

Potential Chlorophyll-a Criteria Alternatives

James CHLA RAP | April 25, 2017



Clifton Bell

757.518.2456

cbell@brwnncald.com



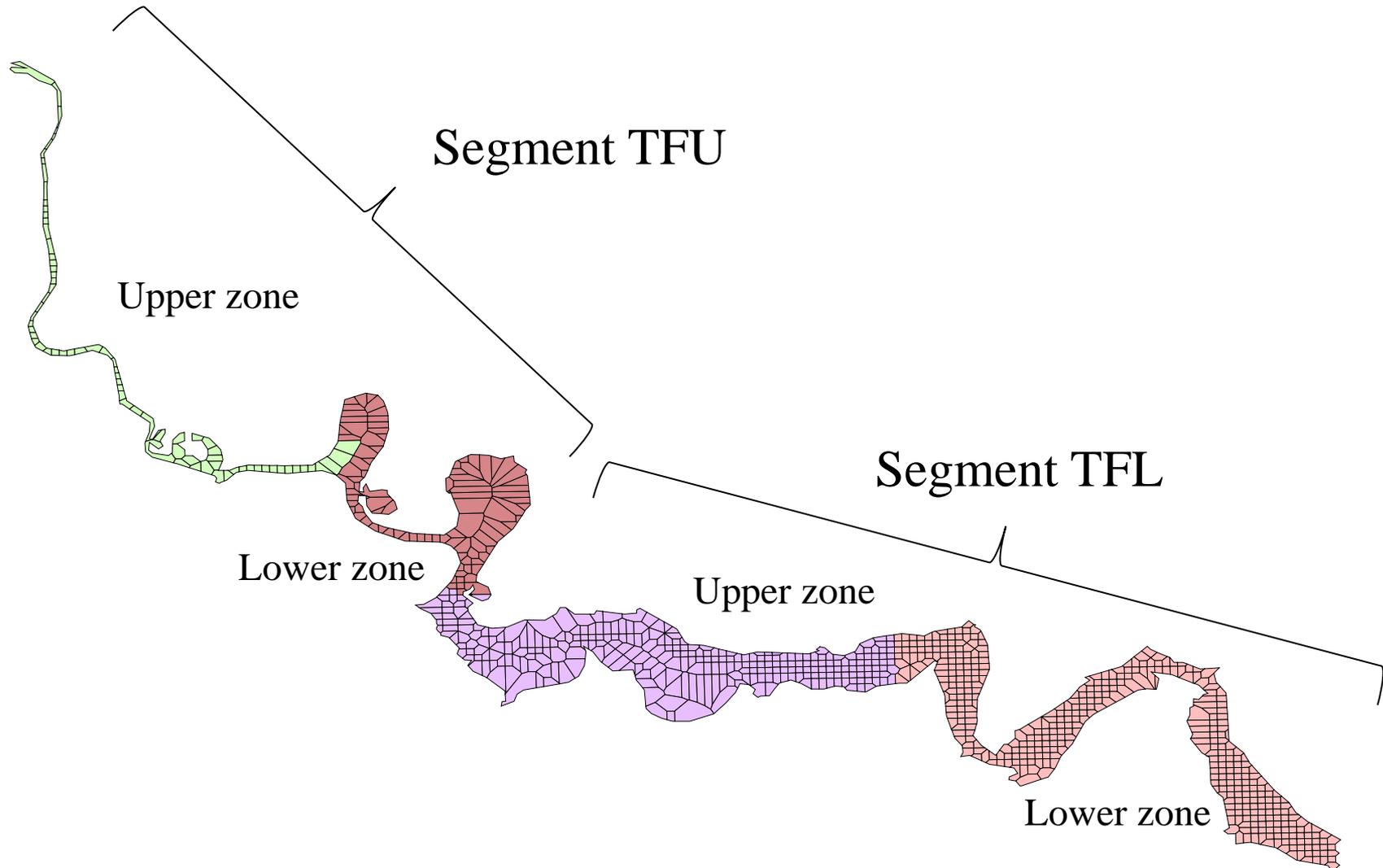
Potential CHLa Criteria Alternatives

- Intended to keep full range of options open pending completion of alternatives analysis.
- Alternatives pertain to tidal freshwater summer.
- Utilize DEQ method, only spatial considerations are in play.

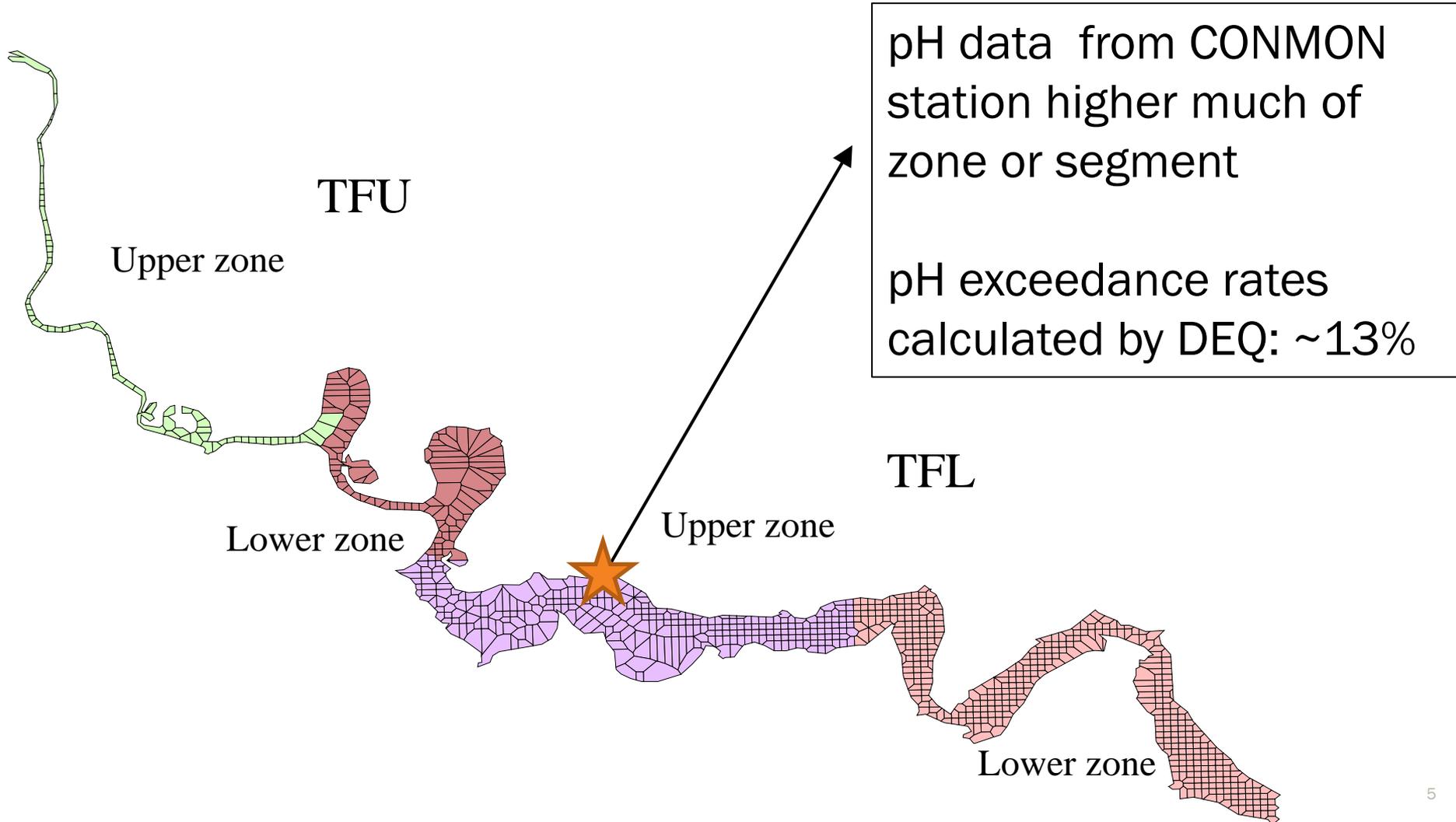
Background on Proposed TF Summer Criteria

- Segments TFU and TFL divided into two zones each
- Segment-wide CHLa criteria based on weighted average of targets for the zones
- DEQ explored CHLa targets associated with $\leq 10\%$ exceedance of different metrics
 - pH
 - Microcystin
- Target for zone set to the lowest resulting value, which might be historic baseline

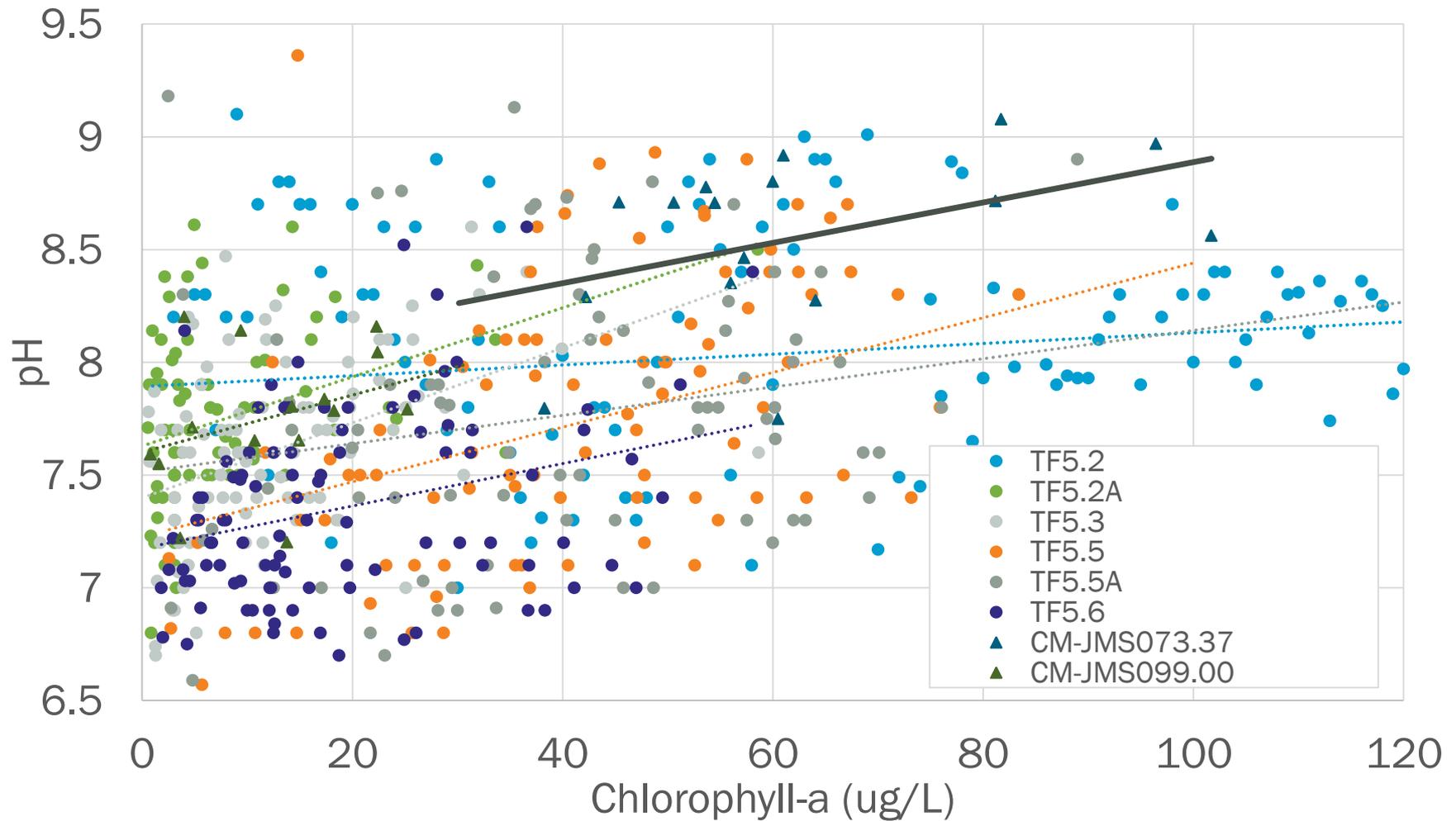
Tidal Freshwater Segments and Zones



In some zones, CHLa targets are controlled by higher-pH *subzone*



pH from COMMON at least 0.5 units higher than other stations



In some zones, CHLa targets are controlled by higher-pH subzone

DEQ TFU Summer CHLa Criteria:
21 ug/L

Upper zone
Baseline

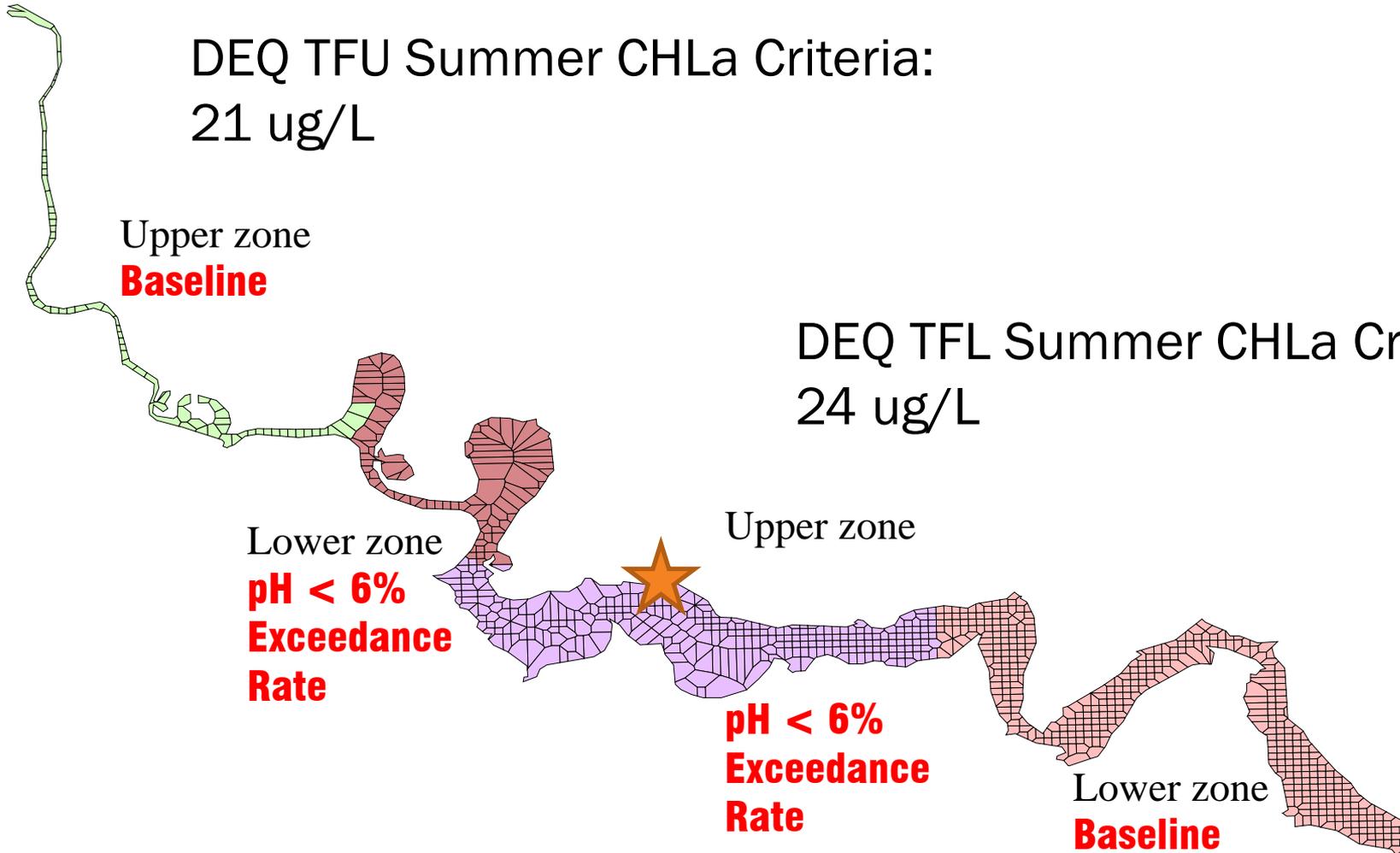
DEQ TFL Summer CHLa Criteria:
24 ug/L

Lower zone
**pH < 6%
Exceedance
Rate**

Upper zone

**pH < 6%
Exceedance
Rate**

Lower zone
Baseline



Alternative Criteria Concept

- Apply $\leq 10\%$ effects concept to zones instead of subzones
- Apply $\leq 10\%$ effects concept to segments instead of subzones
- Conservative assumption:
 - pH for zones is at least 0.1 units lower than for subzone
 - In this case, microcystin or baseline—rather than pH—would control zonal targets
 - Small increase in CHLa criteria

Focus on zones instead of subzones

TFU Summer CHLa Criteria:
21 → 23 ug/L

Upper zone
Baseline

TFL Summer CHLa Criteria:
24 → 25 ug/L

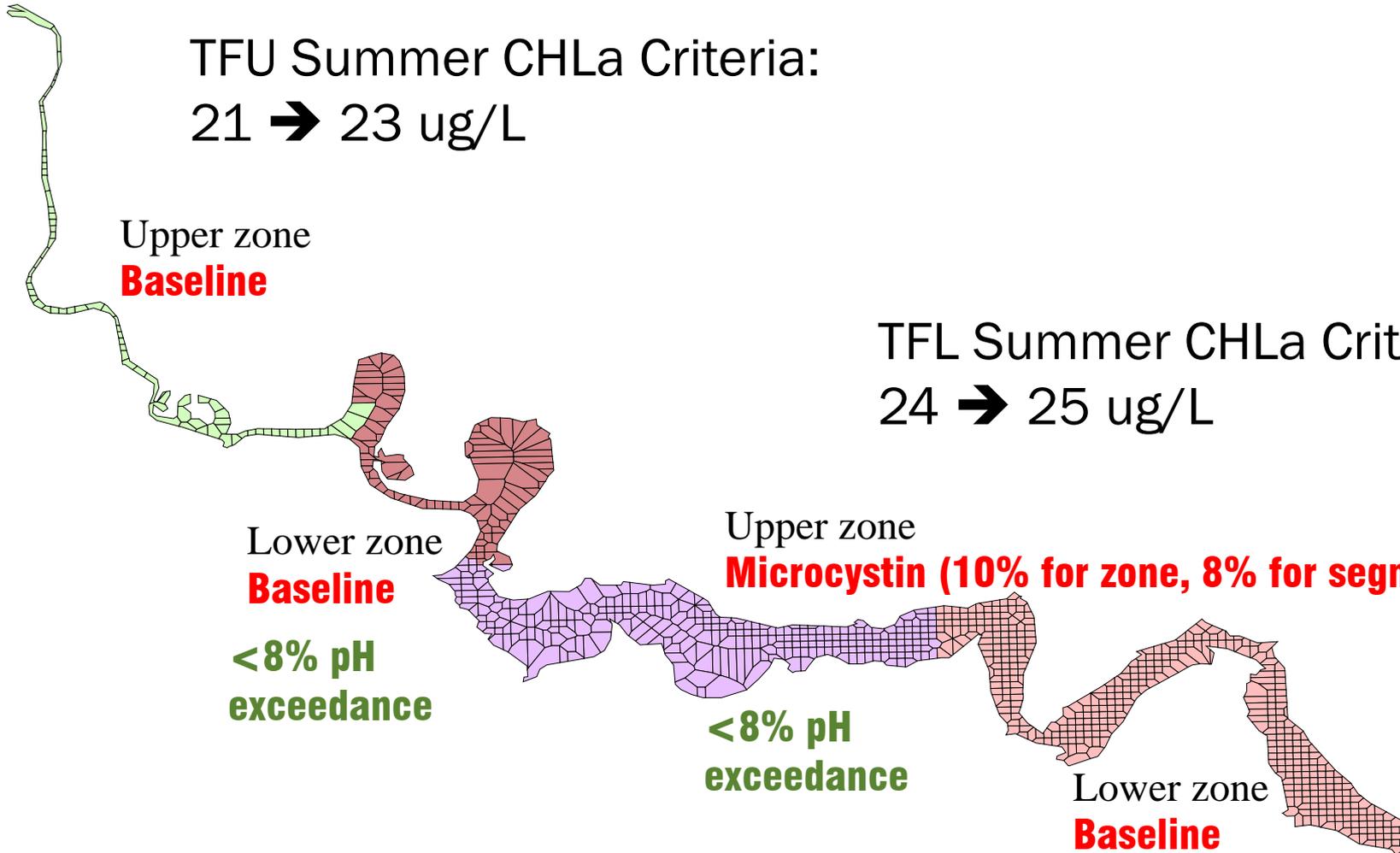
Lower zone
Baseline

<8% pH
exceedance

Upper zone
Microcystin (10% for zone, 8% for segment)

<8% pH
exceedance

Lower zone
Baseline



Focus on segments instead of subzones

TFU Summer CHLa Criteria:
21 → 23 ug/L

Upper zone
Baseline

TFL Summer CHLa Criteria:
24 → 26 ug/L

Lower zone
Baseline

<8% pH
exceedance

Upper zone
Microcystin (14% for zone, 10% for segment)

<10% pH
exceedance

Lower zone
Baseline

Related Recommendation: Confirm that Baseline-Based Criteria Would Not Control Allocations

- Some proposed criteria are based on historical baseline in segment-seasons where no effects were observed.
- These probably won't control allocations.
- If they model predicts that they would, adjustments should be considered.

Conclusions

- Different spatial considerations would lead to a small range in potential TF summer criteria
- Still consistent with overall method including application of a $\leq 10\%$ exceedance factor
- pH and microcystin exceedance rates still relatively low in zones and subzones
 - $< 13 - 14\%$ in subzones
 - $< 1 - 10\%$ in zones and segments

Existing pH Criteria

- Virginia
 - 6.0 – 9.0
 - No explicit duration or frequency components.
- USEPA
 - 6.5 – 9.0
 - Dates to 1976 “Red Book”, repeated in 1986 “Gold Book”.

Upper limit of Red/Gold Book pH criteria based on two lines of reasoning

- General statements about the effect of pH on the toxicity of other substances
- Literature review performed by European Inland Fisheries Advisory Commission (1969):
 - “Chronic exposure to pH values above 10.0 are harmful to all species studied, while salmonid and some other species are harmed at values above 9.0.”
 - Longer-term (>30-day studies)

