Fall Steady Flows Comment Table

Document Title: Study Plan: Fall steady flows
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Comment Number	Page	Line	Reviewer Name	Affiliation	Reviewer Comments (Be specific)	Identify Action Requested	Response Requested	GCMRC Response/Action Taken
1	na	na	Capron	WAPA	**Line numbers**. It would be helpful if the line numbers ran throughout the document, having them start over at 1 on each page can get confusing.	continuous numbering	Y	We will seek to make this modification in the next iteration.
2	na	na	Capron	WAPA	**Synthesis**. The document lacks a coherent synthesis which integrates the different lines of data in order to show how information will be used to answer critical questions (e.g., SSQs). It is of little utility to merely list the SSQs each project is related to and then leave it at that. What is missing is the description of how they will be answered and to what extent and likelihood they can be answered. What lines of evidence will be used to answer each one. It would be helpful describe these linkages in a section of its own, so that when this project is completed reviewers can then compare the results to what was expected to be completed. This would then lead to a logical progression of future recommendations. It is difficult to have any confidence that this work will lead to answers to our critical questions. A variety of data streams are being collected, but there is no synthesis of how these data will be used to test hypotheses. This plan appears to be more of a compliance document, a response to a biological opinion, and not a science plan. Missing is the criteria for success or failure and how key information will be interpreted. For example, a decision matrix could be constructed which would show how different conclusions might be integrated to support recommendations for future study (e.g., longer steady flow tests, different seasons). The ultimate question (from the biological opinion) is whether this scientific test will result in benefits to native fish (i.e., humpback chub). What are the key variables that will be considered to	Add a section of text	Y	We will attempt to more clearly link the proposed/ongoing research presented in the plan with the SSQs in our next revision of the Fall Steady Flow Plan. Re: synthesizing the various data streams, it is our expectation that the ecosystem modeling project that is described in FY10 workplan (R12.P1.10) will serve this need.

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					determine whether impacts were likely or unlikely?			
3	na	na	Capron/LaGory	WAPA	**Scientific Approach**. What is generally missing from GCMRC science plans is a scientific approach to hypothesis testing. For example, this plan provides background information on nonnative catches, nonnative control efforts, and then talks about potential strategies. It might be beneficial for GCMRC to replace Dr. Coggins with a biometrician that would be available to GCMRC to construct science plans that are designed around hypothesis testing and designing plans to answer critical questions, illustrate how that will be done, and how information will be synthesized and what analytical techniques will be used to do that synthesis. The elements of the study plan are not sufficiently integrated in this plan to demonstrate that they address the effects of fall steady flows. The plan should be more clearly hypothesis driven and a description should be provided as to how each element will address these hypotheses or subsets of hypotheses.	Modify	Y	We didn't develop the experiment; it was provided to us with the direction that we monitor. We don't believe that construction of formal hypotheses is a useful exercise. Comments on personnel management are well outside the scope of this document review.
4	na	na	LaGory	WAPA	In general, the presentation of the SSQs, RINs, EINs, etc. does little to show how the proposed research will address those questions. Certainly, the proposed research will not address the questions fully, but there is no presentation of the linkage between the research and the questions. A better approach would be explicit statements of hypotheses that are being tested by the research.	Modify	Y	We believe it is important to include reference to the questions and information needs because we want to demonstrate responsiveness to the AMP committees' formalized needs statements. Please see cover memo for responses to hypothesis testing comment.
5	na	na	LaGory	WAPA	The argument (stated on page 9) for using the same flow level (10,000 cfs) each year during the experiment has a number of problems associated with it. It is stated that the question of greatest interest is whether or not steady flows in the fall have a positive impact on the recruitment of juvenile humpback chub, and that using the same flow level	Modify	Y	We stand by our statements that having a simple flow experiment (i.e., same discharge across all years) will greatly simplify interpretation of

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					each year will greatly simplify interpretation of the information. The authors call secondary the questions regarding the degree of nearshore warming at different temperatures and habitat selection at different flows. It is likely that there will be tradeoffs between habitat availability, primary and secondary productivity, and water temperature at different flow magnitudes. There will also be uncontrollable antecedent effects resulting from the number and condition of fish at the beginning of the steady flow period each year and flow and sediment conditions earlier in each study year. It seems more important to understand how flow magnitude affects the environmental variables and relationships that affect recruitment. A number of short-term targeted experiments (e.g., flow manipulations) to help understand these relationships (e.g., habitat availability and nearshore warming at different flows) could aid in the interpretation of any observed trends in recruitment.			humpback chub recruitment data. Further, we do not even know whether environmental variables (degree of near-shore warming, availability of backwaters, etc.) are playing a critical role in humpback recruitment, so it seems premature to expend a lot of effort and resources on designing short-term experiments, especially when one considers that these experiments might complicate interpretation of data from the larger Fall Steady Flow Experiment.
6	na	na	LaGory	WAPA	The conceptual model (Figure 3) is useful for helping frame the research. Bioenergetics modeling should also be considered to help focus research on those variables that are likely to have the greatest influence on humpback chub recruitment. Modeling should use appropriately conservative assumptions to determine the possible magnitude of effects. Measurements could then focus on the effects of flow on physical and biological conditions identified as most important (e.g., depth, volume, temperature, turbidity, food availability) in nearshore habitats used by young humpback chub.			We fully agree with the reviewer's suggestion to pursue modeling. We have included such efforts in our FY 10 and 11 work plan. Please see work plan for details.
7	na	na	LaGory	WAPA	The discussion of transition flow experiments should focus on the questions or hypotheses being addressed. These questions will help focus the experiments to be conducted. The BO text provided on page 9 is fairly general and refers to "detrimental effects to fishes and food base for fish." From this text it is not clear if the only effect of interest is related to food base or whether or not other effects (e.g., fish stranding, changes in habitat availability) are of interest. The discussion in the study plan			Please see cover memo for response to suggestion to develop hypotheses. We are working with GCMRC physical scientists to incorporate habitat information.

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					regarding examining the effects of changing from fluctuating to steady flows or providing a higher base flow at the end of August seems premature until it is better understood what questions are of interest and what if any effects are likely. Some questions can be addressed, at least to some extent, without elaborate experiments that target the transition period. Habitat availability during transitions could be examined using information on channel morphology to determine the availability of habitats at different flows and fluctuation patterns using computer simulations. It seems likely that any reduction in flow (whether fluctuating or steady) would result in a decrease in primary productivity. Any transitioning may only decrease the rate at which these changes occur. Food base measurements that are currently being made and that would be made during the steady flow period should provide the information needed without the need for any specific experimentation.			
8	na	na	LaGory	WAPA	The approach described on pages 13 and 14 outlines the overall study elements, but never clearly identifies what the results of the fall steady flow experiments will be compared to.			We will attempt to more clearly describe how data collected will be analyzed in our revision.
9	na	na	Palmer	WAPA	**The Nature of the Experiment** The experiment for which this science plan has been developed – whether low volume steady flows during the months of September and October will improve the abundance of HBC in the mainstem of the Colorado River in the Grand Canyon – has been viewed by some as being an experiment with a duration that is insufficiently short to make an adequate scientific determination as to the effect of steady flows on the Grand Canyon HBC population. On the other hand, in the Summer of 2000, a steady flow experiment was conducted with a six month duration. Beyond the direct research costs of approximately $4 million dollars, the experiment costs an additional $32 million in indirect costs associated with maintaining federal power contractual obligations. This prompted one Grand Canyon scientist to declare the 2000 year experiment			Much of this comment belongs in a forum other than a document review.

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					as the most expensive field experiment on record. The result of this expensive experiment – in terms of abundance of HBC - was scientifically – mixed. Therefore, there is some sense to conducting a steady flow experiment that is intended to be less expensive and less disruptive in order to determine if steady flows from Glen Canyon Dam are worthy of further investigation. We are sympathetic with the position of some scientists that the experiment, as described by the BiOp, is less than what may be needed to draw a robust scientific conclusion regarding the relationship between HBC abundance and steady flows. We suggest instead, a science plan that includes the gathering and evaluation of data that – given the evidence – would lead an astute scientist to conclude that more steady flow experiments are likely to lead to significant improvements of numbers of HBC in the mainstem of the Grand Canyon or that they are not and given the expense of this type of operation, should be abandoned in favor of other actions that provide "more bang for the buck".			
10	na	na	Palmer	WAPA	**Transition Flows** Based on e-mail communication between Western and Reclamation, a major consideration of transition flows is the stranding of HBC in pools that do not connect with the Colorado River at low flows. While the "stranding" issue was not mentioned in the BiOP, it appears to be a major component of the development of the transition pattern from August to September in 2009. As backwaters are relatively few in the Grand Canyon below the LCR and stranding in standing pools separated from the mainchannel is easily observable, we suggest that the science plan gather the observational data to "put this issue to bed". This would mean identifying backwaters of interest and observing and quantifying the number of HBC stranded in pools after the transition. Also, the numbers should be analyzed as to its import relative			This comment mentions a topic of concern, stranding, that is not mentioned in the BO, so it is difficult for us to determine if this is an issue shared by a large number of stakeholders. We will conduct monitoring in Sept. and Oct. in a limited reach, so if stranding occurs in the NSE study reach we will be present to observe it. It is probably also important to note that backwaters are always changing, so the results from one or limited observations may not be

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					to the entire population. The ultimate fate of these fish, if found, should also be determined.			entirely conclusive.
11	5	14	Capron	WAPA	It would be beneficial to include a stand-alone section describing the key results of the 2008 steady flows research. Results from that are sprinkled about in this plan, but there is no overall description of the LSSF and key results (Ralston 2009). You could also include the steady flows from 05 in there as well. The results of the 2000 LSSF should really drive this plan, but it seems to be less integrated than that.	Summarize results from 2008	Y	In the plan we organized our presentation of previous results/experiments along the themes of near-shore water temperature, near-shore habitat stability, and food resources because: 1) these are the variables that are expected to change with stable flows and 2) the projects that are presented in the plan are addressing key uncertainties in each of these areas. We feel this is a more logical way to organize this material, as compared to results by year (i.e., 2000 vs. 2005 vs. 2008). We are not at the point where we can provide a complete synthesis of results from 2008 steady flows, in part because we are working on HFE reporting deadlines.
12	5	13	Capron	WAPA	This is an abrupt transition from the BiOp discussion to the previous experiments and studies. What may be missing is a more detailed explanation of the current plan. For example, using the SSQs, what are the critical questions we are trying to answer with these fall steady flows – this may require some new SSQs derived from the BiOp. Then, discuss the historical experiments and explore how that information may relate to the questions we are looking to explore in this experiment. Then, later on the plan can tie the expected results back to the SSQs and current knowledge.	Add a section of text	Y	We feel that our Approach section is a detailed explanation of the current plan. In this section we list the SSQs that the plan as a whole will address, and then each project description includes SSQs that are specific to that project. We feel developing new SSQs derived from the BiOp is

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								unnecessary.
13	6	34	Capron	WAPA	The statement "increasing recruitment after about 1998". Is this referring to the 1998 year class which would have recruited in 2002 (roughly) or the 1994 year class which recruited in about 1998? This terminology is often used in this way -- please be more precise. For example, if it is the 1998 year class, then they would have been juveniles during the 2000 LSSF and may have benefitted from those conditions. If it is the 1994 year class, then any benefits of the LSSF would not have been felt until after their recruitment event.	Clarify	Y	Accepted. We have changed the wording of this section.
14	7	1-4	Capron	WAPA	Awkward sentence, this could be rewritten to be a bit more clear.	Clarify	Y	Accepted.
15	7	23-29	Capron	WAPA	Trout results of growth rates from Korman and Campana may not be translated to HBC or other native fishes downstream of Lees Ferry. This important caveat does not appear to be described in this document. It should also be addressed in Project 4. These results may only apply to trout in Lees Ferry and may not be applicable to other fishes (e.g., native fish) in other reaches of the mainstem.	Clarify	Y	Accepted. We will attempt to more clearly describe the potential implications, and limitations, of work in Lees Ferry to downstream resources.
16	7	31-42	Capron	WAPA	It is unclear why this section starts with the premise that a constant discharge would increase food resources, when the next section seems to provide evidence to the contrary. This approach would fit better if the entire document was designed around hypothesis testing, but it isn't written like that and this section seems to move in that direction. This should be rewritten to include the following line of thinking: steady flows could either increase or decrease productivity or result in changes in draft rates that could combine in a complicated way to alter the short term amount of drifting food available to consumers. For example, primary and secondary production could increase under low flows, but with reduced sloughing could actually result in less drift in the short term, and vice versa.	Rewrite section	Y	Disagree. It is not our premise that steady flows would increase food resources. Rather, we are describing possible mechanisms whereby steady flows *could* increase food resources, and then present data that explore these different mechanisms.

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17	7	43-44	Capron	WAPA	It appears the changes in temperature were under constant flow conditions? Please clarify. And if so, we're any experiments combined to alter both flow and temperature?	Clarify	Y	The experiment was fully factorial with 3 replicates of each flow (3 treatment levels) and temperature (2 treatment levels) combination. There were no significant interactions between flow x temperature, so we only presented data on the main effects in the plan. A report that fully describes these experiments and results is currently undergoing USGS peer-review and should be available soon.
18	8	G	Capron	WAPA	These results are very helpful in this document.		N	Accepted.
19	9	36	Capron	WAPA	The question of transition flows appears to be focused on the impacts of moving from a high volume month with fluctuating flows to a low volume month with fluctuating flows. However, the current research plan proposes to test the impacts of a transition flow when going from fluctuating flows to steady flows. Under these conditions, the transition flow study is hopelessly confounded. It is not possible to answer the question being asked these conditions. When operations change from fluctuating flows to steady flows, it involves two changes: no fluctuations, and flows which leave the varial zone above the new steady water level for two months. The transition study was a question of going from August high fluctuations to September low fluctuations - only one change, the location of the varial zone. Thus, the premise of the original question is illogical under this flow condition. When steady flow operations remove any varial zone in September, the research that results would be	Clarify	Y	The reviewer identifies some important complications of conducting a transition flow experiment that we fully agree with. In this plan we attempted to develop a transition experiment that 1) would not compromise the larger fall steady flow experiment and 2) would address at least one aspect of abrupt transitions in monthly volume that were of concern to FWS, based on our reading of the Biological Opinion. We will be seeking input and guidance from FWS and BOR before revising this section of the plan.

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					comparing apples to oranges. The varial zone from the high volume month would still be above the new wetted zone, but the new wet zone would only be exposed to steady flows and not fluctuations. This could have substantial impacts on the response of the new wetted zone, growth rates, and food transport rates. Thus, logically we have two separate questions from the BiOp; (1) what is the effect of moving from a high volume month with fluctuations to a low volume month with fluctuations, and (2) what is the effect implementing steady flows in September and October. These two tests cannot be overlaid. A better approach would be to test some of these questions in laboratory conditions ss described in the Loyolla results on page 8. Flow has a big impact on growth rates and likely on sloughing and the availability of food in the water column. More consideration is needed here and perhaps a recognition that this question cannot be answered with the current flow regime. The question is probably most likely addressed via the experimental stream efforts at Loyolla. In summary, it is not scientifically possible in the field to test the fall transition question while implementing steady flows. GCMRC might collect data but it is likely to be irrelevant to the effects which would occur during normal operations when moving between two months, each with fluctuating flows.			
20	9	19-34	Capron	WAPA	This paragraph argues against implementing lower flows to increase backwater area based on changing sediment conditions between years. But then includes a statement that negates this information with “regardless” and offers to look at lower flows anyway. In another section of the document under experiments the document states: “The number and size of backwaters has greatly	Rewrite	Y	We propose consulting with BOR if and only if the results of the 2008 HFE 1.D project indicate there is a specific discharge, either higher or lower than what we propose in the plan, that maximizes backwater area. We will attempt to

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					diminished since the March 2008 High Flow Experiment (Kennedy, 2008-2009, personal observations). In April 2008 immediately after the High Flow Experiment there were at least 6 large backwaters between the Little Colorado River and Lava Chuar, which represents the study reach for the Near-Shore Ecology Project, and they were all present across the full range of April flow fluctuations. Presently, there is only 1 backwater in this reach that is present across the full range of flow fluctuations that occurred in July 2009 (Yard, July 2009, personal observations)." -- so this seems to be contradictory. Perhaps inclusion of these backwater observations here would clarify the situation more for the flow choice being made and not include a statement about changing this approach.			consolidate the discussion of backwaters in our revision.
21	10	21-36	Capron	WAPA	These proposals do not remove the confounding issue, which is going from fluctuating flows to steady flows. The issue these proposals deal with is the other confounding variable of going from a lower limit of 12,000 cfs to 10,000 cfs. The only way to deal with the fluctuating issue is to change operations in the end of August to fluctuations which include a varial zone mostly below the previous varial zone – this is the issue described in the BiOp and that has been discussed historically. However, if this is attempted over these dates, it could have profound implications to the starting conditions of the fall steady flows. Thus, it may not be possible to truly address the key questions here under this flow regime, we cannot adequately alter flows in this short period in a way which we can follow the effects. We would propose that GCMRC explore other months/times of the year to test the transition flow question. Sometime in May or June might be appropriate to initiate a short term test which looks only at changes in the varial zone when moving from high volume fluctuations to low volume fluctuations. This is a test that could be easily designed. It is unclear at this point how season would confound the test if the "transition" at question always occurs from	Rewrite	Y	Again, we fully agree with the reviewers concerns about confounding. Daily algae production measurements should be able to determine whether transitions that occur at other times of year are having a major impact on algae production without needing to design a special experiment. The dissolved oxygen data needed to make these estimates are being collected currently and we are making progress on developing the techniques for analyzing these data under fluctuating flows; we have already made estimates of algae production in Lees Ferry during steady flows. We will seek input and guidance from FWS and BOR to better determine

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					August to September. But at least in this approach you would be looking at the key question of the transition period.			the desired focus of the transition studies before revising this section of the plan.
22	10	38	Capron	WAPA	The 7-day approach seems reasonable, but we would propose that during this transition that fluctuations cease and BOR implements a linear flow decline over the 7-days. This will slowly dewater shoreline and may perhaps provide a stronger cue to fish to move with a new base flow condition. It also might offer some opportunities to track primary production as flows dewater the varial zone. This could provide some insight into the transition flow question, but only in part.	Reconsider	Y	We will seek input and guidance from FWS and BOR to better determine the desired focus of the transition studies before revising this section of the plan.
23	10	38-46 and beyond	Capron	WAPA	Again, the premise of this approach if flawed. The text which begins here and continues to the next page indicates those confounding variables but GCMRC is appears reluctant to admit that although we would like to study these transitions, it really isn't an answerable question giving these flow conditions. Another option is to use flows in a different month, perhaps much earlier in the year to test the transition issue (as described above under #19). The scientific question is whether by moving the varial zone dramatically from one month to another, are there biological consequences – primarily in primary and secondary production and habitat availability for fish.	Reconsider	Y	We will seek input and guidance from FWS and BOR to better determine the desired focus of the transition studies before revising this section of the plan.
24	11	38-39	LaGory	WAPA	The focus on "process-level measurements" is a good one.	Comment	N	Accepted.
25	12	Fig 3	Capron	WAPA	As complicated as this looks, some links are missing. The diagram that C. Walters could develop using ecopath might be a better description of linkages and energy transfer. A link is missing between nearshore habitat availability and juvenile and adult native fishes. Perhaps this figure is being used to help inform the ecopath simulations?	Edit	Y	We will add the link to the ecosystem diagram that the reviewer correctly identifies is missing. The goal of this conceptual diagram was to help frame the experiment and the associated projects—it was not intended to portray energy flow.

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26	13	12	Capron	WAPA	Separate "otolithdaily" into two words.	Edit	Y	Accepted.
27	13	3-5	Capron/LaGory	WAPA	This statement that strongly positive recruitment trends from cohorts spawned during 2008-2012 would "provide compelling evidence that steady flows in September and October benefit humpback chub" is not necessarily true. Such an observation might support the hypothesis, but there are many other factors that could result in the same observation. HBC have been increasing at about 8-10% per year since 2002/2003. The trend may even be showing signs of increasing over the last two years. In part this may be due to recent translocations which may be resulting in higher growth rates and higher survival rates than the larger LCR population. Regardless, this sentence used in the document doesn't seem reasonable. To determine if the fall steady flows had an effect we would need to look closely at the NSE study to see if growth rates increased during this time (otoliths or other methods), and try to track survival rates of tagged fish. If survival rates appear to increase for these year classes and we can demonstrate substantially increased growth rates this may provide some evidence for cause/effect. Yet, this is still all confounded by the nonnative removal program which could have a substantial effect by reducing predation on juvenile HBC. It is hard to see how this array of treatments can be disentangled.	Rewrite	Y	Agreed. We will rewrite the sentence in question. We did not develop the experiment. Mechanical removal will indeed complicate interpretation of humpback chub data. From a learning perspective, the best experimental design would involve treatments (i.e., flow, mechanical removal) that are not confounded. Nevertheless, we believe the ecosystem modeling project (R12.P1.10) provides a good framework for separating the effects of flow from other variables (i.e., nonnative abundance, changes in food resources, tributary hydrology).
28	13	15-25	LaGory	WAPA	This discussion of the effects of flow on piscivory focuses on primary effects (e.g., short term effects on predation rates) and does not acknowledge that longer term, population-mediated effects could occur. Even if steady flows did not affect predation rate directly in the short-term, these same flows could result in increases in predator populations over the longer term that could ultimately affect those rates.			Monitoring projects will provide us with data that can be used to inform the ecosystem modeling project. We believe the ecosystem modeling project (R12.P1.10) provides a good framework for separating the effects of flow from other variables (i.e.,

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								nonnative abundance, changes in food resources, tributary hydrology).
29	13	38-41	Capron	WAPA	This sentence references work by Korman, but then goes on to discuss a paper not by Korman (Gloss and Coggins), and then states that these papers included conclusive evidence on the relationship of dam operations to fish vital rates, specifically survival. The Korman and Campana paper looks at habitat use by age-o trout and may have found increased otolith growth rate on Sundays in one year but not the other, however this didn't appear to result in a statistically significant effect in somatic growth rates. Thus, this sentence appears to go beyond the results of these papers. Plus, this section expands the results to "fish" but the research was only on trout -- we don't know that these results seen with Lees Ferry trout will be translated to HBC or other native fish. "Fish" should be changed to trout.	Rewrite	Y	Agreed. Will re-write.
30	14	1	Capron	WAPA	Is it correct that the water temperature proposal is still unfunded? Any chance GCMRC can find funding for this?	Consider	Y	The project is not funded at this time. We wish to discuss this with TWG to determine the group's level of interest in such work.
31	14	15-22	Capron	WAPA	The plan should provide more explicit descriptions of each SSQ and how the research/data will be used to respond to them and the results are expected. It is of little utility to see a list of the SSQs which relate to a research topic and not describe how the research is intended to answer them.	Rewrite	Y	We feel the individual project descriptions, which appear on subsequent pages, do a good job of describing how the research will address the SSQs.
32	17	25-35	LaGory	WAPA	This task statement as written is to "investigate sampling methods," but the text describes measurements of effects not tests of methodologies.	Rewrite	Y	The tasks presented include testing methods and analysis of effects of flows. More detail is

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								presented in the full proposal which is included as an appendix to the plan.
33	17	41-42	LaGory	WAPA	What are "unstable habitat types?" Are these related to flow changes or habitats that change between years because of unstable sediment substrates (e.g., sand bars)? The text predicts that use of these habitats will increase during the fall steady flow period when flows are stabilized, but if these "unstable" habitats are within the varial zone, they would not be available for use during the steady flow period.	Rewrite	Y	Accepted. We'll edit to clarify. The quote refers to sand bar-mediated backwaters. Greater detail can be found in the full proposal included as an appendix.
34	17	44-45	LaGory	WAPA	The basis of the prediction for increased growth and survival resulting from the predicted change in habitat use is not clear. Please explain.	Rewrite	Y	Accepted. We'll edit to clarify. Increased growth would be a predicted outcome if habitats offer more favorable conditions, such as food and higher temperature.
35	18	13-15	LaGory	WAPA	It is not clear how otoliths from native fishes would be used to investigate "habitat use and origin of fish." Please explain.	Clarify	Y	Accepted. We'll edit to clarify. Otolith microchemistry will be employed to look for unique isotopes. More detail is in the full proposal, included as an appendix.
36	20	32	LaGory	WAPA	Describe the "routine monitoring efforts" that will be used as the basis of the stock assessment.	Clarify	Y	Accepted. We'll edit to clarify. Monitoring described in GCMRC/AMP work plan.
37	23	34-35	LaGory	WAPA	These measurements of production and drift should provide useful information for examining the effects of fall steady flows.	Comment	N	Accepted.
38	25	1-7	LaGory	WAPA	This discussion about the relevance of studying the Lees Ferry foodbase seems contrived. Since the "food web structure in Lees Ferry is considerably different than around the Little Colorado River confluence," any results of the study may have little relevance to humpback chub. I would recommend implementing measurements around the Little Colorado River in this first year of study rather than	Rewrite	Y	Agreed. We will attempt to better describe the inferences that can be drawn from work conducted in Lees Ferry.

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					waiting for the Lees Ferry results from this first year.			
39	28	1-9	LaGory	WAPA	It is not clear how the rainbow trout work at Lees Ferry "will help inform native fish collected at downstream locations." It seems likely that any rainbow trout response would be quite different from that of humpback chub. This study does not seem to address the effects of fall steady flows on humpback chub.	Rewrite	Y	We are investigating whether methods used for rainbow trout will be useful for studying humpback chub.
General			**Kubly**	**BOR**	**This document seems to portray that its development was spurred by requirements of the 2008 environmental assessment and biological opinion on operation of Glen Canyon Dam. While we appreciate the value of integrating ongoing studies to assess the effects of prescribed flows, and have supported doing so for the 2000 LSSF and the 1996, 2004, and 2008 HFEs, we do not know of a requirement in either of the referenced EA and BO compliance documents to develop this science plan or to single out the effects of fall steady flows. We question the interpretation that it is required, because it may have the unintended effect of suggesting that the Bureau of Reclamation or Fish and Wildlife Service is promoting parsing of the annual hydrograph, whereas our intent is to study resource responses to the entire hydrograph, including MLFF, HFE and FSF flows, both within and among years. It is for this reason that we have structured our request for the Nearshore Ecology study to concentrate on comparisons and contrasts among the effects of these different flow regimes.**	**Accept/Reject for all**	**Yes for all**	Accepted. We'll edit to clarify. We agree that the plan is not required by the BO, but was requested by AMP committees.
General			**Kubly**	**BOR**	**We are not sure whether the added text beginning on p. 9 (see GCMRC memorandum on changes made) satisfies the Science Advisors concern that a comprehensive experimental design is missing from the Fall Steady Flow plan. The plan still appears to us largely as an amalgamation of pre-existing studies, with limited change to those study designs to provide the comprehensive approach requested by the Science Advisors. We do not, however, want to prejudge the Science Advisors**			This plan is not entirely made up of existing work because the Near Shore Ecology project is still very new, just entering its first full year of field work. We have repeatedly reviewed our approach of bringing together existing monitoring and research to

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					response, so we advocate that they be allowed to speak for themselves in a follow-up review of the document.			address FSF monitoring with the AMP committees and have received an AMWG motion in support of this approach, including preparation of this plan. We believe that if TWG has concerns we should work together to address, not refer to a third party (SAs) again.
1	**2**	**12-16**	**Kubly**	**BOR**	**We do not think there is a disconnect with the sediment work. The nearshore ecology conservation measure (see p. 11 of the biological opinion and pp. 15-18 of this document) does identify connections between flows and physical parameters in nearshore habitats, some of which are founded in fine sediments. We anticipate that the physical and biological responses within and among these habitats will be determined in large part by how habitat geometry changes in response to differing flow regimes. Thus, there is anticipated to be a strong connection between the physical and biological responses. This relationship is identified in the nearshore ecology study, which is incorporated into the fall steady flows science plan.**			Agree that work on shoreline physical habitats, especially the 2008 HFE project 1.D (backwater evolution and fate) will support.
2	**4**	**8**	**Kubly**	**BOR**	**Change "has proposed" to "is" since steady flows are being released from Glen Canyon Dam.**			Accepted.
3	**4**	**10**	**Kubly**	**BOR**	**Insert "partially" between "to" and "mimic".**			Accepted.
	4	**12**	**Kubly**	**BOR**	**This line contains the first use of the word "juvenile". Since this term can have different meanings, in terms of life stage and size of fish, we suggest defining here the range of sizes included in the term.**			Accepted.
4	**4**	**13**	**Kubly**	**BOR**	**Make "ecosystem" plural.**			Accepted.
5	**4**	**21**	**Kubly**	**BOR**	**Remove "the" from before "Reclamation".**			Accepted.

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6	**4**	**22-25**	**Kubly**	**BOR**	**Both the EA and BO make it clear that MLFF flows are part of the experiment, i.e. interjecting HFE and FSFs within MLFF may change the resource responses to MLFF, and thus the entire hydrograph should be looked upon as the experiment, not just the two components identified in this plan (see the first general comment above).**			Accepted. We'll try to make this more global, though our charge has been to describe monitoring and research aimed specifically at the FSF.
7	**4**	**26-29**	**Kubly**	**BOR**	**As we understand it, the concern with transition flows across months is not limited to the effect of "a change in the lower limit of discharge". It includes the (downward) change in maximum flows and the day to day rate of change in both minimum and maximum flows. Also, the Service has pointed out that the best, but not only, example for this concern for monthly transitions is the August to September transition, i.e. other monthly transitions also are of interest to them.**			We will seek input and guidance from FWS and BOR to better determine the desired focus of the transition studies before revising this section of the plan.
8	**5**	**26**	**Kubly**	**BOR**	**Epilimnion thickness also can affect temperature of release water.**			Accepted.
9	**6**	**3-6**	**Kubly**	**BOR**	**Are there empirical measurements that have been made of residence time, or these qualitative statements concerning backwaters and low-angle shorelines. We recall that Ralston (2006) found a wide variety of warming rates among backwaters, the implication being that variation in backwater geometry could play a large part in determining water temperature response. Did we get that right?**			We have measured residence time in backwaters across flow regimes (i.e., steady vs. fluctuating) and will make additional measurements in October 2009. As part of the HFE reporting we are drafting a report that summarizes these findings and measurements of food production in backwaters. We have not measured residence time for the habitats that are mentioned in this section (low vs. high angle shorelines); we will change the wording of this section to reflect that. We believe the different amounts of backwater warming that are

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								documented in Ralston and others 2007 owes primarily to the spot measurements being collected at different times of day (i.e., late afternoon vs. morning).
10	**6**	**23-24**	**Kubly**	**BOR**	**Should this question not then be one of the major driving science questions for the NSE and FSF studies?**			We believe it is.
11	**7**	**23-24**	**Kubly**	**BOR**	**Were otoliths used to measure growth in both the HBC (above paragraph) and RBT examples? If not, it is not clear how the two examples can be correctly contrasted.**			We will re-write this paragraph for clarity. In contrasting these examples, we were attempting to highlight the importance and strength of process-level measurements; we were not trying to make the case that rainbow trout would benefit from fall steady flows while chub would not.
12	**7**	**45 et seq**	**Kubly**	**BOR**	**Were the volumes of water the same that were used for the different experiments? And were there any portions of the algae that were subjected to drying by the fluctuating flows? Seems that these conditions would have to be taken into account to make the comparison?**			The volumes of water used in these experiments were identical, so there was no varial zone. Water velocity was the only thing that varied. A report describing these experiments is currently undergoing USGS peer-review and should be available shortly.
13	**8**	**43-65**	**Kubly**	**BOR**	**Are HBC strictly drift feeders? Are there any ontogenetic changes in their mechanism of food procurement? Also, it seems that these comparisons are predicated on there being an autotrophic and autochthonous base for production. Is that borne out by the food base studies?**			HBC are opportunistic feeders as far as we know, but they have been documented to feed on the drift which is why we go through that line of reasoning. We are seeing evidence that HBC are

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								feeding on both algae and terrestrial detritus, and aquatic invertebrates that are relying on these same forms of carbon, so these comparisons are justified.
14	**9**	**6-8**	**Kubly**	**BOR**	**Yes, but recruitment rate relationships with environmental conditions may well be confounded by having different conditions in the years leading to recruitment. And it may not be possible to control the hydrology to ensure that within year, or year to year, conditions are the same. If so, are there other demographic or individual measures that could be used for the assessment?**			Monitoring projects will provide us with data that can be used to inform the ecosystem modeling project. We believe the ecosystem modeling project (R12.P1.10) provides a good framework for separating the effects of flow from other variables (i.e., nonnative abundance, changes in food resources, tributary hydrology).
15	**9**	**19-21**	**Kubly**	**BOR**	**Doesn't the nearshore GIS habitat work lend itself to this kind of quantitative analysis? Also, since backwaters are formed in fine sediments, doesn't the underlying geometry change over time and thus change the relationship between backwater area and discharge?**			Work could be adapted to meet this need. Discuss with TWG to gauge group's level of interest.
16	**9**	**33-34**	**Kubly**	**BOR**	**Are these relationships quantified, i.e. could we model the effect of "further increases"?**			Work could be adapted to meet this need. Discuss with TWG to gauge group's level of interest.
17	**14**	**7-10**	**Kubly**	**BOR**	**See our earlier comment (# 1) re: nearshore ecology requirements for rearing habitat, including those situated in fine sediment, evaluation.**			Accepted. We will re-state requirements for plan.
	2	7	Bill Persons	AZGFD	"Four existing projects are collecting data that will be used to determine whether biological resources benefitted from these flows". This is a pretty strong statement, and I'm concerned that the rest of the document doesn't provide this much certainty that we will be able to determine if resources benefited from the flows. Can it be toned back a little? Don't want to give the impression that this is an experiment	Revise	Yes	Agreed.

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					designed to study impacts on biological resources, rather an attempt to learn from flows imposed on the program. Perhaps "collecting data that will be used to assess possible impacts of these flows on biological resources".			
	2	18	Bill Persons	AZGFD	Recommendation for comparable flows (10,000 cfs) across years is good.			Accepted.
	2	26	Bill Persons	AZGFD	Good, suggest you spell out the proposed flows. Is it 7 days of transition flows?			Agreed. We will be more specific.
	9	16	Bill Persons	AZGFD	Good to recommend some consistency in flow volumes for Sept and October across years.			Accepted.
	10	10	Bill Persons	AZGFD	Good acknowledgement of complexity and shortcomings of experimental flow design, esp. regarding ability to assess impacts on HBC and algae production.			Accepted.
	11	6	Bill Persons	AZGFD	You state that transition experiments would need to be longer than 7 days in duration if managers wish scientists to determine the increase in algae production that occurs with an increase in the lower limit of discharge. If the transition period is only 3 days, does it argue against doing the algae work because it is likely to be inconclusive?			Yes, we do not feel special transition flows should be designed with the goal of studying algae response unless they are at least 7 days in duration. We are seeking input and guidance from FWS and BOR regarding the desired focus of the transition experiments.
	12		Bill Persons	AZGFD	Should there be a line between nearshore habitat availability and juvenile native fish? (Yes I did look at the figure!).			Yes.
	13	5	Bill Persons	AZGFD	Delete phrase "compelling evidence". If HBC recruitment from cohorts spawned during 2008-2012 are strongly positive, it will "provide insights" but I wouldn't prejudge interpretation of results to be compelling. Don't sell this experiment as something it likely is not, in other words acknowledge that it will be difficult to assess direct impacts of Sept-Oct stable flows to HBC. In earlier versions of the plan, I believe the Center suggested that it would be difficult, if not impossible, to discern the impact of a two month flow treatment on long lived species such as fish. I would rather see an expression of the	Revise	Yes	Accepted. We will revise this sentence.

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					uncertainty around these research projects than statements that may give some stakeholders the hope that the question of steady flows will be answered once and for all with this experimental design.			
	27		Bill Persons	AZGFD	2nd paragraph from end of page. I think the statement that catch rate indices may not be adequate… is correct, but don't think it belongs in this document. We can certainly update the stock assessment model, and that could be in the methods/tasks.	Revise	Yes	Accepted. We will revise to make a more general mention of the approach for this year.
			Bill Persons	AZGFD	Comment and suggestion of Science Advisors (p. 9 of their review) that GCMRC expressed concerns over the timing and period should be a focused subject of the knowledge assessment in 2010-11.			Accepted.
1	**13**	**15-21**	**Brian Healy**	**NPS – GRCA**	The plan cites the results of the unpublished trout foraging ecology study (Yard and others) as a reason to dismiss the need for further study of the interactions between native/non-native fish. I would urge GCMRC to publish those results, as they may be critical in supporting additional non-native species management activities within GRCA.	**Publish trout foraging ecology study**		This manuscript is completed and is going through formal review as of this writing. We recognize the need to publish/distribute so are working to complete the documentation.
2	**13**	**2-5**	**Brian Healy**	**NPS-GRCA**	GCRMC requests that the steady flows for September and October currently planned (or proposed?) for 2008 - 2012 be maintained, which the best available science indicates may not result in benefits to HBC (as opposed to steady flows earlier in the year). GCMRC states that "*if HBC recruitment trends from cohorts spawned during 2008-2012 are strongly positive this will provide compelling evidence that steady flows in September and October benefit humpback chub.*" Given other confounding factors, it seems unlikely that this conclusion could be drawn. Another question that should be addressed is what	**Identify where/how the effects of non-native fish removal would be addressed.**		Monitoring projects will provide us with data that can be used to inform the ecosystem modeling project. We believe the ecosystem modeling project (R12.P1.10) provides a good framework for separating the effects of flow from other variables (i.e., nonnative abundance, changes in food resources, tributary hydrology).

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					effect other management activities (mechanical removal) may have on HBC recruitment.			
3	**19-22**	**General comment**	**Brian Healy**	**NPS - GRCA**	<u>Comments on Project 2 - Stock Assessment of GRCA Native Fish</u> The continued assessment of native fish populations and how management activities impact population dynamics is a cornerstone of adaptive management in GRCA. Assessing the status of HBC populations, and how variability in populations and recruitment is tied to the operation of GC dam and other management activities are high priorities. The primary SSQ 1-1 will evaluate how populations are linked to tributary and mainstem fish production, and how production is tied to mainstem conditions, however it seems that only one tributary, the LCR, will be addressed. While the LCR is the top priority, it would be helpful to understand the fish population dynamics and role of other tributaries in native and non-native fish production. Also, the design needs to incorporate an analysis of how mechanical removal may influence HBC populations, so that speculation in interpreting results can be minimized in the future.			Comments are useful for documenting stakeholder/manager areas of interest. We are expanding mainstem monitoring in FY 2010 and beyond but do not anticipate additional tributary monitoring at this time owing to limits of time and funding. The reviewer's comment asking for more analysis of the effects of mechanical removal will be incorporated into our ecosystem modeling project under Goal 12 in the 2010-11 work plan.
4	**21**	**NA**	**Brian Healy**	**NPS - GRCA**	The evaluation of how population estimate techniques may be used for other native species (bluehead and flannelmouth sucker), would also be of assistance in determining how well the Park is meeting its management goals for native species.			We are currently limited by time and funding from expanding to work on these populations, though some data are currently collected re: these species. We invite the reviewer to

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								make this point at future work plan meetings to judge AMP committee interest in this topic (other native fish species).
5	**21**	**NA**	**Brian Healy**	**NPS - GRCA**	Page 21- in support of implemented and planned HBC translocations, and also to comply with recommendations of the PEP, monitoring efforts should be expanded in the mainstem sooner than 2011, as proposed by this plan. A goal of the translocation projects may be to augment HBC numbers in aggregations, and without baseline aggregation data, it will be difficult to assess whether goals are obtained.	**Consider re-initiating or expanding mainstem monitoring sooner than 2011.**		We anticipate expanded mainstem monitoring in 2010, and then additional expansion of mainstem monitoring in 2011 if supported by data analysis recommended by 2009 Fish PEP reviewers. All mainstem trips plan to spend at least some effort at HBC aggregations.