Review of draft Oregon Lower Columbia River Recovery Plan for Salmon and Steelhead (version dated January 30, 2009)

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Notes on the review

At the request of the NOAA Fisheries Northwest Regional Office, the NOAA Northwest Fisheries Science Center (NWFSC) and the Recovery Implementation Science Team (RIST) reviewed the draft Oregon Lower Columbia River Recovery Plan for Salmon and Steelhead (version dated January 30, 2009). The review focused on the scientific aspects of the plan and used review guidance provided the Lower Columbia River Joint Salmon Science Team (included as Appendix A). Our review contains an initial Summary Points section that highlights key issues identified by the review team. We have then included comments from individual reviewers by chapter. Although variable in terms of format, these individual comments contain useful information for improving specific sections of the plan and provide important elaboration of the Summary Points as well as additional issues. Finally, we are sending a track changes version of Chapters 5 and 7 edited by Lyndal Johnson that includes some very useful recommendations on toxics and water quality.

Table of Contents

Summary Points

Note: These summary points roughly follow the sequence of the recovery plan, but only roughly…

Overall impression: The recovery plan is generally well written, concise, transparent and pragmatic. It is a tremendous step forward in creating a coherent recovery strategy that can be used to guide all the entities involved in salmon recovery. Despite the fact that the remainder of out summary points dwell on the areas of the plan we felt could be improved, there was an overall sense that the plan was well put together and well researched. It provides a strong foundation for recovery.

Sufficiency of actions: We appreciate the difficulty in quantitatively estimating the outcomes of all the proposed recovery actions. Still, it would be useful to understand whether the planners think the actions proposed are all needed for recovery. Are the suite of actions intended to be a lower starting place and more can be added as need or is the list of actions believed to be overkill with an assumption that recovery can be achieved with a subset? Is there any precautionary or minimalist philosophy?

Estuary: Perhaps it is because estuary actions are covered in the Estuary Module, but there was an overall impression that the importance of estuary actions should have received greater emphasis in considerations of chum and fall Chinook recovery, especially for populations in the coastal strata.

Climate change & population growth: Addressing these topics, even in a relatively qualitative way, improved the plan. The addition of a 20% "buffer" in the gaps to account for climate change and population growth, seemed an OK approximation. However, because actions are not quantitatively tied to the plan, it is not clear that effort on the actions would increase by 20%. LFA and actions addressing climate change could have shown more geographic specificity. For example, Hood River and Youngs Bay will probably respond very differently to climate change.

Toxics: The plan does a reasonable job of identifying toxics as a potential threat, though there was not a lot of supporting information. Toxics were only included as part of the water quality section, but toxics in the sediments and food web should also be addressed as these are likely a bigger threat than the water column for some compounds. It is not clear that the actions addressing toxins, which rely on existing regulations, are adequate. There is a view that current regulations are insufficient for addressing the synergistic effects of multiple toxins and stressors.

Consistency with TRT current status assessments: The plan is generally consistent with TRT products, or at least the intent of the TRT. The current status is taken from McElhany et al. (2007), which was derived from the TRT viability criteria. The changes to current status in the gaps analysis reflect data changes and modified methods that are compatible with TRT approaches.

Top ten list: The list of recovery actions is rather extensive and not completely prioritized. It would be interesting to see the "Top ten list" of immediate recovery actions to get a sense of the initial focus of recovery efforts. Salmon recovery is not a simple problem and the solutions are not simple; it will probably help to break recovery actions into simpler steps.

Recovery time horizon: The delist target was set for 2030 and broad sense for 2050. How were these time horizons set? Intermediate target dates would be helpful for evaluating interim progress. Were actions evaluated against the 2030 and 2050 time horizons?

Errors in delisting criteria: In chapter 1, page 27, the plan suggests that delisting may occur before delisting criteria in the plan are met. It should be recognized that delisting may not occur even after the criteria in the plan have been met. The plan criteria may err in either direction and future status assessment will use the best information available.

Current status evaluation: The results in chapter 3 are based on McElhany et al. (2007). We did not review McElhany et al. (2007) and can not comment on the methods used in chapter 3. Some brief summary of the evaluation methods would be helpful. None of the reviewers noted any disagreements with the status conclusions.

Gorge recovery goals: The plan deviates from the TRT gorge strata recovery goals. The TRT population identification and viability criteria represented a working hypothesis based on the information available at the time. Like all science, these hypotheses and methods are subject to change as new data or analyses methods become available. The plan makes a reasonable case for reassessing historical population structure and, therefore, viability goals for the gorge. However, it would be useful to see more of the basis for reassessment. The new Intrinsic Potential (IP) modeling method probably provides a better assessment of watershed suitability than was available for the TRT evaluations, and it would be helpful to see an evaluation of the current IP models and their results.

Intrinsic potential: IP analysis is used for estimating the capacity of gaps and in the RME section. The methods need to be described and documented. The NWFSC analysis cited is not publicly available. The IP analysis estimates are very uncertain, and sensitivity analysis of the B parameter in CATAS should be conducted to evaluate the consequences of errors in the IP estimation.

CATAS model abundance gaps: The CATAS model determines gaps with a density-independent “gap coefficient”. How are results likely to be affected by density dependence? The gap is expressed as a single abundance number. There is an implicit productivity associated with that abundance level which produces a given extinction risk. What is that productivity? This value is potentially important because there are likely some productivities that can produce the same abundance but have very high extinction risks. Such uncertainty is one of the reasons that the abundance gaps should be treated as very crude approximations and should not be used for any application requiring high precision.

CATAS model validation: The gaps, of course, can not be entirely validated. However, comparison should be made between the CATAS model current abundance estimates and empirical spawner counts.

CATAS climate variables: What is the basis of 7 years in the CLRSI running sum? Different populations of the same species are probably responding to the same climate patterns so using different climate indices for the different populations seems to be somehow over-fitting, leading to an overly optimist view of model performance (i.e. all populations should use the same index). Allowing the lag to vary among populations in fitting the index also seems to be ignoring mechanistic constraints in order to give an inflated confidence in the model.

CATAS model assumptions: Several CATAS model assumptions need additional justifications including: 1) bootstrap parameter estimation, 2) depensation method, 3) model fitting (show results and AIC), 4) sensitivity of gaps to errors in input, 5) stationarity of future climate patterns, and 6) bias caused by use of average age structure.

CATAS parameter estimation with no fish counts: The reviewers were mixed on this. On the one hand, applying population averages may be extrapolating beyond what is reasonable and a more qualitative definition of gaps may be more appropriate for these populations. On the other hand, as a back of the envelop sort of calculation, it may get you in the correct order of magnitude for relative recovery needs among populations. If the method is used, the extreme tentativeness of these estimates needs to be emphasized in all applications. Also, see comments on Intrinsic Potential.

Habitat limiting factors: The plan recognizes the importance of side channel habitat, but it would benefit substantially from a more quantitative assessment of the loss in these habitats associated with individual populations.

Out-of-ESU-hatchery fish: The plan needs a more explicit approach for dealing with out-of-ESU-hatchery fish. Out-of-ESU-hatchery fish are a very big deal and discussion of the issues surrounding them seemed to be almost entirely lacking. The Rogue River Chinook in Youngs Bay, the Warm Springs Chinook in Hood River, and the "Up River Brights" in the mainstem should be identified as special problems with specific actions.

Hatchery factor thresholds: The 10% and 30% thresholds for key and secondary factors are obviously somewhat arbitrary. The thresholds should take into consideration the duration of hatchery propagation and the origin of the stock (e.g. within population or ESU). Theory suggests that substantial genetic damage is possible at levels below 10% hatchery spawners.

Hatchery fish reduction and wild fish sanctuaries: In most cases, the most effective way to reduce the negative effects of hatchery fish is simply to reduce the production of hatchery fish. This action is seldom recommended in this plan. Instead, there is reliance on the creation of "wild fish sanctuaries" with out demonstration that such sanctuaries are in fact feasible. The plan needs to lay out the options for reduction of hatchery fish should creation of wild fish sanctuaries using weirs or other management options not prove possible, as we believe may be the case in many populations. We are skeptical that recovery can be achieved for Chinook and coho without some reduction in hatchery production.

"Split-basin" hatchery management: Many of the LCR populations are currently operating or proposed to operate with a sorting facility in the middle of a watershed for excluding hatchery fish from the upper part of a basin while allowing hatchery fish to spawn in the lower part of the basin. This action does not create an isolated wild fish sanctuary because the hatchery fish spawning below the sorting facility are exchanging migrants with the sub-population above the facility. This "pseudo-isolation" problem is discussed in the soon-to-be released RIST hatchery report.

Tule harvest rates: The plan includes harvest rates on tule Chinook between 35% and 70%, which is similar to the status quo. From a simple red-face test perspective, these seem very high for an ESA-listed species. We do not see a compelling biological argument supporting such high harvest levels. Many of the Oregon LCR populations are considered “extirpated or nearly so”, suggesting that they could sustain little if any additional mortality. These high harvest rates do not seem consistent with a weak stock management approach.

Key and secondary limiting factors: The approach for identifying limiting factors was clearly presented, and, like the rest of the document, very pragmatic. In particular, we support the plan’s willingness to identify what the authors believe are the truly important limiting factors, rather than simply list every possible known impediment to recovery. However, because the limiting factors were largely determined through expert opinion, it is not always clear why certain factors were considered “key limiting factors” and others “secondary limiting factors”. Presumably, this delineation was the result of the iterative process described in section 5-1, but there is no factor-by-factor rationale provided. That being said, the limiting factors (key and secondary considered together) generally seem plausible, though there are few disputed by the reviewers (described in other summary points).

Harvest factor threshold: What is the rational for the10% and 35% harvest rate breakpoints between key and secondary factors? These numbers are important in the plan and require some explanation.

Hatchery fish ecological interactions: Given the very large releases of hatchery fish, it seems surprising that predation and competition by hatchery fish would be a secondary rather than a primary concern. Studies have shown these ecological impacts of hatchery fish can be quite significant, especially for fall Chinook and chum.

Phenotypic selection by harvest: In general, the plan gives short shrift to potential selective actions of harvest on size, age, timing, or other attributes. This potential for selection should be considered in the limiting factors and actions sections.

Basic Model: The model is admirable in its simplicity and transparency. However, these traits come by ignoring issues of density dependence. How changes in life stage improvements affect risk reduction can shift substantially if density dependence is considered. How would consideration of density dependence affect the basic model output?

SLAM: In general, the report does not have nearly enough information about SLAM to understand how the analysis was conducted. Simply pointing to the SLAM documentation (which was never actually done) is not sufficient. The discussion of implementation timing was interesting and seems useful. However, the discussion did not touch on what seems the most significant difference between the Basic and SLAM modeling - density dependence. Did the inclusion of density dependence change the perspective on the relative importance of different classes of recovery actions? Also, did SLAM provide any information on data gaps and monitoring priorities?

SLAM parameterization: The SLAM appendices are not easy to read. The information in them should be summarized in a few tables that parse out the common transition values used for all analyses and the transition parameters that changed by population or scenario. There is interesting information about the parameterization, but it is completely buried.

Wood placement: There identification of actions. For example, the strategy was to "protect natural ecological processes…" (Ch. 7, p. 28). The action for streams where habitat complexity was lacking was wood placement. Wood placement is not protecting an ecological process. Protecting ecological processes requires approaches much different than simple wood placement.

Hatchery and harvest linkage: Hatchery and harvest actions are treated separately in the plan, though they are clearly linked from a management perspective since the hatcheries exist to support harvest. This linkage should be given explicit consideration in the plan.

Habitat actions for all populations: A lot of these actions sound like management side-boards (e.g. Action 62) or planning philosophy (e.g. Action 46) rather than actual actions. Many of these actions seem intended to make the plan non-scary to private land owners. While this may be a desired purpose of the plan, it seems a little weird to include some of these statements as actions. If the actions are going to emphasize the voluntary nature of habitat recovery, the risks and benefits of that strategy should be explicitly discussed in the plan. This is a policy, rather than strictly scientific issue, and the two seem a bit muddled in this habitat action list.

Additional actions: The plan could include actions to address 1) marine mammals and 2) catastrophic spills of toxins.

Habitat actions (site specific): Terms like "stream restoration" or "riparian enhancement" are used throughout the population action sections. It would be help for a brief description up front of what sort of actions are considered in these categories.

Youngs Bay: Chinook and coho in Youngs Bay continue to be managed as a hatchery and harvest operations. This decision raises the question of why devote any habitat effort to Youngs Bay given the limited resources for recovery, especially because the Chinook stock is from outside the ESU. We are not advocating abandonment of habitat efforts in Youngs Bay, but the signals in the recovery plan seem mixed and not very explicit or consistent.

Extinct vs. extirpated: Many of the populations in the LCR (especially chum) have very low abundance and is it not clear if any fish are returning to spawn. It makes sense to consistently refer to such populations as "extirpated or nearly so", rather than "extinct" or "functionally extinct". Extinction implies a global, permanent loss, whereas extirpation implies a local event from which reintroduction or recolonization is possible. This seemingly trivial semantic issue can have important policy implications.

Chum reintroduction: It is great to see a plan to get chum back in Oregon. However, 1) the plan should cover entire LCR, not just the coast stratum – this omission is a major opportunity missed, 2) the actions should have a much greater emphasis on habitat (especially estuary) and not be just about hatchery stocks, 3) the Intrinsic Potential maps need to be clarified and refined, and 4) the plan needs to provide a sunset provision for the hatchery operation – this important provision was a key recommendation of the HSRG, which we support, that was totally ignored in the plan.

Clackamas fall Chinook: Buried way back on page 37 of the RME document, it is suggested that the Clackamas historically contained only late fall Chinook and not tules. What is the evidence for this?

RME plan: The RME chapter is a strong contribution to the plan and its implementation should be a high priority. Although there are parts of the RME plan that need to be fleshed out (see individual comments section), the RME chapter provides a good framework.

Individual Reviewer Comments

Note: Comments from a particular individual on a specific chapter are given an arbitrary letter designation.

Overview

[A Comments]

In general I think it does a great job on status, gaps, and limiting factors. It also does a good job of describing the types of actions that will be taken to address factors. There doesn't seem to be much there to convince the reader that the actions will be sufficient, however.

Overall I'm very impressed with this document. It seems to do exactly what a recovery plan is supposed to do, and it is written and formatted in a way that seems like it will be very helpful for both recovery implementation as well as information ESA regulations (section 7). In particular, I found the introduction, background, and current status chapters to be clearly written and very informative. This document will clearly serve as a valuable reference for policy makers, managers and scientists interested in Lower Columbia River salmon issues. On that note, it is unfortunately that salmon recovery planning in the LCR had to be broken down along state lines. The Washington side recovery plan is also highly informative, but it would have been nice to have a complete summary of the entire LCR status and background information in one commonly formatted document.

In addition to being a nicely presented and readable plan, I was impressed by the scientific pragmatism of the plan. Salmon recovery is a complex topic, and one of the primary challenges recovery planners face is how to synthesize a large amount of disparate information into a coherent whole. This plan managed to make it look fairly straightforward by taking a pragmatic approach that appeared to involve two good principles: simplicity and transparency. An example of this approach is how the plan dealt with missing abundance and productivity data for many populations. Rather than simply ignore these populations, the plan estimated values by averaging over population for which data were available, taking into account an empirically derived relationship between presence of hatchery fish and natural population productivity. Whether or not one agrees with the specifics of this approach, it is simply and pragmatic and it allowed the planner to move forward with their task. This appears to have been the general philosophy throughout the plan, and I think it is a good one.

There are some section of the plan that appear to be preliminary and incomplete, including the Monitoring and Evaluation and Implementation sections.

[B Comments]

Summary: The draft Oregon plan defines target status levels corresponding to delisting and broad sense recovery, respectively and sets a pretty ambitious objective – achieving the levels corresponding to delisting by 2030, and the higher levels of abundance/productivity associated with broad sense recovery by 2050. Meeting those objectives will require aggressive implementation of strategies to address limiting factors across the Hs. The current draft plan appears to be designed to provide general guidance during the planning process – the potential for successfully meeting the objectives of the plan, including the milestones for achieving delisting and broad-sense recovery, would be substantially enhanced by including interim milestones for key implementation actions – including many of the specific evaluation actions identified in Chap. 8 . The Implementation chapter (chap. 9) provides a general framework for addressing this need.

<u>Strategies and Actions</u>

Plan focuses on actions that will address a key or secondary limiting factor (Chap. 5)
Uses watershed assessments where available. For other watersheds, planning team identified actions, calls for watershed assessments to update strategies.

Principles (Chap. 7)

- Build on past/current efforts (example, continue efforts to modify hatchery programs)
- Express strategies as hypotheses, test key assumptions as part of implementation
- Use RME to provide 'timely information on both overall progress ...toward achieving recovery goals and the contribution of individual actions.'
- 'Priority should be given to actions that directly address key threats and limiting factors if funds do not exist to implement all actions simultaneously....Actions that address those threat categories that require the most improvement should have a higher priority..'
- Actions...represent a combination of..relatively immediate impact on reducing significant threats..(e.g., harvest and hatchery actions) as well as actions that will take a longer time before benefits are realized (e.g., some habitat actions).'
- Climate change/human population growth: 'It is important that actions be implemented now that prevent or mitigate for ..future impacts.'

Example: Coastal MPG. Four of the 7 populations (each) of chinook and coho assigned to this strata are associated with Oregon tributaries. The Draft Oregon Plan highlights the chinook and coho populations in the Claskanine and the Scappose Rivers for restoration to low or very low risk.

Harvest:

- Continue to implement coho and chinook restrictions in PFMC, PST. Evaluate and promote mark selective fisheries in the ocean and inriver.
- Develop/evaluate return forecast models, sliding scale exploitation rate approaches (ocean and in-river fisheries).

Hatcheries

Continue actions to reduce impacts of hatchery releases on natural production areas (several actions)

Monitor hatchery strays – if strays compose more than 10% of the spawning escapement:

1. Identify sources of strays

2. Investigate adding trap to remove hatchery fish in lower river (Clatskinine)

Degraded Physical Habitat quality

Conduct watershed assessment, tidal area assessment (connectivity and hydrologic function) to improve understanding of reach specific recovery action needs.

Priority tidal areas – protect intact habitats, restore degraded riparian areas. Restore high potential off-channel areas, breach or lower dikes and levees to improve access, vegetate dikes.

Lower mainstem of tribs: restore/protect riparian functions, improve off channel connectivity, instream complexity, establish working group to identify, work with landowners to implement.

Major freshwater habitat threats:

Coho: not specifically defined, objectives are expressed as estimated no. of miles of high quality habitat (implication is for juvenile summer/overwintering) required based on application of management guidelines developed for Oregon coastal coho.

Chinook: major threats are generally identified as poor water quality, substrate condition in mainstem reaches.

Modeled improvements:
Expressed as reduction in total human induced mortalities required to achieve delisting level (Claskinine River example – mortality estimates from Chap. 6, tables 13 and 43, survival improvements = [1-Mreduced]/[1-Mcurrent]):

	Coho		**Chinook**	
	Mortality Reduced	Survival Imprvmt	Mortality Reduced	Survival Imprvmt
Trib habitat	83% to 68%	1.73	99% to 80%	8.03
Estuary	10% to 8%	1.02	32% to 26%	1.09
Predation	6% to 4%	1.02	6% to 5%	1.02
Harvest	35% to 25%	1.15	60% to 35%	1.63
Hatcheries	13% to 10%	1.03	45% to 5%	1.73

These are potential changes based on general assumptions regarding the level of impact or habitat degradation in each sector. The Basic method used to generate these estimates calculates mortalities associated with human induced changes to tributary habitats by 1) assuming that total human impacts accounts for the proportional reduction – current vs. estimated historical abundance and 2) assuming that tributary habitat degradation accounts for the remainder of that proportional reduction after accounting for estimated impacts in the other sectors. Using this simple model, achieving the recovery objectives stated in the draft for these populations obviously depends heavily on the assumptions that major gains in trib habitat survival over current conditions can be realized through the restoration of access to habitats that are in good condition or through restoration of conditions across key habitats. (note: the approach likely underestimates the impact of losses in rearing capacity in the estuary/lower reaches of tributaries for chinook populations – those impacts are shifted into tributary habitat degradation in the Oregon Basic model approach). Although the estimates of the potential contributions of restoration in the tributary habitat and estuarine areas will be substantially improved by using info from more detailed population specific assessments, it is likely that restoration in these areas will remain high priorities for each population.
The draft does take the trib habitat increment a step further for coho than for chinook. Under an assumption that habitat benefits for trib restoration for coho can be calculated in terms of a shift in the number of miles currently at low smolt productivity to high and moderate and that the relative condition (low , mod, high) can be expressed as expected smolts produced per mile (based on Oregon coastal info), the draft identifies the number of miles that would need to shift to high and the number that would need to shift to medium to achieve the target improvement levels in smolt production. The number of miles of high intrinsic potential habitat is provided as reference.

The basic model used by the Oregon planners to generally identify the relative levels of human induced mortality associated with each H indicates that restoration of self sustaining natural production in Lower Columbia populations will require substantial improvements in estuarine and tributary habitats. With a couple of exceptions (basins where analyses have been conducted based on reach level tributary habitat assessments) the general problem of degraded tributary and lower river/estuary habitats have been acknowledged and the action plans call for detailed watershed assessments/subtidal assessments. The implementation chapter provides an opportunity to highlight the importance of identifying key reaches, the associated habitat degradation and the processes/sources of those problems early on in the implementation process.

The plans recognize that an important step in implementing the action strategies to address key habitat conditions would be to conduct watershed assessments/tidal area assessments to identify reach specific opportunities, and to involve key stakeholders in implementing the actions in areas with high potential.

While the draft does recognize the importance of these steps for many of the populations, it does not directly incorporate target dates or expectations into the proposed implementation schedule or RME check in descriptions.

The potential for achieving the plan objectives by the called for target dates could be enhanced by:

1) Reviewing and summarizing available information on the relative level of habitat impairment associated with the tributary and adjacent estuarine habitats for each population (example: gis based mapping of subtidal habitat loss in the lower sections and adjacent estuarine embayment) and,

2) Setting milestones (prior to the first five year checkin) for completing the watershed assessments and sub-tidal habitat analyses called for in the population level action summaries in Chap.7. (see the Puget Sound draft MAMA plan for examples).

GIS mapping of estuarine habitat losses (diked areas, filled areas) in the Lower Columbia is available. The GIS data set could be used to characterize the relative amounts of subtidal habitat that is currently functional vs. the amount that has been cut off or filled in the lower reaches and the immediately adjacent estuarine areas associated with lower Columbia Chinook populations (note: this exercise could also benefit recovery implementation for Washington side tributaries). A number of studies (e.g., Healey, 1980; Reimers, 1973) have determined that a substantial portion of the juvenile ocean type chinook produced in rivers that enter an estuary migrate to the estuary in the spring to rear and grow for 2-3 months prior to entering the ocean.

Simultaneously carrying out watershed/tidal area assessments to an appropriate level of detail across all populations in a short period of time may be beyond available staff/funding resources. One approach might be to focus initially on the basins supporting populations identified for restoration to primary status - setting specific target dates so that the information will be available prior to the first scheduled five year check-in.

Healey, M.C. 1980. Utilization of the Nanaimo River estuary by juvenile chinook salmon, Oncorhynchus tshawytscha. Fish, Bull. 77: 653-668.

Reimers, P.E. 1973. The length of residence of juvenile fall chinook salmon in the Sixes River, Oregon. Res. Rep. Fish Comm. Oregon. 4:1-42.

[C Comments]

HABITAT QUESTIONS

1. Did the analysis use models or other appropriate method to understand potential fish responses to habitat improvement strategies? What is the nature of the analytical support linking population status to changes in habitat forming processes and local conditions?

I did not read chapter 6, and assume a lot of it was in there (SLAM, e.g.). Didn't see too much explicit mention of it in chapters 5 & 7, though I may have missed it.

2. How well supported are hypotheses/assumptions for 1) VSP related factors most limiting recovery and 2) habitat forming processes and conditions that are limiting population response?

Some of the key and secondary priorities seemed arbitrary to me, and I assumed they were arrived at through the iterative process described up front (panel, stakeholders, etc.).

3. Does the plan describe a habitat recovery strategy? If so, is the recovery strategy consistent with recovery hypotheses linking population status, key limiting habitat factors and threats?

Yes, but I do think some of the actions are quite vague; I suggest separating and identifying actions that are "research priorities" from those that can be started now to "stop the bleeding".

4. Are the proposed actions in the plan consistent with target changes in habitat conditions? Are there empirical examples demonstrating the proposed actions are effective?

Yes, seem consistent. Didn't see empirical examples – maybe I missed?

5. Is the habitat recovery strategy consistent with recovery strategies in other Hs (habitat, harvest, hatcheries and hydropower)?

Seems to be consistent – many more actions in habitat (which I'd expect).

6. Does the habitat recovery strategy preclude other actions in any arena that may be desirable in the future?

Don't think so.

[D Comment]

These two chapters [3 & 4] are very concise and clearly written.

[E Comments]

The Oregon LCR is better than the other 3 plans we've reviewed in dealing with 3 of the 4 classes of uncertainties the RIST has identified (mainstem/estuary, climate change, human population growth) but is weaker on taking an ecosystem-based approach to recovery.

[F Comment]

I think they did a pretty good job of including toxics as a potential threat to listed stocks, although the didn't have a lot of supporting information.

I am reviewing this document primarily to comment on the sections about toxic contaminants as a risk factor for salmon recovery, so my comments will focus on that issue.

Overall, I think document does a good job of identifying chemical contaminants as a potential limiting factor for salmon species in the Lower Columbia, but the supporting data are somewhat limited. The same is true for strategies that are identified to reduce the effects of this stressor. I've edited this part of the document to include more detail on the types of contaminants present in the estuary as a whole, and their potential effects on listed salmon, as well as specific information on populations of concern, when this was available.

One point to note is that toxic contaminants are included only as part of the water quality section, which is understandable, but it should be clear that contaminants in the water column are not the only problem; contaminants in sediments and in the food web are also problematic for endangered salmon. In fact, for many contaminants, the diet is probably a much more important route of exposure than water.

Also, in addition to direct effects on the salmon themselves, contaminants can have effects on the feed web and the salmon prey base. This is especially true for some of the pesticides that are designed to target insects. This should be mentioned in the document. It might also appropriate to include about effects of toxics on salmon prey in the section about impaired food webs, since in some cases toxics reduction may be needed to restore foodwebs to their natural condition.

[G Comments]

My overall impression is that this is a very good "preliminary" product. Much of the material in the background/current status chapters is an adaptation of the work done by the UWLCR TRT. While there are some revisions of the TRT's approach, primarily in the viability modeling, there does not seem to be any substantial reworking of the TRT's findings. The limiting factors/threats, recovery actions/implementation, and monitoring chapters are rather general. While population specific limiting factors/threats are presented, the recovery action section lists a general suite of 97 actions for all of the populations. Many of the recovery actions are not direct actions, but an array of comments about continuing actions, planning for actions, acquiring funds for existing programs, discussing possible actions, etc. While there is nothing wrong with including these actions it might be useful to separate “true” actions from organizational actions or “actions in development”. There is an overall plan for recovering each of the ESUs/DPS and their component MPGs. Furthermore, there is a general plan for recovering each of the populations to its target risk level as part of the overall recovery program. Population plans provided basic guidance on how and to what degree the various limiting factors would be addressed. Chapter 7 gives the “short list” of prioritized actions to bring each population up to its desired risk status. Understandably, the majority of these actions target habitat. Since there is little population specific information available for the majority of the populations covered in this recovery plan it is understandable that a generalized recovery approach was undertaken. The RME section is extensive, this is especially important given the limited information available for most populations. Much of the recovery approach is based on adaptive management – simply because the information necessary to develop detailed recovery plans is too limited or not available. While my overall impression of the recovery plan was good there are a few areas where it fell short.

The recovery plan presents logical framework for linking threats to limiting factors to status to recovery action. In most cases this linkage is in the form of a simple relationship and less commonly a simple model. There is less emphasis on complex models (i.e. EDT) to quantify the effect of the current status or the potential benefits of recovery actions. This is due, in part, to the lack of information necessary to develop complex models. In lieu of predictive models the recovery planners utilized an expert panel to predict the degree to which improvements in each of the Hs could be made. Given our limited understanding of many of the ecological processes and their potential response to recovery actions the use of an expert system may be more useful (and at least as accurate) in assessing the benefits of certain actions. Given the monitoring programs suggested in the plan and a fairly comprehensive gap analysis, it is likely that more complicated plans will developed in the first few years following the initiation of the recovery plan.

The authors have provided a fairly exhaustive list of limiting factors and threats and although they defer prioritizing specific threats to be addressed for a subsequent draft of the recovery plan. In the implementation section of the recovery plan they present a general allocation of recovery effort based on reduction in mortality due to each of the Hs. The recovery plan sets out an initial plan of action with monitoring and adaptive management comes into play later. I would agree with the authors assessment that it is important to get the recovery plan underway as soon as possible – “stop the bleeding”. Many populations are at critically low abundance levels and many recovery actions require years to produce a detectable effect. This is especially true for a most actions addressing habitat threats where, for example, improvements in riparian habitat (i.e. reforestation) take years if not decades to complete. For other recovery elements there is little precedent for defining a successful range of actions (i.e. water releases from hydropower projects) and a period of experimentation and monitoring well certainly be necessary to meet the recovery objectives.

This recovery plan is certainly provides a reasonable framework for recovery. At this point the work is short on specifics, in part due to the paucity of data for many of the populations. Where there are informational gaps, the recovery plan puts forward a monitoring plan to rectify these deficiencies in knowledge. There is a considerable amount of integration/coordination in recovery actions among populations. All of the populations covered in this recovery plan utilize the mainstem Columbia River as an emigration corridor, nursery area, and adult migration corridor to some extent. Harvests are almost always on mixed populations or mixed species. This situation mandates a multi-population approach and the recovery plan reflects this. Many of the mainstem River harvest, hydro, and habitat recovery actions are common to populations within a MPG and within the ESU/DPS. While there is considerable discussion of coordinated actions across MPGs and ESUs/DPS on the Oregon side of the river, there is mostly an implied coordination with the Washington side LCRB or other co-managing bodies. Many of the recovery actions will require multi-state and multi-agency coordination and agreement (i.e. mainstem fisheries or mainstem hydro operations). This coordination is beyond the scope of the present recovery plan, although the plan does lay out what is thought to be necessary for recovery.

The recovery plan goes into considerable depth discussing the potential effects of hatchery fish on naturally-produced populations in Chapter 5. The relationship between the proportion of naturally-spawning hatchery fish and DIP viability is outlined in Chapter 6; this is an adaptation of the simple hatchery contribution categories developed by the Lower Columbia TRT (although there is no scaling to adjust for the degree of genetic similarity between a DIP it is hatchery counterpart). Given the complexities of hatchery x natural interactions it is probably best to focus on a general model, especially if one considers that population specific hatchery stray data is fairly limited. The RME chapter outlines future efforts to quantify the extent of the straying problem and the effects that these fish have on population viability. In the interim, the model it is probably sufficient to develop recovery scenarios using the model presented in the recovery plan, albeit with a healthy degree of uncertainty.

Integration:
The recovery plan lays out a coordinated plan of population specific and regional (MPG/ESU/DPS) actions. The generalized scenario for each population specifies the improvements in survival (reductions in mortality) necessary to achieve the target risk level necessary for overall MPG viability. I believe that the recovery plan makes a good case that the recovery actions presented may lead to recovery. That conclusion is dependent on the recovery actions specified being cared out in a timely manner. The authors note that many of the recovery actions are voluntary, a situation that increases the level of uncertainty in evaluating the recovery plan.

There is relatively little forecasting of the rate of recovery, although there is a general time horizon given for recovery. I don’t think that it is very realistic to attempt to predict the magnitude and rate of change. So many of the recovery actions operate on very different time scales. Some actions can be very rapid: removing barriers, replacing culverts, providing more instream flow, while others can take years or decades.

Modifications in hatchery programs require two to four years to affect all of the year classes. While harvest can be modified relatively quickly, selective harvest requires coordination with hatchery releases and there may be a several year lag before such actions become possible. With recovery actions moving forward at different rates it is difficult to predict the outcome of specific actions. This is especially true because the benefits of some actions cannot be fully expressed until other actions (that effect earlier life-history stages) have been completed. The authors have accounted for the protracted nature of the recovery efforts and the lack of stationarity for a number of habitat factors by including an additional 20% degradation in habitat effect. There are also some provisions for year-to-year variability in the harvest element. The recovery plan suggests that a matrix model be used for harvest rates. This specifically provides some additional protection for weak stock when the overall run size is down.

In regards to future improvements and the pace of recovery, the recovery plan does makes two very important points. Firstly, that the recovery process will take years if not decades and, secondly, that moving ahead quickly with recovery actions is necessary. Given the status of many Chinook, chum, and coho populations, it will take considerable time to reach viability. The fact that we are at the 10-year anniversary of the listings underscores the need for action.

[H Comments]

In general I think they did a nice of job of trying to focus on the limiting factors, link them to actions, and describe basic benefits to the fish. I think the actions leave something to be desired, in some cases, not because they are not important, but it does not seem like there is a real leverage point to get at true legal requirements, so falling under voluntary leaves a lot to be desired.

1. Did the analysis use models or other appropriate method to understand potential fish responses to habitat improvement strategies? What is the nature of the analytical support linking population status to changes in habitat forming processes and local conditions?

The analysis seemed to be thorough and semi-quantitative so the link between potential responses and habitat improvement strategies seem to be there in chapters 6 and 7. I do not know the nature of the analytical support, perhaps it is in chapter 6?

2. How well supported are hypotheses/assumptions for 1) VSP related factors most limiting recovery and 2) habitat forming processes and conditions that are limiting population response?

The link between limiting factors and VSP related metrics seems to be somewhat supported. I think the authors could do a better job on the use of references for broad statements related to historic conditions, impacts, and general statements that seem to be common knowledge.

3. Does the plan describe a habitat recovery strategy? If so, is the recovery strategy consistent with recovery hypotheses linking population status, key limiting habitat factors and threats?

Yes. The recovery strategy seems consistent between the hypotheses and limiting factos.

4. Are the proposed actions in the plan consistent with target changes in habitat conditions? Are there empirical examples demonstrating the proposed actions are effective?

The proposed actions are consistent with potential changes in habitat conditions, however, many of the actions seem to be second tier actions, meaning that they do not directly address the specific limiting factor or need because they are voluntary. While these actions are important, they may not be enough, in my opinion, to see true change. In addition one thing that is truly lacking is no mention of the magnitude of the actions – how much is needed and how often? Some actions may not work unless they are implemented at a large scale.

4. Is the habitat recovery strategy consistent with recovery strategies in other Hs (habitat, harvest, hatcheries and hydropower)?

The actions seem consistent.

5. Does the habitat recovery strategy preclude other actions in any arena that may be desirable in the future?

This does not seem to be the case.

[I Comments]

1) Those arbitrary thresholds for what determines a primary and secondary threat for hatcheries and harvest seem kinda crazy. At a minimum, re-looking at those as a function of current population size/condition. I like that they wanted to be consistent across populations but it's not really necessary. Expert opinion on whether current hatchery/harvest situation is a threat would be better.

2) We need a list of "Top Ten Actions To Do Right Now." There is still a major list of things to do that goes well beyond what is likely to get done. I like that they have said we need to act fast - so it wold be great to push forward a few specific actions.

Chapter 1: Introduction

[J Comments]

paragraph 1 – There a 5 ESUs covered in the plan (not 4) because the plan also includes the Oregon Coast steelhead ESU (which is not listed).

page 4, footnote 5 – It is not the in the prevue of the recovery plan, but splitting jurisdiction for different morphs (i.e. resident or anadromous) of a single population among different agencies (i.e. FWS and NMFS) is biologically bizarre. Just had to say that one more time…

Page 10, management units, Is the estuary a "management unit"?

1.4.2. – Is there an "Appendix A" that contains a list of experts?

1.4.3. – Is there an "Appendix B" that contains a list of the planning team members?

1.4.4. – Is there an "Appendix C" that contains a list of the stakeholder team members?

1.5.9 – Did the ExCom become the steering committee? Where is the steering committee described?

Page 24 – How was the target year of 2030 set? Are actions coordinated with these time frames?

Page 25, Viable populations – should briefly define the 0-4 scale or this doesn't make sense.

Page 26, "NOAA Fisheries Service has noted in delisting criteria for other plans…" – Need to provide citations.

Page 27, "Nothing in these criteria should be understood as precluding a delisting determination…" The criteria can error in both ways, so meeting the criteria does not automatically result in delisting. The status will need to be evaluated with the best methods available when delisting is considered. Hopefully, the methods and information available at that time will be improved over those in this plan.

Page 27, bullets on delisting consideration – this is a good list.

Page 27, " Oregon agrees with statements by NOAA Fisheries Service in de-listing criteria…" – need citation

Page 28, Recommended threat delisting criteria – agree with general approach, positive trend is a useful measure

Page 29 - How was the target year of 2050 set? Are actions coordinated with these time frames?

Chapter 2: Background

[K Comments]

2.2 – Cite TRT?

Page 18, "These fish can be anadromous of freshwater residents (and under some circumstances, apparently yield offspring of the opposites form)…" – The production of andadromous fish from residents fish and vice versa is very well documented, no need for the wishy-washy "apparently". Treating resident and anadromous forms as separate species or populations is biologically incorrect. The jurisdictional split between USFW and NMFS is biologically bizarre.

Page 20, Doesn't the harvest record suggest >million chum harvested, not 500,000?

Page 20, the records of chum in the Umatilla and Walla Walla are very dubious. It is unlikely that chum were above cellilo.

A life history diagram like a Gantt chart showing the different timings of life history stages for the various species would be helpful in this chapter.

Chapter 3: Current Status

[L comments]

3.1 Background

p. 2, 3rd para, ln 4: It should be clear that this risk is over the next 100 years, not any future 100-year time period.

p. 2, 3rd para, ln 8: No comma after "although"; doesn't this probability have a time frame associated with it?

p. 3, 1st para, ln 2: McElhany

p. 3, 1st para, last sentence: should be a semicolon (not a comma) after "exist": i.e., "…does not exist; rather, we felt…."

What about considering a decision–theoretic framework for evaluating viability, such as that used by the Oregon coast TRT?

p. 3, 2nd para: It seems that all 4 criteria are weighted equally in estimating the overall risk score, but that should be explicit.

p. 3, 3rd para, last ln: "…our assessment of population status…."

I think the methods referred to in this section need more detail to clarify how the assessment determines the shape and elevation of the diamonds in the graphs. As it's written currently, here's no way for me to evaluate this from the information given in this chapter. In general, I think the report would benefit from a fuller (but still concise) description of how the status estimates were arrived at. This is my main criticism of this chapter: I can't adequately tell how the status estimates were produced.

3.2 Coho Population Status – High Extinction Risk

p. 5, 1st para, ln 5: "All wild Columbia basin coho populations upstream…."

p. 8, 1st para, ln 1: "McElhany et al. (2007) concluded that…."

p. 8, 1st para, ln 4: "cast much doubt" ?

3.4 Chum Salmon Status – Likely Extirpated (Should be Chum Population Status…)

p. 9, 2nd para, ln 5: "However, this has not been the case." A citation should be added here, I think.

3.5 Steelhead Status – Moderate Extinction Risk (Should be Steelhead Population Status…)

[M Comments]

Page 3, "Our approach was to evaluate…" – Does "our" mean McElhany et al or is it different? Clarify pronoun.

We (NWFSC/RIST) are not doing a review of McElhany et al. at this time.

3.3. - Section should mention origin of Hood River spring Chinook as outside of ESU.

Page 8 – There seems to be part of the sentence missing right below the figure.

3.4 – note that there are some chum in Washington.

[N Comments]

The recovery plan has generally adopted the goals set forth by the LCR TRT. There was, and has always been, some discussion about the ability to recover populations in the Gorge MPG (strata). I sure this aspect of the recovery plan will be discussed in another venue

The primary model for evaluating the extinction risk for a population, the Conservation Assessment Tool for Anadromous Salmonids (CATAS) model, is very similar to that utilized by the TRT. In developing the model for each population the authors have specifically set or limited certain variables in a cautionary manner. Firstly, the risk level was set at the lower 20% threshold for the 1000 iterations. Secondly, productivity values were derived under conditions that included naturally-spawning hatchery origin adults (which presumably would average down the productivity) – if, as recommended the proportion of hatchery spawners decreases productivity should improve. Using initial productivity values would then give one a conservatively low estimate of recruits during recovery (when hopefully hatchery stray levels would be lower). Lastly, for those populations where there is insufficient information to estimate productivity the authors adjusted average productivity (from know values) using the relative contribution of hatchery origin spawners in specific basins. While there is some discussion about how the estimated productivity was derived there is still a considerable amount of uncertainty in these estimates.

Chapter 4: Gaps

[O Comments]

The plan's ways of dealing with uncertainty and the precautionary approach they took are very clearly explained. Policy makers can debate how precautionary they want to be, but there is certainly nothing hidden here.

From Overview comments…
I was impressed by the scientific pragmatism of the plan. Salmon recovery is a complex topic, and one of the primary challenges recovery planners face is how to synthesize a large amount of disparate information into a coherent whole. This plan managed to make it look fairly straightforward by taking a pragmatic approach that appeared to involve two good principles: simplicity and transparency. An example of this approach is how the plan dealt with missing abundance and productivity data for many populations. Rather than simply ignore these populations, the plan estimated values by averaging over population for which data were available, taking into account an empirically derived relationship between presence of hatchery fish and natural population productivity. Whether or not one agrees with the specifics of this approach, it is simply and pragmatic and it allowed the planner to move forward with their task.

[P Comments]

I looked over the IP stuff in Appendix 4C and poked around in the other chapters, too. I found it odd that there was no description of the IP models that they used or how they applied them. It seems to me that such a description is necessary for people to fully evaluate how they developed the data they rely on.

Here are some specific comments for Appx 4C: Overall, I think that the approach for using IP to fill in the B value for populations with no abundance time series is an interesting one. However, I have a few concerns as the methods for doing so were poorly defined:

1) What models were used to develop IP-km? I assume that the Burnett models were used for coho and steelhead. Was the Busch et al model used for Chinook? If so, I need to caution that the Busch et al model was very back-of-the-envelope. It was looked at by

a few species experts, but did not go through a formal review process and has not been tested against field data. The recovery report should acknowledge the preliminary nature of this model, and explicitly outline a plan for incorporating more accurate future habitat models, as they are available.

2) How sensitive are extinction risk estimates from the CATAS to the B parameter? This should be tested, and the implications of the sensitivity on the setting of recovery goals explored. If model results are highly sensitive to B, then a range of B should be used to develop a reasonable range of model results. For example, one could test model output using B values that range from 0.75B, 0.9B, B, 1.1B, 1.25B, or some other reasonable range of values.

3) I assume that data for all species was included in the regression of IP-km against B. Because species use habitat differently, I expect that the relationship between IP-km and B may vary among species. Was this potential phenomenon explored? To avoid this problem, could separate regressions be run at least for steelhead and Chinook (the species with the most populations)? Given the small number of populations of coho, I understand that a species-specific relationship may be impractical. In addition, I think that the species-specific relationships between IP-km and B should be included as a figure.

[Q comments]

4.1 Background

I thought this section was good – to the point and concise.

4.2 Abundance and Productivity Conservation Gap Methods

p. 4, 1st para, ln 2: Over what time series??

p. 4, 2nd para: How do other stock-recruit functions fare, such as the hockey stick or constant recruitment models?

4.2.1 Uncertainty in Model Estimates

I thought this section was a clear presentation of a complex set of approaches to evaluate the uncertainty in the CATAS output.

I particularly liked the empirical approach to identifying the 80th percentile extinction probability as a more conservative metric to account for model parameter uncertainty.

p. 6, 1st para, ln 5: delete second “of”; “Regardless of the cause, inevitably there will be….”

p. 9, 2nd para, ln 1: principle

p. 9, 2nd para, ln 7: I assume "geomean" is shorthand for geometric mean?

4.2.2 Extinct Risks – Present versus 2007 Status Report Methodologies

I thought the superimposing of the status class diamonds onto the status diamond graphs from McElhany et al. (2007) was a clear and transparent way of comparing these different assessments.

p. 10, 2nd para, ln 2-3: "…we did not superimpose our findings on their graph….However, in the case of the Scappoose…."

4.2.3 Diversity and Spatial Structure Conservation Gap Methods

p. 15, 3rd para, ln 3: McElhany

4.3 Abundance and Productivity Conservation Gaps

p. 18, 4th para, ln 6: "For populations that are near extinction or are extinct…."

[R Comments]

Page 2, "However, in developing this concept…" – delete "However"

Page 3 – Gaps does not model changes in capacity – how does this effect estimate

Page 3 – SPAZ can estimate gap curves, this is not a computational constraint

Page 4 – How is uncertainty incorporated in gap analysis?

Page 4, fitting climate variable – Is the climate index really population specific? Is this "cheating" to get a better fit when then mechanism is not likely to population specific?

Table 4.1 – Report confidence intervals on alpha, beta and gamma parameters.

Table 4.1 Is it even meaningful to estimate productivity for a population with 90% hatchery fish???

Page 6, "…each data point corresponds with a slightly different form for the assumed recruitment model." – Is this really the same functional form with different parameters?

Page 6, distributions from CATAS – Get faster computers!

Figures 4.3, 4.4, 4.5. In text, explicitly discuss the reason for difference for each population where McElhany et al. differ from gaps results.

Perhaps gaps should be put into bins to prevent perception of pseudo-precision?

Explain the relation between gaps and goals. This is not explicit until later chapters –this needs to be clear here.

Page 13 – How do future harvest and hatcheries affect gaps (I think this gets answered later in the chapter)

Page 16 – maybe use 1-4 space/diversity gap method on productivity and abundance?

Page 18, first paragraph – good

Table 4.7 - How does current status mean abundance compare to actual fish count data?!?

Table 4.7 Gaps are only expressed in terms of abundance. What about productivity? This gap estimate has an implicit assumption about productivity – this needs to be made explicit! There is some combination of abundance and productivity that is OK, why only single abundance gap. Abundance only is misleading.

Chapter 4 Appendix A

page 2, "under massaging" – is this the right term? The analogy gets a little weird.

Table A1, etc. – define all the columns

Chapter 4 Appendix B

Page 1, equation 1 – Preharvest recruits?

Page 2, CLRSI index – Why 7 years? Any mechanism?

Page 5, best models – Show AIC tables?

Table A1 – show bootstrap intervals

Table A1 – show climate index and lag

Table A2 – Are these averaged over generation time?

Page 7 – In McElhany et al 2007 viability curves, the reproductive failure threshold (single brood year) was the same as the CRT (averaged over generation)

Page 7, equation 2 – show gap scalar in equation 2

Page 7, equation 2 – show harvest (HR) in equation 2

Page 8, “We selected this particular method because it did the best…” – Any statistical evaluation?

Page 8, climate simulation – this is not very clear, would some sort of diagram or example simulation help?

Table A3 – These FIR values were used for all gap analysis estimates. In practice, the future FIR should be tied to the goal for the population. For example if you want a very low risk population, it is insane to leave the harvest rate at 90%. If you do the gap calculation assuming 90% harvest, you naturally need a very high pre-harvest abundance change. This needs to be dealt with. The relation between gap abundance an harvest should be explored with a sensitivity analysis and should be considered in goal setting.

Show sensitivity of gap method to all input parameters; especially need to see sensitivity to future harvest rate.

Page 10, There is an assumption that 1974-2006 is stationary. Is this valid?

Describe how the gap abundance is calculated. How is the gap scalar turned into the number of fish.

Chapter 4 Appendix C

Page 1, paragraph starting “Before delving…” - good

Page 2 correlation between alpha and percent hatchery – look at RIST review of topic

Page 4 Need citation and/or appendix describing IP estimate.\

Table A1 – what is “new” IP?

Table A1 – add Gap column to table

[S Comments]

The plan makes a considerable effort to compare “current” population using the recovery methodology with the status reported by the TRT. There were some minor differences in the extinction risks for a few populations perhaps due to the additional years of abundance and other information available to the authors of the recovery plan. Methodology differences did not appear to dramatically influence the outcome relative to the TRT. In any case it is unlikely that the majority of these differences are significant in any way.

The recovery plan presents a credible method of evaluating the viability of the listed salmon ESUs and the steelhead DPS in the Lower Columbia River.

[T Comments]

Page 4 – For PS Chinook we fousn that the length of the data series was important at to whether environmental covariates helped. How long is the data series here?

Table 4.1 - Spell out climatic index names in legend. How long are time series?

Page 6 paragraph 1 – If the recruitment model plugged into the PVA were precise, and knew the environmental pattern into the future, there would be no extinction risk. We would know exactly when the population would go extinct. Imprecision causes risk.

Page 9 – confusing; is MAT the 12 year geomean of observed spawners or is MAT determined by other means and 12-yr geomena of projected spawners is tested against MAT to determine risk category?

Page 12 " There seems to be no particular reason fro this difference other than the methodology used was dissimilar." – Which means there must be differences in assumptions for methods, but then why for some pops and not others? Was there any new data (yes0. used in the CATAS analysis?

Page 15 – dam mortality (e.g. above Bonneville) can be readily quantified (like fisheries)

Figure 4.6 – bottoms of diamonds seem to be cut off in "very high" region.

Table 4.7 – put definintion of CRT in footnote.

Table 4.7 – Does this mean for example, that Sandy coho would need to increase in abundance from 1622 to 2038 to move into the high risk and 5388 to get into the very low risk? Where does productivity fit into this?

Chapter 4 Appendix A

Page 4 "1-[(1-OceanHR)*(1-ColmHR)*(1-TribHR)]" - Is this applied to NOR spawners to get catch of cohort? 4 year interval? or partitioned out by age?

Table A1 "Overall Fishery Mortality" – Is this for the cohort spawning in spawn year?

Table A1 – Why constant fishing mortality of series years.

Table A1 - I am not clear about overall fish mortality; obviously fish caught in river were returning to spawn that year; is it assumed that they are all 4 year olds or are they apportioned by age to 4 cohorts? Are ocean caught fish also assumed to be returning to river to spawn or some stay out in ocean for a another year? This applies to all populations.

Page 7 last sentence – should be 11 of the 33 years (not 10 of the 32 years)

Page 10 “Age composition of Sandy spring Chinook was determined from scale samples obtained from fishery and carcass recovery sampling” – for some years? why is it constant for all years in table A3?

Table A5 – Again, why constant age structure?

Chapter 4 Appendix B

Table A1 – Add column of climate index

Table A2 and A3 – Column heads of “Population” should be changed to “Coho”, “Chinook” and “Steelhead” as appropriate.

Chapter 4 Appendix C

I liked this section; was wondering if there was any data from these pops (1 or more years) How did they fit with Spawner-Recruit curve?

Table A1 – Need to explain all column labels

[U comments]

Chapter 4 – Population Conservation Gaps

Overall, I think the approach adopted here is reasonable. In particular, using a PVA model to assess population risk for varying levels of productivity and abundance is appropriate, and it is important to characterize the variability in model outcomes, as the analysis does here. I think one of the major challenges will be to translate mitigation actions into changes in the BH parameters, particularly because they can change either or both parameters. In addition, characterizing spatial structure and diversity indices is difficult, and this document does a reasonable job of presenting the risk associated with these indices.

Also, from a more general standpoint, this chapter does not deal with any climate change scenarios, which is a shortcoming of the plan if it is not treated elsewhere.

Do any of the populations have any additional data, such as smolt counts? If so, I have found that additional life stage data allows one to further partition the life cycle into life stages (e.g., ocean versus FW), resulting in much greater ability to identify climate and density-dependent effects. I would strongly encourage you to incorporate all data and build more complex models if the data warrants instead of adopting a “one model fits all” approach. Models of varying degrees of complexity can still produce outputs in a common currency for comparison. Along those lines, I think building models without data is tenuous, as I elaborate below.

I have some specific comments regarding the data, PVA model, and the treatment of climate, which I detail below.

Appendix 4A: Data

I'm not very familiar all the LC data, so I can't really comment of the stock reconstruction methods for the specific populations. However, the method of applying a constant age class proportion to returning adults can produce bias in the estimates of the stock recruitment parameters (Zabel and Levin 2002). Applying a constant age proportion has the effect of overestimating recruitment in bad years and underestimating recruitment in good years, which ultimately makes density dependence appear stronger.

Appendix 4B: CATAS model.

I have several comments regarding the implementation of the model.

First, I think incorporating climate into the recruitment function is good idea. However, I have a few issues with its implementation.

1) Climate indices. I don't understand why the authors convert the climate indices into 7 year moving averages. The authors provide no justification for this, and it is in contrast with most (all?) other studies of salmon and climate that have related survival to indices that vary annually (Logerwell et al., Scheuerell and Williams 2005, Zabel et al. 2006, Lawson et al., Crozier and Zabel 2006). The studies just mentioned had the advantage of examining life stage survival (ocean or freshwater), but nonetheless if salmon populations are responding to signals in particular life stages, using a 7 year moving average will water down any signal that might be out there. Salmon populations have long term patterns related to climate because the climate patterns themselves have long term variability. Thus the extended periods over which populations experience "good" or "bad" years are based on the decadal scale climate patterns and not on some sort of cumulative climate effect over years. To capture the effect that multiple climate indices can affect salmon populations across several life stages, I'd recommend using multiple indices in a single model (see below).

Also, how was the Columbia River flow index calculated? Mean flow of a certain period every year?

2) Climate models. Why not consider models with multiple climate indices? This could improve your fits considerably. You could reduce the number of candidate indices considerably by 1) use yearly indices instead the 7 year moving average; 2) Reduce the number of lags to 3 (year of spawning, 1st year in FW, 1st year in ocean – I realize this could get more complicated with steelhead); 3) Select one FW index (they are strongly correlated) and one of PDO or PNI (PDO has been used more often). This would reduce the set of candidate indices to 6. Then, limit the model dimension to a maximum of 3 climate variables per model. This would result in a total of 41 possible models. Note also that including climate factors additively on a log scale would result in the factors having a multiplicative effect on survival, which is desirable.

3) Model weighting. I recommend using AIC model weighting to select among alternative models in the Monte Carlo simulations. Each model is weighted according to AIC value (see Burnham and Anderson), and the weights sum to one. Then the models are drawn randomly with the frequency corresponding to their weight. This approach acknowledges that several models may fit the data comparably and should receive weight, in contrast to the "best fit" approach that only selects one model.

4) Bootstrapping. The desire to represent the uncertainty in the recruitment relationship is valid. However, the bootstrapping is probably overkill. Why not just sample from the multivariate normal distribution of the parameter estimates? This is what the bootstrapping is attempting to represent. The fitting routine should produce the variance-covariance matrix (R provides this), and a program such as R can produce random variates from a multivariate normal distribution. I have done this if you need any assistance. Also, when you sampled from the population time series, did you also sample the corresponding climate series? If not, this is essential.

The use of the median parameter values derived from the bootstrapping in the deterministic model is odd and not conventional. I don't understand why you don't just use the best-fit parameters for the deterministic model. The median values from the bootstrapping (I'm assuming each parameter median is chosen independently) might not reflect the correlation structure of the parameters and might therefore represent an unlikely combination of parameters.

The sentences at the bottom of the second full paragraph on page four are quite confusing. Does this mean you select from each possible model (characterized by different climate indices) or each iteration of the bootstrap sampling? If it is the former, you would be using poor fitting models, which is not advised (see model weighting above). Either way, please clarify this statement.

4) Model fitting. It would be interesting to see results. Which factors and lags were in the best fitting model, and were there other models that were close in AIC?

5) Depensation. The approach seems rather arbitrary. What's the justification? You might want to conduct a sensitivity analysis to address the issue.

6) Simulated climate data. This approach does not capture the cyclic nature of the underlying climate data, which is an important feature. The 7-year MA produces some cyclic behavior, but not that of the climate data. I recommend one of two approaches: 1) use autocorrelation from climate indices to generate simulated data; 2) use the actual climate data, repeated to produce longer time series. In this latter approach, the starting year can be selected at random.

7) Future scenarios. The "current" time period was dominated by bad climate when compared to the past 100 years. Thus uncertainty exists for what future climate will look like. You might consider alternative future climate scenarios, including where climate gets worse.

8) The treatment of hatchery impacts seems superficial. It would informative to incorporate hatchery fraction directly into the recruitment function. Eric Buhle has done this for interior populations and coastal coho.

Appendix C.

I don't endorse the approach of deriving model parameters for the sake of producing model outputs for data poor populations, particularly when the underlying relationships are relatively poor. I think this has a strong potential for producing spurious results, which are worse than no results. As I mentioned above, I think it would be better to adopt a tiered approach to the modeling, where the model complexity is determined by data availability. In the case where not enough data are available to develop a PVA model, then scientific judgment based on all available information is more appropriate. In these cases, the recovery plan should call for more monitoring.

Chapter 5: Limiting Factors

[V Comments]

Summary:

The Limiting Factors chapter of the draft Oregon Lower Columbia Plan is well organized in a logical, hierarchical structure. Factors that impact multiple populations are described in the aggregate. In general, factors operating at the population level are summarized from population specific assessments. The introductory section sets up an approach for classifying limiting factors, including standardizing the assignment of specific factors as key or secondary based on predetermined impact levels. In some cases, explicit examples are provided to illustrate key vs. secondary assignments. Tributary habitat limiting factor summaries include at least some consideration for the specific conditions or setting for individual populations. With respect to estuary impacts, the plan appears to use the NOAA Estuary module as general support for defining estuarine/nearshore ocean impacts, relies mainly on inferences based on the xxx and Hilborn paper for quantifying impacts.

There are some clear opportunities improving the draft plan including:

The basis for assignment of some types of limiting factors/threats to key vs. secondary categories was not clearly described. In some cases limiting factors were described without clearly identifying whether they were assigned to one of the categories. In other instances assignments were clear but the basis for determining the appropriate category was not provided.

In the general intro narratives to this chapter, the draft clearly recognizes the importance of side channel habitats in the lower river reaches and adjacent estuarine areas to fall chinook and chum populations. Restoring sufficient capacity and functionality to these habitats should be a major focus of recovery efforts aimed at these species. The tributary limiting factors section (either directly or through a references to info added to the chap 7 strategy sections) would benefit substantially <u>if a more quantitative assessment of the loss in these habitats</u> <u>associated with individual populations </u>was provided (there are some estimates for the entire Col. River estuary, but not for the estuarine habitats associated directly with individual populations). For starters, a simple summary of the relative amount and proportion of these habitats that have been cut off or filled in based on existing information could be provided (see the Skagit work summarized by Green and Beechie (ref) as an example of an approach). I looked quickly through other sections of the plan (chapters 1,4 6 and 7), I didn't see that this was done as part of describing status or developing population specific scenarios.

Benefit from a general discussion up front regarding how different species relate to different habitats within a typical tributary (Beechie et al. as an example), implications for limiting factors impacts.

Same comment as above for tributary habitat sections – would be useful to have some simple summaries of how much stream/riparian habitat across the reaches that historically supported each species is currently degraded by major category (riparian, sediment, flow). If it can't be done for this plan, it would be good to identify mapping it out and using the results to verify or update the focus/amount of change targeted by trib habitat strategies for individual populations. As an example, the Oregon Mid Columbia plans include summary tables in the Limiting factors section that identify the what they term primary (and secondary) impacts by limiting factors categories by major subwatershed or reach within populations. More quantitative estimates of the amount of change targeted by subwatershed or reach and factor can be derived from the info presented in the action/scenario sections of those plans).

Hatchery section: Would benefit from a discussion of the relative impacts of strays from a harvest augmentation program derived from out of ESU stock vs. programs that employ stocks derived from the local ESU.

Harvest section – a lot of descriptive info and a focus in trends in annual fishery induced mortality rates. Some of the detail could be moved to an intro or status section, would be informative to include a brief description of how management has evolved for each species – the main changes in fisheries management (or, in some cases fish abundance) that have driven the patterns in mortality rates - e.g., time/area restrictions on terminal net fisheries, impact limit tule exploitation rates in ocean Chinook fisheries imposed in the late 1990s, etc.

Comments (in page order)

Page 5.1 Good description in the third para of the range in relative uncertainty that is likely to be encountered across limiting factors. Should be carried through consistently in descriptions further on in section.

Limiting factors categories (page 5-5). Categories listed in table 6-1 are different from the general list developed by NOAA Fisheries in coordination with TRT chairs and used in the PCSRF (as well as in the draft Oregon Mid-Columbia Plan. Seems like it could be converted (as was apparently done for the Oregon Mid-C). Not sure that it substantially impacts the ability to pull together a well functioning consolidated Lower Columbia Plan, but it would reduce confusion among readers outside of the planning forum.

Page 5-7: The first para on this page is a concise statement of the intention for the plan to present limiting factors in a framework that provides some strategic guidance, not just a list of generic limiting factors. Recognizes two categories key and secondary. Useful concept, but the draft could use more discussion about how factors are assigned to the categories for different components (especially in land management element which covers tributary and adjacent estuarine habitats).

Harvest – page 5-14: 35% or higher = key concern, 10-35% secondary concern (basis for these choices not clear from text). Also, should acknowledge if this definition of levels related to 'concern' was specifically designed for rebuilding or restoration phase or if it was intended to apply more broadly(given broadsense objectives for both strong natural production and harvest).

Hatcheries: page 5-23 - key concern if hatchery proportion over 30 years has averaged 30% or higher, secondary if between 10-30. Current weirs are assigned secondary concern status. Basis for the decisions not clear from text.

Hydro related impacts: pages 5-27 to 5-30. A number of factors are assigned as either key or secondary concerns or are described without assignment to a concern category. The list includes direct impacts of hydro as well as indirect, some that may be covered within individual population evaluations (e.g. impact of hydro dams within the Clackamas, Sandy and Hood watersheds).

Land and Water Management: page 5-30+ Series of summary paragraphs for a range of habitat related factors, some for mainstem impacts that affect multiple populations, others pretty specific to one or a small group of populations. Not all identify key or secondary risk assignments (example, estuary habitat loss does not).

This discussion is followed by a summary table that identifies primary factors for population sections:

General note: could use a brief discussion in the introductory sections of this chapter that summarizes general guidance (or provides evidence for consistency) for the assignments of individual habitat threat components to key, secondary or no categories.

In several places, the draft Oregon Lower Columbia plan clearly recognizes that the variation in basic life history patterns among the species of anadromous fish means that degraded or lost habitat within different sections of each tributary/associated estuary can have different impacts. Fall Chinook (ocean type life history pattern) and chum both rely on the estuarine habitats immediately outside the lower reaches of their natal rivers (in addition, mainstem Columbia spawning areas were an important component of the ESU). The linkages between habitat conditions in the lower rivers and the adjacent estuarine areas could be better described in the limiting factors summaries. In addition, the contribution of impairments in these areas to the overall assignment ratings for physical habitat quality by population should be clarified.

The summary section

Page 5-58 – second full para. States that Big Creek SAB fall run program was moved to Youngs Bay in 1996 to "..address the problem of excessive straying" - should expand a little, was this move to reduce straying into Big Creek spawning areas or was the intent to generally reduce into adjacent areas (including Washington tribs)?

..I will try to get further into the specific trib sections over the next couple of days, focusing on comparing the LF descriptions with assumptions/info in the strategy and modeling sections (chap 6 and 7)

Editorial comments

What do the lines in the figures starting on page 5-20 depict? Should be removed or explained in captions.

Page 5.22 first full paragraph first line – 'which' probably should be 'while'???

[W Comments]

General comment: The approach for identifying limiting factors was clearly presented, and, like the rest of the document, very pragmatic. In particular, I appreciated the plan's willingness to identify what the authors believe are the truly important limiting factors, rather than simply list every possible known impediment to recovery. That being said, because the limiting factors were largely determined through expert opinion, it is not always clear why certain factors were considered "key limiting factors" and others "secondary limiting factors". Presumably, this was just the result of the outcome of the iterative process described in section 5-1, but there is no factor-by-factor rationale provided. That being said, all of the limiting factors (key and secondary considered together) seem plausible.

p. 14 – What is the biological rationale for the 35% harvest breakpoint being a key/secondary limiting factor?

p. 20 -- what are the red lines in the figure?

p. 23 – What is rationale for 30% criteria for primary/secondary concern regarding % hatchery fish? The data presented within the plan (appendix 4B) and elsewhere suggest that impacts can be large at 30%, and theoretically work suggest it doesn't take much straying to have a genetic impact. In addition, it seems that some consideration of the source of the strays might be important to consider.

p. 23 – Realistically mass marking means 98-99% marking. If hatchery/wild ratios are really skewed, that 2% could still be a large fraction of the unmarked fish in some areas. Estimates of hatchery stray proportions will be greatly improved, but use of a fin clip may not be sufficient to sort hatchery fish at a weir even at 98% marking.

p. 24 – Given the very large releases it seems surprising that competition with hatchery fish would be a secondary rather than a primary concern. The plan presented relationships between % hatchery spawners and natural population productivity, and focuses on controlling hatchery effects through attempts to limit natural spawning by hatchery fish. However, similar relationships have been observed for hatchery releases, and in general it seems that the potential ecological effects the very large scale hatchery releases in the area are not given much attention in the plan, although in a later section there is a call for research on this topic. The ISAB, in its review of the Columbia River Estuary Module, also criticized that document for failing to address ecological effects of hatchery releases.

Table 5-10 – why bother with the crosshatched cells?

[X Comments]

1) Maybe this is the case with all recovery plans, but it seemed to me to be really bulked up on "what we know" text, which made it harder to find the "what we need to do" parts. Possible to move some of that background to appendices?
2) Further, many of the "what we know" statements weren't referenced, so some of it may have been opinion.
3) Pg 5-14: how did they decide on the >35% and 10-35% cutoffs? I understand that they may need to be arbitrary, but didn't see any justification or discussion about how these assumptions might affect results, and if they plan to be revisited. Also seems like this broad-brush cutoff might not be applicable across all populations.
4) Pg 5-19: statement about hatcheries limiting "spatial structure" seems odd – better as "spatial extent"? Also was confused about entire statement – could use better explanation (i.e., that hatcheries physically block access to upstream-migrating fish)
5) Pg 5-23: Ditto statement above regarding cutoffs for hatchery stray rates (10%, 30%) – seems arbitrary and maybe shouldn't be same across populations.
6) I found the limiting factors and threats very vague in general (primary and secondary key factors) – making it hard to see how they would link to specific actions.
7) Any more details on nonindigenous species? Seems disproportionate, but glad to see it in there.

Tables are great (and useful) summaries

[Y Comments]

<u>Large-scale critical uncertainties</u>

The Oregon recovery plan reviewed here was developed based on known, actionable threats to salmonid populations, and the plan was organized with these threats in mind. However, additional factors, issues, and processes could potentially overwhelm or at least undermine recovery efforts. The RIST attempted to assess how well such additional, potentially "critical uncertainties" were addressed in the plan. The critical uncertainties identified were thought to be generally applicable to all Recovery Domains, were of such large scale that local RP implementers were unlikely to even design monitoring actions to determine local impacts, and finally, that the scope of these uncertainties was outside that of a Recovery Plan action strategy, yet any or all of these factors could potentially confound or outweigh all RP actions. As such, the RIST thought that while RPs may not feel compelled to develop strategies to act on these factors, they should at least consider the potential for their impacts to overwhelm RP actions. Four classes of such uncertainties were considered:

i. Large rivers / estuaries
ii. Population growth
iii. Climate change / patterns / variation
iv. Ecosystem state / integrity / integration

To its credit, the Oregon plan explicitly recognizes that factors additional to those originally recognized as limiting recovery could emerge in the future (Introduction 1.8.1.2), and that attention should be paid to potential limiting factors and threats that do not currently have significant impacts on LCR salmon and steelhead populations, thus "ensuring that factors not currently posing a significant threat do not do so in the future."

Details of coverage of these uncertainties in the plan follow. Summarizing overall, the RIST concluded that two critical uncertainties – human population growth and climate change – could require modification of the existing recovery plans, adjustment of emphasis and timetables, or even major revisions. These uncertainties require monitoring by the responsible agencies so that management plans can be adapted as needed. The Oregon plan recognizes the possible complications that these two factors could impose and presents some analyses that take population growth and climate change into account, although the plan ultimately concludes that it cannot directly address these future threats because of a lack of population area specific information.

Large rivers and estuaries (and nearshore coastal nursery habitats) can influence the outcome of plan implementation and deserve greater attention and resources. The detailed Columbia River Estuary Recovery Plan Module, referenced in the Oregon plan, covers estuaries well. Equally important is the multi-stakeholder estuary partnership described in the plan. Given that the Upper Columbia will depend on Lower Columbia research on estuaries, the estuary recovery plan module is important throughout the basin and is therefore valuable in its proposed scope. Coordination with Washington state efforts regarding estuary interactions would be valuable.

The importance of an ecosystem-based perspective is becoming increasingly appreciated among managers in general. Integration of an ecosystem perspective into the plan (and communication/integration among agencies and workers throughout each basin), as was done in the Puget Sound plan, deserves greater emphasis in the Oregon plan.

Large Rivers / Estuaries

Mainstems. A major focus of the Oregon plan is, understandably, the Oregon portion of the lower mainstem Columbia River and the mainstems of major tributaries; habitat conditions throughout are emphasized (especially in Chap. 5). Dams, powerhouses, and reservoirs throughout the basin (Federal Columbia River Power System, FCRPS) affect the four listed Chinook, coho, chum, and steelhead species covered in the Oregon plan. The FCRPS 2008 Biological Opinion covers the mainstem Columbia from Bonneville Dam to the river's mouth, which extends to much of the area included in the Oregon plan for the Oregon portion of the lower Columbia. Implementation of the recommendations in the Biological Opinion relevant to the Oregon plan are complicated by ongoing litigation by Oregon against various federal agencies, including NOAA, challenging the adequacy of mainstem measures contained in the current Biological Opinion. If anything, Oregon is promoting greater understanding of and protection for mainstem entities than what is called for in the federal document.

Estuaries. The Oregon plan references, in Introduction section 1.5.5, the Columbia River Estuary Recovery Plan Module (LCEP 2004). This Module is a NOAA Fisheries proposed recovery plan for salmon and steelhead and will be the basis of estuary recovery actions in the Columbia River Basin. The module emphasizes a unified set of actions for the Columbia River estuary to address the needs of all listed Columbia Basin ESUs and DPSs. The module lists 23 broad actions whose implementation would reduce the threats and thus increase survival of salmon and steelhead during their time in the estuary. Additional attention is given to the importance of the estuary via the Lower Columbia River Estuary Partnership (Introduction 1.5.7), a collaboration of economic interests, citizens, non-profit organizations, and local, state, and federal agencies working to protect and restore the estuary. The importance of the estuary in the life history of salmon is evident in Table 5-1, and fishery harvest, competition with hatchery releases, and impacts of altered flows on food webs and sediment delivery to the estuary are highlighted in the summaries in Chap. 5. Specific actions for improving estuarine conditions are given in Table 7.6, with details for different areas discussed in other tables in Chap. 7.

Population Growth and Climate Change

In discussing delisting criteria, the Oregon plan recognizes the value of assessing trends that "may potentially contribute to other impacts in the future, especially considering future climate change and human population growth" (Introduction 1.8.1.2). Section 5.2.6 ("Future Threats: Climate Change and Human Population Increases") recognizes that "Climate change and increases in human population will undoubtedly impact LCR salmon and steelhead populations in the future." The recovery plan does not prioritize impacts of these influences for each population, geographic area, and salmonid life-stage but instead discusses general impacts of these future threats.

Projected climate change scenarios are nicely reviewed (e.g., Table 5-5); possible effects, particularly on habitat, are discussed briefly. Specific plans or projections that attempt to take into consideration various scenarios of predicted climate change -- increased winter flooding; decreased summer and fall streamflows; elevated stream, river, estuary and ocean temperatures (ISAB 2007a)—vary among the different parts of the plan. For example, in Appendix 4B. "Conservation Assessment Tool for Anadromous Salmonids (CATAS)," a population viability model was developed to assist salmonid conservation and recovery planning. Population trajectories based on climatic variation assume that "future conditions would essentially be the same as those conditions experienced during the past time period when most population data were collected, 1974 to 2006" (pp.7-8). It might be valuable (or at least interesting) to alter the climatic indices to incorporate climate change and its effects on model run outcomes. In contrast, Chapter 4.Population Conservation Gaps recognizes that "adaptive processes may lead to life history traits that are different from historical benchmarks" given probable climate change (p. 16). Chap. 6 is more specific in that the recovery scenarios developed adjust for negative impacts from human population growth and climate change. Chap. 7 focuses heavily on possible responses to these admittedly hard-to-predict future impacts (e.g., Table 7.17. Summary of actions needed to mitigate for the future impacts of climate change and human population growth; specifics appear in Appendices 17 D-L).

Chapter 5 also summarizes the findings of the ISAB 2007b report on human population growth in the region. The report preparers were obviously aware of these projected trends and their potential impacts and interactions but apparently do not include either in their actual planning. For example, Tables 5-6 through 5-9 summarize primary limiting factors and threats to recovery and form the heart of the limiting factor analyses. The tables list limiting factors and identify whether a factor is a key or secondary concern at the population level, and link limiting factors to the primary threats—fishery harvest, hatcheries, hydropower and flood control, and land management—that cause or contribute to the effects. However, the tables "do not show impacts related to future climate change and human population growth/development" (p.5-39).

The plan ultimately concludes, in the Chap. 8 Research, Monitoring and Evaluation (RME) discussion, that it is unable to directly address these future threats of human population growth and climate change because of a lack of population area specific information on the exact nature of these threats.

Ecosystem State / Integrity / Integration

The plan recognizes the impacts of habitat alteration on natural ecosystem functions and processes (e.g., p. 5-32), and that recovery will ultimately be dependent on "the key biologic, ecologic, and landscape processes that support the ecosystems upon which salmonid species depend" (1.8. 2). However, an ecosystem-based management approach, as developed in the Puget Sound Salmon Recovery Plan and Monitoring and Adaptive Management Plan (PSSRP 2007), is nowhere apparent.

References

ISAB. 2007a. Climate change impacts on Columbia Basin fish and wildlife. ISAB Report 2007-2.

ISAB. 2007b. Human population impacts on Columbia Basin fish and wildlife. ISAB Report 2007-3.

Lower Columbia Estuary Partnerships and Lower Columbia Fish Recovery Board (LCEP and LCFRB). 2004. Mainstem Lower Columbia River and Columbia River Estuary Subbasin Plan. Prepared for the Northwest Power and Conservation Council.

PSSRP. 2007. Puget Sound Salmon Recovery Plan,www.sharedsalmonstrategy.org-/plan/toc.htm

[Z Comments]

Chapter 5, limiting factors, Water Quality (9a, 9b, 9c). pp 5-33 to 5-35. This portion of this section on toxic contaminants summarizes the main concerns about contaminants in the Lower Columbia River and Estuary, but is quite brief, leaves out some important references, and is not very well-organized. Studies on agricultural chemicals are mixed with those on urban and industrial chemicals, and the effects of the two classes of contaminants are mixed up. This section also neglects to mention possible effects of these contaminants on the food web and the food supply of salmonids. I have edited this section to include some of this missing information, and associated references; the edited text is attached.

Chapter 5.3. Limiting Factors for Populations

I notice that in these sections, limiting factors are listed for both the tributaries and estuary for each group of populations, but only the factors for the tributary are discussed. I assume that is because those for the estuary are considered limiting factors and threats and were discussed in the previous section?

Young's Bay. The water quality section includes only temperature, but there may be some threats associated with toxics due to industrial and urban development around Astoria. For example, some in the Oregon DEQ Water Quality Assessment database, (give web site). there are 303d listings for trace metals in creeks near the Astoria landfill. There are also some reports of fecal coliform in the Klaskanine River and the Lewis and Clark River, and Skipanon Rivers.

Big Creek. Water temperature is listed as a secondary concern, but no supporting discussion is provided in the document. Agricultural and urban toxic chemicals are not listed, which may be appropriate as there are relatively few water quality violations for toxics listed for Big Creek in the ODEQ Water Quality Assessment database. However, there are a number of violations for fecal coliform and E. coli. This suggests that there could be inputs of sewage or other waste into the system, and a potential for contamination with wastewater compounds such as pharmaceuticals and steroids. However, to my knowledge there are no monitoring data to confirm this.

Clatskanie. Water quality impairment due to high temperatures is discussed. However, high levels of fecal coliform have also been noted in the ODEG Water Quality Assessment database, suggesting that other wastewater contaminants associated with sewage and septic tank effluents might be present as well. Also, in the same database, there are some reports of metals at levels that are of potential concern in the Clatskanie River and the South fork of the Goble Creek.

Scappoose. Water temperature only is listed as a concern. Toxic chemicals may need to be added as well, because high concentrations of PAHs and PBDEs have been measured in salmon and salmon stomach contents from juvenile Chinook some sites in the area (Columbia City, Sandy Island near Goble Creek; LCREP 2007b; Jones et al. 2008). Municipal outfalls and other industries may be contributing contaminants to the area as there are several Environmental cleanup sites (see ODEQ Environmental Cleanup Site Identifiction database. http://www.deq.state.or.us/lq/ECSI/). However, these activites might be considered as threats in the estuary rather than the estuary tributaries.

Clakamas. Both water temperature and toxics from urban and industrial sources are discussed, but only water temperature is included on the chart for the tributaries. There is a good discussion of problems associated with toxic contaminants in the Lower Willamette; some additional references could be added which I've provided in the text of Chapter 5. Agricultural chemicals should be included on this list as well, since USGS monitoring has identified high concentrations of pesticides in some tributaries in the area. (Carpenter et al. 2008).

Sandy. Water quality section only includes temperature (9a) but information on toxics from agricultural chemicals should also be included. In the Oregon DEQ water quality database, problems with fecal coliform bacteria and E. coli have been reported in some tributaries (Beaver Creek, Cedar Creek, Kelly Creek), suggesting that other wastewater contaminants associated with sewage and septic tank effluents might be present. There are also reports of PAHs, dioxins, and heavy metals in sediments in this area, especially in Beaver Creek; some of these compounds may be associated with the Reynolds aluminum smelter at the confluence of the Columbia and the Sandy (USEPA 2008).

Lower Gorge. The document includes nothing about water quality for this watershed, and it appears that little or no data are available based on Oregon DEQ's water quality database. However, the NWFSC has some data on this area from Restoration Effectiveness and Ecosystem Monitoring studies we conducted over the past year with the Lower Columbia River Estuary Partnership (Jones et al. 2008; Sol et al. 2009). Sampling in the Latourell Creek, Young Creek, and Mirror Lake area and around Pierce and Sand Island in the estuary indicates that high water temperature may be a limiting factor during the summer months in some streams and tidal freshwater habitats; temperatures above $20^{o}C$ were common in July and August. However, preliminary data suggest that toxic contaminants are not a major concern in this watershed. Concentrations of PAHs in bile and DDTs, PCBs, and PBDEs in salmon tissues have been measured in some fall Chinook salmon, and levels of contaminants are low, similar to those we have observed in juvenile salmon from other undeveloped areas (L. Johnson and G. Ylitalo, NWFSC, unpublished data).

Upper Gorge. The document includes nothing about water quality for this watershed; it appears there are no water quality violations in the area, based on the DEQ Water Quality Assessment database. There is potential for exposure to PCBs from contamination at nearby Bradford Island; information about the site is available at on the Army Corps website at https://www.nwp.usace.army.mil/issues/bradford/home.asp.
The Oregon Department of Human Services (DHS) has issued a shellfish advisory related to elevated levels of PCBs in crayfish and freshwater clams living in the Columbia River immediately above Bonneville Dam. All commercial crayfish harvesters, sport fishermen, and food collectors are advised to avoid catching or eating clams, crayfish, or other bottom-dwelling organisms from the Columbia River between Bonneville Dam and the mouth of Ruckel Creek at mile-post 147, which is about one mile upstream of the dam. See http://www.oregon.gov/DHS/ph/envtox/0301esc.shtml
However, this would likely be considered as a threat in the mainstem Columbia above Bonneville, rather than in the tributaries. Information about
https://www.nwp.usace.army.mil/issues/bradford/home.asp

Hood River. Has good discussion of agricultural pesticides as a limiting factor for populations in this area, and documents examples of water quality violations.

[AA Comments]

Table 5-3: The category of "Hydropower and Flood Control Management" would be more appropriately labeled "Water Management" or "Damn (sic) Operations" since it refers to the alteration of flows resulting from the operation of dams. While dams are operated to provide hydropower and flood control, they are also provide for navigation and water diversions for agricultural and municipal purposes.

Section 5.2.1, Lower Columbia River commercial fisheries (page 5-9): "Incidental landings of steelhead occurred in both fisheries until commercial harvest of steelhead was banned in 1975." What is the situation since then? Gillnets will still be catching steelhead, and most will be dead or moribund when landed. What happens to them? Are there estimates of the incidental mortality?

(page 5-12) Fishery effects, directed harvest mortality: All salmon fisheries are "mixed stock" to some degree. Even if a fishery takes place on the spawning ground, there may be strays on the spawning ground. The closer you get to the spawning ground, the less impact there is on other stocks, but it is shades of gray, not black and white.

(page 5-13) *Size, Age, Timing Selection.* Even when fisheries are not size selective, ocean fisheries harvesting immature fish alter the age structure of the spawning escapement of species with multiple age classes in the spawning population toward younger age classes, and thus exert selective pressure for younger maturation. This happens because fish that would mature at an older age must survive the risk of harvest for more years than fish that mature at younger ages.

Appendix 4A – page 3 Sandy River late fall Chinook : The text says that if 3-yr-old fish are exposed to 1 year of ocean fishing, 6-yr-old fish would be exposed to 3 years. This is incorrect; they would be exposed to 4 years of ocean fishing if they become vulnerable at the same age as 3-yr-olds. Also, the fishing mortality rates reported in the table A1 are really bad. If North Fork Lewis is being used as an indicator stock, there is no excuse for using constant average exploitation rates for 1995-2001 and 2002-2006 instead of the exploitation rates from the CTC annual exploitation rate analysis. North Fork Lewis River is a CTC exploitation rate indicator stock and there are annual estimates of the total exploitation rates available that are calculated from CWT recoveries. The CTC annual report containing the distribution of mortality over fisheries and escapements is available online at http://www.psc.org/publications_tech_techcommitteereport.htm. Also, use of the age 4 impact rate makes no sense at all. The CTC reports annual exploitation rates that include impacts over all ages, or brood year rates that represent the total reduction in spawning escapement over a brood attributable to harvest impacts. These would make much more sense.

(page 5-17) Figure 5-7. The comment above applies to this figure as well.

(Page 5-18) Figure 5-8 the caption should refer to Appendix 4A (page 5-18) steelhead: The first sentence says that steelhead are harvest in ocean fisheries. The background text (page 5-9) on fisheries said that ocean harvest is assumed to be zero, and Appendix 4A says that only catch record card data from recreational fisheries was used to calculate impacts.

[AB Comments]

Table 5-3 Fishery management – also consider genetic selection (e.g. size or age)
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Table 5-3 Hatchery management – hatcheries have very limited pure conservation benefit

Table 5-3 Hydropower – also consider dredging

Page 5-11 font size in the box is really small for high-mileage eyeballs

Page 5-12 Fisheries effects – clarify the different meanings of "selective". There is "mark-selective" where only hatchery marked fish are supposed to be harvested. There is also "phenotypic selection", "genetic selection" or "evolutionary selection" caused by the fishery preferentially taking certain phenotypes (e.g. size, age, run time). I prefer "phenotypic selection" for this. The two different potential meanings of "selective fisheries" are completely different phenomena and it can get very confusing.

Page 5-12 "Regulations prohibiting harvest of wild fish…" – citation

Page 5-13 – Add discussion of "drop off mortality"

Page 5-13 – harvest is completely entwined with hatcheries; the two need to be considered together.

Page 5-13 – Other harvest effects are 1) habitat modification (e.g. trawls for other species or installating on fish wheels since there is talk in the plan of live harvest methods), 2) ghost fishing from abandoned gear (this is a potentially big deal in Puget sound), 3) food web effects from harvest on non-salmon species (e.g. changes in the composition of salmon predators, competitors or prey)

Page 5-16 Cite Kope paper on harvest rates

Figure 5-7 – mortality rates from 1994-2006 are obviously crude estimates –are there really no actual data?

I agree with key and secondary threats assignments for fisheries. Need to explicitly way which harvests are not considered a threat. Make a table of fisheries threat assignments?

page 5-19, 5.5.2 Background – First paragraph, need to describe limited role for conservation hatcheries

Figure 5-10 – What do red bars mean?

Figure 5-13 – Also a more detailed map of LCR hatcheries?

Page 5-22, “ Hatchery releases create large returns of adult hatchery origin fish…” – Need numbers and citations.

Page 5-23, “Recent evaluations show that…” – weird sentences.

Page 5-23 “Habitat access (2a)” etc. – Where is the key to the codes in parentheses (e.g. “2a”)? I don’t know what this means.

Page 5-23 – 0-10% hathery = OK, 10-30% = secondary, >30% = key. Arbitrary, not much justification. How does this compare to WDFW or HSRG goals?

Page 5-23 – need to consider pseudo-isolation

Page 5-24 – need to highlight importance of stock origin (e.g. Rogue River and Warm Springs stocks)

Page 5-24 – put hatchery fraction summary in table or map

Page 5-24 – Competition with hatchery fish is may a key concern

Page 5-25 - Predation with hatchery fish is likely a key concern, especially for chum and fall Chinook

Page 5-25, section 5.2.3 – map of dams?

Section 5.2.3 – What about smaller dams – there are lots of these in region, are they treated with habitat?

Page 5-27, Habitat access (2c) – is Bonneville dam a key concern for upper gorge and hood river chum?

In general, need to discuss uncertainty and dissenting views in talking about threats.

Page 5-28, first paragraph – How much habitat loss? show the numbers

Page 5-28, predation – Can you show any data or citations on this???

Page 5-29 – Are there any residual sediment issues with the removal of Marmot?

Page 5-30 – “Dewatering of chum redds…secondary concern…” – Note that this has been a big problem in the past and is at the whim of hydro operations.

Page 5-30, “ In the Hood River system, low head hydro…” – Is this considered a threat? Need to make sure text is always explict about whether you are calling something a key, secondary or non threat.

Page 5-32, predation – thesholds are 10% and 30%, which is lower than harvest – why does harvest get an extra 5%?

Page 5-37, section 5.2.5 – What introduced species? What threat? Be more explict.

Section 5.2.6, future threats – Should exotic species be elevated to the level of climate change and human population growth as an unstoppable force that can reshuffle the entire deck?

Page 5-37, climate change – Will climate change affect hydro operations? What about ocean acidification? Are there any possible positive effects of climate change?

[AC Comments]

Aspects of the Habitat Element were addressed within Landuse and Hydro threats. The recovery plan (Chapter 5) goes into considerable detail regarding the different limiting factors and threats affecting each DIP. For each habitat limiting factor the recovery plan provides a clear descriptive linkage between the factor and its effect on the viability of the population. Each limiting factor is assessed across a number of life stages and further categorized as a key (primary) or secondary concern.

The expert panel process utilized to rank limiting factors lacks transparency, although it is unclear if a more quantitative process could have been developed with the quantity and quality of information available. While the overall list is complete, I would disagree with some of the ranking. Freshwater water quality limiting factors (temperature, pesticides, metals, etc) are set as secondary concerns or not even listed. I believe in those basins with substantial land development (urban and agricultural) that these factors should be given greater attention. Recent research demonstrates that the action of many of these anthropogenic chemical inputs are synergistic in their toxicity. Additionally, higher temperatures also appear to further magnify these effects. This underscores the primary drawback to the expert panel process, that it is not possible to dissect the reasons for different prioritization. That said, many of the basins in the Lower Columbia River are so impaired that almost any recovery action is likely to produce some improvement in population viability. Additionally, I believe that the members of the panels that were convened are certainly well qualified to render judgments on the status and needs of basin in the Lower Columbia River. When recovery actions are finally prioritized there needs to be a clear rationalization for the habitat restoration actions that are to be emphasized.

[AD Comments]

Habitat
Page 5-5, Table 5-2:

1. The plan states that competition, disease, and food web cannot effect spatial structure, but these variables could affect the spatial structure of populations

relative to their historic condition. For example if temperatures increased in specific areas that led to outbreaks of specific disease types, then areas of a stream could become essential “no fish” zones for a long enough period of time to alter the spatial structure of a population or between populations.

   a. Add spatial structure to the first three limiting factors listed.

The report does a good job of defining terms for the reader up front

Page 5-7 – The set of statements need citations:
“Commercial fisheries on the lower Columbia River expanded rapidly after 1866 when salmon canning began in the Northwest. Commercial landings were usually canned and estimates of landings are available from cannery records. These records show that landings exceeded 40 million pounds, annually, in 1883, 1884, 1895, 1911, 1915-1919, and for the last time in 1925.”

Page 5-8 - “More recently, commercial and recreational harvest of salmon and steelhead has generally been reduced to meet international treaty agreements, fisheries conservation acts, regional conservation goals, the Endangered Species Act, and state and tribal management agreements.”

Page 5-23 – This sentence seems incorrect? “Recent evaluations show that, which many hatchery programs are being reshaped to provide better protection for wild populations, Lower Columbia River hatchery programs often remain inconsistent with recovery goals (HSRG 2007). “

Page 5-23 – is anything be done about this? “Many LCR salmon populations are characterized by high proportions of hatchery fish on the spawning grounds. The major concern with these hatchery programs is the effect hatchery strays have on productivity and long-term fitness of naturally spawning populations (HSRG 2007).”

Page-24 – is this a key or secondary concern? The prevalence of hatchery fish spawning in local spawning areas (called straying in this document) where they interbreed with wild fish is considered a key or secondary concern for most LCR salmon or steelhead populations. Strays are identified as a key concern for a population if available data indicates that the proportion of hatchery fish on local spawning grounds over roughly a 30-year window averaged 30 percent or higher, and as a secondary concern if the proportion averaged between 10 and 30 percent.

Page 5-24 – I am little confused. Uncertainty about the proportion of straying, yet the report then states stray rates between 50 and 90%? Seems like starying is a key issue and should just be identified as one.

Page 5-28 – fascinating information on the change in the food-web!

Pages 5-30 and 5-31 – references for all these bulleted statements would be quite helpful.

Page 5-31 – reference for this statement: "Today, many streams have lower pool complexity and frequency compared to natural conditions that existed in the past. Channels also lack the complex structure needed to retain gravels for spawning and invertebrate production, and connectivity with shallow, off-channel habitat areas that once provided flood refuge, over wintering and hiding cover, and productive early-rearing habitat. "

Pages 5-40-48 – the tables work well, nice summary!

[AE Comments]

Page 5-16 Sandy late fall harvest rate 50% - giving range rather than 5% we might be more descriptive of fish mortality. Figure 5-7 shows 40% 1994-2001. In appendix 4A only 3 yrs had ER > 50% 1995-2001 are all 0.397; is this a guess? 2002-2006 are all 0.196; is this also a guess?

Table 5-10 – what do white cells indicate?

[AF Comments]

It would be helpful to have one table that summarized all life-stages in a consistent way. Are the fry in the estuarine model different from fry in upstream reaches? One table with life history name, riverine location, and season would help reduce any confusion.

Does the estuarine influence really reach all the way to Willamette Falls? Are these reaches also considered riverine for purposes of restoration planning?

Table 5-2: This table has great potential but is also potentially misleading. Harvest should certainly be in the leftmost column! Hatcheries should also be in the leftmost column! Hydropower should also probably be in the left column although it could be argued that impacts are covered under food web, access, physical habitat quality, water quality, and hydro regime. I don't see that the row for population traits does anything but obfuscate the role of harvest and hatcheries in limiting population performance. I understand that these will also be in the threat table.

Climate change and increasing population densities should be included in the threats table even though their effects are unknown.

Pg 5-12 – "Management through these various organizations has resulted in the decline of harvest rates for Columbia River salmon and steelhead, especially since the 1970s." Management through these agencies and treaties has contributed to the decline?

Pg 5-12 – "As a result, today's fishery impact rates for most hatchery-produced chum, Chinook, coho, and steelhead are higher than for wild fish of the same species because of the selective fishing regulations and other actions." Is this true for sure? Any data to back this up?

Pg 5-14 “Harvest is identified as a key concern for a population if the estimated recent average harvest rate was 35 percent or higher, and as a secondary concern if it was estimated to fall between 10 and 35 percent. “ These are arbitrary cut-offs that should be reconsidered. If a population in close to extinct then 10% is clearly way too much. Since this is one of the few human actions that can be quantified and controlled, the detail of analysis for “how much is too much?” should be much more sophisticated!

Pg 5-23: Sentence needs to be edited o meaning is clear “Recent evaluations show that, which many hatchery programs are being reshaped to provide better protection for wild populations, Lower Columbia River hatchery programs often remain inconsistent with recovery goals (HSRG 2007). “

Pg 5-23: What about habitat loss from hatcheries? Key or secondary concern? Conclusions seem to be missing.

Pg 5-23 “Strays are identified as a key concern for a population if available data indicates that the proportion of hatchery fish on local spawning grounds over roughly a 30-year window averaged 30 percent or higher, and as a secondary concern if the proportion averaged between 10 and 30 percent.” Again – this should be in relation to current population condition. There is no quantitative guidance for these thresholds and it certainly seems that populations well below VSP cannot support even a 10% stray rate without significant negative effects,

Pg 5-24: ” Chum: Hatchery strays are not identified as a concern for Columbia River chum salmon. Historical hatchery practices do not appear to have influenced the chum populations.” Do Chum experts agree with this statement??

Pg 5-25: How was the conclusion reached that competition is only a secondary concern? The data and logic behind these cut-offs and conclusions is absent. For example, a model or even a conceptual model demonstrating the logic behind the conclusion of what has the biggest impacts in terms of limiting fish performance. Ditto for predation and hydrology. What’s missing is a life-cycle perspective!

Pg 5-26: Sheer and Steel (2006) provide data by watershed on kilometers of lost habitat and habitat loss by species preferences. They also provide data on which types of habitat have been differentially lost.

The actual climate change section is thorough, relies on literature and helps bracket the likely scenarios. This is super. The potential effects of climate change and human population growth should be included in the assessment of key concerns – are there some key concerns which will become progressively more problematic with climate change and more people – these might be things we have a chance of managing if we act before the problem is in full force. In Chapter 7, it says “All of the scenarios described, incorporated an additional 20% improvement in survival above that needed to achieve strata delisting goals. “ (page 50) but can that be slightly customized so that populations expected to be hardest hit are identified and have, perhaps, even a higher margin of buffer.

Tables 5-10 and the parallel tables for each population are excellent. I assume that, after the expert review of these tables, the assignment of threats was agreed upon - the arbitrary nature of the cutoffs above seemed Ok when applied at each individual population? I think it might be worth noting this at the top – when the arbitrary cut-offs were rolled out? It is not true that these cut-offs need to be consistent across basins so if they need to be tweaked from their starting points – that's fine.

Chapter 6: Scenarios

[AG Comments]

General comment: This section continues the generally pragmatic tone of the document by attempting attempt to assign survival impacts due to major threats. Many of these seem to be crude approximations at best, which the plan acknowledges.

p. 17 – It is interesting that the effect of hatchery spawners on extinction risk is similar to harvest at the same rate. I assume this is just a pure coincidence? A little more information on this would be useful. In addition, the plan should acknowledge that this approach will not capture all of the risks associated with hatchery fish. As was mentioned above, there are likely to be additional survival reductions to due competition of juveniles in estuary and ocean, and it would be nice to see some attempt to take this into account. I really like the way the report uses the empirical relationship between % hatchery fish and natural population productivity – perhaps a similar approach could be used using hatchery releases as a variable? In addition, even in the % spawners case, if the reductions in productivity are due to genetic impacts, these would be expected to accumulate and grow more severe over time. So simply assuming that, for example, a 20% stray rate of hatchery fish on the spawning grounds of a population will indefinitely reduce productivity by X compared to pristine may not be correct since the effect could grow worse over time. I appreciate the plan's valid attempt to quantify the hatchery effects on natural fish survival, but the plan may want to point out that there are other hatchery impacts that have not been quantified.

p. 20 – " it was thought that a reduction of 5% from current rates was feasible for <u>these</u> populations." Not clear which populations "these" refers to.

p. 23 – The plan makes a good point regarding handling mortality at weir.

p. 23 – The plan is really very vague on how the hatchery straying goals will be implemented. The plan identifies hatchery and harvest issues as primary limiting factors, but for the most part there seems to be little change from the status quo in terms of managing these impacts.

[AH Comments]

(page 10, 1st paragraph) In section 6.3 the authors refer the reader to Section 6.15 for details and results of SLAM; there is no section 6.15. In fact, I cannot find any details or references for methods used in the SLAM modeling. All there appear to be are vague verbal descriptions and box-and-arrow diagrams.

Page 15 – bottom of the page: "For modeling purposes most populations were assigned an impact rate of 60%, with exceptions for Young's Bay and Big Creek (due to additional terminal fisheries, and populations above Bonneville dam that are exposed to the Zone 6 tribal fishery (see specific rates in population sections below)" MNFS guidance to the PFMC is for a maximum 38% impact rate for tule fall Chinook in 2009 and has been dropping year-by-year.

Page 35 – The harvest impact rate assumed as current for Clackamas coho (and for all other coho populations outside of Youngs Bay and Big Creek special areas) is 35% with a planned reduction to an average rate of 25% to achieve delisting. Actually, NMFS guidance to the PFMC and the states during the preseason planning process for LCR natural coho has been to apply the ocean harvest rate prescribed by the Oregon plan's harvest matrix and apply that as a cap to total harvest impacts. In the past three years that guidance has capped harvest impacts at total rates of 15%, 20% and 8%. The guidance for 2009 fisheries is to total harvest impacts not to exceed 20%. The planned reduction to an average rate of 25% would represent a substantial increase in harvest impacts over what the population is currently experiencing.

Page 51 – Clatskanie fall Chinook. Table 43 lists current harvest as 60%. NMFS ESA guidance to the PFMC has been an exploitation rate not to exceed 49% until 2006. This was reduced to 42% in 2007 and 41% in 2008. The guidance for 2009 is not to exceed 38%. While the 35% proposed represents a reduction from current conditions, it is not as large a reduction as portrayed in the table.

(page 99) Section 6.5 3rd paragraph, 4th sentence doesn't make sense and I cannot figure out what was intended. I believe the phrase "once the run" is the problem. Perhaps what is intended is "simple to run", or "only need to be run once"?

Neither references nor equations are provided for the SLAM model, just some flow charts. Consequently, there is no basis on which to evaluate the validity of the approach at all.

Appendix 4B – the CATAS tool: I generally like the approach take here, but the first Equation (2) is logically incorrect. It assumes that if A_j is the proportion of recruits that return at age j then it is also the proportion of returns that were recruited j years ago. This is only true if recruitment, natural mortality rates, maturation rates, and cumulative fishing mortality rates are constant. Variability in recruitment, or any of the rates will alter the proportion of returns that are members of any particular age-class. The effect of using this equation will be to reduce the perceived variability in recruitment by averaging adjacent year classes, and artificially make the spawner-recruit data appear to fit a

Beverton-Holt, or "hockey-stick" spawner recruit relationship. One problem with these spawner-recruit relationships is that they tend to overstate population productivity at low spawner abundance, and thus underestimate extinction risk. This is entirely consistent with the observation on page 4 of Chapter 4 that the B-H model consistently fit the data better than that a Ricker model. The "age engine" in VRAP is one attempt to deal with this problem, but I do not believe there is a satisfactory solution. For coho, this should not be an issue since each population comprises three temporally distinct, demographically uncoupled brood lines.

There are also two equation (2)s. Beginning with the second equation (2) all equation numbers need to be incremented.

Table A3: NMFS consultation standard for LCR tule Chinook is .38 for 2009 and is decreasing.

[AI comments]

The recovery plan uses a life cycle oriented approach to assess the different sources of mortality. In this way a number of additional elements are incorporated into the recovery plan. The list appears to be fairly complete although some of the sources of mortality in the "other elements" category are included for completion sake and there appears to be little opportunity for recovery actions (i.e. in marine competition), whereas in other cases there are a number of specific actions addressing sources of mortality (estuary habitat, mainstem flow dynamics, etc.). Overall the recovery plan makes a very credible attempt to address the threats posed by the 4Hs and others across the time dimension of a fish's life cycle.

[AJ Comments]

Page 2 – Any consideration of TRT recommendations to overshoot efforts because of potential for failure?

Page 4 – need to really show that gorge is not achievable for all species.

Figure 1 – Figures shows a high broad sense goal for gorge populations, but the text goes on about how this is impossible. why show this as the goal?

Page 10 – Are SLAM parameter estimates completely independent of the other PVA?

Page 10, "A shortcoming of SLAM…" – Are you slamming SLAM?

Page 11, last paragraph – I like this paragraph on stationarity

Page 12 – Buffer of 20% for climate change is arbitrary, but good to include.

page 13 – Put term in the text equation examples in the same sequence as the written equation 1.

Page 14 – assumed 50% of B'ville pinniped predation natural and 50% human caused. Why?

Table 1 – These are estimates of impact; what is feasible to recover?

Pages 15-16 – need citations for the harvest numbers

Page 17 – hatchery effects estimate totally density independent – what are consequences of this?

Page 18 – professional judgment used to estimate mortality from dams on hood river and sandy(?). What is basis for judgment? Comparison to similar systems? Need to see some hint of the logic involved.

Page 18-19 – How is the estimate of historical abundance obtained?? Need citations.

<u>Basic model analysis</u>
What is difference between current and historical abundance is because of change in capacity, but the modeling treats everything as density independent???

Approach also assumes all factors are independent of each other, but there may be interactions among the factors.

How is uncertainty dealt with in the "basic model" analysis? Is some sort of monte carlo approach possible?

There is a lot of uncertainty in the historical and current abundance estimates

Show table of current and historical estimates and all estimates on Page 19.

What are the impacts of hatcheries on current abundance estimates? (this is not as simple as only excluding 1st generation hatchery fish)

What about density dependence?

How well do the basic model analyses line up with the key and secondary threats designations?

Page 20, Section6.3.2, estuary – What if estuary capacity is limiting?

Page 20, harvest – Looking at reduction of harvest on fall Chinook in the 30-45% range. Is this appropriate for a listed species? This may fall into the category of "Extraordinary claims require extraordinary evidence." The reduced harvest is based on a mark-selective fishery – is there evidence that this will work?

Page 21, coho harvest – expect average harvest of 25% but also argue for weak stock management. Some weak pops should probably have zero harvest. How will weak stock management work? Is it consistent with 25% harvest?

Page 22, last paragraph, “Reducing hatchery stray rates to zero is not feasible…” – The paragraph then talks about weirs. There seems to be no consideration of the most effective means of reducing strays – i.e. eliminate hatchery production. The feasibility of this option should be discussed.

Page 23, “Ultimately it is believed that the proposed hatchery stray rates at different risk level goals (i.e. 30% for moderate risk, and 10% for low or very low risk) are feasible for most populations.” – I’m skeptical for a number of reasons, many of which are covered in the RIST report (e.g. pseudo-isolation)

Page 24, Tributary habitat threats – Because trib threat fraction is estimates as the remainder after considering all the other threats, it will have a big uncertainty. The uncertainty in all of the of the other estimates will contribute to this. It would be good to have to also some other means of independent estimate for comparison.

Page 24, “…EDT data…” – Should use term “EDT output” rather than “EDT data”.

Page 25, equation 2 – Should include the bottom line thresholds in the text that poor = 50 fish/mile, moderate = 100 fish /mile and high = 150 fish/mile

Page 25 – need citation for using 5.4% marine survival rate

Section 6.4.1 – Youngs Bay seems to written off as hatchery harvest zone – need an explict justification of habitat effort. Tell us why bother?

Page 99, Section 6.5 heading – SLAM stands for Species Life-cycle Analysis Modules

Page 99, “It is advisable to generate predictions from more than one model in order to evaluate the validity of each model.” – Agree completely that multiple models are a good idea, but this does not evaluate model validity. Validity is a measure of whether the model predictions are true. Comparing models tells you whether they are consistent, but not whether they are true. It is probably not possible to validate a PVA since the output parameter is extinction risk in 100 years, however various model assumptions could be validated by comparison to empirical data.

Page 99, last paragraph – Also note that genetic process can be slow.

Page 100, “Determistic models are…” The terms determistic, uncertainty, annual variability (process error) and stochasticity can be confusing. This paragraph is not exactly correct. Some clarifying defitions would be helpful.

Page 100 – Why not use SLAM to model current condtions. This seems a necessary step to see if the model is in the ball park.

SLAM – In general, the report does not have nearly enough information about SLAM to understand how the analysis was conducted. Simply pointing to the SLAM documentations (which was never actually done) is not sufficient. SLAM is a very flexible framework and any particular application needs to clearly state what was done.

SLAM discussion of results – The discussion of delays in implementation of results was interesting and seems useful. However, the discussion did not touch on what seems the most significant difference between the Basic and SLAM modeling - density dependence. Did the inclusion of density dependence change the perspective on the relative importance of different classes of recovery actions? Also, did SLAM provide any information on data gaps and monitoring priorities?

Chapter 6 Appendices A,B,C, SLAM parameterizations – The are not easy to read and contains tons of redundant information. This should all be summarized in a few tables that parse out the common transition values used for all analyses and the transition parameters that changed by population or scenario. There is interesting information about the parameterization, but it is completely buried. These complete tables and the SLAM files should be available on-line if anyone need all the details on a single population.

[AK Comments]

General comments on Chapter 6

Due to the length of the chapter, its appendices, and time constraints, I only made comments on those issues I thought were most important. Therefore, someone with intimate knowledge of the specific basins should review the details for those sections (pp26-99).

6.2 Strata level objectives

1) I would be more specific about whether the 2 criteria outlined at the top of p3 are both necessary (it could be inferred that it’s an either-or situation).
2) The arrows as symbols in Figs 1-5 make it hard to decipher where the point estimate lies (ie the head, tail, middle). I’d suggest just using simple symbols like filled circles or squares.

Estuary Habitat and Predation

There are some problems with the calculations of estuary mortality rates based on the analyses of Magnuson and Hilborn (2003). I outline them here:

1) Magnuson and Hilborn (2003) estimated a mean S_{tot} of 1.77% in estuaries with 100% natural shorelines that decreased exponentially to a mean S_{tot} of 0.5% in estuaries with 0% natural shorelines (which does mean a 30% decrease in S).

Conversely, however, mortality at the 2 endpoints was 98.23% and 99.5%, respectively. That means there was only a 1.3% increase in *M* across the entire gradient of human influence. Using these values, F_{human} = 1 - (0.9826 / 0.995) = 0.0128.

2) As stated in Equation 1, TEM = M_{total} * F_{human}. Solving for Equation 1 results in a human related mortality rate for fall Chinook and chum of 0.0128 * 0.50 = 0.0064, and for coho, steelhead, and spring Chinook a human related rate of (0.0128 / 2) * 0.40 = 0.0026. Both numbers are much lower than used in the plan.
3) Also, from a broader perspective, the regression results of Magnuson and Hilborn (2003) showed an incredible amount of variability about the mean response, but I don't see any consideration of that in the plan.
4) The same criticism applies to the calculations to adjust for estuary predation (p14) and mortality associated with tributary habitat (p18).

<u>6.5 SLAM model & appendices</u>

3) With respect to the comment on p100, other, more recent, studies have found important effects other than just density-dependence (eg, Zabel et al. 2006).

<u>SLAM appendices</u>

For coho (but also apply to others):

1) The estuary mortality calculations from earlier come into play on p6.
2) Why simulate only the mean and variance of the "climate signal" while fixing the years of the step changes (not "cyclic," as inferred on p100 of the chapter)? A better approach would be to analyze the time series in the frequency domain, estimate modes of variability, simulate the process, and then use a transfer function to translate them back into a time series of climate signals.
3) I am very uncomfortable with relying on EDT for estimates of p & c under historical conditions (p8). Their estimates were biased way high in the Snohomish.

Chapter 7: Actions

[AL Comments]

Table 7.1 – Not clear how columns relate to rows in some cases

Table 7.3 – The estimated mortality increase due to hatcheries was estimated in many cases to be quite large, and based on the figures in chapter 7 the plan appears to be relying on lowering this mortality substantially in order to achieve recovery. As I understand it, these survival gains are assumed to be achieved through reductions in the proportion of hatchery fish in naturally spawning populations. The actions in Table 7.3 all seem sensible, but there is little information provide to indicate how these actions will result in the stray reduction that seem to be at the core of the plan's approach to

hatcheries. It may be enough to say, as the plan does, that a combination of weirs, altered release strategies, monitoring and research will be sufficient to move things in the right direction, but our impression is that these are largely minor tweaks on the status quo.

Table 7.5 – Bigger riparian buffers are bad for fish?

[AM Comments]

1) Not impressed with "ecological integrity" and "ecological health" terms – these are mired with confusion in the ecological literature, and the short definitions provided didn't help to clarify/discern between them, in my opinion.
2) Lots of actions seem nebulous, e.g. "monitor", "explore feasibility", "move toward", "look into", "explore options" – I understand that a lot of these are research priorities, so maybe it would be worth separating the "on the ground" actions and "research actions" into two sections? Would highlight what we can get started on now (stem the bleeding), vs. what remains to be learned.
3) The modeled 90% stray rate of hatchery fish seems really really high compared to estimates I've seen from radiotelemetry studies in the Columbia for Chinook and steelhead finclipped fish (Peery, Keefer).
4) I know there's an entire section on implementation and lack of regulatory teeth (i.e., that these actions will all need to be voluntary), but would be good to have a sentence or two acknowledging that in this chapter in case someone doesn't read those chapters.
5) Table 7.4 #27, p. 12 – how is the "natural hydrological cycle" defined?
6) Table 7.5 #65-6 – who would be expected to do this? Any actions, really?
7) Nonindigenous species again… glad to see it and agree that predation is a major threat (maybe the biggest), but we also don't know enough (don't have the data) to assess effects of competition or of altered food web structure. Since there were research priorities included in other sections, I believe these should be included here too.
8) Are these tables of actions already prioritized? i.e., is #73 a higher priority than #74? Not clear.
9) Loved seeing the climate and population growth scenarios – these sections are great. However, would suggest adding nonindigenous species to this, since we don't have a good feel for how they affect population dynamics yet.
10) Again, tables are perhaps most useful part. They seem thorough, and encapsulate a lot of the text concisely and in a way that is comparable across populations. I think the economic analysis will add a lot as well.

[AN Comments]

Chapter 7. Strategies.   In this chapter, strategies are suggested for recovering Lower Columbia River salmon and steelhead from degraded water quality due to agricultural practice and toxics from urban and industrial sources for tributaries and for the estuary.

For the tributaries, only two strategies are listed:

Protect & restore headwater (Upland) rivers and streams (salmon and non-salmon bearing) to protect the sources of cool, clean water and normative hydrologic conditions. Implementing actions identified above, particularly to restore riparian conditions, will also improve water quality.

Provide more resources and incentives to small (non-metropolitan) communities so they have the infrastructure to better manage runoff from impervious surfaces

For the estuary, however, there is a much more comprehensive list of actions, which includes implementing best management practices for pesticides and fertilizers, identifying and reducing industrial, commercial, and public sources of pollutants, monitoring the estuary for contaminants and considering contaminant monitoring and cleanup when doing habitat restoration; supporting cleanup activities; and implementing stormwater best management practices. These are all excellent suggestions, and in many cases should be applied to tributaries as well as the estuary, although the degree of emphasis and resources needed would vary depending on the size and land use practices of the tributary, and the degree to which problems with toxic chemicals have been identified.

Thee other actions that should be included for both the estuary and tribututaries are:
1) to revise existing sediment and water quality standards as needed to ensure that they are protective of sublethal effects of pesticides and industrial contaminants in salmon. This would include support of the current revisions to the Sediment Evaluation Framework being developed and implemented by the US Army Corps, NMFS, US Fish and Wildlife Service, EPA, Oregon DEQ, Washington DOE and other agencies through the Regional Sediment Evaluation Team (RSET) process. (Details are available on the US Army Corps Web site at https://www.nwp.usace.army.mil/pm/e/rset.asp.
2) to support research needed to understand the effects of contaminants on listed salmonids and their prey base and collected needed exposure-response data to set protective regulatory guidelines.
3) to support the development and implementation of the Columbia River Toxics Reduction Work Plan and Toxics Research and Monitoring Plan, which are being developed by the multi-agency Columbia River Toxics Reduction workgroup (see USEPA 2009).

Also, either in the water quality of the impaired food web section (for both the estuary and the tributaries), something should be added about reducing concentrations of toxics (e.g., pesticides) that are harmful to salmon prey.

Section 7 Appendices. I didn't include any additional comments on the text of the appendices. All were similar, and included all the actions to address threats associated with toxic contaminants that were listed for the estuary. No priority locations, funding status, cost, and schedule have not been completed for any of these sections; I'm uncertain what the procedure will be for including that information.

Appendix D. Actions to address limiting factors and threats in the Youngs Bay. Actions to address limiting factors and threats in the Scappoose. Actions listed for reducing impacts of toxic chemicals in table look good, includes all identified for the estuary.

Appendix G. Actions to address limiting factors and threats in the Scappoose. Actions listed for reducing impacts of toxic chemicals in table look good, includes all identified for the estuary.

Appendix H. Actions to address limiting factors and threats in the Clackamas. Actions listed for reducing impacts of toxic chemicals in table look good, includes all identified for the estuary.

Appendix L. Actions to address limiting factors and threats in the Hood River. Actions listed for reducing impacts of toxic chemicals in table look good, although priority locations haven't been selected.

References (most are also added to references in Chapter 5 on limiting factors)

Carpenter, K.D., S. Sobieszczyk, A.J. Arnsberg, and F.A. Rinella. 2008. U.S. GEOLOGICAL SURVEYScientific Investigations Report 2008–5027. Pesticide Occurrence and Distribution in the Lower Clackamas River Basin, Oregon, 2000–2005. Prepared in cooperation with the Clackamas Watershed Management Group (Clackamas River Water Providers and Clackamas County Water Environment Services) and the National Water-Quality Assessment Program.

Jones, K.L., C.A. Simenstad, J.L. Burke, T.D. Counihan, I.R Waite, J.L. Morace, A.B. Borde, K.L. Sobocinski, N. Sather. S.A. Zimmerman. L.L. Johnson. P.M. Chittaro. K.H. Macneale. O.P. Olson. S.Y. Sol, D.J. Teel, G.M. Ylitalo, and L. Johnnson. 2008. Lower Columbia River Ecosystem Monitoring Project Annual Report for Year 4 (September 1, 2007 to August 31, 2008). Prepared Prepared by the Lower Columbia River Estuary Partnership with support from the Bonneville Power Administration. October 2008.

Lower Columbia River Estuary Partnership (LCREP). 2007b. Lower Columbia River and Estuary Eocosystem Monitoring Water Quality and Salmon Sampling Report. Prepared for Bonneville Power Administration. 70 pp.

Sol, S.Y., O.P. Olson, K.H. Macneale, P. Chittaro, and L.L. Johnson. 2009. Summary of Results of the Fish Monitoring Component of the Lower Columbia River Restoration Effectiveness Monitoring Project 2007-2008. Prepared for the Lower Columbia Estuary Partnership by the NOAA Fisheries Northwest Fisheries Science Center. January 2009.
U.S. Environmental Protection Agency (USEPA). 2008. First Five-Year Review Report for Reynolds Metals Superfund Site City of Troutdale, Multnomah County, Oregon United States Environmental Protection Agency Region 10. July 2008

U.S. Environmental Protection Agency (USEPA). 2009. Columbia River Basin: State of the River Report for Toxics. EPA Report EPA-910-08-004, US EPA Region 10, January 2009.

[AO Comments]

Table 7.2 – The table has specific recommendations prescribing harvest rates for coho salmon (the harvest matrices for OCN and LR). It also has vague recommendations about developing harvest strategies for Chinook. It would be very useful to include specific management actions for Chinook, including prescribed harvest or exploitation rates, to remove or reduce uncertainty associated with NMFS annual ESA guidance to the Pacific Fishery Management Council. This uncertainty causes a lot of problems in the pre-season planning process because the managers often do not know what the constraints on harvest will be until they are well into the planning process.

Priority Actions –

Youngs Bay - There seems to be a mismatch between the figures and the recommended harvest actions in associated tables for fall Chinook. Figure 7.2 indicates a planned reduction in harvest impacts, yet the recommended action is an increase in harvest of hatchery fish to reduce straying. Increasing harvest of hatchery fish should increase the incidental mortality of wild fish. For coho there are no specifics about how the reduction might be achieved.

Big Creek - This has problems as Youngs Bay.

Clatskanie – For both coho and Chinook, Figure 7.4 indicates intended reductions in harvest impacts, yet no actions are indicated in Table 7.10

Scappoose – This has the same problem as Clatskanie

Clackamas – Figure 7.6 shows substantial reductions intended for harvest impacts on coho and fall Chinook, with none planned for steelhead and spring Chinook. The only harvest related action in Table 7.12 is an increase in harvest rate for hatchery coho which is supposed to benefit coho and steelhead.

Sandy – Figure 7.7 shows substantial reductions intended for harvest impacts on coho, fall Chinook, and late fall Chinook, yet there are no intended actions listed in Table 7.13

Lower Gorge – This also has Figure 7.8 showing reductions in harvest mortality for coho and fall Chinook, with no actions listed in Table 7.14 to accomplish these reductions.

Upper Gorge – Figure 7.9 shows reductions in harvest mortality for fall Chinook and none fore steelhead. Figure 7.15 has one listed harvest related action and that is to discuss reductions in steelhead impacts in Zone 6 fisheries.

Hood River – Like the upper Gorge, the action listed is for populations that do not indicate a planned reduction in harvest impacts, while no actions are indicated for the one where harvest mortality reductions are anticipated. Also, for summer steelhead they intend move from a current tributary habitat impact of >90% mortality to a negative mortality rate of <-20%???? A negative mortality rate is such a neat trick, I'd like to know how they intent to accomplish it. Appendix L does not seem to shed any light on this. After referring back to the scenarios in Chapter 6, interpretation of these survival or mortality rates relative to pristine conditions is not at all clear.

[AP Comments]

Table of contents looks well-organized!

Definition of "Biological Risk Scenarios" - This definition isn't what I think of when I read this phrase. I would try to come up with a more intuitive title. Something like "Biological Objectives"

Definition of "Strategies" - I don't think this is the best definition. "broad statements" makes me think they're unreachable. How about something like "general approach for achieving recovery"? or "brief description of the plan for achieving desired threat category status" or something.

Figure 7.1 - shouldn't there be a circle in here? Threats and limiting factors help us determine priority areas and strategies, but then actions and programs are supposed to affect those threats and limiting factors, right? Also, this layout neglects completely socio-politico-economic considerations, which in actuality drive most of the priority areas and strategies.

Page 3 "Manage hatchery fish" - Not just hatchery FISH – the entire art prop program! This may include turning some of them off.

Page 4 - It would be useful if the entire strategy could be wrapped up in one or two sentences. E.g…."Because the LCR ESU is primarily limited by a lack of habitat, our strategy focuses on x, y and z…., with secondary emphasis on a, b, and c…."

Page 6 "Building on Past and Current Efforts**" -** Most of this section and the subsequent belong up in the intro or in a discussion. What I'd like to see in this chapter is a lucid, succinct, linear description: 1) how far we have to go; 2) why we're not there; 3) what can address those factors; 3) what we're going to do and why.

Page 7 - It strikes me that some of the strategies might be to "determine the impact on population status of restoring floodplain function" or something of the sort.

Page 8 cost estimates - Are the cost estimates in only to satisfy the requirement that cost estimates be provided, or are they meaningful parts of the prioritization scheme?

Page 9 Immediate Action - This seems like a key component of the overall strategy I would frontload it in the table and in the discussion.

Page 9 mitigation for climate change and human pop growth - Agreed, and I'm glad to see this in here. Is there any strategy to do so? In fact, I would include such a strategy up in the table.

Shouldn't there be some mention of strategies and actions that benefit multiple species or ESUs?

Page 9 "we believe" few chum - Any data to support this belief?

Page 9 "will lead to the development of a chum reintroduction strategy" - Lead to the development of a strategy? Isn't the goal to develop the strategy?

Page 9 chum recovery - What about making sure that habitat is suitable? Prioritizing areas for restoration?

Page 9 last paragraph - This would be stronger if you summarized the intent o f those sections.

Table 7.2
<u>Limiting Factor</u>: Loss of population traits from direct harvest (1a) and by-catch (1f)
<u>Strategy</u>: Manage fisheries so harvest impacts do not compromise recovery efforts - This factor and the strategy would both be improved with more specificity. E.g. "Limiting factor: increased adult mortality due to harvest" or "Limiting factor "selection against earlier-returning fish due to harvest" and strageis: "Reduce harvest rates" "Spread harvest proportionately across the run-timing"

Action I.D. #1 - What will this achieve?

Action I.D. #7 - Any actions to move toward that uni-laterally?

Action I.D. #10 - Why not the weakest population?

Action I.D. #11 - Unclear what this achieves.

All Limiting Factor and Strategies could use more specificity.

Action I.D. #15 - Growing evidence suggests that there may be significant competition either way. For this, and for all actions and strategies, how will they be revised as additional information comes to light?

Action I.D. #17 - It's kind of the whole program, not just the broodstock that are integrated or segregated.

Action I.D. #18 “adaptive management options” - ???

Action I.D. #21 - Why not investigate reducing total releases if this is the case?

Action I.D. #22 “what type/stray rates?” - Is it stray rates or composition of the population that you’re interested in?

Action I.D. #22 “Monitor stray rates for 9 years and begin evaluation for adaptive management in 2016” - In some cases, a lesser number of years might yield useful info (e.g. if for 5 years ina row >90% of fish returning to a population are hatchery fish, then one might want to take action before the 9 years are up.)

Action I.D. #23 - Is it stray rates or composition of the population that you’re interested in?

Action I.D. #23 - This is a good action, but needs to be structured so that other environmental factors are accounted for appropriately.

Action I.D. #24 - I don’t really care if these’ groups compete. I’d rather see competition between wild fish and those two groups reduced.

Action I.D. #25 - Don’t appear to be any actions aimed at microdetrital inputs…

General comment – some of actions have sub-components, and some don’t. To my mind, almost all of them SHOULD have sub components. I’d suggest keeping these to just the main issue, and adding an appendix that has sub-components, clearly defined as a policy task, a science task, or a policy task with scientific input, etc., defined for all.

Action I.D. #37 - I don’t see any description of restoring upland processes here.

Page 14 “**<u>Strategies</u>: Protect natural ecological processes; Restore floodplain connectivity/function, riparian condition, and channel structure/complexity” -** Overall comment on this table – most of these seem like mechanisms to get to some other, unspecified goal. What, in fish terms, is desired here?

Action I.D. #41 - I would like to see some discussion of long-term vs. short-term strategies. IN the short term, ELJs may be needed. However, ELJs shouldn’t be the long-term strategy – they should be a stop-gap for situations where the processes that would normally deliver large wood are being restored.

Action I.D. # 45 - Looks like you’re going to be using a lot of ELJs, but these don’t seem to be incorporated into a strategy anywhere, nor is its importance described. Are they going to be prioritized? Incorporated into a coherent long-term strategy (as above)?

Action I.D. #46 - Phew! This is a big one! Be sure to recognize and acknowledge that science informs, but doesn't have the last say – you get to bring economic and other concerns in as well.

Action I.D. # 47- This also seems like a tall order

Action I.D. # 48 - This also seems like a tall order

Action I.D. # 49- I would bet that all wood actions here could be combined into a single action with subcomponents.

Action I.D. # 54 - About what?

Action I.D. # 55- For what?

Action I.D. # 57- For what?

Action I.D. # 58 - Not sure what this means

General comments on action tables: 1) There are lots of verbs here, but very few subjects of these verbs. Would be useful to have some sense of who is going to do all this. 2) For a number of these tables, there are bit long lists. Is there any way to provide some organization within the tables. E.g. by sub-topic, by policy issue vs. "tangible product", or some other kind of thing?

Action I.D. # 74 - First mention of watershed status goals – what are they and how are they tied to salmonid population status?

Action I.D. # 76 - Any considerations for climate change?

Action I.D. # 78 - Good – though, obviously challenging to know what to do!

Action I.D. # 83 - I would guess that most users of sand and gravels think they are using them beneficially.

Action I.D. # 86 - This is a bunch of stuff in one action – education, monitoring, enforcement – I would suggest either having an umbrella action for this kind of set ("Reduce introduction and spread of nuisance invasive plants…") or separate and lump all education, all monitoring, etc. (following suggestion above, or action 87 fllows this set up quite well.

Action I.D. # 87, 88, 89, 90- I really like how the starter phrase for 87,88, 89, and 90 work. To improve these, somewhere we need to discuss why each one of these is helpful.

Don't see any actions in here about food webs.

Action I.D. # 95 - Might consider reducing total food base (e.g. hatchery salmon) for these terns as well. If not, why not?

Page 20 Would prefer a quick summary of chapter 6 sideboards.

Figure 7.2 - Survival impact compared to pristine? Does this mean that 0% is the amount of mortality that would have occurred historically (i.e. it's a relative measure)?? Tidying up the labels and figure legend to make this clear would be helpful.

Page 22- Again, does multi-species benefit factor into the prioritization at all?

Action I.D. # 118 - Nobody really benefits from considering something. (I certainly recognize that you have to consider it before it can happen, though….). Might try a different verb, though.

Table 7.8 Why are action ID # out of order?

Action I.D. # 115 - I'll make this comment again – I'm not quite sure to do with these things that are obvious first steps to fixing things but don't really provide any benefit (except perhaps economic stimulus for fisheries biologists) on their own. Somewhere, perhaps, it should be acknowledged that these are first steps and not "tangibles"

Action I.D. # 105 - Does this mean for presence of or potential for ELJs? If the latter, see my comments above.

Figure 7.3 - I'm not finding these graphs very useful. Can you summarize in a paragraph (and replace the paragraphs you have) what the priority actions are and why?

Page 24 paragraph starting with "Table 7.9" - Much of this previous paragraph is fluff. Perhaps add a column in the table to indicate whether it's addresseing a key or secondary threat, and eliminate the paragraph altogether. (This comment holds for all these write-ups)

Action I.D. # 205, 213 - "Need" is even verb worse than "conduct"!!!

Action I.D. # 202 - Reiterate previous comments – if this is ELJs (and even if it's not) I'd like to see the overarching purpose reflected in here.

Action I.D. # 301 - The level of detail between limiting factors and between populations reflects, likely, different people developing these tables and the actions within them. I would strongly urge some consistency between tables.

Action I.D. # 416 - This parenthetical comment on "Loomis property") makes me think this is an opportunity action (landowner willingness). Woudlike to see in the strategy some description of how these situations are dealt with – are they only pursued when they meet "key limiting factors" or does the political ease override? How about getting not so easy actions? What pre-work is being done?

Action I.D. # 551 - The action sentence makes no sense.

Section 7.3.3 - I am glad you included this section. Well done.

Page 50 addition 20% strategy - I am glad you included this section. - I like this strategy.

Page 50 Sentence begins "Once better estimates …" - This is reasonable, but for human population growth, there might be actions that can and should be taken now to help cope – I don't know what the constraints of recovery plans are, but how about identifying priority areas for preservation? Passing legislation to prohibit development in floodplains? Other such stuff.

Table 7.17 action begins "Implement credible, science-based programs…" - Any sense of priority on these programs, policies and rules?

Table 7.17 action begins "Future development in 100 year floodplain …" - These ones I"d definitely suggest organizing by "education/outreach" "planning" and other similar categories

[AQ Comments]

Table 7.1 – Should strategy 8 have check on hatchery management (i.e. do hatcheries ever affect water quality?

Table 7.1 – Strategy 12 should have check on "Hatchery Management" and strategy 13 should have check on "Fish Harvest". Hatcheries and harvest are intimately connected with each other and should not be considered in isolation.

Page 7, Linking Actions to Recovery Goals – Is it your best estimate that the actions are enough? Do you think they are a minimum or a maximum set of actions? Is there any sort of intetial bias (e.g. precautionary over-kill, do minimum set and see if you need more, etc.) What is the strategy here?

Page 8, Identifying Priorities and Costs – This section does not suggest any cost-benefit analysis; should that be part of prioritization?

Page 9, Immediate Action – Is it possible in the tables or the text to find out which actions would have immediate effect and should be done soon?

Page 6, six key elements of chum restoration – this list needs to include some habitat actions!!!

Action ID 9 – "Look into…" is pretty lame. Since this is identified as a key threat, need a little more proactive action.

Table 7.2, harvest actions – Need weak stock management of all species, need explict action for tule harvest, need connection to hatchery actions, any recommendations for non-LCR salmon fisheries (e.g. shad?)

Action ID 12 – Where are the existing "wild fish sanctuaries"? Can you show these on a map in the current status or background chapters?

Action ID 13 – Are you calling for marks in the entire Columbia or just LCR? For example Lack of marks on upriver coho is a problem

Action ID 15 – But can larger smolts eat more fish? Is there a trade off here?

Action ID 17 – Does this plan contain broodstock recommendations? How do Rogue River fish in Youngs Bay and Warm Springs fish in Hood Canal match this action?

Action ID 18 – Is this included in RME plan?

Action ID 19 – This needs to be Columbia wide, not just LCR

Action ID 20 – Any preliminary recommendations on placement and timing of weirs? Any new Wild Fish Sanctuaries planned?

Action ID 22 – Any re-introduction should be done in the context of a comprehensive wild fish sanctuary plan.

Action ID 23 – Is this experiment part of RME plan?

Table 7.3, Hatchery management – Need to explicitly consider release reductions. This is the most effective way to reduce hatchery impacts on wild fish and needs to be on the table!

Table 7.4 – Need to explain what “RPA” and “OR” mean in the context of this table.

Table 7.4, Hydro- Do these actions include the Sandy and Clackamas, or just the mainstem Columbia?

Table 7.5, habitat – A lot of these actions sound like management side-boards (e.g. Action 62) or planning philosophy (e.g. Action 46) rather actual actions. Many of these actions seem intended to make the plan non-scary to private land owners. While this may be n desired purpose of the plan, it seems a little weird to include these as actions. If the actions are going to emphasize the voluntary nature of habitat recovery, the risks and benefits of that strategy should be explicitly discussed in the plan. This is a policy, rather than strictly scientific issue and the two seem a bit muddled in this habitat action list.

Action ID 43, “ Work with federal forests to identify ways to improve access to available large wood.” Does this mean large wood for placement in streams or is this for harvest of timber?

Action 66 – This action is to protect land owners, not fish. The two are connected, but maybe the action is to increase beaver, then the implementation plan (which is not written yet) could lay out exactly what rules would work to make the action happen. Is people not killing beavers limiting salmon populations?

Action 70 – Is this phrased correctly? It sounds weird.

Action 74 – Good! (make sure this is in RME plan)

Action 80 – Good idea to prevent introductions; any idea how???

Action 82, “…willing landowners…” – Is willing sufficient – this sounds like another mix of policy side-boards and actions.

Action 86 – OK, some steps to address exotics

Action 88 – Good!

Other potential action areas – 1) Marine mammals, 2) catastrophic spills

<u>Section 7.3.2, site specific actions</u>

What is the basis for the site specific actions in this section – a brief review of methods.

Maps with each population showing the locations of the site specific actions would be really helpful to understand the spatial impact of each of the proposed actions.

A quick recap of the desired status at the start of each population section would help provide context

The figures on current and future mortality (e.g. 7.2) are a bit confusing and potentially misleading. The Y-axis is labeled “Survival impact compared to pristine” – this needs to be explained. It suggests that these are relative mortalities. The relative mortalities are interesting, but so are the absolute mortalities. It is probably clearest to show both. Something could show large relative mortality but small absolute mortality, which gives a different perspective on the import of that threat.

Terms like “stream restoration” or “riparian enhancement” are used throughout the population action sections. It would be help for a brief description up front of what sort of actions are considered in these categories.

Are there any chum specific actions in the population action tables
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page 21- Youngs Bay – Why do tributary work to protect out of ESU Rouge River stock? How and where will wild fish sanctuaries be created?

Actions 102, 120, 121 need to consider “pseudo-isolation” from split basin hatchery exclusion. Any reduction in hatchery production proposed? How will rogue stocks be isolated from Washington?

Action 310, what is “life cycle monitoring site”?

Actions 310-312 and 308, also apply to fall Chinook?

Action 421, what to do if excessive straying?

Action 417, what is evidence this may be happening – should be described in limiting factors sections.

Action 522 – what is impact of hatchery harvest on wild fish?

Action 548 – Pseudo-isolation?

Action 549 – Finally a hatchery reduction!

Action 550 – Just so long as they stay in the hatchery…

Action 551 – what species benefit?

Action 510 – Also Willamette superfund clean up?

Action 601 – good

Page 40, altered hydrology – How about a complete overhaul of western water law?

Action 615, "Limit future in river…" – how about limiting current withdrawals?

Upper gorge and hood river – Any actions to reduce predation in Bonneville pool?

Actions 915, 923 – pseudo-isolation?

Action 941 – still a lot of fish!

Action 944, 945 – good

Action 906 – Is this sufficient??

Section 7.3.3 - Since the actions are not quantitatively tied to gaps, how do you know if you are doing "20% extra"?

Table 7.17 – This is not a list of new actions, but perhaps a list of actions especially important because of climate change. Maybe these sorts of actions could be highlighted in the previous tables, as an indication that the might be priorities. The section could focus on actions that would only be done because of climate change, like non-intuitive location prioritizations.

Section 7.3.4, This section will be fleshed out once we have cost estimates from NOAA's economist" – This is not the only factor holding this up!

[AR Comments]

Having roughly prioritized the limiting factors the recovery plan presents a series of actions in Chapter 7 that address one or more limiting factors. The actions are fairly well detailed (certainly sufficient for the purposes of the recovery plan), although there is little empirical support for the various merits and successes of each action. Although the authors defer prioritizing actions for each population, the actions listed appear to be a reasonable set of potential remedies for each limiting factor. The exhaustive list of possible "actions" included many actions that were not exactly "shovel ready". They described processes such as: encourage, discuss, find funding. Other actions appear to focus on developing local stakeholder participation. While these are useful endeavors, it is hard to assess how they will ultimately contribute to recovery.

Harvest Element:

Harvest effects are clearly identified as a major risk to the majority of the populations discussed in the plan. Harvest management offers a potentially rapid avenue to reducing the extinction risk to a population; however, because of the complexities of ocean, estuary, river, and tributary management it is not clear if and to what degree harvest mortalities can be actually be reduced for specific populations. The problem is potentially more complicated by the fact that there is little if any data available to breakdown the harvest based mortalities for most populations. The majority of estimates are based on expansions of CWT hatchery fish for a few select basins. The recovery plan has a population-specific overall harvest rate target, but it is less clear how this change in harvest will be accomplished. Several approaches are discussed: selective fisheries, reduced harvest in certain areas, etc; but there is considerable uncertainty as to how successful attempts to reduce these rates will be. The authors argue that there is little uncertainty in harvest reductions; however, in most cases it is not possible to assess the true level of harvest until some time after the harvest year is completed. This is especially true with ocean salmon fisheries, where international agreements come into play (This is addressed in the Assumptions and Limitations section), and the information is often not available for years after the fact. In fact the authors assume that there will be little reduction in the ocean fisheries. Notably absent was any discussion of the potential to reduce salmon bycatch in offshore fisheries (non-salmon fisheries) or to what degree this affects run size (in the case of the Bering Sea Pollock fishery intercept considerable numbers of Chinook salmon, although not LCR Chinook salmon). Further research is likely necessary to establish the magnitude of indirect harvest (salmon bycatch in non-salmon fisheries), but it may be an important consideration in assessing sources of mortality.

Mainstem and tributary fisheries are under more direct local harvest management and potentially more easily modified; however, the success of harvest based recovery actions will require coordination with local hatchery programs and protocols (number of fish released, location of releases, specific marking protocol, etc). In an effort to maintain fisheries, the recovery plan basically allocates Youngs Bay and Big Creek as terminal fisheries areas with substantial hatchery production. Monitoring will certainly be necessary to ensure that there is not excessive hatchery fish “spill over” into other basins, as was the case with previous Rogue River bright releases from Big Creek hatchery. While concentrating high risk activities in a few basins offers some benefits it is basically a triage approach and may limit or preclude future recovery efforts in those basins. There is also some discussion of modifying harvest timing in order to minimize harvest on “wild” fish. The authors point out that this harvest strategy carries the risk of altering run timing in naturally-produced populations. Given that the run timing for naturally produced Lower Columbia River coho salmon populations is not well understood the consequences of this strategy are somewhat unpredictable.

Being last in line, harvest wise, tributary fisheries have only limited room for harvest reduction at the tributary level. In spite of the complexities of harvest management I think that the further reductions in harvest, especially for coho and fall-run Chinook salmon, would provide a more rapid and efficient method of reducing extinction risks – of course provided that sufficient habitat exists. I doubt that harvest rates in excess of 30-45% are sustainable for most naturally sustained populations, in part because of the small population size of many of these populations. In the absence of definitive markers most harvest analysis can only be done post hoc. The authors should provide more detail in the degree that harvest could be reduced in certain fisheries and which management avenues might offer the best chance of success. Selective fisheries, while appealing in theory, only work if well executed and enforced. Additionally, hatchery production is also closely linked with selective fisheries. Large scale hatchery production of marked fish for selective fisheries also results in the production of a small proportion (< 5%) of mismarked or unmarked hatchery fish. Even a small percentage translates into a large absolute number of hatchery fish masquerading as wild fish that may be even more numerous than the existing wild populations.

Ocean fisheries offer the greatest area for harvest reductions in Chinook and coho salmon, although politically they are the most difficult to change. Any reduction in ocean harvest, which is non-selective relative to population or hatchery/natural origins, would also result in an increase in the numbers of hatchery fish returning to the Columbia River. Strategies would need to be developed to ensure that these extra hatchery fish are removed via the fisheries or return to hatcheries, but do not stray and spawn in natural production areas. Ultimately, hatchery production may need to be curtailed in areas where there are continuous surpluses or straying problems. The management of in-river selective fisheries can be complicated, but it does offer the only practical way of undertaking population-specific harvest. As part of an overall selective fisheries plan the author suggested the use of weirs to sort out hatchery. This may have a number of non-desirable consequences, most notably the interruption of upstream or downstream migrations for a number of species. What is clear is that any harvest action will have to have to be coordinated with hatchery releases and RME.

The Harvest Element of the Recovery Plan does offer a number of actions to improve the status of populations. The actions are relatively well supported and predicted benefits appear reasonable, although there is very little population specific harvest data available to base these predictions on. Given the relative ease with which survival can be improved via harvest management it is unfortunate that there were not larger reductions in harvest. Possibly harvest could be further reduced as habitat capacity improves. The Harvest Element focuses on in-river and tributary fisheries, an area where the State of Oregon has far more management influence than in the ocean fisheries. This provides some certainty that many of the recommended actions can be realized.

Hatchery elements

Given the breadth of the discussion on potential hatchery effects I was concerned that there was not more attention paid to those hatchery programs that produce non-native or highly domesticated fish (especially the Rogue River Bright program, aka select area brights SAB). In contrast to statements made in the recovery plan I believe that there is data from Washington rivers in the Lower Columbia coastal tributaries that documents the introgression of SAB fish into fall-run Chinook salmon populations. Likewise, large numbers of Spring Creek NFH fall-run Chinook salmon, early-run coho salmon, and Skamania summer-run steelhead are released outside of their native basin or MPG. These programs, more so than others, have the potential to negatively influence the recovery of natural populations. In contrast, releases of Upper Willamette River spring run Chinook salmon into Youngs Bay, while undesirable, probably has a more benign effect on the recovery of local populations. Additionally, there is little discussion of the use of Deschutes River (Warm Springs) spring-run Chinook salmon in the Hood River. There certainly needs to be further discussion on the benefits to the ESU by establishing a non-native population. The TRT, in their evaluation of current status, gave the Hood River spring run a viability of 0 due to its out of ESU origins.

In Chapter 7, the recovery plan outlines 12 recovery actions (#'s 12-24). The majority of these actions focus on monitoring or actions to facilitate monitoring (marking). These actions are fairly general, in part because there is very little population specific information available on hatchery x natural interactions or even the magnitude of hatchery strays in most basins, without monitoring and its associated requirement for marking all hatchery fish, it would be difficult to develop hatchery recovery actions with any certainty of success. However, Action 17 - *For each hatchery program, utilize the type of broodstock (integrated or segregated) that scientific studies show has the least total impact on wild fish* – does not provide much guidance. There are only a few instances where specific hatchery reduction goals are put forward (e.g. Clackamas). Given that hatchery straying is acknowledged as a major impediment to population restoration in many basins it is surprising that a more definitive plan was not put forward. For example, a hatchery production reduction could be directly linked to the level of straying on natural spawning grounds – this reduction would stay in place until other methods of reducing the incidence of strays have been implemented. That said, the risk posed by hatcheries is clearly put forward, the mechanisms to monitor the magnitude of the potential for a problem are described (for example, we can't readily measure the actual competition effect of commingling hatchery and natural smolts, but we can establish that they are co-occurring during their emigration), and via adaptive manage one could implement the necessary recovery actions.

There was some discussion in the recovery plan about the restoration of populations in basins where apparently few fish currently return to spawn. It is not clear if these fish are returning to their natal streams or are simply strays from other populations or hatcheries. I am very hesitant about bring in fish from other basins, especially when in most cases the only available surplus fish are from hatcheries. Although there is some discussion of a process for reestablishing fish in a basin, I would like to see a systematic plan for evaluating basins and deciding on the preferred restoration strategy. The recovery plan identifies a number of chum and coho populations where the native population *appears* to be extirpated. These two species have very different life histories and one would imagine that different actions would be necessary. Chum spawn in the lower reaches (with the exception of the Cowlitz River) and may be more likely to colonize open habitat, whereas coho salmon may exhibit a higher degree of homing fidelity (with the possible except of hatchery coho salmon) and natural colonization may be less likely. In the chum salmon restoration section there is an extensive discussion of how the hatchery program should operate – which assumes that the hatchery option is the only option. Every effort should be made to establish whether indigenous salmon still exist before fish are introduced from outside the basin. In either case habitat restoration could begin immediately. Given the potential productivity of chum salmon, the populations could recover relatively under good habitat and ocean (nearshore) conditions.

Hatchery effects, like harvest effects, were identified as being major limiting factors, and like harvest effects there appears to be minimal reduction in normal hatchery operations. With the exception of a few programs there were no reductions in production or changes in broodstock. Many actions will ultimately be dependent on the results of monitoring, but if so, the recovery plan needs to give a clearer guidance on what those actions will be. If hatchery stray rates are well above acceptable levels will the hatchery production be curtailed immediately? Estimating the success of programs must be linked to the certainty that actions will occur.

[AS Comments]

Actions

Page 7-3 – what is the role of maintaining and perpetuating natural processes in terms of achieving the state goals? No mention of natural processes directly.

Page 7-3 – do you have anything more specific for goal definitions than what is in the footnote for diversity, integrity, and health?

Page 7-3 – the flow chart works, simple, yet to the point

Page 7-6 – A table summarizing current efforts would help make the point that a lot of effort has already been taken.

Page 7-6 – so if all this efforts has already been undertaken, what are the results from it? Any monitoring data that could help support these statements?

Page 7-9 – why does the chum salmon recovery paragraph seem so stand alone?

Table 7-5 – the first point about developing a sediment source analysis seems critical to any of the actions below

Table 7-5 Seems like identifying caveats to general actions is important. For example a large portion of the actions seem voluntary, so if we cannot influence direct actions then perhaps stating somewhere that this a major constraint to potential recovery?

Tables and figures to show potential reduction in mortality work well. You may want to change the title of the y-axis to % reduction in mortality rather than the current name. the current names seems indirect and is difficult to understand at first glance.

Does the report mention that actions which benefit multi-species take precedent? Seem logical

Seems like a summary analysis of all the watersheds with the most important for the entire ESU might be useful at the end of the watershed-scale analysis.

[AT Comments]

I was tasked with reviewing Ch. 7 and selected appendices. Chapter 7 was a summary of the proposed actions for each species/life-history type in various watersheds of the Lower Columbia area. Certainly, ODFW addressed all of the factors responsible for the population declines and listed potential actions and strategies the arrest the declines and initiate recovery. This was a comprehensive list.

A primary question that I had about the document was whether ODFW expected that all of the actions they deemed as essential needed to be initiated and to be successful (based on the assumptions made in Ch. 6). The list of actions for each basin is quiet extensive and identifies a number of actions to be undertaken, many which I assume would be voluntary. How did ODFW deal with this in Ch. 6? It appears that they made assumptions (example Ch. 6 p. 26-27 that 20 miles of high quality habitat would be restored for Young's Bay coho). Other than the opinion of the LCR recovery planning team, what evidence is there to support this? Improving twenty miles of stream to reduce the risk of extinction substantially seems to be a very big assumption. One mile could be improved in each of 20 watersheds or 20 miles in a watershed with limited potential to provide habitat for coho could be improved. Neither of these would likely make a contribution to coho recovery. If results of habitat work were predicted from EDT (p. 25), what support is there that predictions from EDT produce fish other than on paper?

I found that there was a disconnect between the strategy for addressing land management threat and the identification of actions. For example, the strategy was to "protect natural ecological processes…" (Ch. 7, p. 28). The action for streams where habitat complexity was lacking was wood placement. This could address a short need if concerns raised below were addressed. However, wood placement is not protecting an ecological process. Protecting ecological processes requires approaches much different than simple wood placement and the current rules and regulations for riparian areas on state and private lands fall short of this (see IMST Forest Report and Burnett et al. Ecol. Applications 17:66-80).

There was an implicit assumption that that placing wood in the channel was the primary mode of improving habitat quality. What was the basis for this? Cederholm et al. (1997 NAJFM 17:947-963) showed that wood levels need to quiet high to get increased smolt outputs. What levels are ODFW assuming will occur in the various watersheds? How likely is that these levels will be reached in any watershed, much less in a sufficient number basins to make a difference?

There were a number of other actions that neither were clear in their definition or their assumptions. For example, what does it mean "To protect/manage existing high quality habitat" or to "improve riparian conditions"(Ch. 7., p. 31). Where is the evidence to show that such projects can affect fish production?

My concern with the analysis is that it appeared that the Recovery Team assumed that the identified actions would happen as they describe and that the actions would be effective. I think that it is imperative that the Recovery Team explicitly state their assumption and then talk about the likelihood of this happening. This would have major implications to the recovery of fish in the Lower Columbia.

The issue of climate change was treated similarly throughout the area of concern. I would guess that the impact of climate change would vary widely in the area because of the geography, climate and topography. Hood River and the upper Gorge will be affected by climate change differently than will areas down river near the coast. Also, it was difficult to understand how some of the proposed actions would mitigate climate change impacts. As an example, how does placing large wood in the stream or developing benchmarks for beaver damage (which could lead to beaver removal) off-set climate change?

An editorial comment: The graphs showing the change in projected mortality currently and in the future are labeled "Survival Impact Compared to Pristine" on the y-axis but mortality in the table legend. This made it difficult to understand the graphs.

[AU Comments]

Table 7-1 Strategy 14 – Not clear how this addresses harvest or hatchery threats

Action ID # 10 – At the expense of weak stocks? explain this one more

Another potential action – Improving/creating hatchery indicator stocks for wild populations to help estimate ocean harvest.

Action ID 216, 217 – Is this hatchery fish straying to spawning grounds?

Action ID 552 – nothing is "permanent"; short-term (in season) vs. long-term regulation?

Table 7.17 – I like this!

Chapter 7 Appendix D

Page 1 – This is the same as table 5-10 (cross reference)

Table D-1 "Coho: Explore feasibility of mark-selective…" – does this replace current non-selective fishery?

Table D-1 "ChinookL Develop harvest management…" – what does this do to other pops?

Chapter 7 Appendix G

page 1 – table from chapter 5 (cross reference)

[AV Comments]

Page 7: "although there is less uncertainty related to the survival improvements to be gained from coho salmon tributary habitat actions than for those actions targeted at the other species or in the estuary." This statement could use some back-up.

Page 9: ". This, plus the fact that we believe that few, if any naturally produced chum currently exist in most of Oregon's LCR streams has lead us to approach the recovery of chum as a research project rather than a series of actions that are linked to developed recovery scenarios. The intent of this research project is to provide information that will lead to the development of a Chum" This is a great approach that, combined with active RME, has a great possibility of positively impacting chum populations over a wide area.

Tables 7.2 – 7.7: Again, the emphasis on collecting targeted data from which to improve and enforce recovery actions is a good step forward.

Table 7.7: Any particular programs for brook and brown trout?

In general, if I understand the work in Chapter 6 (will check to make sure), this is a really neat approach. The honest assessment of how much of a survival gain is necessary in order to reach delisting and then applying particular actions. Neat! My major comment is that there are still too many actions for the budget. Can the top, first, "stem the bleeding" actions be identified in each location. A START HERE road sign. That would be fabulous!

Table 7.17 Good luck – "Existing programs should be adequately funded and staffed to achieve their mandates"

And with this "Provide education and outreach to contractors, developers, and other resource owners" why not add, "improve science and statistics education to all students K-16 especially in rural areas."

Now I am serious (OK I was serious above too but don't expect it to get too far) "Future development in 100 year floodplain should be low impact development" – what development in 100 year fp???? – can't we just not have any new development in there!!!

Cost section: can anything useful be pulled from Lewis River Economic Models?

Appendix D-L – I don't understand what's different about these tables – costs will be added? Again, it would be nice to see the "Top 10 Actions to Stem the Bleeding NOW" list by population.

Chapter 7, Appendix C: Chum Strategy

[AW comments]

Note: Line number references start on the first page of the chum appendix.

I realize this is the "Reintroduction" section, but as general principle I would always first suggest agencies and others focus on natural re-colonization based on either surviving populations or strays from nearby populations. As chum have extreme cycles of population boom and bust, this is a particularly viable choice for this species. The authors seem to leap immediately into the idea of using artificial propagation to enhance chum runs, without first trying natural solutions and ensuring quality habitat restoration.

Estuarine, near-estuarine, and low elevation habitat issues should be emphasized more than they are in this document. While these are addressed in detail in other parts of the greater plan, they are so critical to successful reintroductions (or recolonizations) of chum salmon; they should have a larger focus here. Studies of steelhead or coho spawning and rearing habitat are generally not useful for chum salmon as the geography of habitation is so different. It has been hypothesized that eelgrass rehabilitation might actually be the best "reintroduction" plan for chum salmon in many locations. This may not be entirely true, but it does emphasize the differences in chum planning versus other salmonid species.

However, it is equally true that chum salmon do seem to be a good candidate for hatchery supplementation and if this program is implemented in a conservative fashion in tandem with a very strong and successful habitat rehabilitation effort, it should also be successful. Two possibilities not mentioned in this document (unless I missed them) are to use the returning chum salmon to Big Creek hatchery as brookstock (along with GR fish) and also to use broodstock (i.e. eyed eggs) from the Oregon coast (e.g. Nehalem or Yaquina stock), the trick is that there are no hatchery programs on the coast, so green eggs would have to be collected from the rivers.

Line 98: "Simply stated, given the limited quantity of brood stock available in the ESU for use in a reintroduction program, Oregon recognizes that the ESU cannot necessarily afford experimental approaches to reintroduction."

Perhaps this I too simply stated? What do the authors mean by "experimental approaches"? What they are proposing is a huge experimental approach. This should be better defined and seems to me to just be an excuse to avoid difficult decision on habitat rehabilitation.

Line 109: "Because chum salmon are considered to be functionally extirpated from Oregon tributaries in the lower Columbia River (LCR) (McElhany et al. 2007; ODFW 2005), a key element of this plan is to develop local hatchery brood sources that can be used for supplementation into targeted basins."

I would like to see the term "functionally extirpated" carefully defined in this document so readers do not have to refer to another reference for such a critical definition.

Also, the authors should be clear what they mean by "local hatchery brood sources for supplementation into targeted basins". Are they going to use 1) artificial propagation of local chum salmon populations (i.e. local to the river where the hatchery/egg box program is) to enhance runsize to benefit supplementation of wild runs or 2) are they going to take a non-native chum stock into a hatchery and try to “localize” it through running it through a hatchery program over several generations and then attempt to reestablish it in the wild, or 3) are they going to do something else. Just be clear what is being proposed.

Line 184 Figure 1.2.1. Map does not have Hamilton and Hardy Creeks on them and these are considered chum pops by WDFW and NMFS documents. Also what about river spawners in front of Multnomah falls outfall?

Line 218 and 237. Terms functionally extirpated and extinct used. Need to define these, as might assume they mean the same thing.

Lines 245-250. Why isn’t it equally likely these fish are “native” to the Oregon side? I would just report what has been documented and not include undocumented speculation.

Line 346 Rule and Maser 2002 is referenced on line 2245 (Rule, G. and J. Maser. 2002. Lower Columbia - Clatskanie River Watershed Assessment. Submitted to Oregon Watershed Enhancement Board), but is virtually impossible to fine. However:

Line 354 and others: Rule and Maser 2007 is not referenced in the citations (as far as I can tell) and is also unavailable. Is this a switch of a 2 and a 7, or are these different documents and one not cited? Rule, G. and J. Maser. 2002. Lower Columbia - Clatskanie River Watershed Assessment. Submitted to Oregon Watershed Enhancement Board.
Line 378. A survey of Carcass Creek (1990) is mentioned but needs citation. Also it says “this is the stream survey that consistently found desirably low levels of fine sediments within riffle habitats” but the next sentence says “It should be noted that habitat surveys in the Clatskanie basin are on the order of 10 to 20 years old, and there are many reaches that have never been properly surveyed.”

Would not this imply the Carcass Cr survey is useless or worse, very misleading. In 1987-1990 and 1997, chum were certainly observed in this creek during coho surveys, but in the 1980s they were observed in other creeks also, so information that old can be very misleading. Unless the Carcass Creek survey is actually more recent?

Lines 397-406. It is confusing to note that predation on chum fry by hatchery coho is also identified as a potential limiting factor in the Clatskanie subbasin (ODFW 2008), but there have been no hatchery releases of coho into the subbasin since at least 1990. How can it be a serious problem in 2008 if none were released since 1990? Strays? Whatever this is it needs to be more cleared written.

Line 353. The Rule and Masser date is important as at line 353 it says: “The ODFW Native Fish Status Report (ODFW 2005) reported that most of the historical habitat was accessible but the quality of the habitat has been greatly reduced. Rule and Maser (2007) reported that most of the migration barriers in the Clatskanie basin occur within the historic floodplains along the Columbia River." So these two documents appear to contradict one another with ODFW says "accessible, but poor quality" and Rule and Masser (20007) saying "migration barriers." Were their barriers in 2002, but not 2005 or was there access in 2005, which was blocked by 2007. More likely this is just different or unclear definitions of the terms, but it is important and should be clearly stated.

Line 509 – Need to include location of Gorley Springs on the map. I would also include "Crazy Johnson Creek" and include it in the discussion. Crazy Johnson Creek in the lower Grays according to WDFW, has not been modified to any large extent. So it would be interesting to know if chum have naturally increased or decreased here.

Line 588 – "(2) potential chum freshwater high intrinsic potential habitat based on geomorphic and landscape features;" "Intrinsic potential" should get at least a sentence definition, but more important, as far as I know the aspect of this is not yet published. I guess the word "potential" is meant to indicate this, but it should be clearly stated if they authors plan to use the published results of an intrinsic potential analysis in their selection.

***Line 607-609*.** High intrinsic potential (HIP) either needs a definition or at least an explanation as to why "StreamNet" would identify high IP. This is important as the term <u>may</u> be used throughout the document to mean different things (example Line 1779 and here). Definitions are always good.

"Potential Spawning and Rearing Habitat: To identify areas of high intrinsic potential (HIP) chum habitat within the Clatskanie and Scappoose population areas, the current known chum salmon distribution was first queried using StreamNet."

Line 912 **–** "Eyed-eggs from Grays River Hatchery will serve as the basis for broodstock establishment in Oregon." This is one of the most significant conclusions in the document in terms of "local" stock. Needless to say, Grays River is about the only location in the CR with sufficient "excess" production to provide sufficient eggs. However, the authors should also make sure they use any chum salmon naturally returning to Big Creek in their re-colonization program. While many may assume these fish are strays from GR or elsewhere, the evidence right now is just as clear that they are native.

Another possibility not mentioned is to use chum salmon from the Nehalem and Yaquina systems. These are coastal fish, but in many respects are from systems more similar to Big Creek than the GR fish might be.

Line 2707 – goes from metric to English system.

[AX Comments]

Need page numbers!

This plan covers only the coast strata, which is a significant missed opportunity. Planning should cover the entire ESU. Recovery will take some time –best to start as soon as possible. There may be actions taken for other species that also effect chum recovery, so it is important to consider the recovery of all species simultaneously. The lack of consideration of Cascade and Gorge stata seems a major shortcoming.

Page 3, "…Oregon recognizes that the ESU cannot necessarily afford experimental approaches to reintroduction." – This makes no sense. Any reintroduction is going to be experimental in that the outcome is unpredictable and adjustments are going to need to be made as things to go exactly as planned. Perhaps you mean that you intend to be very careful in the use of valuable broodstock? Do you mean something else? Be explicit.

Comments on the terms "extinct", "functionally extinct", "extirpated", "very high risk",etc.

For populations that that currently have very few or perhaps no fish, I think that the description as "extirpated or nearly so" is most appropriate; not "exinct" or "functionally extinct".

Although we (NOAA, ODFW, etc.) have not always been consistent on this, the absence of fish in a population should probably be considered an "extirpation" rather than an "extinction". Extirpation is a local event and, assuming conditions are permissible, recolonization is possible. Extinction often refers to a global event that is permanent. Based on our application of the ESA, loss of an ESU would be an extinction.

Showing that something is extinct can be challenging because it is difficult to prove that something does not exist. For example, prior to 2004, the ivory billed wood pecker was considered extinct. A recent paper demonstrates the difficulty in demonstrating with statistical confidence that a species is truely extinct as opposed to very rare (Scott et al. 2008). I consider the possibility that there are a few undetected chum spawning in the Oregon LCR far more likely than what ornithologists previously would have given for the rediscovery of ivory-billed woodpeckers. I would consider Oregon LCR chum extirpated or nearly so (i.e. very high risk), but not demonstrably extinct.

The presence of hatchery fish complicates things a bit, but the genetic influence of hatchery fish does not indicate that a population is necessarily extinct. For example, consider Big Creek tules; clearly lots of hatchery influence and lots of habitat problems. Still, I would not call them irretrievable extinct. There is some spawning in the wild and the hatchery stock is from the same ESU so could serve as a source for reestablishment of a functioning natural population. It would be hard, but I would guess easier than rebuilding ivory-billed woodpecker populations. My point is that I would not call Big Creek tules extinct.

The term "functionally extinct" that is used in the chum plan is confusing and misleading. It should be dropped. The term may suggest that extinction (irretrievable loss) is inevitable. These populations are not guaranteed extinction, though they are at extremely high risk and some may be extirpated.

We should be explicit and perhaps create a new category to describe situations where the original habitat for a population is currently inaccessible (e.g. Tilton Spring Chinook). However, this doesn't happen in the Oregon LCR - all of the populations have access to much of their historical habitat and the "extirpated or near so" description seems to fit the very high risk populations.

Even for populations without access to historical habitat, it is not always clear cut that a population is extinct. For example, some variation of Tilton spring Chinook stock is present in the Cowlitz hatchery and spawning downstream of the dam. The population might be considered displaced (and genetically degraded) rather than extinct.

Whether a population is considered extinct will affect management decisions. If a population is considered extinct, it is gone forever and there is no need to consider it at all in management planning – it doesn't exist. However, if a population is considered extirpated or nearly so, the effects of management actions on the population do need to be considered. If recovery of the population is considered important, actions need to be consistent with either recovery of the remnant population, natural recolonization or reintroduction (or some combination).

Literature Cited
Scott, J. M., F. L. Ramsey, M. Lammertink, K. V. Rosenberg, R. Rohrbaugh, J. A. Wiens, and J. M. Reed. 2008. When is an "extinct" species really extinct? Gauging the search efforts for Hawaiian forest birds and the Ivory-billed Woodpecker. *Avian Conservation and Ecology - Écologie et conservation des oiseaux* **3**(2): 3. [online] URL: http://www.ace-eco.org/vol3/iss2/art3/

Page 3, Forward, "… a key element of the plan is to develop local hatchery brood sources…" – What about habitat as key element?

Page 3, Forward, last paragraph, "…artificial propagation…short term measure…" – Yes!

Page 3, Forward – last paragraph suggest that chum are addressed in other parts of the plan. They are not; this appendix is it.

Section 1.2- Discuss microhabitat needs like upwelling.

Section 1.2 – What do you think was the cause of the decline?

Page 8, "Primary and secondary limiting factors and threats…" - it is not clear in this sentence which factors are primary and which are secondary.

Page 9, “The extent to which hatchery releases of coho salmon have affected chum salmon fry has not been evaluated.” – but what does the literature say??

Page 15, “There are ten populations…” – should be “There *historically were* ten populations…”; some may be extirpated.

Page 15. “A hatchery supplementation program designed to increase…” – this sentence is weird.

Part Two – are there any lessons to be learned from the Hood Canal chum recovery efforts?

Section 2.1, first paragraph – again, this is a reintroduction and it will be experimental.

Section 2.1, Framework for CRS development – This list needs to include habitat actions!!!

Section 2.2, Existing spawning and rearing habitat – You say current information does not include key metrics. What are those key metrics?

Section 2.2, Potential spawning and rearing habitat – Analysis uses a 1% accessibility threshold and claims this is “conservative”. The term “conservative” is very ambiguous in this context. In some cases, chum have be document above reaches with 1% gradient, so the maps used by ODFW may be a minimum historically accessible area. It is unclear whether that is “conservative”. It is better to explicitly state whether you think the method used will be biased toward over or underestimate the amount of habitat. I suspect that the method used will underestimate the extent of habitat accessible to chum. However, it will tend to overestimate the amount of habitat used by chum, because not all the habitat that is accessible can be used.

Page 22, “…se recommend that physical habitat surveys be initiated…” – Yes!

Page 22, What about the idea that chum spawning is depending on upwelling and hyporheic flow? How important is this in plan development? How can upwelling be measured

Overall – What about habitat actions???

Page 28, Framework element 4:…Program Duration – Despite the title, this section does not describe program duration. How long is the hatchery expected to be in operation?

Page 33, How good is homing fidelity of chum in other hatchery systems. (need quantitative info).

Page 34, artificial spawning channels – I agree with the conclusions about artificial channels; a natural process is preferred.

Overall - How long are you planning to do reintroductions? Hatcheries are a conservation action of last resort.

Part 3 – What will be the marking strategy for hatchery chum?

Strategy 3.2.1 – Risks should include domestication and the inability to measure natural productivity. The ignorance (lack of info on productivity) caused by hatcheries is often overlooked, but can in itself be significant risk factor.

Action 3.3.1(d) – This requires relating habitat to chum, which is a good thing, but what are you going to use for fish data? How will you get a predictive model? Will your program collect sufficient data?

Action 3.3.1(f) – What are the "restoration projects" that you think will help chum. Need to be more specific.

Strategy 4.3.1 – good strategy.

Action 4.3.2(b) – good action

Strategy 4.4.1 – Think though measuring natural productivity – hatchery fish can really confound these estimates.

Monitoring – What about estuary studies focused on chum?

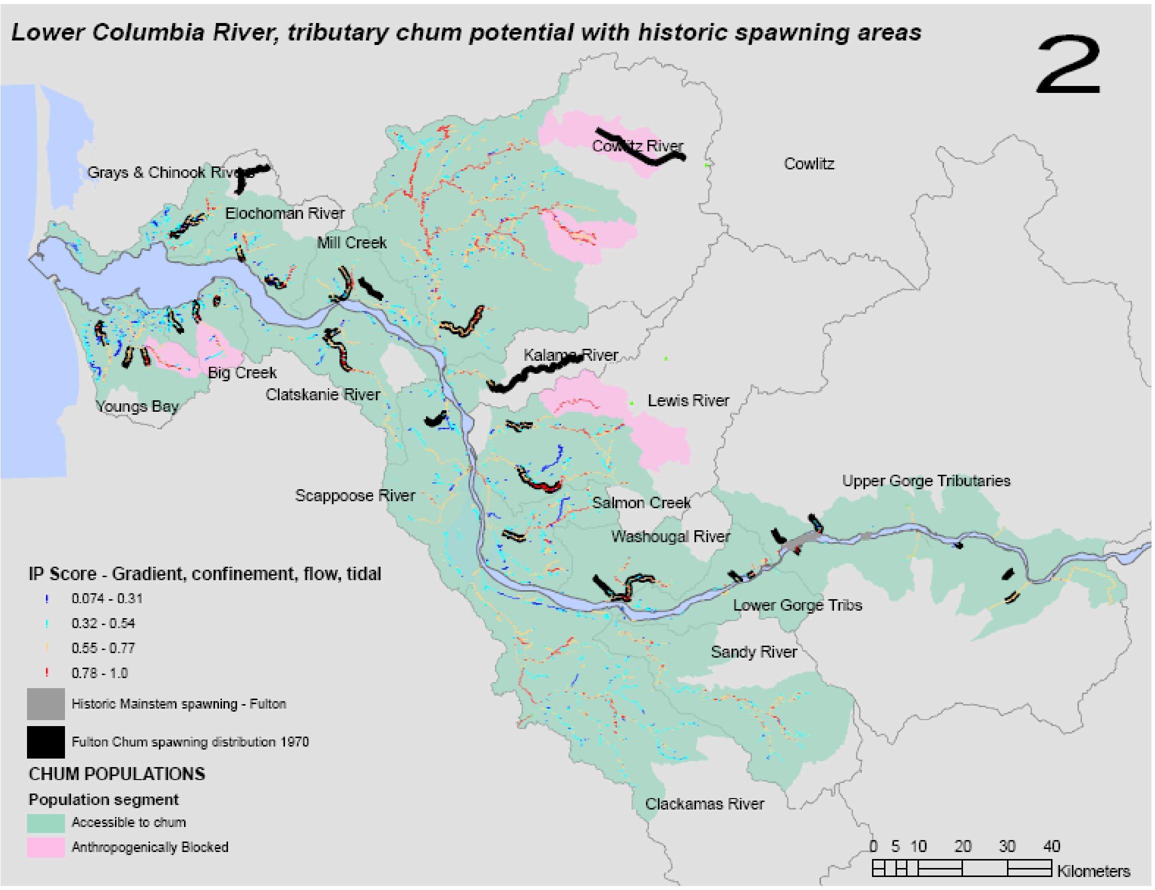
Chum Appendix B, HSRG recommendations – HSRG conclusion #4 "Programs should include a sunset clause that would suspend the hatchery program after 3 generations…" – I totally support this recommendation. The issue of program duration was completely ignored in the plan.

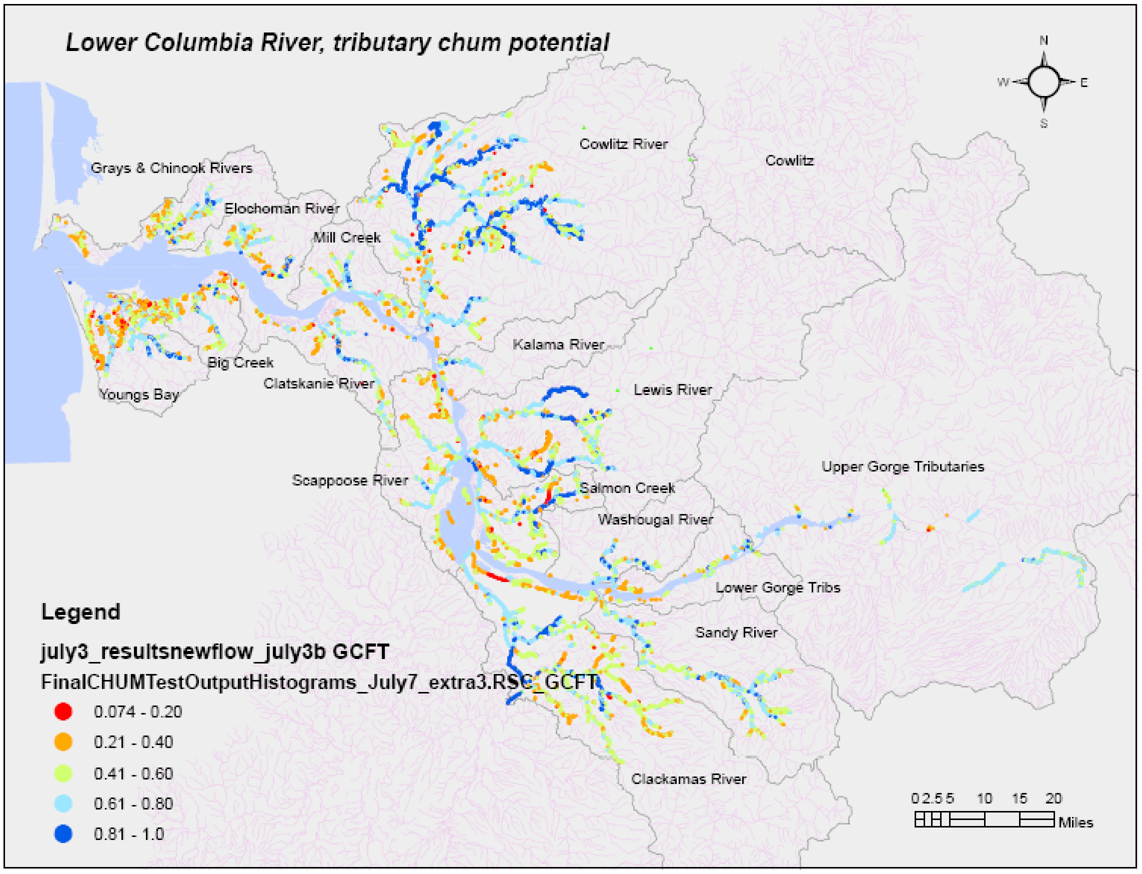
[AY Comments]

Comments on Chum IP model
Interesting, because I had thought the only stuff with Chum in Oregon had been done by the Wild Salmon Center, and their curves (even if from ODFW) were considered to be appropriate for coastal chum streams. We've been using the 5% gradient cutoff, and the breaks suggested by WDFW (2000) from one of their habitat manuals - 0-3% useage; 3-5% pasable / will pass through, 5%, no passage. The ODFW details you mention are extremely conservative, considering that in WA our "historical" river-level documentation of chum extends way upstream of >1% gradient streams (see attached Fulton map). I didn't yet look at the map they are referring to in the recovery plan.

This is one source of gradient info for chum, but have seen other sources that put them passing 1%, and I'm seeing this also in the fall chum index reaches I'm mapping in Puget Sound. The limited historical info (shown in the Fulton map) we have definitely supports that they pass through 1-3% gradients, though likely use mainly spawning habitats of <2% gradient.

A map of the first Chum IP model I came up with, that "best" represented the limited data I had, including Gradient, Confinement, Flow, and Tidal influence reflects this as well (GCFT attached), though I am modifying this model to include the following (which will negate the inclusion of confinement), but the dark blue areas of highest IP will still be dark blue, but will extend lower in the streams near confluence with the Columbia river, and areas higher in the watershed will have lower scores than in this map (reaches >3% gradient in totally snow driven hydrograph watersheds or totally rain-driven regions):
1. a channel type/hyporheic potential metric, which will give higher scores to channels within these gradient ranges with highly complex habitats (or those that intrinsically have these characteristics - floodplains/braided and meandering channel types).
These will include many many kms upstream of 1% gradient reaches, as well as reaches lower in the LC rivers including the areas they mention (excluding lower trib sections in major tidal influence - downstream of Cathlamet in the columbia), the reaches themselves - meeting the channel types characteristics will l;ikely be in channels <2% or <1% gradient, and,
2. a scour potential threshold, which will limit high potential reaches for chum in rain or snow dominated systems to streams with <3% gradient. Rain on snow or transitional systems will not be affected by this.





Chapter 8: RME

[AZ Comment]

p. 7 and 8 – What is rationale for saying recovered if recovery goals are meet in only 6/12 years? Are recovery goals an average target or a floor? Second, I found the description of the calculations to be very confusing as it relates to evaluating recovery. In particular, the 6/12 business seems to be applied to estimated post-harvest recruits assuming that recovery has occurred.

[BA Comments]

Page 3 – describe relationship between TRT criteria, listing and delisting.

Page 4 – nice example with fence

Page 5, Key question, "Do all the strata that historically existed have a high probability or are clearly trending toward a high probability of persistence?" – This "clearly trending" language is a weird political artifact. The estimates of persistence probability include a consideration of trend. The "clearly trending" language describes a probability of a probability. This is awkward language – why not just multiply the probabilities and say that that is the acceptable risk. Given that the determination of "high persistence" is often rather qualitative, this a bit of semantics, but it is unnecessarily confusing.

Section 8.4.2 – Some of these analytical guidelines came from the TRT and should be cited.

Page 6, “Measurable criteria - abundance and productivity” – This is introducing yet another set of viability criteria that were not used in the current status evaluation, gaps analysis, or scenarios. Do we really need so many different metrics?

Page5 and6, Steps 1 to 7 – should this be included in chapter 4?

Figure 2 – Should consider measurement error. Kalman filter process?

Page 9, RME needed to assess abundance and productivity – should note that these are important things to measure no matter what actual metrics and thresholds are finally used for assessment.

Section 8.4.3 – cite TRT for criteria

Page 13 – Do maps of potential spawning sites exist for the spatial statistics?

Page 13 SVB – I like the idea of applying spatial statistics to this problem, but I’m not sure the null models are really applicable in such a heterogenous environment. Not all sites are equal. The threshold suggested (devotion from random) may not be appropriate.

Page 15, Critical research uncertainty – I would add a third point which is the relationship between spatial structure and viability. We need to know how much is enough.

Page 15, Divesity metric #1 – this is not “Gene Flow”; this metric gets at effective population size, which is a different problem.

Section 8.4.4. Analytical procedures… - This section should discuss hatcheries, measuring selection pressures (e.g. is harvest phenotypically selective), and climate.

page 18, Critical reseach uncertainty #1 – Good to look at climate and diversity

Page 19, Evaluation of thresholds for habitat related metrics – Trends should be statically meaningful.

Table 2 – This table shows additional miles. It would be good to also see current miles to get a sense of what is going on in the basin.

Page 22 – Effectiveness monitoring is supposed to detect a 30-50% fish response. Over what time frame?

Page 23, hydropower – Do these address Bonneville?

Table 3 – what about other coho pops? Fall Chinook harvest rates are high.

Page 26 – Why not use a harvest matrix for other species?

Page 26, status and trend monitoring – need to make sure harvest estimates include bycatch harvest in non-target species fisheries.

Page 26 – why just marine survival estimates for coho? Why not other species?

Page 27 – Should also evaluate whether harvest is phenotypically selective (e.g. size, age, timing, etc.)

Page 29, disease related metrics – There are no disease metric identified; is there really no monitoring for disease?

Table 6 – these summary goal table are really useful; they should be included in the scenarios chapter.

Page 34, other risks – Other risks that may warrant montoring are catastrophic threats, climate change, invasive species.

Page 36, section 8.6.1, integrated monitoring – integrating monitoring plans is a really good idea!

Page 37 – I have heard argument that the late fall Chinook is the only fall Chinook in the Sandy, but I have not heard that case before for the Clackamas. What is the evidence???

Figure 3 – need details of the GIS analysis or final citation.

[BB Comments]

The monitoring component of the recovery plan is one of the strongest points of the recovery plan. The recovery plan outlines specific monitoring tasks for evaluating the status of a population or the success of recovery actions, but also identifies several higher level questions that are important to understanding more complex relationships. For many listed populations in the Lower Columbia River there is a near absence of even the most basic information. Where information is available there are concerns about precision and the applicability of this information to other populations. The monitoring schemes put forward in the recovery plan will do a good job of improving the accuracy of current status estimates, but will also contribute to the success of the recovery program. There were a number of monitoring and evaluation areas where the actions were to be determined (TBD) at a later time. It was not clear if the actions were going to be specified in later drafts of the recovery plan or if they were going to be developed during the recovery process as more information became available. There is considerable uncertainty in the potential for success of any one recovery action or suite of actions, therefore, intensive monitoring will be necessary. The plan also outlines a plan for reviewing monitoring data "check-ins" and revising the recovery plan where necessary. This is one of the strongest sections of the recovery plan.

[BC Comments]

General Comments:
Chapter 8 of the Lower Columbia River Recovery Plan focuses on the components of monitoring and evaluation. The chapter is comprehensive in extent, covering the key issues identified in the guidance for recovery monitoring and evaluation. Many of the details for monitoring including the metrics and sampling design are anticipated to follow from an existing body of work and experience with Oregon Coastal coho populations. The coho work provides a useful conceptual and analytical foundation for Lower Columbia salmon and steelhead, but there remains important uncertainty in the implementation and utility of those approaches with different species and environments. Critical uncertainty research will be important to resolve not only important biological and physical process constraining population responses, but also very basic issues of monitoring efficiency, effectiveness, design and analysis. The monitoring and evaluation chapter is clearly a work in progress and many of the details remain to be defined. Given the broader experience in development of other recovery monitoring efforts there are at least two particular issues that might benefit from further discussion. One involves the analyses of bias, precision, power and information content in monitoring data; a second is associated with compilation, standardization, and management of information from multiple/diverse data sources. These are not new issues or limited only to the monitoring anticipated in the Lower Columbia recovery plan. In its review of the Recovery Monitoring and Evaluation plans for the Puget Sound, Upper Columbia, and Lower Columbia Washington the RIST outlined these as key issues for further consideration.

Bias, precision, power represent common challenges to all monitoring efforts. The tradeoffs between resources expended and the information gained as a result is critical to avoid wasting limited resources. Refinement of the monitoring plan might consider more detailed guidance for: 1) quantifying variation and validating metrics and sampling methods; 2) standardization of methods and protocols along with careful coordination among programs and training of field crews to reduce measurement error; 3) monitoring design that builds on applications with the species and environments in question through periodic evaluation review and revision of methods and resulting information. This latter point may be particularly crucial, because the sooner methods that are known or suspected to have important limitations can be refined or abandoned the sooner resources can be focused in more effective or more appropriate ways.

Compilation and management of the complex information anticipated with recovery monitoring is also a common challenge facing most recovery efforts. It has proven easy to suggest standardization and coordination, but difficult to accomplish. Efficient programs will in most cases require an iterative process of design, test, and refinement that begins as early as possible. Some of the plans have taken important steps in this process, others are just beginning. In its review of other draft RME plans the RIST suggested the following points for consideration:

- Define Objectives. Clarify the questions and anticipated outputs to insure data and data base structure will be compatible with and support the analyses required to answer them.
- Clarify the needs of participants. Plan for coordination, communication, and buy in among participants. The governance section of the Puget Sound plan and the identification of protocols and responsible parties in the Upper Columbia plan provide excellent guidance to ensure that scientists, resource managers, NOAA analysts, and decision makers understand and agree on what data will be collected and what information is required, and assembled to answer the questions and meet the objectives.
- Define roles and responsibilities of the participants. Identify timelines and deadlines for data collection and data entry and sharing.
- Identify funding sources. Determine stability and adequacy of funding for individual and common objectives. Seek collaborative solutions for individual and program wide short falls or limitations.
- Agree on protocols and terminology (e.g., a data dictionary). Resolve method and data standardization vs. information standardization.
- Establish consistent and thorough metadata requirements. Metadata should, at a minimum, include details of the scale and grain of sampling, spatial and temporal references, standardized field methods and units of measure, and the organization and personnel responsible for the data.
- Define the processes for filtering, proofing and correction, translation and reporting of existing data to common format.
- Establish the framework and infrastructure for data entry, management, storage and retrieval. Clarify where it will be, what data management system and formats will be used, and how it will be maintained. The data management framework could be centralized or modular and dispersed with a relational structure. In either case it will be important to insure that all participants can access and summarize information for local needs without duplication of effort or conflict with local objectives. The decision regarding structure may depend on existing programs or other resources available for support. In many cases there may be some advantage to work within or adopt an existing data base structure rather than starting from scratch. There are a variety of ongoing monitoring coordination and data management efforts within the Columbia River basin that might be explored (*Reference the table summarizing existing data management efforts*).
- Provide for long term maintenance and security.
- Implement, review and refine. It will be virtually impossible to anticipate all of the issues in compilation, coordination and data management. An iterative process of implementation and review as soon as possible could be key to recognizing and resolving critical problems, minimizing wasted resources and maximizing the utility of resulting information.

Notes on governance???I haven't had the opportunity to review the rest of the plan, so I'm not sure how strong the governance structure is. The Puget Sound and UC plans provide good examples of coordination among the parties to insure consistent implementation, clarify responsibilities, resolve issues etc.

Specific Comments to the text:

P.2.

The draft is intended to "*address questions of metrics and indicators including frequency, distribution, and intensity of monitoring*". The current draft provides an excellent foundation for RME guidance and identifies many of the metrics and indicators. The details of sampling for status and trends in abundance follow from existing methods developed by ODFW for monitoring coho populations that include sampling frequency and intensity and statistical framework for sampling distributions. The draft outline proposes levels of precision as objectives of the work, but it is not clear whether this precision is realistic. Much of the methodology for application to interior basins and other species remains to be developed. Until some pilot work can be accomplished it will be impossible to know whether the sampling design is adequate for the questions at hand.

"*Evaluate the adequacy of existing monitoring programs …*" although the chapter does mention other ongoing work and much of the anticipated sampling is based on existing work with coho, there is no review of existing programs and gaps or inconsistencies that may be important to accomplish the tasks outlined in this plan.

P. 3. "*What are the uncertain relationships or conditions that are critical to making good decisions*" The plan does a good job of identifying critical uncertainties that will be important for further research. In the context of useful information, however, this question might be rephrased or extended to consider how uncertainty may influence the ability of monitoring to detect meaningful trends or changes. Clearly there is much that is not understood about the basic relationships between environmental conditions and salmon or salmon habitat responses that will need to be addressed in the future. But, the capacity to gather meaningful information on basic trends such as population abundance, survival and productivity can be seriously constrained by the sampling errors and inherent variability in processes already understood, but difficult to monitor.

P. 4. "*Firman and Jacobs (undated)*" This work provides a good foundation for sampling design for the status and trends monitoring for abundance and productivity. The e-map site selection and rotating panel should provide the capacity to evaluate inherent variability and the efficiency associated with different levels of sampling intensity. The report does not quantify sampling error or the nature of variation associated with the systems where it has been implemented. The basic framework should transfer to the lower Columbia and new species, but the level of effort required to meet the levels of precision remain unknown. Existing methods are an appropriate place to start. It seems important however to provide some guidance to evaluate and refine the methods as data become available for different species and environments. Limitations associated with detection errors for visual methods could also be a big problem contributing to bias and unknown sampling error that might be important to note as well.

P6-9 Analytical guidelines, abundance and productivity

The approach incorporating elements of abundance and productivity to produce an annual level of abundance as a recovery target is interesting and seems quite innovative. The objective of detecting a change in abundance estimate of ± 30% with 80% uncertainty is consistent with draft guidance from NOAA, but it doesn't seem to follow from the process outlined here. In other words the objective of the methodology is to determine whether observed abundance is less than the composite (abundance-productivity) goal. The reference to a "*percentage standard error no greater than 0.40*" is also confusing. Does this mean a standard error of 0.40 or .40%? If the former it would seem that the anticipated precision could be relatively poor equating to a CI on the abundance estimates of approximately 80% of the mean. The application of estimated precision for answering the recovery question is also not clear. Would a comparison of recovery and estimated abundance be based on an estimate significantly higher than "recovery", not significantly different than "recovery", or significantly lower? These details are obviously beyond the scope of the current draft, but they will be important to consider before or very early in the implementation of the monitoring work.

P. 10 Critical uncertainty research

Each of these seems important to an effective monitoring effort. Presumably new information on variation in distribution and the efficacy of visual methods will be absolutely critical to understanding the bias and precision of monitoring efforts. It might be useful extend the discussion of these elements and emphasize their importance to the overall effort. Without this kind of information it will difficult if not impossible to judge the utility of the monitoring efforts. Considerable time and expense could be wasted until information like this is resolved.

P. 10-14. Measurable Criteria Spatial Structure

The general approach to spatial structure seems appropriate. The relatively simple concept of proportional occupation should provide a direct and efficient means of monitoring since measurement of presence can be considerably less expensive and uncertain than more traditional measures of abundance. There is also a considerable literature and experience with application that can be used to guide the process. There may be some important issues in application, however, that will still need to be addressed. This plan references the percentage of "sites" occupied or not occupied but also mentions "patches". It will be important to define precisely what is meant by a site or patch and clarify the relevance to the recovery criteria. Since occupancy strongly depends on the grain or resolution of the sampling unit, the capacity to measure patterns and detect change will depend on that resolution. For example salmonids may occupy a very high proportion of streams in a basin, but a much smaller proportion of habitat units. Changes in proportional occupancy can be very difficult to detect for sampling units that are relatively few in number and much easier for those that are large, but the biological significance of small units (e.g. habitat units) may be meaningless in the context of recovery (e.g. numbers of local populations within an MPG) or the ecological interpretation of spatial structure (representation of uncorrelated environments that may serve as demographic sources). "Occupancy" or more appropriately "absence" also is not a trivial metric. Presence of individuals in samples is proof of occupancy, but absence can not be proven. The problem is that frequency of "false" absences depends on the abundance and distribution of individuals, the sampling method and intensity, and the grain of sampling. This can be particularly problematic for species that are rare or patchily distributed or as species and populations decline in abundance and distribution leading to errors in estimates that vary with habitat and environmental conditions and species abundance. Fortunately there is a substantial body of work developed to help deal with these problems (e.g. Wintle et al. 2004; MacKenzie, et al. 2002, 2005, 2006). USFWS (2008) provides an example of these issues anticipated in bull trout occurrence monitoring. Some modeling relevant to the bull trout problem for example indicates that detecting a change of ± 15% in occupancy of bull trout "patches" would be virtually impossible (USFWS, RMEG unpublished data), but that result depends on the underlying assumptions, the number of "patches" and the details of sampling within each patch.

P. 15. Critical uncertainty research

In addition to the characteristics of species distributions, it would seem that the basic issues of species detection and measurement of occupancy will be important to address early in the implementation of this work.

P. 15-17. Diversity

This section is still largely undeveloped, but the key metrics outlined will be challenging to measure. Given that there is considerable uncertainty about how and what to monitor, it seems like a step back to first principles might be useful. Stratifying the occurrence sampling (anticipated with spatial structure above) by distinct environments that are presumably the template for the expression of diversity a start might be made. Could the spawning/rearing habitats be classified along gradients of stream power, hydrologic regime, temperature or climate to reflect distinctly different environments and then ask the questions of how well each strata is represented?

P. 20 Analytical procedures

The methodology referenced in the ODFW 2005 Coho report provides an excellent foundation for monitoring of habitat related listing factors. Comparison of monitored habitat conditions to undisturbed "reference" sites to gauge departure from pristine conditions has been a common goal in monitoring across the region, but it is often complicated by relatively high variability in individual parameters and limited power to detect meaningful trends. That appears to be a problem in the coastal region, but it is unclear how those methods and relative power for trend detection will transfer to the lower Columbia. Given that the methods will still require some development it seems particularly important to establish a review or pilot process to critically evaluate the utility of any new information.

P. 36 Integrated monitoring plans

It is very important to acknowledge the need for coordination in the recovery monitoring. Presumably this effort will engage multiple agencies and partners with varied missions, capacities, and monitoring histories. Integration of information from diverse sources has proven to be one of the most challenging problems to large integrated monitoring efforts. The resources available through PNAMP should be helpful, but unless a clear process for coordination and governance of the different elements is created the problems of integration could seriously constrain utility of these efforts. It is not clear at this point in the plan how standardization in methodology and the coordination and allocation of sampling resources consistent with an effective monitoring design can or will be accomplished. That may already be in place, but further details would be useful to anticipate issues likely to emerge. If that is not yet complete the monitoring plans for Puget Sound and Upper Columbia provide potentially useful examples of anticipated governance structures to overcome the many of the issues anticipated in coordination of large complex multi partner monitoring efforts.

P. 37 Data management and access

The issues associated with data management are an extension of those anticipated with coordination and standardization of monitoring efforts. Coordination will go well beyond a data dictionary. "To the extent possible" leaves some uncertainty about the capacity of the different players to work together. If the data cannot be integrated, analyzed and reported effectively much of the effort may be wasted. It would seem useful to identify the critical limitations to coordinated data management and access and to clarify the issues and resources needed to resolve them.

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Chapter 9: Implementation

[BD Comment]

Chapter 9, p. 8 – Annual status assessments – would be good to coordinate with NMFS.

Appendix A: Guidance for Review of Lower Columbia River Salmon Recovery Plans

From LCR-Joint Salmon Science Team
February 8, 2009

Overview/Context

This brief document provides guidance to NWFSC and RIST reviewers of Lower Columbia River management unit and ESU salmon recovery plans. Reviews should be conducted to identify ways to increase the scientific rigor of proposed recovery plans – thereby increasing the likelihood that salmon are actually recovered. To that end, reviews should not merely identify the strengths and weakness of various analyses, but where possible should provide practical recommendations for how the plan could be improved. Providing practical recommendations requires an understanding of the constraints affecting plan development.

Plans were able to use only available data, which in many cases severely limited options for quantitative analysis. Even in cases with limited data, reviews should still evaluate whether existing information is used in a way consistent with "best available science." Practical recommendations for plan improvement should recognize no new data will be available during the revision process, which will take place over the course of months rather than years. If reviewers are aware of relevant existing data that were not used in plan development that should obviously be highlighted.

Time constraints also need to be considered in making recommendations for plan improvement. Plans where developed with fairly restrictive time limitations, so reviews should consider whether methods were appropriate given the amount of time available. Time will also be limiting for plan revision, so recommendations for plan improvement should identify whether the recommendation could be incorporated in the plan within a few months or whether the recommendation would need to be incorporated as part of future adaptive management. Recommendations for analyses that would make a good 5-year Ph.D. dissertation project could be included in the plan's recommendations for future research, but are realistically not going to be completed for plan inclusion in the near term.

Recognizing the data and time constraints under which the plans were developed should not reduce the expectation for scientific rigor. The conclusions need to follow logically from the data, analysis and results. All relevant data should be considered. The analyses methods need to be appropriate for the questions being asked, and reflect contemporarily approaches. Analyses should be competently executed and clearly presented. In other words, "best available science" standards still apply.

The review should include only scientific (biology, hydrology, etc.) and, where applicable, economic considerations. The review should not consider political factors related to the feasibility of implementing the plan. Management implementation issues will be considered in a separate review process. An economic review will be needed of the cost estimates associated with some of the plans.

Elements of a Recovery Plan

A plan that is biologically thorough and robust should include the following elements (slightly modified from Interior Columbia TRT "Questions to Guide Review of Recovery Plans"):

- A logical flow including a statement of desired status, an assessment of current status, and identification of limiting factors, threats, actions and biological considerations for prioritization of actions.
- A treatment or consideration of limiting factors, threats, and actions across the entire life-cycle.
- A scientifically sound basis for identifying limiting factors, threats, and priority actions, and estimating anticipated responses to recovery actions.
- An implementation strategy that includes consideration of the time frame and scale in which the recovery actions can be implemented and their effects realized. (This should not be an assessment of management feasibility, but rather a scientific consideration of action sequences.)
- An adaptive management framework that includes adequate monitoring and evaluation as well as mechanisms to incorporate information gained into future management decisions.

Review Questions

The following questions are also a modification of those developed by the Interior Columbia TRT for review of recovery plans. They are meant to serve as guidelines, not as a strict check list. Some questions may not very applicable for a particular management unit or ESU plan – most likely because the plan has not developed a particular section in much detail yet. The reviewers should make sure that any "underdeveloped" parts of the plan are adequately acknowledged in the plan itself. This list questions is also not exhaustive – there are undoubted relevant questions not explicitly included in this list. However, this list does provide a good overview of the range of issues that should be considered in the review.

1. ESU, MPG and Population Level Goals and Viability
    a. Are definitions of populations, MPG, and ESUs consistent with TRT guidance?
    b. Does the plan accurately characterize population, MPG and ESU viability objectives provided by the TRT?
    c. Does it explicitly address VSP and TRT viability criteria at each of these levels?
    d. Is the characterization of the current status of populations, MPGs, and ESUs consistent with TRT definition of viability criteria? Where adaptations or interpretations were applied, are they reasonable alternatives?
2. Framework questions - for application to each planning sector (H), and across the plan as a whole.
    a. Cohesiveness – Is there a clearly articulated rationale linking action plan to population, MPG, and ESU objectives, limiting factors and threats?
    b. Models and Analysis

i. Are models or analysis methods used to assess fish response to recovery actions appropriate?
ii. How well is uncertainty considered in models and analyses?
iii. What is the support for models and assessment conclusions – are the conclusions logical?

c. Population Specific Data - use of available empirical data from the target population. Is lack of specific data treated appropriately?
d. Empirical and literature support – Is there reasonable evidence that the proposed actions will have the desired effect relative to existing environmental conditions?
e. Does the plan cite examples of responses to action consistent with plan expectations?
f. Is the component/plan part of an integrated strategy at the population level, the MPG or ESU level?

3. Habitat Element – consider each of the following questions for all relevant habitat (tributary (lake as appropriate), estuary, mainstem):

    a. Did the analysis use models or other appropriate method to understand potential fish responses to habitat improvement strategies? What is the nature of the analytical support linking population status to changes in habitat forming processes and local conditions?
    b. How well supported are hypotheses/assumptions for 1) VSP related factors most limiting recovery and 2) habitat forming processes and conditions that are limiting population response?
    c. Does the plan describe a habitat recovery strategy? If so, is the recovery strategy consistent with recovery hypotheses linking population status, key limiting habitat factors and threats?
    d. Are the proposed actions in the plan consistent with target changes in habitat conditions? Are there empirical examples demonstrating the proposed actions are effective?
    e. Is the habitat recovery strategy consistent with recovery strategies in other Hs (habitat, harvest, hatcheries and hydropower)?
    f. Does the habitat recovery strategy preclude other actions in any arena that may be desirable in the future?

4. Harvest Element

    a. Was the harvest analysis based on models or other appropriate technique? What was the level of analytical support for the model(s) used in the assessment?
    b. Did the harvest assessment include population specific data on impact rates, selectivity, and other population-specific effects?
    c. How responsive is the planned harvest strategy to year to year variations in population abundance and productivity?

d. How certain is the empirical support for the effectiveness of the proposed harvest actions?
e. Does the harvest plan include an assessment of the potential selective effects on population diversity?
f. Is the harvest strategy incorporated into the plan consistent with the identified limiting factors and threats for the population, MPG and ESU?
g. Is the harvest recovery strategy consistent with recovery strategies in other Hs?
h. Does the harvest recovery strategy preclude other actions in any arena that may be desirable in the future?

5. Hatchery Element

    a. How well supported is the understanding of the links between hatchery actions and population viability (VSP) characteristics used in the planning?
    b. Does the plan incorporate a hatchery production recovery strategy? If so, is the recovery strategy consistent with identified limiting factors and threats?
    c. How responsive is the planned hatchery production strategy to year to year variations in population abundance and productivity?
    d. Is population specific data used to support the planned hatchery strategy?
    e. Are there examples demonstrating the potential effectiveness of the planned hatchery actions?
    f. Is the hatchery recovery strategy consistent with recovery strategies in other Hs?
    g. Does the hatchery recovery strategy preclude other actions in any arena that may be desirable in the future?

6. Other Elements (mainstem, estuary, marine, ecological interactions, climate change, etc.)
    a. How well supported is the understanding of the links between other element impacts and population viability (VSP) characteristics used in the planning?
    b. Is the recovery strategy consistent with hypotheses linking population status, limiting factors and threats?
    c. How responsive is the treatment of other elements to year to year variations in population status?
    d. Is population specific data used to support the planned strategy?
    e. Are there examples demonstrating the potential effectiveness of the planned actions affecting other elements?
    f. Is the recovery strategy for other elements consistent with recovery strategies in other Hs?
    g. Does recovery strategy for other elements preclude other actions in any arena that may be desirable in the future?

7. Integration

    a. Does the plan explicitly integrate recovery strategies or actions across the four Hs at the population, MPG and ESU levels?
    b. Are estimates of the magnitude and rate of change at the population, MPG and ESU level in response to the recovery strategy robust?
    c. Is the likely magnitude and rate of improvement consistent with the extinction risk of the population, MPG and ESU?

8. Monitoring, evaluation and adaptive management

    a. How well does the proposed monitoring and evaluation program address identified areas of uncertainty?
    b. Are specific “check-ins” identified, either in time, or at the acquisition of particular “endpoints”?
    c. Is there a mechanism to incorporate the results of monitoring into future management decisions?