fish prior to DPC does not mean it's a false positive.	We can re-write this sentence to address this and remove the 'false positive' language. John has potential revision language.	Addressed
150	MM	845	Red	Finding a fish above DPC would be inconsistent with the legal intent.	The fact that a fish is occasionally found above a DPC doesn't mean the DPCs aren't useful. This study is not about DPCs. Discussed with MM at previous meeting.	Addressed