Comments on Chlorophyll-*a* in Advance of September 2017 SAC Meeting

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The agenda for the September 27, 2017 SAC meeting includes continuing discussion of potential CHLa criteria for HRL. Following are some observations and recommendations for conducting that discussion.

1. Order of CHLa-related elements on which consensus should be reached. The magnitude of a CHLa target will have very different meanings depending on how it is expressed. Therefore, addressing these elements is a prerequisite to a detailed discussion of magnitudes. It is recommended that the SAC reach consensus on the following elements priority to tackling magnitude:

a. *Temporal averaging*. Definition of the temporal averaging period would be critical for evaluating CHLa magnitudes. For reference, my current proposal cites is a seasonal (Apr-Oct) geometric mean, as the best measure of central tendency for a log-normally distributed variable.

b. *Spatial averaging*. This is another factor that would affect interpretation of proposed magnitudes. For reference, my current proposal cites averaging of surface samples from reservoir segments that are geomorphically and hydraulically similar (riverine, transitional, and lacustrine).

c. *The proposed approach for using a CHLA range with reservoir-specific information deserves discussion and a decision*. The "balanced uses" approach was previously presented to the SAC as a framework by which to both derive site-specific criteria for HRL and facilitate the transfer of the HRL pilot results to other NC reservoirs. Under this approach, the SAC would first reach consensus on a CHLa range for warmwater lakes/reservoirs. Reservoirs with CHLa values above the range could be considered impaired based on CHla alone, whereas reservoirs with CHLa within the range could receive additional scrutiny based on reservoir-specific information such as that on fishery status, algal toxins, nuisance conditions, etc. (Figure 1). Either way, the upper end of CHLa range would represent a cap on the maximum site-specific CHLa criterion for each reservoir, and site-specific criteria could also be set to lower values within the range (Figure 2).

Putting aside for a moment the specific range to be used, it is important that the SAC reach consensus on whether to recommend this general approach, because it would affect the nature of the CHLa discussion. If the SAC chose to recommend this approach, there would be more emphasis on defining the appropriate CHLa range for general use, and then "piloting" the process with HRL. If the SAC chose not to use this approach, the discussion would revert to a more limited form.
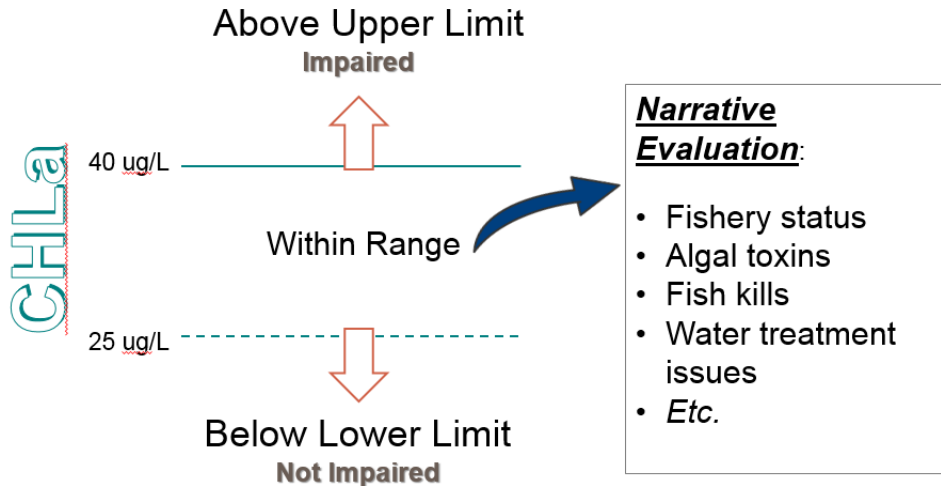
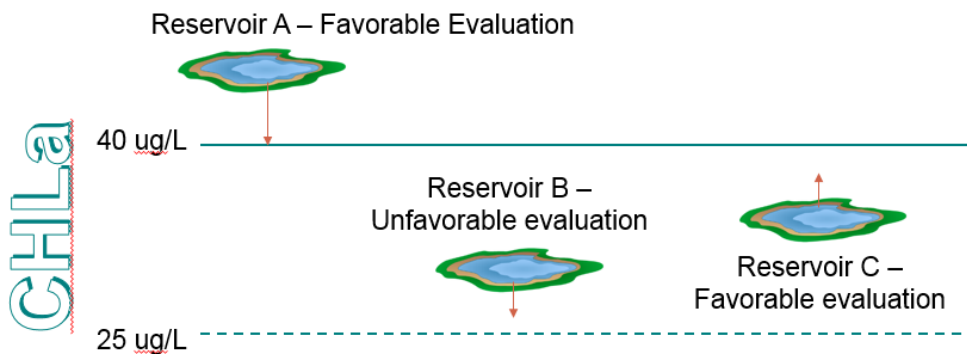*Figure 1-Illustration of using a CHLa range as the starting point for setting a site-specific CHLa criterion.*

Figure 2 - Illustration of how different warmwater reservoirs might receive different site-specific criteria under the proposed process.

2. The SAC should attain consensus on the working range of CHLa targets for NC warmwater reservoirs: It is important that the SAC derive the CHLa range. It is not expected that the lower end of the range will be highly controversial. But the upper end has more long-term regulatory implications and merits a detailed discussion and input from other SAC members.

3. 20-30 ug/L is the wrong range for consideration, because it is based only on the literature and does not incorporate reservoir-specific considerations. The pre-meeting materials summarize the CHLa target ranges cited by myself and Lauren for different uses (recreational, water supply, and aquatic life). It is important to note that these are both literature-based ranges, drawn from a variety of geographically diverse lakes and reservoirs. Many of the literature studies were specifically performed because the lakes or reservoirs were experiencing nutrient-related problems. [I believe that some of the "negative endpoints" cited in the EPA ranges do not represent inherent impairments (e.g., lake fertilization, proportions of cyanobacteria), but this can be part of the discussion]. The literature can be expected to

supply relatively conservative values that indicate the general potential for certain problems. The other half of the story is whether a reservoir actually experiences such problems.

In my opinion, it is important the CHLa range (and eventual site-specific) criteria be informed by *both* the literature and reservoir-specific considerations, which provide insights into whether such problems actually occur in a specific water body. High Rock Lake is a valuable case study for informing the upper end of the range, because it provides an example of a highly productive reservoir that has many favorable use indicators. The recommended range we cited in our CHLa proposal (25-40 ug/L) considered both literature and reservoir-specific considerations. The upper end of the range would also coincide with the original intent of NC's CHLa existing criterion.