Technical Oversight Team Reviews

First Quarterly Report – Cornell University, Ecological Flows Project

TOT REVIEWER 1: Overall the quarterly report documents a good beginning to this important and well-designed project, with reasonable progress on each of the objectives. I've added some technical review comments below.

Yes it is important to "filter out" any existing stream gage records that represent highly modified flows or short flow records. However, I've seen "over-filtering" to the point that the chosen gages do not represent well the range of regional variation in flows, resulting in poor extrapolation power to ungagged streams. So… it is very important to weigh regional coverage in consideration of gage inclusion. (e.g., of 495 mapped gages only 129 have been identified as reference gages; I would revisit this and err on the side of regional coverage; and I realize most USGS hydrologist will not agree with me).

There is no reasonable justification to calculate 171 flow statistics. (other than that you can!). Richter/TNC/etc. have already been down this road, and have identified a short list (6-8?) of key descriptive, orthogonal metrics that fully describe flow regime character that is ecologically relevant. Contact Michelle DePhilip (TNC, Harrisburg) regarding this.

You have tapped into the river classification work group represented by Dr. McManamay, but you should also be leveraging two other tremendous bodies of work that directly applicable:
1) Jim McKenna's (USGS, Cortland NY) thoughtful development of river system classification spatial units and key attributes for New York rivers, through the Great Lakes Regional GAP pilot work over the past 10+ years.
2) Arlene Olivero's (TNC Boston, colleague of Colin Apse) river classification framework for OH-WV to Maine to Virginia. This was done collaboratively with representatives from each state, and in coordination with J. McKenna's work. This is a very strong classification and mapping framework, with some admitted weakness in terms of flow characterization. So your effort could build on this perfectly.

Your effort needs to do a thoughtful cross-walking of the strengths/weaknesses of these 3 approaches and toolkits; and then build the value-adding flow characterization accordingly.

Another element of regional rivers classification is "mapping" of the classes, and a big issue then becomes the scale of river units chosen to map upon. The default is the NHD reaches, but there are perhaps 30,000 of these per state, and some larger unit is desirable, practical, and meaningful. Seelbach et al. 2006 and Brendan et al. 2008 addressed this, arguing for use of intermediate-scale valley or ecological segments (aggregates of reaches); and McKenna uses a similar concept. Earlier work in PA used a minimum drainage area to create a workable number of flow management units or "pour points".

The ability to model and characterize both current and reference condition flows is a great step forward! Has only been done in MA, and perhaps now in PA. Is a key ELOHA conceptual step. You may also like to have stream temperature data to align with fish & flow data. Water withdrawals influence stream temperature, which is arguably the primary factor influencing fish populations. Temperature played a key role in our e-flows work in Michigan. Olivero compiled a lot

of state-level temperature data for her regional classification project; and there are probably more data now!

Bring the stakeholders/partners into the science development process early in the process; and then keep them engaged along the way. Collaboration literature stresses that the decision community needs to feel some "ownership" of the science. This also worked out well in our MI e-flows experience. The MI e-flows work also included a regional-scale model of groundwater-streamflow relationships (H. Reeves, USGS, Lansing, MI-- USGS report). You may eventually need to be thinking about this relationship; beyond just how the streams themselves are characterized.

TOT REVIEWER 2 & 3: We have reviewed the Appalachian Landscape Conservation Cooperative Grant 2012 Progress Report, 3rd Qtr for the project "2012-03, Development of a hydrologic foundation and flow-ecology relationships for monitoring riverine resources in the Marcellus Shale region". This report is a good summary of the progress towards the 4 study objectives. However much work remains for completion of the study by 2014. We have included some suggestions and comments on the Progress Report. We have also reviewed Paul Seelbach's comments on the Progress Report, and will not repeat his good comments, though we may expand on some.

Objective 1: Literature review of hydrologic models currently used within the Marcellus Shale region. Besides the general review of ecological flow literature completed to date, it will be helpful if the study report will include the compilation of literature, along with an annotation of each article that includes its relevance to the study area or to the understanding of flow parameters specific to the study area. Did the literature provide meaningful information to understand streamflow, flow ecology, or flow alteration in the study area? By the way, this objective was scheduled to be completed by Nov. 1, 2012.

Objective 2: Development of geo-referenced stream gage database. There certainly are a number of stream gaging stations in the USGS database for the Marcellus Shale region. Do you plan to include active and inactive gage sites? Will the database include those with only daily data, real-time, or peak flow data? Will you include stream gage sites with water quality parameters besides the hydrologic information? Are there other stream gage data besides those collected by USGS? Perhaps USFS, US EPA or others have collected streamflow or other data? As Paul points out, the HIT generates some 171 statistics, including those identified in the IHA (Richter et al., Poff et al.). What would really be meaningful is if the study would identify which of these measures is important, unique or notable for (1) describing streams in the Marcellus shale region and the Appalachian LCC, (2) stream function, and especially (3) for understanding potential effects of energy production methods and potential for streamflow alteration.

Objective 3: Contact and coordination with users and developers of stream flow modeling tools.
This is an important objective that should occur early on in this process, as the users and developers of streamflow modeling tools can provide substantial insight into existing model applications and limitations; state of the science, etc. We hope to see substantial progress in next report.
Yes, this is a growing arena and many possibilities - USGS is developing a national stream classification and in NC we have explored several, including Hendrickson, McManamay et al., for use with OASIS, WaterFALL and other streamflow models. However, we are finding that stream classifications using stream gage records do not apply well to stream reaches between gages. Beware that the real usefulness of regional classifications is to describe un-gaged areas, and if the gaged-ungaged relationships are not strong, then this objective may not be met.

Objective 4: Development of geo-referenced stream biological database for the Marcellus Shale region.
What about data from other states within region/study area? Are you having difficulty with obtaining data in a reasonably similar format? Or collected with similar methodologies? Will the biological database include fishes, EPTs, plankton, other taxa or stream community data? Are you aware of the Multistate Aquatic Resources Information System (MARIS) database (http://marisdata.org/), an online resource that now contains over one million records for population estimates, total catch, total weight, and water quality for nearly 600 fish species, mostly provided by state fish and wildlife agencies? There is currently growing coverage for the study area in the MARIS database.
Overall, the Progress Report outlines progress made on each of the four study objectives, and reports that the investigators have remained within budget. We are hopeful the study will continue on the current path and provide useful information for understanding flow-ecology relationships in the Marcellus Shale region at a crucial time for balancing conservation of stream resources with a rapidly expanding energy production.

TOT REVIEWER 4: The project is certainly off to a good start with the gathering of literature and data sets and coordination with other entities working on eco flows in the region. The abstract and financial report are acceptable and so my comments are limited to some basic questions and observations on the progress report.

Objective 1: Lit review of hydrologic models in the Marcellus region
An important part of the literature review should also focus on flow responses by indicator taxonomic groups (fish, macroinvertebrates, and their respective traits); this could help inform relationships (once agency databases are assembled) to validate future flow recommendations. For example, rather than focusing on broader IBI or EPT-type responses, are their specific guilds, assemblages, or metrics that are more responsive to flow alteration?

Objective 2: Geo-referenced stream gauge database
This will be an excellent resource once fully assembled. How will the research team reconcile and assess other areas (like WV and Ohio) where USGS tools are not available for ungauged streams?

Objective 3: Contact and coordination with users and developers.
An overarching question is whether and how the Cornell group is working with the recent ELOHA efforts for the Ohio Basin. That workgroup has recently drafted eco flows for the upper Ohio River basin (like the Susquehanna report) and should be consulted as this project moves forward to avoid any duplication. Perhaps this is one of the next quarter's objectives.

Objective 4: Stream biological database
Overall, this database will be an incredible resource to future users. This objective is crucial but could be difficult once databases are assembled and combined. Reconciling field names in different agency databases, as well as reconciling differences in master taxa lists, taxa traits, and built in biometrics could be very challenging and time consuming. The effort will entail a lot of QA/QC, typically proofing and matching of taxa naming conventions (as synonyms are constantly changing). An effort to make sure these database tables are comparable will be important.

TOT REVIEWER 4: I suggest that the relationship between stream flow and biological communities is very complex so be sure to have a good stream (fish and macroinverterate) ecologist on hand when integrating the biology into the classification model; also, wonder if climate change monitoring sites need any special consideration. The work done and cost reported seem to be legitimate.