Environmental Management Commission
Water Allocation Committee
Minutes

November 13, 2019
9:00 a.m.

On November 13, 2019, the Water Allocation Committee or WAC met in the Ground Floor Hearing Room at the Archdale Building in Raleigh, North Carolina**.**

WAC Members in Attendance:
John McAdams (WAC Chairman)
David Anderson (WAC Vice-Chair)
Mitch Gillespie
Pat Harris
Steve Keen
Dr. Stan Meiburg (EMC Chairman)
Donald van der Vaart

Others Present:
Donna Davis
Marion Deerhake
Philip Reynolds (Attorney General's office)

I. Preliminary Matters:

In accordance with North Carolina General Statute §138A-15, Chairman McAdams asked if any WAC member knew of a conflict of interest or the appearance of conflict with respect to items on the November 13, 2019 WAC agenda. Ms. Deerhake noted that her former employer had participated in the Scientific Advisory Board for ecological flow, but that she is no longer associated with that former employer. Mr. McAdams recognized the comment. Chairman McAdams asked if there were any comments or corrections regarding the minutes from the September 11, 2019 meeting. There were no comments or corrections. Mr. Anderson made a motion to approve the September 11, 2019 meeting minutes. The motion was seconded by Ms. Harris and the September 11, 2019 minutes were unanimously approved.

II. Information Items:

A. The Science of Ecological Flows (Chris Goudreau, NC Wildlife Resources Commission)

Ecological flow is more complex than just a term to answer the question, "how much water do fish need?" There are five riverine components that need to be considered when looking at ecological flow:

1) Water Quality – need to maintain temperature and oxygen levels that are healthy for aquatic life. A minimum flow like 7Q10 isn't good enough; it's like a human living in a closet.
2) Biology – need to consider all biota, not just fish, to include mussels, insects, trees, etc. Also need to consider biological needs at different life stages.
3) Geomorphology – need to consider the relationship between the river and the land, and the ability of a river to move water, sediment, and wood through the system and maintain its shape over time.
4) Connectivity – need to consider the many dimensions of connectivity: upstream/downstream (dams break that level of connectivity), connectivity to the floodplain, groundwater, and temporal connectivity.
5) Hydrology (the keystone component) – need to consider the magnitude, timing, duration, natural frequency, and rate of change for river flow.

A river's flow regime is important to maintaining its ecological integrity. Natural flow regimes include base flow, low flows, flushing and floods that allow for both inter- and intra-annual variability which helps maintain the natural system. Flow is important because it influences the river's water quality, biology, habitat, and energy transfer. Maintaining a diversity of flow regimes (base flow, high flow, and overbank flooding) is important in maintaining the ecological integrity of the river.

There are several types of eco-flow recommendations:
1) minimum flow – may be a single value or seasonally adjusted and can be based on a low flow statistic, like 7Q10. This approach reduces inter- and intra-annual variability.
2) statistically-based – includes magnitude, duration, frequency, and season; is tied to ecologically significant events; standard is based on ecological requirements (spawning, migration, sediment movement, etc.).
3) percent of flow – remove x% of flow for a given time (daily, weekly); closest to maintaining natural flow; relatively easy to model.
4) site-specific – not a recommendation in itself, can be used with other recommendation types; looks at the "wetted perimeter" or the amount of stream bottom that is wet at different flows; includes habitat response models.

Flow-habitat relationships are important to consider. More than one species needs to be considered (don't just manage for one keystone species); additionally, considerations should include species that represent different habitat needs.

<u>Questions and Discussion:</u>
Mr. Keen asked about oyster bed closures and what is being done about that issue. Mr. Goudreau replied that he was familiar with flowing riverine systems, models of which are referred to in his presentation. He is not familiar with models of estuarine systems where oysters are found. These two natural systems and the modeling of those systems work differently. The models of riverine systems with which he is familiar don't account for the needs of oysters.

Mr. Gillespie stated that ecological flow is an important issue. He was surprised to hear that 7Q10 isn't enough, since that is the standard that has been used for years. Mr. Gillespie said that he has advocated for 7Q10 because he understood it to be the standard and asked whether there is a different regulatory threshold. He asked where DEQ stands on the issue and asked about the policy implications if the 7Q10 standard is being changed. Mr. Gillespie stated that any changes would require rule-making.

Dr. Meiburg interjected that the informational presentation before the WAC was on ecological flow and the science behind ecological flow, not about a policy change. He understands 7Q10 to be the minimum flow for discharge when determining NPDES permits. Dr. Meiburg stated that he heard from the presentation that 7Q10 is important but does not represent the natural functioning of a river if you're trying to mimic a natural flow regime. Dr. Meiburg said this raises the question of whether 7Q10 is enough.

Mr. Gillespie stated that he understands 7Q10 is being used in policy and that he would like to hear from DEQ at some point. He again emphasized this is a critical issue with greater implications. Any changes to that policy standard would need to go through rule-making.

Mr. van der Vaart reviewed the definition of 7Q10 flow (lowest 7-day average flow over 10 years) and emphasized it is a stringent standard, then said it would be helpful to see how the 7Q10 compares with other flow standards or methods.

Mr. Goudreau stated his presentation sets the background for how the scientific community approaches ecological flow. He also said that 7Q10 represents the "floor," a condition where you don't want to spend all your time.

Mr. McAdams asked whether 7Q10 is the result of flow observations? Mr. Goudreau replied it is a flow statistic calculated by the US Geological Survey or others and is determined by data in the record.

<u>Continuation of presentation: Recommendations of the NC Ecological Flows Science Advisory Board (EFSAB):</u>
The EFSAB was created by NC Session Law 2010-343 and requires DEQ to develop basin wide hydrologic models for each of the state's 17 major river basins. The Session Law also defined ecological flow as "the stream flow necessary to protect ecological integrity." The EFSAB was directed to assist DEQ in characterizing the natural ecology and identifying flow requirements. The EFSAB was composed of many state and federal agencies, academia, and NGOs; the EFSAB met 28 times in three years.

The EFSAB did not spend much time characterizing stream ecology, instead the board focused on ecological flow and studied streams in the state's three regions (mountain, piedmont, coastal, as well as headwater streams). The EFSAB looked at the ecological limits of hydrologic alterations (through the model ELOHA) and ecological responses to changes in flow for different stream types. Statistical analyses were conducted of different stream types and flow. The eco-flow approaches used by the EFSAB were

minimum flow threshold and percent of flow standard. As part of their research, the EFSAB reviewed how other states and regions handled ecological flow.

There were several flow-habitat studies reviewed in NC, with 10 sites in the mountains and nine sites in the piedmont. The results looked at the percent of habitat not protected for different flow recommendations. There was a graph in the presentation that illustrated the percent of piedmont sites not protecting 80% of habitat for different flow scenarios.

Mr. van der Vaart asked for clarification of the graph (Percent of Piedmont Sites Not Protecting 80% of Habitat for Deep Guild). He understood it to represent the modeled biota survivability once a stream flow is reduced to 7Q10. Mr. Goudreau clarified that the percentages referred to the amount of habitat available at the specified flows, not necessarily biota survivability. Mr. van der Vaart asked how much in a year is 7Q10? Is it a steady state of 7Q10? Fred Tarver (DWR-Planning Section) approached the podium and explained the EFSAB looked at the natural hydrograph and what the 7Q10 was for the period of record. Mr. van der Vaart asked how often in real life there is a sustained situation of 7Q10 flow? Mr. Goudreau responded for comparison purposes, the EFSAB modeled 7Q10 flow conditions, which could happen below a reservoir where flow can be controlled.

The more a stream's flow deviates from a natural flow, the more impact there is to habitat. The EFSAB examined the relationships between stream flow and ecology, relating biological conditions to flow data and published the results. Mr. Goudreau stressed that coastal streams operate differently with two-way tidal flow. In coastal systems, flow may be secondary to other factors including tides, salinity, and unique community structures. The EFSAB looked at flow standards from other coastal states. For tidally-influenced streams, other methodology is needed. For coastal streams that are not tidally influenced, similar approaches may be used to those used for piedmont streams.

The ecological flow standard that the EFSAB recommended was the percentage of flow for modeling and planning purposes. This approach retains temporal variability. The EFSAB did not reach consensus for a single flow-by percentage, though greater than 80% was found to be most consistently protective. The board made the recommendation to model the cumulative effects if there are a series of withdrawals within a river system. The EFSAB also made the recommendation to use the 20^{th} percentile flow as critical low flow (by month). Flow models should include three different flow regimes: natural, baseline, and projected (current and future withdrawals and returns). The EFSAB recommended that DEQ should use models to assess changes in biological conditions associated with projected changes in flow. There were no numerical standards proposed for the coast; there is a separate coastal workgroup that is continuing to work on this issue, facilitated by APNEP (Albemarle Pamlico National Estuary Partnership). It was noted that small headwater streams should receive additional analyses to determine the potential for impact due to their higher vulnerability to disturbance and lack of comparison data.

Questions and Discussion:
Mr. Gillespie suggested at the next meeting, the WAC could hear from DEQ about where ecological flow is used and how the data will impact any changes. Chairman McAdams agreed that would be a good idea. Chairman McAdams went on to say that ecological flows are likely very important related to interbasin transfers. Mr. Gillespie suggested there might be some cases where stricter requirements might be good.

Mr. van der Vaart asked whether there are any stochastic models being used for ecological flow, suggesting something is being lost if not using a statistical approach. Mr. Goudreau replied that is a more appropriate question for DEQ, but also stated that biological systems are very difficult to simplify into a model that represents all variables. Mr. van der Vaart expressed concern about using an approach that provides the most stringent answer. Mr. Goudreau responded that the EFSAB tried to use multiple approaches in reaching their recommendations. The model can be used to help better understand the habitat needs and basic biological responses to different flow regimes.

Dr. Meiburg stated he saw great value in having this presentation on ecological flow. The information shared helped illustrate how complex ecological flow is and the impact of withdrawals on flow regimes and habitat needs. Many factors need to be considered when examining the impact of proposed withdrawals. Dr. Meiburg also agreed that interbasin transfers are one of the most controversial actions decided by the EMC. He wants to ensure that DEQ has the best methods and data when considering whether there is enough flow to protect the functioning of aquatic systems. The presentation suggested there may need to be analytical methods that are more complex than have traditionally been used to ensure adequate streamflow and to protect the ecology that has developed around that flow.

Mr. Keen asked about stakeholders on the coast and whether the EFSAB incorporated research or concerns from them? Mr. Goudreau replied there have been efforts to engage coastal stakeholders through APNEP, including scientists on the coast. Mr. Tarver approached the podium and added that there are co-chairs from ECU and Duke on APNEP's ecological flow study group. His understanding is that the group is looking at ecological flows of coastal waters. Mr. Goudreau added that he understood from the group's last meeting that they are interested in starting some pilot studies.

Ms. Deerhake asked about the model's capability to handle extreme events (both droughts and rainfall) and understand the vulnerability of biological systems to sediment? Mr. Goudreau replied that the model can use projected changes in the hydrology data set, to include more extreme events, to see changes in data output from the model and how flow recommendations are impacted. Regarding sediment, it's not explicitly considered, and would need to be looked at separately. Ms. Deerhake followed up to say that biological systems could be more vulnerable to sediment loading from heavy rains following drought conditions, which should be factored into the considerations.

III. Concluding Remarks:

Chairman McAdams asked if there was anything else that needed to be discussed or if there were other comments. There were no additional comments by the committee members or staff. The meeting was adjourned.