Ecological Flows Science Advisory Board (EFSAB)

Meeting Summary

September 20, 2011

Archdale Building, Raleigh NC

X **APPROVED for distribution 11/15/11**

Attendance

Members
Fritz Rohde, NMFS – Beaufort (via web)
Donnie Brewer, Rivers & Associates
Mark Cantrell, USFWS - Asheville
Bob Christian, Biology Dept. - ECU
John Crutchfield, Progress Energy Carolinas
Tom Cuffney, USGS - Raleigh
Chris Goudreau, NCWRC
Jeff Hinshaw, NCSU Extension Service
Jim Mead, NCDWR
Sam Pearsall, Environmental Defense Fund
Judy Ratcliffe, NC Natural Heritage Program
Jaime Robinson, CH2MHill
Jay Sauber, NCDWQ

Alternates
Arlene Roman, City of Gastonia (via web)
Fred Tarver, NCDWR (via web)
Cat Burns, The Nature Conservancy
Peter Caldwell, USDA Forest Service
Vernon Cox, NCDA&CS
Sarah McRae, USFWS - Raleigh
Steven Reed, NCDWR
Vann Stancil, Wildlife Resources Commission

Division of Water Resources
Holly Denham, DWR (via web)
Don Rayno, DWR
Tom Reeder, Director, NCDWR
Sarah Young DWR

Guests:
Ann Coan, Farm Bureau (via web)
Michelle Cutrofello, RTI International
Jason Green, NCDWQ (via web)
Kyle Hall, Charlotte/Mecklenburg Stormwater (via web)
Lars Hanson, TJCOG (via web)
Kenny Keel, Town of Hillsborough (via web)
Jennifer Phelan, RTI International
Haywood Phthisic, LNBA/NRCA (via web)
Peter Raabe, American Rivers Association (via web)

NCSU Cooperative Extension Facilitation Team
Mary Lou Addor, Natural Resources Leadership Institute (NRLI)
Patrick Beggs, WECO - Watershed Education for Communities and Officials
Christy Perrin, WECO - Watershed Education for Communities and Officials
Nancy Sharpless, Natural Resources Leadership Institute (NRLI)

The purpose of the Ecological Flows Science Advisory Board:

The Ecological Flows Science Advisory Board 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.

All information about the Ecological Flows Science Advisory Board is available online at www.ncwater.org/sab

September 20, 2011 Decisions Made/Actions to be Taken

- Amend the bar chart "# of organism types with less than 80% unregulated index B value" to include " and greater than 120% unregulated index B value."
- Mark and Tom will work with the facilitators to formulate the November agenda.
- DWR will send the EF SAB the progress report being written for the legislature.
- DWR will come up with a list of possible sites/streams for each of the classifications.

September 20, 2011Meeting Agenda/Summary

I. Executive Summary
II. Welcome, Agenda Review and Introductions
III. Review August 16 Meeting Summary
IV. Presentation and Discussion of Eno River Flow Scenarios
V. Discussion
   a. Future Agenda Topics
   b. Revisit Proposal to Convene Subcommittee
VI. Agenda for next meeting

I. Executive Summary (added Feb 2013)

Meeting purpose:

To see examples of habitat modeling scenarios using the Eno River State Park site, continuing from the August 2011 meeting.

Presentation And Discussion Of Eno River Flow Scenarios, by Jim Mead

Jim Mead, NCDWR, presented graphs of habitat modeling scenarios using the Eno River. The scenarios centered on the shallow guilds at the Eno River State Park site for summer and winter months. The graphs looked at habitat index B, which is the mean of the habitat events between the 10 and 90 percent exceedance values. The scenarios were split up into approaches- minimum inflow approaches, and % inflow approaches. The graphs contained both percentage habitat and numbers representing how much habitat is available for each guild (to enable EFSAB members to look at magnitude). Jim also showed a graph "Number of organism types with less than 80% of unregulated index B Value" for all flow scenarios.

Questions, Comments, and Concerns Raised

- Is more habitat better? Need to have more detailed information about ecology
- Are guild representing needs of insects?
- Discussion about charge for characterizing ecology
- Need to look at other streams across NC in addition to Eno River

Proposed Actions or Identified Decisions to be made:

- Follow up on charge for characterizing ecology?
- DWR Look into data that developed habitat preference curves

- Add graph more than 120% of unregulated index B Value for all flow scenarios
- DWR to conduct habitat modeling scenarios for other small flashy streams

Discussion about whether to have subcommittee work on whether stream classes are representative of biological community

Questions, Comments, and Concerns Raised

- Need to establish the ecological variability among the stream classes

Proposed Actions or Identified Decisions to be made:

- EFSAB should look at their charge and then discuss how to get at the biological questions.

Decisions and Recommendations : None

II. Welcome, Agenda Review and Introductions

Mary Lou Addor, facilitator, welcomed everyone to the seventh meeting of the Ecological Flows Science Advisory Board (EFSAB). She introduced herself and the facilitation team, reviewed the agenda for the meeting, oriented everyone to the meeting facility, and ground rules of the EFSAB. All attendees were invited to introduce themselves

III. Review August 16, 2011 Meeting Summary

The edited version of the August 16 meeting summary has been reviewed and will be approved at the October 18, 2011 meeting.

IV. Presentation and Discussion of Eno River Flow Scenarios

Jim Mead presented data and a led a discussion on his work with the Eno River Flow Scenarios.

The graphs and tables explained in this summary can be found at: www.ncwater.org/sab.

The presentation centered on the Shallow guilds at the Eno River State Park site for summer and winter.

These graphs are looking at habitat index B, which is the mean of the habitat events between the 10 and 90 percent exceedance values. There is also index A and C, each of which look at the lower 50% of habitat. Index A is the average of the 50-90 percent exceedance habitat values and Index C is the average of the 50-100 percent exceedance habitat values. They look at the lower half of the daily habitat values to see how you may be changing the lower half.

Important to remember: habitat versus flow relationship is not linear, it is a curve, and each guild is a different curve. Sometimes, the higher the flow, the worse the habitat gets, others are the exact opposite. Some are a bell curve with a central flow that is better and it drops off on either the high side or low side. Each guild responds differently.

The numbers at the bottom of the graph are important. They are the Index B value under the unregulated flow scenario.

If you only look at percentages, you may miss another important point and that is "how much habitat is there for these different guilds, relative to each other?" At any given month (or season) the number at the bottom represents how much habitat is available for each guild, and these

numbers vary greatly, for example, between shallow fast high velocity guild and shallow slow coarse substrate guild. It's not just about looking at the percentages; it is about the magnitudes for interpreting the results.

Graph Title: Shallow Guilds, Eno River State Park Site - Minimum Flow Approach - Habitat Effect as % of Unregulated Habitat - Based on daily flows, Index B = Mean of habitat events between 10% and 90% exceedance (2 graphs: Dec-March and July-Sept)

Graph: y axis is the habitat effect as a % of unregulated flow. X axis shows different guilds and 4 minimum flow scenarios (Annual 7Q10, Monthly 7Q10, September Median, Monthly Median)

Numerical amount shown is Index B value under unregulated flow scenario

Dec- March graph [winter]

Shallow slow guilds – at low flows, the shallow and slower the better, as long as the stream is not totally dewatered.

Shallow fast guilds - like it shallow but moving. There is a range of fast velocity preference within the guild: low range of fast, mid range of fast and high range of fast. As is expected, the faster they prefer it, they less they like the low flow scenarios.

Annual 7Q10 is the lowest of these flow scenarios. The ones that like the lower range of fast are still not happy, but they are happier than those that like the mid to high range of fast, because the velocities just aren't meeting their preferences here.

Monthly 7Q10 - there is a big jump because we have increased that minimum flow. Sept median is not much different and monthly median in this group of flow scenarios is the most preferred for the shallow fast type of guilds.

For shallow slow guilds, that monthly median does not produce as much habitat as the monthly 7Q10 or the September median.

You've got these 2 guilds pulling at these opposite ends of what flow might be suggested by these analyses. If you only look at the 3 guilds on the right, the green bar would be the best one for shallow fast, but not for shallow slow.

Comment: the graph measures greater than 100%.

Yes, that is an important point to consider. When the graph shows 100% it is a 100% of habitat that can be expected at unregulated flow.

Comment: For some flows, there is more habitat available than in an unregulated flow condition.

Question: To what extent does the duration of the flow have an impact on this? In other words, is the assumption that that flow you have chosen to represent remains the same that entire time?

Response: For these, yes. This is the snapshot approach. For our first run through, the choice is the snapshot approach to flow where we say that a water intake can take all the water except the 7Q10, or the monthly median, etc. All we have left in the stream is that flat minimum for those months.

Another way to look at it would have been to make an assumption about what size withdrawal do you have and once you exceed the capacity of that withdrawal at higher flows, it spills, so you don't have a flat minimum, you've got a flat minimum except when there is enough water to exceed the capacity of the intake.

This is our first run through, so for our first screening, I understood it was OK to go through with the snapshot approach. I understood the SAB to be more concerned about the lower range of flows,

the minimum. This snapshot is not a real world assumption and we need to remember that. It's the same with the other types of flows scenarios.

The one where you don't have to make that kind of assumption is percent of inflow – with that the intake withdraws, for example 10%, and everything else stays in the stream. The assumption there is that at high flows; a lot of water can be withdrawn.

Question: As I understand it, the model is being run assuming some unregulated flow regime and then you allow withdrawal at different amounts, monthly median being one of those, so if your natural flow is less than your monthly median for a given day, are you somehow adding water back in to make up the differences.

Response: No, if inflow is less than any one of these minimum flows, then for that day or days, it does drop to that lower level. For example, if the 7Q10 in the Eno was 10, the model would show 10, unless the natural flow for that day is 8, then it drops down to 8, but never more than 10.

Question: Are iterations on a daily or monthly basis.

Response: Daily.

The habitat indexes are summarized by month, but are calculated from all the daily flows in a month, which are converted to daily habitat values.

We've looked at both ways, daily versus monthly flows, and the magnitudes change a little but the patterns don't seem to change. Focusing on daily numbers, we do pick up more of the variability that happens.

If we used monthly flows, there would never be a flow that drops below the minimum for a day or two.

July – Sept graph [summer]

Similar patterns for the shallow fast, for right 3 scenarios, green bars are higher than all the others, the blue bars are the lowest, because they like it faster. It is different for the deep guilds, but same within deep guilds.

The best way to interpret this: Summer flows are going to be lower, unregulated flows are going to be lower. Remember on the winter ones, those blue bars were higher, we were actually improving winter conditions by making the flows lower, for these left hand 5 that like it shallow and slow. In summer, it is going to be lower naturally, so that 7Q10 flow doesn't have that advantage in the summer months as it does in the winter months to those guilds that like it shallow and slow. They are already getting it shallow and slow because that is how NC hydrology works. The winter ones, if focusing only on shallow fast, the green bars are preferable to the others.

Comment: I disagree with that interpretation (unable to hear why member of EFSAB disagreed with comment).

Response: YOY means young of year. They like it very slow, some of these have been described as the size of a tomato seed and swim about as well. So for them, slower is better.

Let's look at shallow guilds for a different type of flow regime.

Shallow Guilds, Eno River State Park Site - % Inflow Approach - Habitat Effect as % of Unregulated Habitat - Based on daily flows, Index B = Mean of habitat events between 10% and 90% exceedance (2 graphs: Dec-March and July-Sept)

Graph: y axis is the habitat effect as a % of unregulated flow. X axis shows different guilds and 5 percent inflow scenarios (10, 15, 20, 25, and 30 % withdrawal)

Numerical amount shown is Index B value under unregulated flow scenario

For these scenarios, there is no constraint in the size of the pump, it can take anything that comes along. It is not a real world, it is snapshot. So, each daily flow is reduced by 10, 15, up to 30%, so 30% is taken out for offstream use and 70% left in stream.

The pattern is a little more linear, as you would expect since each step is a 5% change in flow. It isn't exactly linear since the habitat versus flow relationship is not linear. For the shallow slow, the more you take out, the better it is for them. As you get higher in the velocity preferences, the habitat loss gets more pronounced as you take more out, if they like it fast or moderately fast.

Question: How much difference is there between shallow fast lower velocity and shallow slow?

Response: Slow is less than 1 ft per second. [editors note: 3 graphs representing these data are available at the end of this summary. These were supplied by DWR after the meeting.]

Question: Is there a velocity gap between these guilds or are they adjacent.

Response: I don't think there is much of a distinct gap.

These are optimum preference ranges. It doesn't go to a zero preference, the preference just lowers. The numbers are where the optimal preference is. The only way to really understand this is view it on a curve.

Question - clarification question about velocity. How were they established? Was it biologically derived or from a mathematical model?

Response: Biologists came up with guild curves based on one or more species that use that type of habitat. The source of the preference curves vary by guild. Some were observation, some were shocking data, some were best professional judgment.

Question: Are there any scenarios that seem to meet all needs?

Response: looking at percent flow **Dec- March graph [winter]** - even though the blue bars were least preferred for these 5 on the left, they are still at or above 100% of what you'd have at unregulated. Same is not true for the right side of graph, especially far right 2, especially when you get to 30% withdrawal.

You could do well by shallow fast guilds without hurting the shallow slow guilds, but you are not improving them as much as you might be otherwise.

Comment: I'm concerned about the "improving" of habitat just by having greater habitat availability. That isn't universally true for all species at varying times of year.

Response: That is a really important discussion to have with this habitat based approach. Is more habitat better? Is that enough to guide us in terms of ecological flow approach?

Comment: I don't think there is any danger in comparing it to unregulated. A natural flow is the most reasonable you could ask for in imitating the biological needs. But increasing habitat, some places above 300% could end up with a habitat with too diffuse a number of individuals; basically, resulting in the unintended consequences of more habitat.

Question: Concerning seasonality – is the YOY habitat availability relevant, for say fishes, in times when we wouldn't expect to see them, for example at certain seasons. In winter, you would not see YOY.

Response: The life cycle of some, such as shad are reflected and blocked out on the graphs at the times they don't exist.

For YOY, I'm not sure right now why we have no seasonality represented, but instead have it present all 12 months. In other instances we have also modeled this guild for all 12 months. I think this is because even though the habitat preferences are originally based on a particular species' YOY, the guild is supposed to represent a group of fishes – some YOY, some not – that prefer very slow velocities.

Comment – follow up on 100% habitat. We are supposed to be looking at maintaining a balanced integrative adaptive community, comparable to prevailing ecologic conditions. I view that as minimizing the deviation from 100% relative to natural flow for the most guilds, rather than enhancing one guild over another. As we look toward an integrative index, we should have one that is 100% and make note of negative or positive deviations from 100%. If one guild goes over 100%, then another guilds habitat may be going down. More habitat is not necessarily an improvement because it might tend to disfavor one or more members of the community, in favor of another member of the natural community.

For example, driving habitat for guild X above 100% comes at a cost somewhere.

Comment: Concerning the definition of ecological integrity - I wonder if this guild type analysis, which collapses the community down to just a small number of functional groups or guilds is really adequate to support this. You could have massive changes in the species compositions and still have guilds that come out looking the same. So, I think we need to do what it says here and we need to get down to species composition and the measure of diversity and not just remain focused on the guilds, even some of the guilds which really don't have any meaning, like the orders of insects. Somehow we need to bring the ecology in to the level of detail we have with the hydrology. We have tremendous amount of detail with hydrology and very little detail with ecology.

Response: Thinking of our concept flow chart of the scientific approaches we could follow, the blue boxes were habitat based approach, the green boxes were biota data approach, which might be able to get down to a finer level of diversity or individuals species response. Are you saying we shouldn't lose track of the green box concept map section. If that is true, I don't think we are able to do that. It would be lot of information. Also, we don't have information on the habitat preferences for many species. That is one of the reason we went with guilds. If we go with green box biota approach, the collection data is for species.

While the information we have may be imperfect, we do have enough information to know that some of these guilds have a wide range of habitat, especially for insects. We can tell this analysis isn't really appropriate. So we end up with not enough knowledge to reduce to species level, but enough to know that the order level will not work.

Question: Within the guild, if we consider the species that is easily identified with the guild, is there a guild that would represent the needs of insects that might actually be currently part of another guild?

Tricoptera example - in one family, there are species that live under the rock and others that live on the rock - and that is very different habitat.

Would the hydrological factors that led the rock to being in that particular position support the existence of that species in that place?

Response: Well, it depends what species you are talking about. If you have an insect order that may have 40 species in it living in that stream, representing all the guilds there are. So we end up with too much knowledge and not enough knowledge and the SAB needs to communicate that to the group that this resolution is not good enough to protect the resources in the definition we've been presented with in the language of the legislation.

Comment: I think we need to move along the green path, the biota approach. The state surveys for fish, algae, and bugs. We need to move onto this path sooner rather than later.

Comment: These groups cover such a wide range of habitat preferences and uses that it is too coarse a way to come up with an ecological flow

Comment: I think that is true, and even the life cycles can range from several years to a few months.

Comment: I look at it as all the guilds representing the needs of the biota out there, collectively, regardless if any one guild is representative of all the species it tries to capture.

Comment: What is our charge here? There are different expectations of what that is. The charge of the legislation says DENR will characterize the ecology of the different river basins and identify the flow necessary to retain ecologic integrity. Characterizing ecology can be very specific or we can step back and ask if, at a broader brush stroke, this is characterizing the ecology. I think a lot of folks are hung up on that and not sure if we have characterized ecology.

Comment: Maybe this is something we need to deal with at another meeting

Comment: These are an index and it offers a way to compare. The people who made it up will tell you, you can't use it to determine exact numbers of habitat to save, or mitigate etc. It gives us a yardstick to compare options. The denominator is the unregulated prevailing conditions. To look at the relative effects of one flow regime versus another, for some grouping of organisms, be it individual species, or a coarse grouping.

Jim Mead will contact Jim Gore in Florida to speak some more about what went into the preference curves that are behind the data that came from him.

What we have been talking about is a sensitive analysis of these guilds, including the EPTs as presented here - the widest range you have here is 5%. The truth lies, not in the graphs, but in incorporating our uncertainly and our sensitivity on these variables and that is what we are looking for, we are looking for those variables that have a strong slope in their differences because we know those are the areas that will be most sensitive.

We will be either lumpers or splitters and we need to move forward.

A 5% change between 2 flow scenarios is within the noise of modeling and modeling uncertainty.

For traditional flow regimes there are much larger differences (annual, monthly, 7Q10, etc.)

Again, the point necessarily isn't about that particular stream or not, but about whether or not species exist in small flashy streams. A species that doesn't actually exist in a stream may represent habitat needs of other species which do exist in the stream.

Let's look at a way to look at all the flow scenarios at the same time.

Graph Title: Number of Organism Types with LESS Than 80% of Unregulated Index B Value.

Found at end of this summary. The complete set of data can be found on the Ecological Flows SAB website at the presentations tab, Sept 20, 2011 meeting date: www.ncwater.org/sab.

Working independently, Sam and Chris had an idea about a way to pull this together to compare all this data. That was to count the number of guilds within or below some threshold for each flow scenario for that season. Chris looked at anything below 80% of unregulated habitat. Sam looked at anything less than or equal to 70% with a particular flow regime or less than or equal to 50% of unregulated, with that particular flow regime. Chris' work was put in graph format because there was time to do so before the meeting.

Use the table for winter as an example. If it was a season with all guilds present it had 23 guilds present. Each guild below 80% of unregulated has an X in the cell. A red X indicates a low amount of habitat (WUA < 1,000) to keep track of those very small amounts.

Example - for the 7Q10 flow scenario, 17 of 23 guilds are less than 80% of the unregulated value in the winter season. That's 17 out of 23. That is a significant number of the guilds below this threshold.

The graph shows 4 minimum flow, 6 percentages of average flow, and 5 percentages allowed withdrawal (meaning 90% stays in stream, with 10% withdrawal, for the 90% columns.) Here, in a nutshell, the smaller the bar, the lower the height, the better. The fewer number of guilds that fall below that threshold, the better.

For the first grouping, the annual 7Q10, each of those seasons has a large percentage of guilds falling below the threshold. For the monthly 7Q10, it is a little better. Fewer for the Sept median, and even fewer for the Monthly median.

The 2nd grouping or 2nd type of flow regime: as we increase the minimum flow, we don't have any habitat index for either fall or summer.

Last grouping is in other direction, because we are leaving more water in as we move to the right. So even with taking 30% out and leaving 70% in, (the last one) this is almost as good as the best of the 4 traditional minimum flows.

Comment: It would be nice to see comparable analysis, either 20% above or below the 100%, as compared to just looking below, so that anything that was above 120% would be added to the below 80%

The 50-70 thresholds give some clue about the sensitivity of the measure. It also can get us thinking about what is an allowable ecological deviation from unregulated. The numbers 50, 70, 80, are completely random. Their only virtue is allowing us to compare the strategies. These don't allow us to make final decisions. Setting random thresholds allows us to compare the methods.

I think it also gives us locations where we have the most information available. Soon we are going to have to extend all this to locations where we have very little data and we will have to use our sensitivity analysis.

Question: How can we use this when there doesn't seem to be obvious thresholds appearing on the graph?

Response: For the first 4, traditional flows, there shouldn't be thresholds separating the bar graph since they are not comparable, but for the other 2 sets of data , we can look for thresholds, but there don't seem to be any.

Comment: Biologically, having 4 seasons worth of data, compared to having some places with no seasons - that would be important to look at.

Comment: I wonder if you added the deviations above 120%, would you get more specific data. If you maintain a flow that is 50% of average annual flow in summer, then you are enhancing flows and it is important to think about whether enhancing habitat is a desirable thing. Adding the percent above 100% might bring data onto the graph for fall and summer at 50% and 60% average flow as min flow.

This graph is 3 different sets of data on one graph.

Comment: It might be good to look at what guilds have exceeded the thresholds across the seasons and what guilds have taken the most hits, and then decide what is better and what is best.

Comment: Maybe look at whether it is always the same type that is taking the hits.

Comment: I'd like to reiterate my points from previous meetings about concerns of going into this much depth and focus on the Eno, and that is the Eno is not typical of all the streams in the state, nor is it typical of the amount of data we have for rivers streams in the state. I wonder if we are not getting distracted from our central focus, which is too look at a number of different streams and different types of streams, and develop some way to incorporate and apply some type of potential wisdom for how it might work for the entire state. We are pretty far down in the weeds on this one. I have heard a number of good things, instead of doing seasonal bar chart graphs for different guilds. Chris's way he came up with is a good way to do it.

Better even to do that with residuals analysis off of a 100 percentile for unregulated streams, rather than doing it as bars.

Where are the hits coming, but not where are they coming from in the Eno, but where are they coming from most of the streams across the state, and what does our different sensitivity suggest to us for different groups across the state

My hypothesis: in western NC - where we look at flashy high velocity stream, different groups will get hit compared to Piedmont small flashy streams. I think we need to move beyond the Eno so we can coalesce some of these ideas so we can begin to apply it more broadly across the state.

Response: There are 9 places we have the opportunity to do this type of analysis for small flashy streams. Those nine sites are:

Existing Sites for Habitat Models for Small Flashy Stream Classification

* small flashy classification to be confirmed

Neuse River Basin

1. Eno River State Park – 99.4 square miles
2. Eno River, Hillsborough – 66 square miles – (convert from mainframe model)
3. West Fork Eno River – 11 square miles *
4. Swift Creek – 74.1, 80.7, & 116.4 square miles – (consultant 2D model) *
5. Middle Creek – 38.2 & 63.8 square miles – (convert from mainframe model)

Cape Fear River Basin

6. Buckhorn Creek, below Harris Lake – 76.3 square miles *
7. Rocky River, Siler City Reservoir – 55 square miles *

Tar River Basin

8. Tar River, Louisburg – 437 square miles

Broad River Basin

9. Buffalo Creek, below Kings Mtn. Reservoir – 127 square miles *

We started with small flashy because the only model ready to roll was the OASIS model, which could be used to match up with the Neuse. The Cape Fear model should be done soon. The Tar and Broad models may be done the end of 2011. Until we get the model output, we don't know for certain that these are all small flashy streams. We know Tar River is small flashy because we have the gage data. Sites 6, 7, 9, we expect to be flashy, but not sure. We have to run it through our classification software and to do that we have to have the basin model data. Sites 2 and site 5 will require hand entering data into a computer.

Question: We have 7 classifications types, 2 split by temperature. Of them, which ones are most likely to need some sort of management perspective along the lines of the legislation as far as permitting withdrawals are concerned?

The ones with lowest priority and also the least information are the coastal streams, since less surface water used on the coast. Most surface water is agricultural use. We have not had the reason to do studies in the coastal plain, not as much as the Piedmont and western part of state.

Of the large Piedmont river systems, most of them have large reservoirs. The reason we have data is because of hydro-relicensing. Most of the withdrawals are from reservoirs.

Trying to design an ecological flow regime for reservoirs is not something we can do here because of the many types of reservoirs, each one requiring extensive environmental review beyond what we do.

Comment: So, if we only focus on run of river small to midsize streams, that could be a way to prioritize.

I ask because I think we need to start prioritizing. If we keep focusing on the Eno we may apply those results elsewhere and make mistakes. We should approach this with a priority fashion about where those withdrawals may be in the near future.

Comment: Suppose we figure out which stream classes have the most withdrawals in place now, and treat those classes as our draft priorities for analysis, since they are probably the most likely to face expanded withdrawals in the near future.

Comment: My concern there is that it may be somewhat circular to say we are going to prioritize small flashy streams and then recognize them on a map.

Comment: The benefit to staying with the Eno is that we can learn how to predict changes in habitat at a given classification.

Comment: In addition to the presumptive standards we are looking at, there are 2 more that are published in the paper by Richter, et al. ("A presumptive standard for environmental flow protection") Those are to maintain flow in the stream plus or minus 10% varying around the mean monthly value for the period of record and the 2nd is plus or minus 20% varying around the mean monthly value for the period of record. That business of using the period of record helps us comply with the prevailing conditions language that is in the legislation.

Comment: We should look at the Eno because we have a mountain of data, but our next priority should be where the largest human pressure is for water withdrawals.

Count the number of withdrawals and the volume that they withdraw in each of the 11 classes. And whichever class has the most withdrawal pressure on it, look next at presumptive standards to see what happens to habitat in the application of each presumptive standard.

Comment: I would tend to prioritize in a different direction and that is based primarily on the ecology of the stream. Because I think we need to start with a good yardstick, in terms of ecology, where we have an ecological understanding, and then try to understand the ecological classification before we start to merge it with the ecological classification. So that is my suggestion for prioritization - to seek first to understand the ecology.

Response: We have tried to prioritize basin models based on withdrawals pressure, so our development of tools is hopefully consistent with priority of withdrawal.

We will look at amending the bar chart of "# of organism types with less than 80% unregulated index B value" to include greater than 120%.

Comment: Please include the table associated with the graph

We are looking at a multivariate set of data. One question concerning preferences for different habitats is - how much do they overlap?

Question: If the model compares a flow regime that is altered with a 30 year average, on a daily basis, what happens if you pick a random year or series of years, and run the same model, to predict habitat impact? The point is - has anyone examined the background variability, the probability that you would have an impact based on the natural variation on a daily basis in flows, relative to what your model uses which is a 30 year dally average- is that a correct interpretation of how your model works? What I am getting at is - if I apply to withdraw from the Neuse River and I want 20% of the flow out and you came back and said, based on our model, this is the impact you will have on us every day. I would want to know how that relates to natural variation. What I am getting to is, can you put probabilities around these boundaries of impact that you are projecting for the effect of a particular withdrawal regime?

Comment: The background of all this is daily events. It is an index which is an average of everything from the lowest to highest. One thing that comes to mind: if you overlay duration curves of habitat instead of flow, that is one way to get at how are the particular levels of habitat changing.

The challenge of that is looking at visual analysis instead of quantitative analysis.

Comment: You could look at probabilities of being within a certain boundary of a given curve.

I can see this approach being challenged if you haven't applied this type of quantitative analysis.

Comment: These flow regimes are representative of some circumstances, but a more common withdrawal question is - I want to withdraw X amount every day, which is not represented here.

Comment: I hope we have ecological baselines that are non-uniform, that vary with river reach and across seasons. I hope that those who apply for withdrawals will not be allowed to apply for a uniform rate of withdrawal across all seasons, but will have to seek a permit which applies for a pattern of withdrawals, buffering that pattern with whatever is necessary, such as off stream storage, so permit holders don't get permission to withdraw a maximum all the time.

Comment: Going back to range of variance - there is a great paper by Winter. Great idea, but managing to maintain variance is really hard to do. Jim's set of strategies, where you take a percent of inflow on a daily basis (the right hand side of comparison graph), those will maintain variance. Most of the other scenarios don't maintain natural variance.

I'm not taking about variation in flow, but about the probability within the model of you being accurate in your projections about the impact. I'm not looking for the likelihood that we would be correct, but the likelihood that your estimate is within a certain confidence interval.

I'd like to know how likely is it that your projection of an impact falls within certain boundaries, compared to natural variation in flow in this stream. For example, if someone proposes to withdraw this amount and comes up with a set of scenarios and puts it in the model - how accurately does your model reflect what the manmade influences are, versus the natural variation that occurs. It would be of interest to pick a year and run it on a daily basis for comparison and instead of using withdrawal, use the actual daily flow record in the model and see how accurately it predicts it. You could calculate the probability that you are within that layer of confidence.

V: Discussion: Future Agenda Topics

During the August 16, 2011 meeting, several members discussed whether the stream classes are representative of the state of the biological community. This issue has been raised before. One proposal put forth to examine this question was to convene a subcommittee.

Instead of a subcommittee, it was recommended to dedicate a full meeting to discussion about the biology, given a number of issues surrounding this topic and the level of inquiry required. Several members would like something to review prior to a discussion on the biology, such as background reading or the presentation of a straw man idea to start any examination. In addition to taking the time needed to examine the biology, the EFSAB recommended reexamining the charge of the EFSAB.

One member reminded the EFSAB to take into consideration that the definition of ecological integrity in the ratified bill is significantly different than the EMC and water quality rules definition. They are not similar. We need to look at the ratified bill definition.

This section captures questions raised for future discussions or potential discussion points for future meetings.

Question: What are we talking about? Is it developing ecological classes or determining the fidelity of species to the classes we have, or something else?

Comment: We need to establish what ecologically variability is among these classes, so we understand, when looking at the biology whether we have something homogeneous and can move on, and if not, we can tweak things. I'd like to avoid trying to address species composition and address diversity and end up with something so variable we are unable to group them.

Comment: We have not established that fidelity is going to be the topic of the day.

I am able to put forth references and background readings to remind ourselves what has already been done and maybe some places to move forward.

Recommendation: What if we found someone to speak about examples from other regions?

Recommendation: Let's look at our charge and verify that there is clarity around it; then how to get at these biological questions. Those are the 2 big issues - our charge and the biological discussion

The November 15 meeting will be reserved for the biological discussion and the charge of the EFSAB. Tom Cuffney and Mark Cantrell will work with the facilitators to formulate the November agenda.

Question: What about report due to legislature in Nov, 2011? What is the role of the EFSAB with regard to this report?

Response: It is a progress report about the development of the hydrologic models, basically a time table. DWR will send that report out to the SAB.

VI. Agenda for Next Meeting

Provide a list of possible sites/streams for each of the classifications (DWR)

Continue to present additional flow scenarios on small flashy and possibly medium stable (DWR)

Review Richter et al. "A presumptive standard for environmental flow protection"

Begin discussion on charge if time is available (frame the discussion)

Determine 2012 Meeting Dates