

Ecological Flows Science Advisory Board (EFSAB)

Meeting Summary

March 19, 2013

Stan Adams Training Facility, Jordan Lake, Chapel Hill, NC

X Approved for distribution April 16, 2013

Attendance

Members

Hugh Barwick, Duke Energy
Mark Cantrell, US Fish & Wildlife Services
(online)
Bob Christian, East Carolina University
Tom Cuffney, US Geological Survey
Linda Diebolt, NC League of Municipalities
Chris Goudreau, NC Wildlife Resources Commission
Jeff Hinshaw, North Carolina State University
Sam Pearsall, Environmental Defense Fund
Amy Pickle, NC EMC, Duke Nicholas School
Judy Ratcliffe, NC Natural Heritage Program
Jay Sauber, NC Division of Water Quality
Fred Tarver, NC Division of Water Resources

Division of Water Resources

Harold Brady (online)
Ian McMillan (online)
Don Rayno
Sarah Young

Alternates

Rebecca Benner, The Natural Conservancy
Sarah McRae, US Fish & Wildlife
Tom Thompson, Duke Energy
David Williams, NC Division of SWC

Guests:

Jim Mead, Environmental Defense Fund
Kimberly Meitzen, The Nature Conservancy
Jennifer Phelan, RTI
Guy Stefanski, NCDWR
Haywood Phistic, LNBA(online)
Nicole ? (online)

NCSU Facilitation Team

Mary Lou Addor, Natural Resource Leadership
Institute (NRLI)
Christy Perrin, Watershed Education for
Communities and Officials (WECO)
Nancy Sharpless (NRLI)

The purpose of the Ecological Flows Science Advisory Board: The Ecological Flows Science Advisory Board (EFSAB) will advise NC Department Environment and Natural Resources (NCDENR) on an approach to characterize the aquatic ecology of different river basins and methods to determine the flows needed to maintain ecological integrity.

Presentations, reports, and background information of the EFSAB are available at: www.nc-water.org/sab

Webinar: If you cannot attend the meeting in person but would like to join us via the webinar, you can watch the presentations and listen to the live streaming audio of the meeting by going to <https://denr.ncgovconnect.com/sab/> and typing your name in the space labeled "guest."

NOTE: The EFSAB will meet **April 16, 2013, 9:00am until 4:15pm** at the Stan Adams Training Facility Jordan Lake Educational State Forest Center Chapel Hill, NC (see page 24 for meeting agenda topics and directions to location).

Mar 19, 2013: Summary of Decisions/Recommendations and Proposed Actions

Decisions and Recommendations

EFSAB members agreed upon the following consensus principles regarding the final report:

1. **The audience for the report is DWR.**
2. **It contains recommendations as well as other considerations that were eventually rejected.**
3. **Make clear justifications for recommendations that are accepted and recommendations that were eventually rejected so that they are understood to a broader audience.**

Proposed Actions

- The EFSAB decided to review the draft recommendations framework in between the next meeting, to provide feedback on the wording of the recommendations, and to possibly develop and propose trial balloons of their own regarding recommendations before the April meeting or at the meeting.
- DWR should move forward with running PHABSIM for mountain sites for discussion in June.
- Agendas for meetings following July will need to be developed.

Table of Contents

I. Executive Summary.....	2
II. Meeting Orientation and Nov 27,2013 Meeting Summary Approval.....	5
III. Purpose of today’s meeting: moving from divergent to convergent thinking.....	6
IV. Deciding an approach to report writing.....	7
V. Brainstorming Recommendations	11
VI. Discussion about whether to review DWR Trial	18
VII. Developing a timeline.....	21
VIII.Information for Next Meeting	24
IX. Appendix: Initial Brainstormed list of Recommendations	25
X. Timeline developed by.....	30

I. Executive Summary

TITLE: PURPOSE OF TODAY’S MEETING: MOVING FROM DIVERGENT TO CONVERGENT THINKING

Presenter: Fred Tarver, DWR

Fred kicked off the meeting by explaining the purpose for the proposed agenda. He explained that the EFSAB had been engaged in learning about available science for ecological flows and exploring efforts to fill data gaps. Now, responding to feedback from the EFSAB assessment conducted by the facilitators, and the urgency presented by Tom Reeder in November, it’s time to converge on some recommendations based on existing available information. To prompt discussion and identify areas of support and non-support from EFSAB, DWR developed some trial balloons that were sent by email before the meeting, and are on the agenda for discussion today. The trial balloons do not prevent EFSAB from amending or adding recommendations as more data

comes in.

Questions (Q), Comments (C), Response (R):

None

TITLE: DECIDING AN APPROACH TO REPORT WRITING

Continuing from the February EFSAB meeting, the facilitator presented a draft report outline compiled by DWR staff, and reviewed questions and feedback from the EFSAB. Those questions included: 1) who is the audience for the report?; 2) format- Is a detailed report needed or would a memo with appendices suffice?; 3) timeline for writing report? EFSAB members discussed the template's format, with many saying the background section of the report was too detailed, and not enough attention was provided to the recommendations section. They developed consensus principles regarding the audience and content of the report.

Major Discussion items/concerns/questions:

The following topics were discussed in detail:

- EFSAB should focus entirely on developing recommendations, not on writing background
- The proposed template does not lead reader to make conclusions
- There is a power in brevity, particularly in documents to be read by decision-makers
- Report should include items that EFSAB rejects based on scientific evidence
- Each recommendation should include supporting justification that can be understood by others besides DWR staff, including groups who may follow EFSAB
- The proposed template was intended to include everything discussed so far, to provide a place to start
- Not all supporting information will be peer-reviewed literature as the science is currently underway
- We should begin brainstorming recommendations immediately to get that process underway

Decisions Made:

EFSAB members unanimously agreed upon the following principles:

- 1. The audience for the report is DWR.**
- 2. It contains recommendations and as well as other considerations that were eventually rejected**
- 3. Make clear justifications for recommendations that are accepted and recommendations that were eventually rejected so that they are understood to a broader audience.**

EFSAB members decided to begin brainstorming recommendations immediately.

Proposed Actions or Identified Decisions to be made:

BRAINSTORMING RECOMMENDATIONS

EFSAB members decided to put aside the proposed agenda and move into an open brainstorm to share recommendations that may be used to develop a framework. Facilitators asked that they refrain from judging or discussing recommendations in detail. Many recommendations and ideas were developed and summarized/paraphrased on flip charts. The facilitators typed these up immediately following the meeting, organized them into topical areas, and fleshed them out by listening to the webinar recording. The draft recommendations were sent to 3 EFSAB members to assess the topics/organization, and then that revised document was sent to EFSAB for them to review and provide feedback.

Major Discussion topics/concerns/questions

Four major categories with subcategories were developed by the EFSAB:

1. Refine the Charge
 - a. Parameters for the EFSAB Project
2. Characterize Ecology of Different River Basins
 - a. Characterization: What and How
 - b. In Lieu of Classification Approaches
 - c. Other Aspects of the Ecosystem to Define Ecological Integrity
 - d. Treatment of Coastal Areas
3. Determine Ecological Flows
 - a. Necessity of Models
 - b. Current Approaches and Concerns
 - c. Thresholds for Ecological Integrity
4. Future Directions/Adaptive Management
 - a. Final Product Design: How will DWR incorporate recommendations into an internal and/or external design?
 - b. Triggers for Site-specific evaluations
 - c. Pre and Post Monitoring of Withdrawals to Validate Future Recommendations
 - d. Beyond EFSAB

Proposed Actions or Identified Decisions to be made:

The EFSAB decided to review these in between the next meeting, to provide feedback on the wording of the recommendations, and to possibly develop and propose trial balloons of their own regarding recommendations before the April meeting or at the meeting.

TITLE: DWR TRIAL BALLOONS

The group was asked if they wanted to proceed with reviewing and discussing the 3 trial balloons presented by DWR via email before the meeting. They discussed how this could either help or derail them from their recommendation brainstorm.

Major Discussion topics/concerns/questions

- Going into the DWR trial balloons today may detract us from our focus on recommendations- it may not fit into the flow of a potential framework
- Discussing DWR trial balloons could send the group into the weeds
- EFSAB members can present trial balloons of their own the fit into the recommendations framework that will derive from today's brainstorm session

Decisions made

- EFSAB members decided not to discuss the DWR trial balloons during the March meeting.

Proposed Actions or Identified Decisions to be made:

None

TITLE: DEVELOPING A TIMELINE

The EFSAB discussed potential topic items for remaining meetings. The timing of the Biological-Environmental Classification (BEC) System Study by RTI was a key component for determining timeline. Originally thought to be done in late summer, Jennifer Phelan stated that the BEC classifications for macroinvertebrates and fish would be finalized in May, with an optimization (combination) of those classifications finished in June.

Major Discussion topics/concerns/questions

- Should we hear interim results and methods from RTI about the BEC, or just wait until final results are available? (when should it be on EFSAB agendas?)
- Should PHABSIM sites in mountains be run to correlate with physical variables?

Proposed Actions or Identified Decisions to be Made:

- DWR should move forward with running PHABSIM for mountain sites.
- Agendas for meetings following July will need to be developed.

II. Mar 19, 2013 Meeting Orientation and Feb 19 2013 Meeting Summary Approval

Members and alternates of the Ecological Board Science Advisory Board introduced themselves and their affiliations. Guests in attendance and the facilitation team also introduced themselves. Everyone was reminded to sign-in who attended the meeting.

A brief orientation was conducted of the meeting facilities (restrooms, concession) and available technology (webinar). Members and alternates are encouraged to sit at the main meeting table and guests at tables away from the main meeting spaces. During discussions of the members and alternates, guests may comment once members and alternates have completed their comments and questions. During small group work, guests can also participate in small group discussions but may not dominate the time. Everyone is asked to ensure that space is created for others to engage. From time to time, the facilitators will conduct a straw poll to determine the current level of support for an idea or what additional information is needed, not necessarily for a final decision.

The EFSAB approved the February 19, 2013 that was amended with a minor edit to correct a name.

The agenda for the meeting was introduced. The meeting objectives as presented included (note that this agenda changed based on feedback from the board- the meeting summary does not follow this format):

- Overview of meeting purpose from DWR point of view- to build preliminary recommendations with existing available information
- Develop a plan for how and when to write the EFSAB final report
- Review and amend/agree upon s draft timeline for addressing issues raised by EFSAB small groups in Feb meeting
- Establish a shared list of defined guidelines to help inform recommendations (using revised list from Feb. meeting small group work)
- Review and discuss DWR trial balloons, reach preliminary recommendations

The process for discussing and seeking consensus on a proposal was presented in February as the following:

1. Record each proposal separately for consideration and discussion
2. Check for understanding-*what questions do we have? do we all understand the proposal in the same way?*
3. Revise proposal as needed
4. List levels of support from charter
 - a. Level 1: Endorsement (I like it)
 - b. Level 2: Endorsement with a minor point of contention (basically I like it)
 - c. Level 3: Agreement with reservations (I can live with it)
 - d. Level 4: Stand Aside (I don't like it but I don't want to hold up the group)
 - e. Level 5: Block (I cannot/will not support the recommendation, decision, or proposal)
5. Poll for level of support of each proposal – *what is your level of support?*
6. Record level of support

III. Purpose of today's meeting- moving from divergent to convergent thinking

Presenter: **Fred Tarver, NCDWR**

Fred Tarver, NCDWR, kicked off the meeting by explaining the purpose for the proposed agenda. His overview follows. I reviewed the EFSAB Process Assessment conducted by the facilitators to see the responses of EFSAB to what we've been doing. I reflected that until now the group had doing "convergent thinking" to explore ideas. This involved reviewing literature and examining studies by DWR and other NGOs, other professionals. We've been looking over all these efforts for how to characterize ecology and determine ecological flows. We've strayed down the pathway, but as we recall Tom Reeder's presentation in November, time is getting near to where we need to make decisions, even though there are some data gaps that exist, there needs to be convergent thinking. There are a number of beta efforts being conducted by other groups to help with determining e-flows, but there is a need to move forward. We heard in the assessment "don't let the perfect be the enemy of the good". We have a lot of good info, but it may not totally meet your needs, but in an effort to move forward we need to make some decisions.

So today we are proposing some straw men to the Board to test to see how you've synthesized data we've presented, and what you've sought outside of this room to come to decision making. That's the effort of DWR and the facilitators to bring forward some trial balloons. Another comment heard from assessment asked "what would you be comfortable recommending given the present level of knowledge?" We do have data gaps, we've been presented a lot of info, we hope to fill some of those gaps in the near future. Those efforts are with RTI and USGS in terms of biological characterization - the classification efforts are with the BEC (Biological-Environmental Classification). We hope to have information from that to come. There is also info from the SALCC effort in terms of characterization/classification effort in the southeast based on what TNC did in the Northeast. I think they are close to having some product. We have the PHABSIM work from DWR, we've looked quite a bit at those 9 sites in the piedmont that Jim did. There are other sites we're considering resurrecting, to compare PHABSIM sites in the mountains vs those in the piedmont. Hopefully some data gaps will be filled with these efforts. But we can't be sitting around waiting for these gaps to be filled. We have to proceed with the knowledge we have on hand do something while we're waiting.

We would like to identify areas of support and non-support from EFSAB. We have some consensus principles we've discussed, we hope to add to them. Moving forward...we have a limited number of meetings. We do

have an outline of a timeline to discuss later. If you look at the timeline and there is something you want to add, let us know and we can entertain those. Lastly, we need to have discussions on what will emanate from the EFSAB for the final report, what format will it take. There is nothing in statute saying its required, but it would help DWR. The Board should decide if they need a report, what is format, how detailed should it be? Will it be a strictly technical report? If it is more detailed, then there needs to be some divvying up of responsibilities of writing various sections. These things need to be solidified and honed to show we're making concrete progress. That's where I see the efforts for today.

Questions (Q), Comments (C), Response (R):

None

IV. Deciding an Approach to Report Writing

The facilitator led a discussion on how to approach the Report, which continued from the discussion that began at the end of the February meeting. The Board was provided handouts of the report template developed by DWR for the EFSAB's consideration template. She reviewed the draft template (see February 19 Meeting summary appendix for the outline), and the main points of feedback heard from the EFSAB in February. Those included:

- Is proposed template good for audience? Or is a memo with appendices better?
- When – what is the timeline for writing report?
- Who is audience? How broad?
- Some specific suggestions for template section IV Supportive Information were provided (how to compile and reflect what other states have done- bibliography rather than re-write presentations; summarize each state together; ask presenters to summarize; form small groups by topic to reflect what was learned)

Main questions for EFSAB today are who is the audience, whether to do a report or a memo, and what is the format of the template , and timeline.

First question- who is the audience?

EFSAB members raised their hands to provide the following comments.

Comments: The one word in the template "Recommendations" is 100% of our charge. If we don't figure out how to do it by September, we're toast. All the rest is furniture that should be stored until September. We need to spend 100% of our time between now and then on this.

C: What I've learned in past 2.5 years dealing with e-flows is volume, and weighty. I have little interest in expressing the transformation of learning through the process. I don't want to spend our energy on background information. I'd rather have a very weighty set of conclusions, and recommendations. We don't need to share wisdom we acquired through education. Many tools are to be developed, not finished, have not seen any presentations on tools that do not have promise. Don't throw them out. Like most science this will be an evolutionary process and we will have to make a recommendation before the science is complete. We should suggest a number tools, all of which have value, and prioritize a process by which we should go about recommending ecological flows. Should we make value judgments over subsistence vs recreational fishing, from one guild that will benefit under one strategy vs another guild...The toolbox we've been looking at are all useful

tools. I'm not ready to put all of my trust in any one of them. As an SAB, I'm not interested in participating indefinitely, yet clearly some things will go on. I'm ready for recommendations. I prefer recommendations such as on (when to use) I would prefer to make recommendations on site-specific basis, using site-specific data over regional approaches, over statewide approaches. As an SAB we could make those types of recommendations now. In terms of when to use synthetic vs real data, in terms of using empirical data over synthetic data, we can make those decision now. In terms of rehashing everything we've been through and charts we've looked at, I'm not invested in pulling together a treatise on ecological flows.

C: It's important that whatever we put on paper includes our rationale that we use to make those recommendations. We prefer this over that because, x,y,z. I think if we do that, whoever picks up the paper (DWR, EMC, General public) we will have done them a service. I agree we don't want a 3,000 page summary, or appending all these 45 page meeting summaries together.

C: I'm not recommending recommendations without justification, but that we get to recommendations as soon as possible. I think we'll have to do some process documentation and explain how and why we reached conclusions, but we need to get to the recommendations soon.

C: We are making recommendations to DWR. DWR staff has expertise in this field, a lot of it has been them bringing us along so we can make recommendations to them. We should frame it as making recommendations to DWR, we can make a concise document that still is very well stated and will hold up outside of that framework. It needs to be tight, and not where we try to educate a board audience.

C: Whoever picks it up will have access to other resources. The website serves as a reference tool.

C: The intent of template- there is a need for supporting information. My original intent was the kitchen-sink approach. I recognize the recommendations are the most important part, but thought there had to be supporting documentation as to why the conclusions were made. The audience will be DWR but also other audiences. It's easier to take things out than add in. I appreciate we need to get to recommendations, but we're waiting for some data gaps. However we decide to format the reports, it would be a good use of time that some of this is done now while we're waiting for data. We don't want to be crunched later in year trying to pull together supporting data.

C: There will always be data gaps. If we do not start to decide what we can make recommendations about today, we are putting ourselves behind. The magnitude of our task to make recommendations at this stage is daunting. WE have work to do figuring out what the recommendations are. When talking to students, I say that writing to a decision-maker is not like writing a mystery novel- don't put off your point to the end. That's what this report template does. I agree much of what's in this is useful, but in this particular structure This template would not lead a reader to conclusions in supporting our recommendations. A process-oriented template without the answer is a distraction. Shifting our focus to that one word, such as with Jay's suggestions, is a more useful way to spend our time now. A year ago, I may have argued differently.

C: A two- part report, recommendations and attachments.

C: I appreciate Fred's tenuous position. We have an incredible amount of information readily available and easily referenced. As SAB we are making recommendations based on our current knowledge. We could have made recommendations 2 years ago with our knowledge then. It's not our charge to make final decisions. There will be other SABs that will follow us based on additional data and information. It's time for us to conclude what we've learned and provide that to DWR. I don't need to look at any more graphs/data to move forward. We've done that and it's not being funneled to an answer. We can make recommendations at any point in time. We will have recommendations; we can do post-processing recommendations- such as for additional work, additional review groups, but delaying process will not help. Frankly I think we'll have new

legislation replacing that which we're working under if we don't act soon.

C: Everybody seems to agree audience is DWR. We have to say if we agree, then begin to structure the report. What we may come up with now with 2 years of experience is to provide DWR with guidance as to where they can go to fill in data gaps. Purpose is to give DWR guidance based on our educations- we cannot give them the answer. For example we can support PHABSIM direction as appropriate, there are others to consider, can provide a hierarch recommendation, ex when to use site-specific data. If we did that 2 years ago we may not have had the information to back that up. The report should be in a form useful for DWR. First step there are things on the table we can agree on, like audience.

C: Note the executive summary was expected to be the "cliffnotes" of the mystery novel, maybe it is the whole thing.

C. The outline of recommendations should be in the same level of detail as the background information in the template currently is- then we could talk about how to structure that to support the recommendations. Currently the document is a description of the process of the last 2 years, not supporting a memo or document structured to integrate the info/process with recommendations.

C: Looking at the charge, recommendations have 2 parts- characterization/classification part; can have description of what our recommendations are, then identifying flow requirements, and why we came to those conclusions. We can go this far because we have this information, or we could only go this far due to lack of information. I think we're saying the same thing

At this point, the facilitator asked to go around the room (round-robin style) to provide everyone an opportunity to comment on the template. The following bullets are comments provided by EFSAB members (each bullet was provided by a different EFSAB member).

- Section IV: does not need to be a detailed summary for each presentation. All of that can be in bibliography. I agree with coming up with recommendations.
- I agree with the emphasis on recommendations. Also, it's also important that we include things we rejected (like 7Q10 for example) it's important to put things like that in there so a legislator doesn't grab onto it and say "SC is using this and why don't we?" We need to put clear statement that we considered this and we reject it for the following reasons. We're on the cusp of having some much better material, but if we don't reject some of this based on scientific justifications it may come back to haunt us.
- Move forward with recommendations. The preamble to our recommendations will contain to some degree supporting information in reference to all the background. In terms of when we decide to frame recommendations- think about future groups, this could help guide them. We may have other folks replacing us down the line that could be called to task.
- It's not another audience, it just including citations.
- In terms of citations, keep in mind- not everything we recommend is backed up by published literature – to rely strictly on published literature it would be difficult to reach conclusions, since a lot of this is in progress.
- We need recommendations first, that speak to original goal, then once we have those the report will come.
- This template is not the proper format. We have to realize this is a planning tool. It's not something we'll implement that has legal consequences if we don't do it. Let's get recommendations, have a

shorter, more concise formatted document.

- Could we as a group of subject matter experts, brainstorm a list of recommendations?
- To me you read the abstract of a paper first, similarly, have the recommendation first. I respect what Fred has done, but we have a tone of material to reference. If we don't have something, I imagine it won't take long for somebody in the room to summarize it. Start with a recommendation and a paragraph with how we got there, why, references. Supporting information is the last thing we write. We know the justification; we've talked about it for 2 years.
- It was hard for me to figure out what the trial balloons were, those aren't the ones I'm thinking of in terms of recommendations. I'm personally not interested in looking at more graphs.
- The power in our conclusions and recommendations comes in brevity. If we produce a document that is 20 pages, half the number of people will read it than if it were 10 pages. The sooner we can get something out as draft recommendations, or substantive conclusions, the more feedback we'll get back before we do a final.
- This is my 2nd meeting. Given what I've seen, I think we're far from consensus or having all the answers. Absolutely we need have what we agree to reject is clearly in this report, this is important in the absence of (further) agreement. Somebody will want to develop an answer after us since we don't have an answer, so we want to steer people away from those things we reject.
- We have never brainstormed on recommendations- we should do it, this afternoon would be great. It's essential to find out what people think the recommendations should be.
- It's all been said.
- DWR will gladly accept what the SAB puts our way.
- DENR is not operating under the same administration and principle- the climate has changed. We don't need to be sensitive to that as an SAB, but to me it indicates that those folks may not be patient. We need to meet our report deadline, whatever target we set.

Facilitator: can we get back to the audience and come to agreement? Is it DWR?

Comment: An audience other than DWR (such as a summary for general public) may be misconstrued as trying to develop policy if we're not careful in our report, which is not our charge. We should focus the outcome as advice to DWR.

C: Yes, I agree with audience is DWR, but nuance is to write in a way that others can understand, that the justifications are sufficiently robust, and include clear description of the best professional judgment that this body has used to come to recommendations. That they are not keyed to the expertise at DWR, we need to be cognizant that DWR will not be only ones reading it.

An EFSAB member suggested some consensus principles for the group to consider regarding the Final Report, and to revisit the WaterFALL consensus principle if needed. Another member suggested that there was no need to revisit the WaterFALL consensus principle. The facilitator noted that there was one person who was at a "4- do not support but do not want to stand in way", and suggested setting the WaterFALL consensus principle aside to discuss at a future meeting.

The following Consensus principles were proposed by group members and tested for consensus using the 5-

finger scale. All EFSAB members supported the consensus principles with “1s” (Endorsement- I like it).

Consensus principles for the EFSAB Final Report:

- 1. The audience for the report is DWR.**
- 2. It contains recommendations as well as other considerations that were eventually rejected. (replace in other sections)**
- 3. Make clear justifications for recommendations that are accepted and recommendations that were eventually rejected so that they are understood to a broader audience.**

V. Brainstorming Recommendations

Rather than going into a timeline and issues discussion as was proposed originally on the agenda, the facilitators suggested the group move into a brainstorm for ideas for recommendations as suggested by the group. They asked if the group wanted to do that.

C: I'd like to do that, but based on what I saw was on the agenda, I'm not totally prepared to do that so my ideas may be a stream of consciousness.

Facilitator: that's what a brainstorm is- to put out ideas and not judge.

Q: Will these trial balloons we were going to see help us brainstorm later?

Facilitator: From what we're hearing, it seems like you're ready to brainstorm. This allows you time to think together as a group about kinds of recommendations.

The EFSAB then participated in an open brainstorm of potential recommendations.

Process that occurred between March 19 and April 16 meeting

At the March 19, EFSAB meeting, members of the board generated a list of “recommendations” that have been organized by categories. This summarizes the recommendations by categories; the recommendations are listed in an appendix in the order that they were generated (**note that the numbers on the two lists do not correspond**).

Comments generated by the EFSAB (at the March meeting) fit into a **next steps category**:

- May recognize agreement for how to move forward with recommendations [generated today]. Could organize and create report next meeting.
- Framework is there, there is still a gulf between the concepts and specificity that some people are looking for and others might want to avoid. Some recommendations will have to be concepts; some can be a range from a concept to a specific #. **For those that have a specific range, we need to find out what kind of consensus we have or how far away we are from a final product. Some of that would come out if we had an example [to test the recommendation using trial balloons].**
- Go through what we have here, work through specific recommendation language and start to say these are the studies we are relying on, this is how specific we can be, this is how specific we can't be, and we can get into this level of conversation, but we can't have it divorced from the recommendations we have had today.
- At some point Board members bring forward written recommendations, laying out recommendations a, b, c and followed up by why you came to that recommendation.

After the March 19, 2013 meeting, the facilitation team:

1. Typed up and organized the recommendations
2. Sorted the information into categories
3. Judy and Fred reviewed the information and added additional suggestions which were taken into consideration.
4. Distributed the recommendations

Between the March 22 and April 16 meeting the EFSAB was asked to:

1. contribute additional recommendations in separate WORD attachment by April 3.
2. contribute Trial Balloons for moving forward. Please let us know by April 3 if you have a Trial Balloon to introduce at the April 16 meeting. The plan is to briefly introduce the trial balloons so that the EFSAB has an idea of the number of options they might consider.

Results: one EFSAB member provided a couple minor edits to the recommendations framework. Two EFSAB members provided trial balloons to further develop recommendations.

The document sent informed that at the April 16 meeting the EFSAB will:

1. Continue generation of recommendations
2. Review the new recommendations
3. Combine and improve ideas (process of association)
4. May determine order of tackling the recommendations

Topical Categories of Recommendations

Four major with minor categories were developed to organize the recommendations generated by the EFSAB at the March 19 meeting:

1. Refine the Charge

- a. Parameters for the EFSAB Project

2. Characterize Ecology of Different River Basins

- a. Characterization: What and How
- b. In Lieu of Classification Approaches
- c. Other Aspects of the Ecosystem to Define Ecological Integrity
- d. Treatment of Coastal Areas

3. Determine Ecological Flows

- a. Necessity of Models
- b. Current Approaches and Concerns
- c. Thresholds for Ecological Integrity

4. Future Directions/Adaptive Management

- a. Final Product Design: How will DWR incorporate recommendations into an internal and/or external design?
- b. Triggers for Site-specific evaluations
- c. Pre and Post Monitoring of Withdrawals to Validate Future Recommendations
- d. Beyond EFSAB

Refine Charge for EFSAB

Parameters for the EFSAB Project

1. These flows should not supersede or interfere with any existing flow agreements already in place (FERC or other agreements)
2. Our job to advise and recommend when possible. Need to make readers aware of the uncertainty we have wrestled with. We may not be able to provide an answer to the question that was posed to us.
3. Don't undermine what does come out of this given that uncertainty somehow characterizing what we can say definitively, and potentially make recommendations about what is necessary to say anything more definitively. [Let's not] Don't undermine what we can say because we are not comfortable making specific numeric recommendations, which I totally agree with.
4. This is scale dependent. We are talking about ecological flows for the entire state. We use fish and bugs because that is what is available. For site-specific can use other data as available.
5. We need to address ramifications of what we recommend.

Characterize Ecology of Different River Systems

Characterization—What and How

6. Characterizing ecology is a just means to an end, not an end in itself.
7. Characterization is going to include at least 3 classes (at least piedmont, mountains, and coastal plain).
8. A classification of streams is required; that classification should not be based solely on flows, based on our experience with EFS and McManamay, but should be based on biological and environmental data.
9. We should continue to inform each class with new data as it comes in from IFIM, PHabsim, RTI, new research, and sampling from DWQ, etc.
10. This is scale dependent. We are talking about ecological flows for the entire state. We use fish and bugs because that is what is available. For site-specific can use other data as available. [listed under "Refine Charge" section also]
11. Fish and benthos classifications developed will differ, and the flows derived from those will differ: have to address how we put those two elements of the ecosystem together with acknowledgement that there are other ecosystem parameters we are not addressing. Do we choose the most sensitive? Average? Least sensitive? We have to address this issue.
12. Could use the more sensitive as trigger to go the more site specific and use the more generalized approaches for larger scale.
13. Or address by which most impacts the goods and services provided. (I'm not voting for that one, but it is an option)
14. Develop biological responses for each class.
15. Incorporate a means to adjust baseline characterizations to reflect long-term changes in climate and land use.
16. Continue to inform those classes with new data as it comes in from new research data from DWR, RTI, etc.

In Lieu of Classification Approaches

17. Referencing Richter paper: in lieu of classification, use Sustainability Boundary Approach (SBA) 10-20% off hydrograph, wherever you are in the state.

18. Use Sustainable Boundary Approach where you take off 10% or 20%. The hydrograph captures the variability of that stream in that particular eco-region based on topography, slope.
19. Use document developed in early 1990's that shows low-flow basins, etc. It is very general but it provides more than just mountains, piedmont, coastal plain. If you look at slate belt streams, we can predict that they are much more vulnerable to withdrawals than a coastal plain stream, for example.
20. If we get to a specific point on a graph as a recommendation, we need to provide justification for reaching that conclusion. For example, if the approach uses PHabsim, I would need to see validation that the habitat modeling approach actually reflects what is going on [with the biota]. That's what I need to get some comfort with recommending a discrete flow boundary.

Other Aspects of the Ecosystem to Define Ecological Integrity (concerns over taxa and a biotic interactions that may not be considered such as nitrate fixation, for example).

21. Our definition of ecology and ecological integrity is based on fish and invertebrates primarily and doesn't explicitly include other aspects of the ecosystem (nitrogen fixation at a certain rate, for example). We have essentially ("**rejected**" **was edited out by EFSAB member**) put aside looking at ecological integrity from the point of view of some other processes.
22. Corollary to that we should consider other ecological functions where they may ultimately end up impairing fish and benthos, such as low-flow withdrawals that will exacerbate longer retention time that could trigger algal blooms that would then in turn affect fish and benthos.
23. One classification is fish and benthic-based, but there may be other approaches that could be pursued as data becomes available.
24. We did not reject some approaches (such as those addressing nitrogen fixation or other processes in the coastal plain) by choice, but rather because the data is not available.
25. We have not discussed in detail other elements of ecological communities or processes, but we could. Thus far, we have used fish and benthos as indicators, but even though data is not available, we could incorporate into the recommendations including that data as it becomes available.
26. Eco flows should take into account impacts on threatened and endangered species.
27. Eco flows should take into account the entire ecology.
28. Processes triggered by droughts and floods should be included.
29. We are working with fish and benthos because that is our best data, but there could be data that could be gathered, just not in time for this process. I think this is where are going with the nitrogen retention, threatened and endangered species and the coastal question.

Treatment of Coastal Areas

30. Biggest area of question is coastal area. Falls outside of OASIS as well as WaterFALL. Any input that the Board could provide on e-flows for coastal would be greatly appreciated. Is there a need to come up with eco-flows for the coastal region? Are there perceived impacts quantity-wise?
31. Recommendations for Coastal Plain:
 - a. Use literature
 - b. Other sources of guidelines come from other agencies (Division of Marine Fisheries, Division of Water Quality)
32. Recommend strong future need for more research on eco-flows in coastal plain with plug for WRRRI and Sea Grant to include that in their calls for proposals.
33. Very difficult for this board to address coastal question. Unknowns are insurmountable given time restraints. We could recommend always doing a site-specific study or recommending falling back on the current threshold. It would be useful to analyze how often the current threshold is exceeded or not in the coastal plain. (Is it effective at protecting ecological interests in the coastal plain?)

34. Albemarle Pamlico National Estuary Program (APNEP) is charged by EPA to assess water quality in APNEP region, which is 2/3 of the coastal plain. Does that include some consideration of flow? Should we reference that even to acknowledge that there is another Board working on this?
35. In ideal world if we were successful in establishing e-flows in piedmont and mountain regions, that in turn, it would, intuitively, protect downstream areas as well.

Determine Ecological Flow

Necessity of Models

36. We should say that models are necessary because don't have actual gage data in some places
37. Add to that that we not say what kind of models they [DWR] use, but that they should use models that incorporate actual flow data when available and predictive information if actual flows are not available.
38. DWR use whatever tools they deem best.
39. The charge to EMC (approval of model) is to develop a model that protects ecological flows amongst other things. I see the charge as creating a post-processor. In absence of that black box, we need to capture the process that we hope DWR goes through in the form of a flowchart of the steps DWR needs to go through, as specific as science allows. That kind of graphic representation of our work would be very helpful for explaining it to EMC and others and may help to get to these other questions of whether we are providing an actual number. To the extent this group has knowledge or experience with specific areas of the state, it may be possible to drop a few reaches through that process and make recommendations within either specific classifications or specific reaches with some additional granularity. I think that what would be most useful to me in my position on the EMC would be understanding with as great specificity and with as much scientific background as possible that process.

Approaches to Determining Ecological Flows

40. The best way to answer the questions in the legislation is to address for each class:
 - a. Divide year into relevant time steps (perhaps differently for each class)
 - b. For each time step, set % ambient flow to be required
 - c. For each time step and % flow, what constitutes allowable violations in terms of magnitude, frequency and duration of deviations from that preserved flow.
41. Focus on approaches rather than flows: scale dependent on data available.
42. Legislation says DWR comes up with flows; not clear what EFSAB's charge is.
43. Some flow recommendations are incompatible with maintaining ecological integrity (need to flesh out which and why)
44. Referencing Richter paper: in lieu of classification, use Sustainability Boundary Approach (SBA) 10-20% off hydrograph, wherever you are in the state.
45. Recommending an approach rather than conclusion. Any recommendation we make would have to be evaluated in light of whatever scale we are using to approach that recommendation. If approaching basin, it could be X%. If looking at site-specific recommendation we may be so far off base because we do not have the information. We need to focus on approach rather than #. Information we're using to develop our definition of eco-integrity, fish and bugs for example, and the more refined we get in the process the more information we uncover, it is quite likely that you end up with a narrower and narrower the frame of flow limitations. The more you discover may find there is one bacteria and that is the only place it lives so if you move one drop of water, it is going to be gone. Have to look at it from that perspective as well as

from the physical scale perspective. Difficult to support #'s with info we have. We can make justifiable recommendations if we focus on the approach.

46. There's a gap [for getting to] BEC, etc. Dual-track tool – shows trial balloons, as statewide since classification not done. Do people know how flows vary by region? There is info to help that we have set aside (example, regarding flows in mountains).
47. At some point we are going to have to wrestle with what that number or range or condition is.

Thresholds for Ecological Integrity

48. There may be different recommendations coming from the data and the analysis, but it might be possible that the recommendations could be a range of flows where you could have a limit of more protective flow standards and a limit of upper threshold you would not want to cross over, so there could be a range as opposed to a specific flow recommendation. That would provide boundaries on what would be the most protective for certain sensitive species and what would the upper threshold for what we would want alterations to exceed.
49. A range for each class and time step not significant different from a target flow with allowable variation.
50. We're talking about thresholds; whether it's a number or other way of characterizing it, we need to wrestle with what protects ecological integrity and what is the threshold beyond which we are not protecting ecological integrity anymore. Is that x %; is it some other way of looking at it?
51. Add to that a level or threshold for screening purposes whereby which you would strongly suggest further site-specific evaluation.
52. Determine what level of disturbance meets the definition of ecological integrity in the legislation and recover.

Future Directions/Adaptive Management

Final Product Design: How will DWR incorporate recommendations into an internal and/or external design?

53. I don't know what DWR's final product is envisioned to be: map showing e-flows for each reach across the state—it is done proactively? Or is it an on-demand product where a city, for example, says they want to increase their withdrawals by x amount, and they can see how that is going to affect the streams in the region.
54. My understanding is that DWR will plug ecological flows into their basin wide flow models, which could be used in either direction. It could demonstrate where there is available flow without exceeding these concerns or it may be used as planning tool to tell a potential user to not consider additional withdrawals because that additional water is not available
55. They could do in a way (like Michigan, although it is not completely analogous because Michigan has permitting) that you can input a plan for withdrawal and either get a green light that says go ahead or a red light that triggers a site-specific study.
56. I think an appropriate compromise would a map showing where all the classes are, and for each class some reference that you could determine how the DWR will approach the question of ecological baselines. And then you have a brought guideline of time steps and % and when do we transgress the baseline and how much, how long and how frequently, with some clear stipulation that DWR will make a clear determination in its evaluation using these guidelines.
57. We need to have a discussion at some time about how DWR would use the product.

Triggers for Site Specific Evaluation

58. Project evaluation will always require site specific evaluation.
59. Need a description of process or criteria that forms a trigger for when a site –specific evaluation is needs to be done. Also a description of “reach” and a description of the scope our classification applies to.
60. Require or strongly recommend site-specific studies where the available tools suggest a high degree of uncertainty or extreme ramifications
 - a. Project based, or
 - b. Where at limits of the classification
61. We’re going to want site-specific studies where we have water withdrawals.
62. Once there is a recommendation for what the e-flow is at a particular site, I can see its being used with OASIS to trigger further analysis for withdrawal, but once that site-specific analysis is underway, will the eco-flow recommendation be considered at that stage of the analysis?
63. We need to focus on telling DWR how to answer the question of how much water is required in each class to maintain ecological integrity. We do not need to advise them on what to do with that information.
64. Best way to protect integrity is site-specific analysis. If have to classify the entire state, I think each and every withdrawal would require a site-specific analysis. That is likely infeasible. Then is important to recommend how DWR uses – need to be explicit that flows recommendations are at the state planning level because the recommendations we make would be erroneous at a site-specific scale.

Pre and Post Monitoring of Withdrawals to Validate Future Recommendations: What can we learn?

65. We should continue to inform each class with new data as it comes in from IFIM, PHabsim, new research, and sampling from DWQ, etc. [also listed in Characterization of the Ecology]
66. This needs to be an adaptive process that needs to continue through time and feedback on itself to produce better and better estimates of eco-flows involving more and more components of the ecosystems where possible.
67. We are really saying that we need validation
68. Each significant proposed water withdrawal is bracketed by monitoring prior and posterior so that we know the effect of the withdrawal and if it is having impacts, then can adjust those flow alterations. It is an insurance policy that the decisions are going to be made better in the future.
69. Agree we need validation of these models, whatever method is used to support make the criteria.
70. We could recommend analyzing some withdrawals before and after to verify our expectations for ecological integrity, but should not recommend going back to the user (or requiring them to pay) for those studies.
71. Really recommending:
 - a. Each withdrawal be monitored before and after to gain understanding of effects on ecological integrity
 - b. If having impacts, then can adjust flow recommendation.
72. Being one charged with doing evaluations, the “pre” is most contentious part of that—is it one year, 3 years, 5 years? I don’t disagree that the info would benefit future decisions.
73. There’s equal potential that what we learn from that experience could lead to the lessening of flow recommendations (easing them up) because we find that withdrawals have not changed the habitat or the species composition, and there could be room for discussion of whether the recommendation was too strict. It could work both ways—to the disadvantage of the withdrawer or to their advantage and the disadvantage of the scientist who cares about specific species. There are 2 sides to that caveat.

74. We need to build a system where in the future we can have more confidence in the recommendations.
75. I'm not so interested in having every withdrawal analyzed or in just the significant ones. I am interested in having those withdrawals that benefit from flow alterations to continue to contribute to the knowledge base for future decisions. —Can be done a lot of different ways, not just on site-by-site approach. Can do more holistically.
76. Recommend how you would evaluate within a class if the recommendations are working, choosing, perhaps, reference sites within a class that you would monitor over time to identify whether we are understanding this or is there some type of gap we need to fill. Apply our backgrounds to answer a question going forward that we are unable to answer now.
77. Look at discharges (flows), not just withdrawals and impacts of the flow (not just the chemistry).

Beyond the EFSAB: Recommendations for Report

78. Recaptured from what I've heard, this process is not ending with this group; all of the things regarding future information need to go in there.
79. Need to make readers aware of the uncertainty we have faced.
80. This needs to be an adaptive process, progressively including more aspects.

VI. Discussion about whether to review DWR trial balloons

The EFSAB discussed whether to continue with discussing the trial balloons that DWR had sent prior to the meeting for discussion.

C: I don't feel like I was well prepared today, but will be for next meeting. I think at next meeting we can take this and continue it without prioritizing. I would like to continue the brainstorm

Facilitator: we may organize and categorize it in between now and then.

C: Can we have it in anticipation of next meeting

C: How does this fit with what we called Plan B- the trial balloons. Is there a plan B in there?

C: Yes, I think it's in there.

Facilitator: I imagine you would flesh them all out.

C: An observation- if the next step is to reconvene in a month with the material organized, abridging it and coming up with outline for our recommendations, we can go home if we've done as much as we can until next month.

Facilitator: we appreciate knowing how you would like to use the rest of the day

C: if rest of agenda is discussing details that may be perceived as down in the weeds, they should have option of staying, if others think we are putting up brainstorms and don't want to get down in weeds. I'm not sure I understand what remainder of the agenda would be.

Facilitator: Last month you discussed topical ideas for a timeline for recommendations- we took that information and put together a timeline for you to review. The other thing is that DWR provided 3 trial balloons

for your consideration. We'll need to discuss how you want to structure the April meeting.

C: I'm interested in the trial balloons in a sense as that we're still working around a flow recommendation that we don't have. Maybe we get there through the trial balloons.

C: going through them might help us move through some of these thoughts we put up today.

C: I'm happy to stay if there's work to do.

C: I think the timeline will be related to what we just built.

C: I would suggest that we do not break into small groups but rather discuss as one group.

C: For me, I find it much easier to work from general to specific in logical progression, in part because I don't have the same level of expertise as others around the table. I can place the technical discussion in context if it's in a larger outline. It's challenging to flip back and forth from the details to the outline. Is there any additional work to be done on the brainstorm that would be useful for moving forward. There is a lot of work in that brainstorm list. I need a better idea of the higher context of recommendations before getting into the details.

C: What do we have (to work with) . We have a limited number of things we have to put together.

- Various models
- Classification systems
- PHABSIM
- Ecological flow stuff

C: I'm confused- are we a science advisory board that is going to make recommendations, or are we a work group extension of DWR that is trying to determine quality of science. It's not easy to be successful at both of those. I like what we did today, it helps me deal with my confusion. I hope it will help us in the future. I don't mind sitting here today discussing trial balloons but not sure it will help me. #1 priority is to add to the brainstorm, wordsmith them to make them more understandable. I am burnt out today, but looking forward to seeing meeting minutes from today. Rather than get distracted, let's celebrate, call it a great day, prepare for our next meeting.

C: If all of that over there were typed and organized topically, then I think this group would be delighted to know there is almost not internal conflict, and could process that into the outline of a recommendation document in one session. We can't do it this afternoon.

C: I agree, I think the organization needs to be sent out ahead of time.

Q: Framework is there but there is a gulf between the concept and specificity that some people are looking for. When I saw the trial balloons, I wasn't sure how they would enhance the conversation. Can that be clarified?

DWR: There's a gap between the brainstorm and where we are right now. There is a bridge needed. It's based on using whatever data we have for moving forward. Jim provided a stepwise path forward (sent via email and provided as handout). The Dual track I sent out was my attempt to conceptualize what we've been doing to try to characterize and develop flows (2 tracks). Down the center are the flows we would come up with. In my view there are the methodologies and the flows themselves. Assuming there's a link between classification and flow

requirement, you could check a box based on the classification. The reason I've put smiley faces for the trial balloons, an attempt to poke the board to test their comfort at some level. The reasons for these levels, is under state-wide we do not have a classification yet. We've discussed them- eco-regions and physiographic regions, but how do they tie into flows? Mountains versus piedmont-how flows vary-does anyone know?

C: yes, there is a document, statewide established in early 90's. It says these are low-flow basins. It's very general, not appealing for a site-specific level but it's understood to a degree that its more than just mountains piedmont. For example slate-belt streams go dry and are more susceptible to withdrawals. That info has been put aside.

DWR: So this is a boundary approach, if you took off 10%of the hydrograph, it captures the variability of the stream in the ecoregion based on topography, slope, etc. These are trial balloons. Reason I picked 80% inflow, 40% average annual and monthly median. If you look at 80% there is a certain amount of habitat loss (amount guilds/species below)- if you look at the graphs, below 80% you see a drop in habitat, if you look across for those other scenarios, it is similar for the other 2 trial balloons.

C: I think it's going back into the weeds and implementation, and we should keep our focus on what we started today and what advice the SAB may be making. Some of those issues are best dealt with by DWR or through an implementation work group that is different from this very diverse group at the table. I would vote for not going into that level of detail today.

C: Thanks for explaining, I didn't know how to interpret the spreadsheet. Now I understand what you were using to get to that, the key to me is that you made a decision about what you think is protecting ecological flows. That is where we need to have that discussion- why did you think that is protective of ecological flows, does everyone agree with that approach, and why or why not? That's an example of what we need to discuss, whether today or not.

DWR: The graphs are the 9 piedmont flow study sites, based tangentially based on our rule of thumb is 20% loss of habitat associated with site-specific studies. You will need to discuss that.

C: I think that is best discussed in context of how species respond to flow alterations. We'll have that info soon.

C: I think questions will come up when you get in the weeds. This is where we outline these items and get to a specific point, then we have to justify why you made that decision. I would ask how many sites have you gone back to look at biological data to justify the model about what's going on. We need to be prepared to look at that and say the data is there to support it, or say it's not. It may be these are great and right on target, or too lenient. It will require more evaluation and organization. I don't think we can accomplish that this afternoon.

C: This conversation is good example for me of most efficient way to proceed is to organize recommendations, as we make them more specific we'll come up with data gaps, questions, and issues about how specific the recommendations can be. But to have them divorced from an overall framework is a way to proceed but not best for me. I think we should organize it, take chunks of them, then work through it. Then we can get into this level of detailed conversation.

C: I suggest that EFSAB members provide trial balloons to discuss future meetings for recommendations- anyone who has an idea bring it forward.

C: We have a wall full of trial balloons as a starting point. We could get more specific for any one of these. At some scale we're pretty much in agreement with most of these things, the question is how far into detail can we go and keep everyone comfortable. If we start with a framework and then get more and more specific that may

get us where we need.

C: Some of these may or may not be in consensus. Anyone who wants to present recommendations written up- write my recommendation, how we came to that recommendation, and why (justification). Board members can present trial balloons with justification.

Process decided upon-

Facilitators will type up, categorize and check the recommendations against the recording before sending the Recommendation Framework to a small group (Judy, Sam, and Fred). The small group will review the categories and provide additional feedback on how to frame the categories and organize the responses by Thursday. The categorized list of recommendations will be sent out Friday March 22 to the EFSAB. The EFSAB will have until April 3 to review and send additional comments or recommendations. EFSAB members can develop trial balloons, either by themselves or in small groups, related to specific recommendations and send out ahead of time.

C: This was not the easiest way to do. If there is a substantial recommendation, we should be responsible for writing it on a card so that you are not trying to write what somebody is saying and possibly characterize it incorrectly. That is too challenging.

C: Even better, EFSAB members could send them by email before the meeting.

Facilitator: We can write them out somehow to display them and you can wordsmith them together in the meeting. Also it's important to allow recommendations to come up verbally throughout the discussion.

VII. Developing a Timeline

The EFSAB discussed a potential timeline for the remainder of their meetings. The timing of the Biological-Environmental Classification (BEC) System Study by RTI was a key component for determining the timeline. Based on previous statements, the project team had anticipated that data would not be available until late summer. Jennifer Phelan, RTI, stated that the BEC classifications for macro invertebrates and fish would be finalized in May, with an optimization (combination) of those classifications finished in June. Tom Cuffney, USGS, is working on the BEC classifications for macro invertebrates.

C: Regarding preliminary results in April, I'd rather just hear the final classification when its ready to roll in May, unless you think there is a lot for the board to say about it. Then in April focusing on what we have here and potential trial balloons. What I see happening is a similar pattern that we'll talk about it preliminary results, then talk about it again and again. If there are not action items for Board to address in April re. the BEC I'd prefer to wait.

Q: Does group want to hear if there is an overlap or difference between fish and bugs in April?

C: if there is no overlap, are you expecting something from board to deter you from proceeding or get new direction? If it's going to cause me additional anxiety if they're far apart, I'd rather deal in May.

C: I hope you see from us a best fit solution for 3 independently derived classifications- topodaphic, benthic, and fish clusters. I hope when we bring them to group we're not presenting a mess, we're presenting a best fit solution for those 3 inquiries.

Q: is that most likely to happen in April or May?

R: May, but Tom Cuffney won't be here in May- we can't do it when he's gone (since he's doing the macro invertebrate)

C: It won't be final, but we'll give it our best shot.

C: Another item: PHABSIM sites for the mountains?

C: Not necessary

C: We did notice hydrologic metrics did not vary much in the mountains compared to the piedmont, but it would be interesting to see if we see the same pattern in PHABSIM.

C: You can tell us.

C: If we can't get BEC to work, there is something in PHABSIM that may be useful. I don't think it is the tool of first choice.

C: Part of the reason of BEC is to give PHABSIM relevance, we couldn't do PHABSIM everywhere, we had a limited number of groups/classes where we could do PHABSIM in those classes. It wasn't a matter of either or, it was one leading to the other.

C: There is a certain lack of overlap depending on how the classes work out.

C: We mentioned if we had 100 classes that's not going to work.

C: The data the BEC is using is wadeable streams, where PHABSIM data includes some that are much bigger. There are some types of critter the PHABSIM data may have that BEC does not.

C: I think it would be interesting to take PHABSIM data and correlate it with physical classes to see how it correlates. (RTI is not funded for that). Is that something DWR could do?

C: We talked about re-running some PHABSIM sites, it would take cooperation with RTI to get the WaterFALL data.

Facilitator: Could that be presented in June? (yes)

C: My reaction to that is we're hoping the biological classification is useful with the BEC approach, if not, the surrogate is a habitat-based approach, if not, we're back to literature/conceptual approach. It makes sense to try to tick them off in that order.

Q: Do you go ahead and start working on Plan B while we await BEC? Is Plan B running PHABSIM and correlating it to topoedaphic, having it in back pocket if BEC is too far apart? Then presumably we're achieving same goals in roughly same timeline. PHABSIM has long term support in literature.

Facilitator: we were thinking BEC was way out in September, but now we're seeing it's sooner. So you may have information to help you move forward sooner.

C: About PHABSIM, it is not assailable. Its value as a strategy for understanding what is going on for a particular guild is well established. It cannot be applied to the whole state- the questions asked in the legislation cannot be answered using only PHABSIM. What it may be is a way to add data to the classes, to create another data source into the classes, especially in the mountains so we have an idea of what's going on in the classes. I don't see it as a fallback position.

C: I can see results of PHABSIM, if you don't prejudice yourself by saying this is a piedmont stream, mountain stream, what you get is data output about how habitat is responding to flow regardless of where you are. You can put a PCA and see how similarly each stream is responding, how habitat responds may be pooled together. They could potentially pool out together. Then I'd suggest taking topoedaphic class and see if there is a correlation to how they're responding. It might be based on slope, or some other variable or combination that is replicated across the state. Even if you're in Granville County you may have a stream that responds exactly as if in French Broad. Those 2 systems may respond in same way and be managed similarly.

Q: Interesting strategy, can you get it done in April?

C: The one thing that you suggested, when you run PHABSIM analyses, you have to make a choice about what guilds, the guilds in the mountains are different from piedmont. You already have a difference. The list of guilds we decided on and ran was for the piedmont- no trout, sculpins, hogsuckers...

Q: Are there a subset of guilds that might be the bugs?

C: They will be able to use some overlaps.

C: I don't have the skillset to do that analysis, maybe somebody else at the table does.

C: Statistically there may not be enough PHABSIM data sets.

C: Lets have a run in next few months looking at how PHABSIM sites correlate with mountain data and then decide what to do. Is that ok?

C: There's nothing to prevent us from keeping this on table as future endeavor perhaps when PHABSIM has more data points, as a recommendation.

C: In July we're proposing to talk about the coast. Between now and then I'd like to talk to people outside of this group about possible ways to deal with the coast that we haven't addressed. We've talked about the problems but haven't come up with any solutions.

The following timeline was written on flipcharts as the proposed process:

April 16:

- BEC preliminary results (2 hours) 30 mins RTI, 20 mins USGS, discussion 60 mins
 - flow biology relationships
 - methods for eco –responses
 - strategy for integrating the fish and benthos classification
- Recommendation Framework (4 hours)
 - Potential trial balloons from EFSAB members

May 14:

- BEC finalize classification
- Discuss support for BEC from EFSAB
- Other items as warranted.

June 18:

- PHABSIMs using mountain sites – how it correlates with class
- Optimization of macro invertebrate and Fish classification – BEC

July 16:

- Coastal Discussion
 - Contributions from Coastal Coordination Group

August 20: To be determined

September 24: To be determined (no decision about whether to make this a 2-day meeting or not was made)

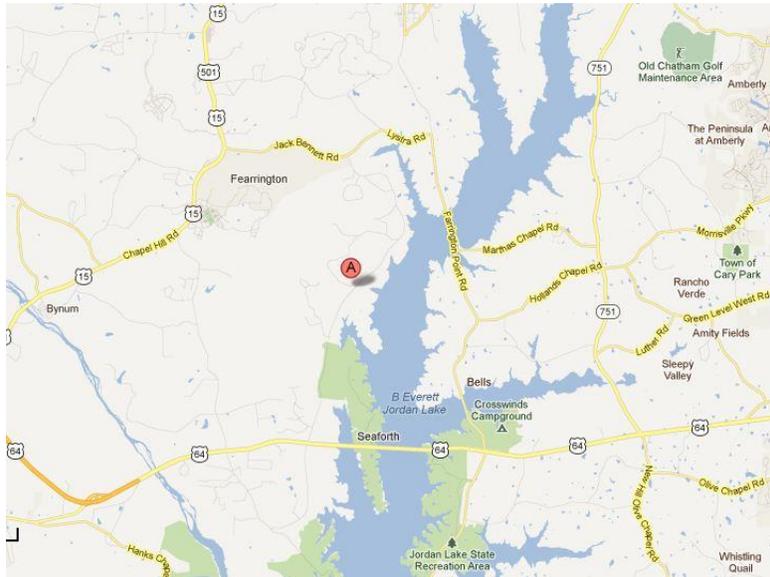
VIII. Information on Next Meeting

The draft agenda for the April 16, 2013 meeting includes:

- BEC preliminary results (1.5 hours) 30 mins RTI, 20 mins USGS, discussion 60 mins
 - flow biology relationships
 - methods for eco –responses
 - strategy for integrating the fish and benthos classification
- SALCC classification results (1 hour) Presentation by Mary Davis
- Recommendation Framework (3.5 hours)
 - Further refine recommendations
 - Provide overview of the trial balloons from EFSAB members (if any are provided)

The next meeting of the EFSAB is scheduled for **April 16, 2013** at the Stan Adams Educational Center from 9:00am until 4:15pm. Please remember to bring lunch and refreshments with you. Coffee will be available on site and soft drinks are (\$1). **Webinar:** If you cannot attend the meeting in person but would like to join us via the webinar, you can watch the presentations and listen to the live streaming audio of the meeting by accessing the link and typing your name in the space labeled “guest”: <https://denr.ncgovconnect.com/sab/>

Meeting Location & Directions: The meeting location is the Stanford M. Adams Training Facility at Jordan Lake Educational State Forest. Directions are: 2832 Big Woods Road, Chapel Hill, NC 27517. From Rt 64 and Big Woods Road, it will be the first Forest Service sign on the right. Pass the office building and continue on through the gate to the education center. For Map link: <http://go.ncsu.edu/stanadams>



XI. Appendix: Initial Brainstormed list of Recommendations

Initial Brainstormed List of Recommendations (by EFSAB members) (Verified with meeting notes and webinar, 3/19 & 20)

EFSAB members were asked to support the following two rules of brainstorming:

- Defer judgment of your ideas and the ideas of others (withhold any and all criticism):
- Concentrate on generating ideas

The following list of ideas mirrors the language used by the EFSAB members and in order of when the speaker's contributed comments. Any comment with [] was inserted by the facilitators in an attempt to clarify the speaker's point.

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1. Characterizing ecology is a just means to an end, not an end in itself.
 2. Characterization is going to include at least 3 classes (at least piedmont, mountains, and coastal plain).
 3. Referencing Richter paper: in lieu of classification, use Sustainability Boundary Approach (SBA) 10-20% off hydrograph, wherever you are in the state.
 4. A classification of streams is required; that classification should not be based solely on flows, based on our experience with EFS and McManamay, but should be based on biological and environmental data.
 5. We should characterize biological responses to flows for each class using all available data: PHABSim, IFIM, and other data available such as WRC and DWQ.
 6. We should continue to inform each class with new data as it comes in from IFIM, PHabsim, RTI, new research, and sampling from DWQ, etc.
 7. Project evaluation will always require site-specific evaluation.
 8. Develop biological responses for each class.
 9. The best way to answer the questions in the legislation is to address for each class:
 - a. Divide year into relevant time steps (perhaps differently for each class)

- b. For each time step, set %ambient flow to be required
 - c. For each time step and %flow, what constitutes allowable violations in terms of magnitude, frequency and duration of deviations from that preserved flow.
10. We shouldn't say anything about what kind of flow models DWR should use
 11. That they (models) use actual flows as available and predictive information if actual flows are not available
 12. We should say that models are necessary because don't have actual gage data in some places
 13. Add to that that we not say what models they use, but that they should use models that incorporate actual flow data when available and predictive flows if not.
 14. DWR use whatever tools they deem best
 15. Incorporate a means to adjust baseline characterizations to reflect long-term changes in climate and land use.
 16. Some flow recommendations are incompatible with maintaining ecological integrity, 7Q10 for example (need to flesh out which and why)
 17. Our definition of ecology and ecological integrity is based on fish and invertebrates primarily and doesn't explicitly include other aspects of the ecosystem (nitrogen fixation at a certain rate, for example). Have essentially rejected looking at ecological integrity from the point of view of some other processes.
 18. Corollary to that we should consider other ecological functions where they may ultimately end up impairing fish and benthos, such as low-flow withdrawals that will exacerbate longer retention time that could trigger algal blooms that would then in turn affect fish and benthos.
 19. One classification is fish and benthic-based, but there may be other approaches that could be pursued as data becomes available.
 20. We did not reject some approaches (such as those addressing nitrogen fixation or other processes in the coastal plain) by choice, but rather because the data is not available.
 21. These flows should not supersede or interfere with any existing flow agreements that are currently in place (FERC or other agreements).
 22. We have not discussed in detail other elements of ecological communities or processes, but we could. Thus far, we have used fish and benthos as indicators, but even though data is not available, we could incorporate into the recommendations including that data as it becomes available.
 23. Eco flows should take into account impacts on threatened and endangered species.
 24. Eco flows should take into account the entire ecology.
 25. Processes triggered by droughts and floods should be included.
 26. Determine what level of disturbance meets the definition of ecological integrity in the legislation and recover.
 27. At some point we are going to have to wrestle with what that number or range or condition is.
 28. We are working with fish and benthos because that is our best data, but there could be data that could be gathered, just not in time for this process. I think this is where are going with the nitrogen retention, threatened and endangered species and the coastal question.
 29. Recaptured from what I've heard, this process is not ending with this group; all of the things regarding future information needs to go in there.
 30. This is scale-dependent. We are talking about eco-flows for the entire state. We use fish and bugs because that is what is available. For site-specific can use other data as available.
 31. This needs to be an adaptive process that needs to continue through time and on itself to produce better and better estimates of eco-flows involving more and more components of the ecosystems where possible.
 32. Need a description of process or criteria that forms a trigger for when a site –specific evaluation is needs to be done. Also a description of "reach" and a description of the scope our classification applies to.
 33. Require or strongly recommend site-specific studies where the available tools suggest a high degree of uncertainty or extreme ramifications
 - a. Project based, or

b. Where at limits of the classification

34. We're going to want site-specific studies where have water withdrawals.
35. I don't know what DWR's final product is envisioned to be: map showing e-flows for each reach across the state—it is pre-done? Or is it an on-demand product where a city, for example, says they want to increase their withdrawals by x amount, and they can see how that is going to affect the streams in the region.
36. My understanding is that DWR will plug ecological flows into their basinwide flow models, which could be used in either direction. It could demonstrate where there is available flow without exceeding these concerns or it may be used as planning tool to tell a potential user to not consider additional withdrawals because that additional water is not available
37. They could do in a way (like Michigan, although it is not completely analogous because Michigan has permitting) that you can input a plan for withdrawal and either get a green light that says go ahead or a red light that triggers a site-specific study.
38. I think an appropriate compromise would a map showing where all the classes are, and for each class some reference that you could determine how the DWR will approach the question of ecological baselines. And then you have a brought guideline of time steps and % and when do we transgress the baseline and how much, how long and how frequently, with some clear stipulation that DWR will make a clear determination in its evaluation using these guidelines.
39. We need to have a discussion at some time about how DWR would use the product.
40. We need to address ramifications of what we recommend.
41. Fish and benthos classifications developed will differ, and the flows derived from those will differ: have to address how we put those two elements of the ecosystem together with acknowledgement that there are other ecosystem parameters we are not addressing. Do we choose the most sensitive? Average? Least sensitive? We have to address this issue.
42. Could use the more sensitive as trigger to go the more site specific and use the more generalized approaches for larger scale.
43. Or address by which most impacts the goods and services provided. (I'm not voting for that one, but it is an option)
44. Once there is a recommendation for what the e-flow is at a particular site, I can see its being used with OASIS to trigger further analysis for withdrawal, but once that site-specific analysis is underway, will the eco-flow recommendation be considered at that stage of the analysis?
45. We need to focus on telling DWR how to answer the question of how much water is required in each class to maintain ecological integrity. We do not need to advise them on what to do with that information.
46. Best way to protect integrity is site specific analysis. If have to classify the entire state, I think each and every withdrawal would require a site-specific analysis. That is likely infeasible. Then is important to recommend how DWR uses – need to be explicit that flows recommendations are at the state planning level because the recommendations we make would be erroneous at a site-specific scale.
47. There may be different recommendations coming from the data and the analysis, but it might be possible that the recommendations could be a range of flows where you could have a limit of more protective flow standards and a limit of upper threshold you would not want to cross over, so there could be a range as opposed to a specific flow recommendation. That would provide boundaries on what would be the most protective for certain sensitive species and what would the upper threshold for what we would want alterations to exceed.
48. A range for each class and time step not significantly different from a target flow with allowable variation.
49. We're talking about thresholds; whether it's a number or other way of characterizing it, we need to wrestle with what protects ecological integrity and what is the threshold beyond which we are not protecting ecological integrity anymore. Is that x %; is it some other way of looking at it?
50. Add to that a level or threshold for screening purposes whereby which you would strongly suggest further site-specific evaluation.

51. Recommending an approach rather than conclusion. Any recommendation we make would have to be evaluated in light of whatever scale we are using to approach that recommendation. If approaching basin, it could be X%. If looking at site-specific recommendation we may be so far off base because we do not have the information. We need to focus on approach rather than #. Information we're using to develop our definition of eco-integrity, fish and bugs for example, and the more refined we get in the process the more information we uncover, it is quite likely that you end up with a narrower and narrower the frame of flow limitations. The more you discover may find there is one bacteria and that is the only place it lives so if you move one drop of water, it is going to be gone. Have to look at it from that perspective as well as from the physical scale perspective. Difficult to support #'s with info we have. We can make justifiable recommendations if we focus on the approach.
52. Legislation says DWR comes up with flows; not clear what EFSAB's charge is.
53. Our job to advise and recommend when possible. Need to make readers aware of the uncertainty we have wrestled with. We may not be able to provide an answer to the question that was posed to us.
54. Don't undermine what does come out of this given that uncertainty, and somehow characterizing what we can say definitively, and potentially make recommendations about what is necessary to say anything more definitively. Don't undermine what we can say because we are not comfortable making specific numeric recommendations, which I totally agree with.
55. The charge to EMC (approval of model) is to develop a model that protects ecological flows amongst other things. I see charge as creating a post-processor. In absence of that black box, we need to capture the process that we hope DWR goes through in the form of a flowchart of the steps DWR needs to go through, as specific as science allows. That kind of graphic representation of our work would be very helpful for explaining it to EMC and others and may help to get to these other questions of whether we are providing an actual number. To the extent this group has knowledge or experience with specific areas of the state, it may be possible to drop a few reaches through that process and make recommendations within either specific classifications or specific reaches with some additional granularity. I think that what would be most useful to me in my position on the EMC, would be understanding with as great specificity and with as much scientific background as possible that process.
56. Biggest area of question is coastal area. Falls outside of OASIS as well as WaterFALL. Any input that the Board can provide on e-flows for coastal would be greatly appreciated. Is there a need to come up with eco-flows for the coastal region? Are there perceived impacts quantity-wise?
57. Recommendations for Coastal Plain:
 - a. Use literature
 - b. Other sources of guidelines come from other agencies (Division of Marine Fisheries, Division of Water Quality)
58. Recommend strong future need for more research on eco-flows in coastal plain with plug for WRRRI and Sea Grant to include that in their calls for proposals.
59. Very difficult for this board to address coastal question. Unknowns are insurmountable given time restraints. We could recommend always doing a site-specific study or recommending falling back on the current threshold. It would be useful to analyze how often the current threshold is exceeded or not in the coastal plain. (Is it effective at protecting ecological interests in the coastal plain?)
60. Albemarle Pamlico National Estuary Program (APNEP) is charged by EPA to assess water quality in APNEP region, which is 2/3 of the coastal plain. Does that include some consideration of flow? Should we reference that even to acknowledge that there is another Board working on this?
61. In an ideal world if we were successful in establishing e-flows in piedmont and mountain regions, that in turn, it would, intuitively, protect downstream areas as well.
62. We are really saying that we need validation
63. Each significant proposed water withdrawal be bracketed by monitoring prior and posterior so that we know the effect of the withdrawal and if it is having impacts, then can adjust those flow alterations. It is an insurance policy that the decisions are going to be made better in the future.

64. Agree we need validation of these models, whatever method is used to support make the criteria.
65. We could recommend analyzing some withdrawals before and after to verify our expectations for ecological integrity, but should not recommend going back to the user (or requiring them to pay) for those studies.
66. Really recommending:
 - a. Each withdrawal be monitored before and after to gain understanding of effects on ecological integrity
 - b. If having impacts, then can adjust flow recommendation.
67. Being one charged with doing evaluations, the “pre” is most contentious part of that—is it one year, 3 years, 5 years? I don’t disagree that the info would benefit future decisions.
68. There’s equal potential that what we learn from that experience could lead to the lessening of flow recommendations (easing them up) because we find that withdrawals have not changed the habitat or the species composition, and there could be room for discussion of whether the recommendation was too strict. It could work both ways—to the disadvantage of the withdrawer or to their advantage and the disadvantage of the scientist who cares about specific species. There are 2 sides to that caveat.
69. We need to build a system where in the future we can have more confidence in the recommendations.
70. I’m not so interested in having every withdrawal analyzed or in just the significant ones. I am interested in having those withdrawals that benefit from flow alterations to continue to contribute to the knowledge base for future decisions.—can be done a lot of different ways, not just on site by site approach. Can do more holistically.
71. Recommend how you would evaluate within a class if the recommendations are working, choosing, perhaps, reference sites within a class that you would monitor over time to identify whether we are understanding this or is there some type of gap we need to fill. Apply our backgrounds to answer a question going forward that we are unable to answer now.
72. Look at discharges (flows), not just withdrawals and impacts of the flow (not just the chemistry).
73. Type up & organize brainstorm, we may be surprised to see amount of agreement. Could organize and create report next meeting.
74. Framework is there, there is still a gulf between the concepts and specificity that some people are looking for and others might want to avoid. Some recommendations will have to be concepts, some can be a range from a concept to a specific #. For those that have a specific range, we need to find out what kind of consensus we have or how far away we are from a final product. Some of that would come out if we had an example [to test the recommendation].
75. Use document developed in early 1990’s that shows low-flow basins, etc. It is very general but it provides more than just mountains, piedmont, coastal plain. If you look at slate belt streams, we can predict that they are much more vulnerable to withdrawals than a coastal plain stream, for example.
76. Use Sustainable Boundary Approach where you take off 10% or 20%. The hydrograph captures the variability of that stream in that particular eco-region based on topography, slope.
77. If get to a specific point on a graph as recommendation, you have to justify. If use PHabsim, I need to see validation that monitoring that demonstrated that the habitat modeling actually reflects what is going on [with the biota]. That’s what I need to get some comfort with going that detailed.
78. Go through what we have here, work through specific recommendation language and start to say these are the studies we are relying on, this is how specific we can be, this is how specific we can’t be, and we can get into this level of conversation, but we can’t have it divorced from the recommendations we have had today.
79. Board members bring forward written recommendations, laying out recommendations a, b, c and followed up by why you came to that recommendation.
80. There’s a gap [for getting to] BEC, etc. Dual-track tool – shows trial balloons, as statewide since classification not done. Do people know how flows vary by region? There is info to help that we have set aside (example, regarding flows in mountains).

X. Timeline developed from February meeting input

The facilitators developed a timeline with potential meeting objectives before the March 19 EFSAB meeting based on feedback from small groups during the February meeting. This item was on the agenda for the March 19 meeting, though the agenda shifted so it was not presented or discussed. It is included here for EFSAB's information.

Ecological Flows Science Advisory Board Proposed 2013 Timeline and Objectives

March 2013	
Meeting objectives	Activities
Develop Preliminary Recommendations from What We Know Now: DWR Trial Balloons	Review Guidelines to Aid Decision-Making Review new tools- Dual track spreadsheet, process flow chart Review and discuss DWR Trial Balloons in small groups, then converge recommendations in large group.
Acquire support for report format, Develop a plan for how to write report	Review and decide upon report format, determine who does what and when.
April 2013	
Meeting objectives	Activities
Finish preliminary recommendations for e-flows	Continue trial balloon discussion if needed, particular if any additional information needed review.
Characterize the Ecology: determine measures of ecologic integrity and define thresholds	Revisit the criteria for classification (from DWR white paper) Endangered/threatened species discussion regarding the fit of this topic for e-flows for planning (Mark C. and Chris G.) Presentation on SALCC stream classification results. Discuss how this may inform EFSAB decisions. Physiographic overlays as a characterization tool: discuss the various approaches, pros and

	<p>cons of each. EFSAB members & DWR provide maps to illustrate the various possible overlays.</p> <p>DWR share newly developed PHABSIM habitat scenarios for the mountains (possible).</p>
Understand other states' approaches and comment on pros/cons of each	EFSAB review a summary of what was presented to them in previous meetings (FL, MI, Potomac, Northeast, SC) <i>(note- this may need to happen after Final Report section IV. Supporting information review of Final Report is complete- June?)</i>
Learn how BEC is progressing and how it may relate to EFSAB recommendations	Update on BEC from RTI, USGS
May 2013	
Meeting objectives	Activities
Understand existing information on coastal areas relating to ecological flows, develop consensus principles for how the EFSAB wants to address these areas.	<p>Discuss coastal hydrologic modeling: determine ahead of meeting if any other literature can support this discussion. Discuss results of literature review. (APNEP, TNC, Savannah?)</p> <p>Discuss interactions between water quantity and quality, coastal salinity, biologic oxygen, DO, thermals.</p> <p>Develop and seek agreement on consensus principles for coastal areas.</p>
June 2013	
Meeting objectives	Activities
Complete Final Report sections III. Introduction and IV. Supporting Information.	Review drafts of these sections, provide feedback so these sections can be mostly finalized by next meeting.
Understand TNC study results and determine if/how results may help with developing EFSAB recommendations	Presentation of final TNC Study results, discussion on if/how they may help with further development of EFSAB recommendations.

July 2013	
Break- no EFSAB meeting	
August 2013	
Meeting objectives	Activities
Finish previously started discussions if needed	
Review any additional information identified that may help in furthering EFSAB recommendations	
Ensure report –writing is on track	
September 2013 (2 day meeting if needed)	
Meeting objectives	Activities
Learn about and understand BEC results. Discuss results and determine changes and/or additions to preliminary EFSAB recommendations.	BEC results presented by RTI, USGS. Small group discussions.
Finalize framework for final report- sections V. SAB Accomplishments and Discussion; Section VI. Recommendations	
October 2013	
Meeting objectives	Activities
Determine final recommendations and content for report	
December 2013	
Meeting objectives	Activities
Finish final report	
Determine next steps for final report	