## # of Sampling Events per Year by Station

<table>
<thead>
<tr>
<th>Year</th>
<th>D6250000</th>
<th>D8356200</th>
<th>D8950000</th>
<th>D9490000</th>
<th>D9995000C</th>
<th>M610000C</th>
<th>M3900000C</th>
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</table>
Questions

Is the current assessment methodology (surface) for dissolved oxygen representative for Chowan and Albemarle?

Approach: data evaluation

If YES, we move on to other parameters
If NO, moves over to assessment to address recommendations
Dissolved oxygen: not less than 5.0 mg/l, except that swamp waters, poorly flushed tidally influenced streams or embayments, or estuarine bottom waters may have lower values if caused by natural conditions;
Albemarle Sound Stations
D999500C
ALBEMARLE SOUND NR EDENTON MID CHANNEL

M610000C
ALBEMARLE SOUND BETWEEN HARVEY PT AND MILL PT MID CHANNEL

Dissolved Oxygen (mg/L)
Max
5
0
D999500 – Salt Water
M610 – Salt Water

M610000C - N Exceedance Frequency vs Sample Depth Frequency (2009 - 2018, DO Standard = 5)
For non-trout waters, not less than a daily average of 5.0 mg/l with an instantaneous value of not less than 4.0 mg/l; swamp waters, lake coves, or backwaters, and lake bottom waters may have lower values if caused by natural conditions.
Chowan R – D8356200

D8356200 - N Exceedance Frequency vs Sample Depth Frequency (2009 - 2018, DO Standard = 4)
Chowan R – D895

DS950000 - N Exceedance Frequency vs Sample Depth Frequency (2009-2018, DO Standard = 4)
Summary Results

Albemarle - assessment methodology appears adequate, meets standards in top 4 meters, low DO in bottom waters periodically in summer months.

Chowan - assessment methodology appears representative, low DO in headwaters throughout water column.

Cause of Low DO in headwaters? Swamp inputs, other organic sources, nutrients? Will be evaluated for 2020 303(d) impairment decision.
A (Very) Brief Overview of EPA’s Draft Numeric Nutrient Criteria for Lakes & Reservoirs

June 17, 2020
General Information

Draft document published on 05/22/2020
  • Public comment period ends: 07/21/2020

Statistical stressor-response models to determine criteria for:
  • Chlorophyll-a
  • TP & TN-DIN (\textit{minus} dissolved inorganic N)

Models based on EPA National Lakes Assessment data
  • Samples collected in 2007 & 2012

Online model tools provided (see slide #9)
Chlorophyll-a Criteria

Address multiple risk metrics for aquatic life & human health uses *(see next slide)*

**Duration** recommended as a growing season geometric mean

**Frequency** is recommended as not-to-exceed
<table>
<thead>
<tr>
<th>Designated Use</th>
<th>Assessment Endpoint</th>
<th>Risk Metric</th>
<th>Model Output (criterion)</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic life</td>
<td>Zooplankton biovolume</td>
<td>Rate of change of zooplankton biomass relative to phytoplankton biomass</td>
<td>Chlorophyll-a</td>
<td>All lakes</td>
</tr>
<tr>
<td>Aquatic life</td>
<td>Cool- &amp; cold-water fish</td>
<td>Daily depth-averaged DO below the thermocline (deep water hypoxia)</td>
<td>Chlorophyll-a</td>
<td>Dimictic lakes with cool- or cold-water fish</td>
</tr>
<tr>
<td>Recreation</td>
<td>Human health</td>
<td>Microcystin concentration to prevent liver toxicity in children</td>
<td>Chlorophyll-a</td>
<td>All lakes</td>
</tr>
<tr>
<td>Drinking water</td>
<td>Human health</td>
<td>Microcystin concentration to prevent liver toxicity in children</td>
<td>Chlorophyll-a</td>
<td>All lakes</td>
</tr>
</tbody>
</table>
Zooplankton Biomass Model Relationships

Figure 4. Schematic of network of relationships for modeling zooplankton biomass. Gray-filled ovals: available observations; other nodes: modeled parameters; numbers in parentheses refer to equation numbers in the text.
Figure 20. Schematic showing relationship between different variables predicting MC. *Numbers in parentheses*: refer to equation numbers in the text.
TN & TP Criteria

Lakes data used to establish relationships between:

- TP (various compartments), Chlorophyll-a, lake depth, ecoregion geography and turbidity
- TN (various compartments), Chlorophyll-a, and ecoregion geography

TN & TP models similar except impact of N content of inorganic suspended sediment on Chlorophyll-a was negligible
TN & TP Criteria

TN & TP models provide two criteria for each

One based on the *Ambient* concentration
- Associated with a targeted Chl a concentration that then provides a candidate criterion for TN-DIN or TP

One based on the *Limiting relationship*
- Can potentially be used to estimate the change in Chl a that would result from a change in the amount of biologically available N or P in the water column (estimate effects of load reductions)

**Duration** recommended as a growing season geometric mean

**Frequency** is recommended as not-to-exceed
Summary

Draft criteria models that provide…. 

Chlorophyll-a criteria for:

1. Two different aquatic life risk metrics (zooplankton/hypoxia)
2. Two different human health risk uses (recreation/drinking)

&

TN & TP criteria based on:

1. Ambient concentrations
2. Limiting relationships
Interactive Model Tools

Tools allow user to manipulate model inputs to derive criteria for the various uses

Phytoplankton/zooplankton: https://chl-zooplankton-prod.app.cloud.gov/

Deep water hypoxia: https://chl-hypoxia-prod.app.cloud.gov/


Candidate Algal Criteria for the Chowan River and Albemarle Sound
Candidate Algal Criteria

• Chlorophyll a
• Phycocyanin
• Exposure or Recreational Contact Advisory Days
• Cyanotoxins
• Algal Density
• Algal Biovolume

Other ideas?
Questions for Each Candidate Criterion

• Background
• Pros
• Cons
• Ambient or episodic application?
• Preliminary recommendation: continue or drop?