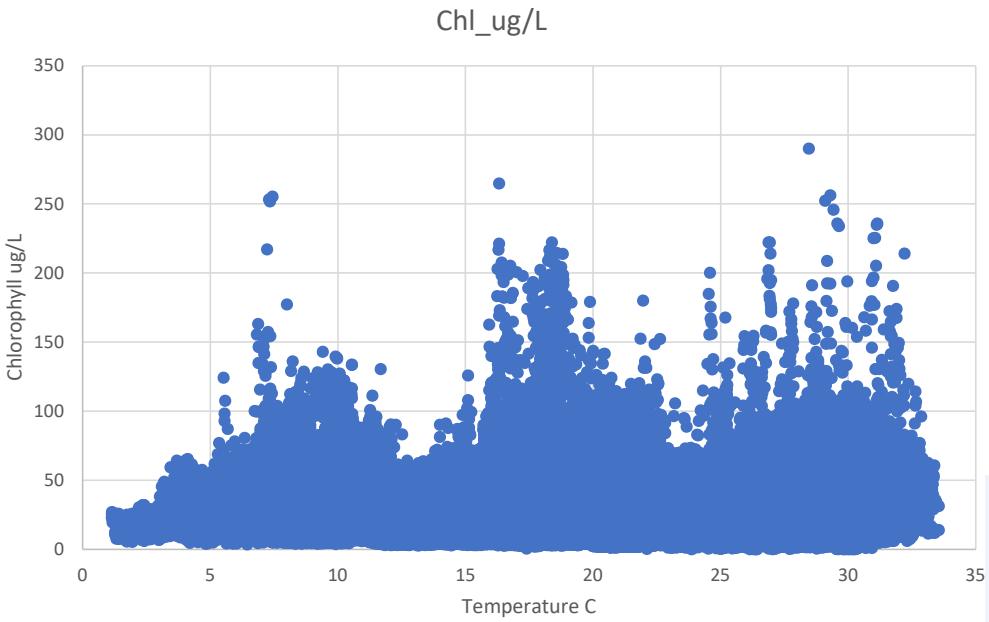
What are we doing?

Examining existing data for hints on how to treat algal growth rates during climate change scenarios. E.g. Temperatures > 30C

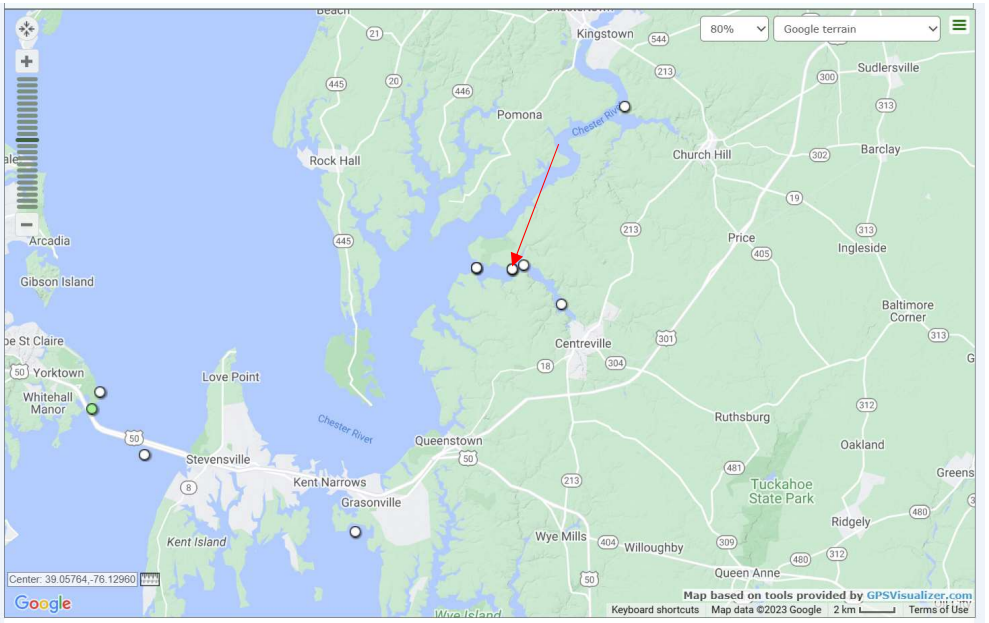
Initial Indications

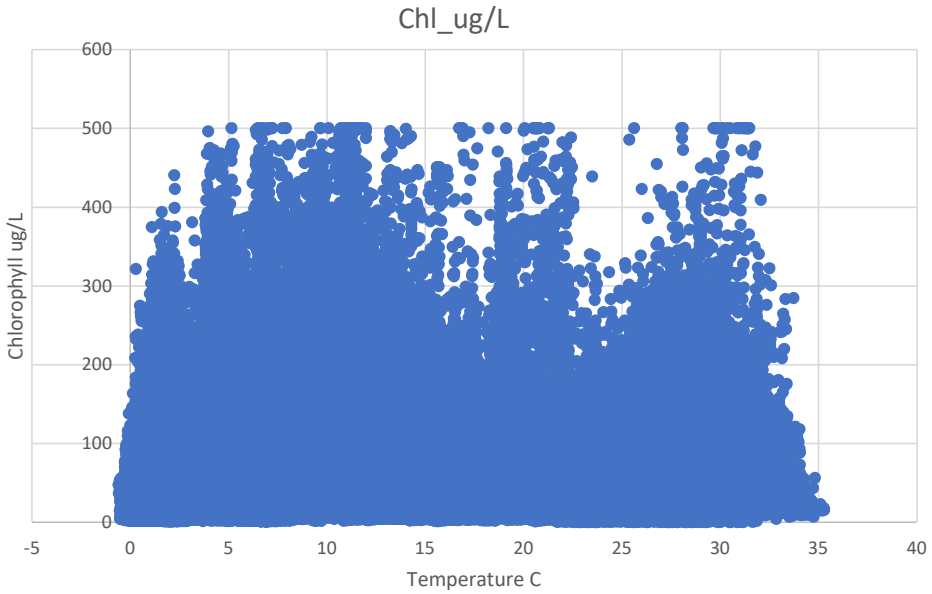
Observations indicate chlorophyll concentration declines above ≈32C.

At present, temperatures this high are restricted to isolated small tributaries. Mostly freshwater or low salinity.

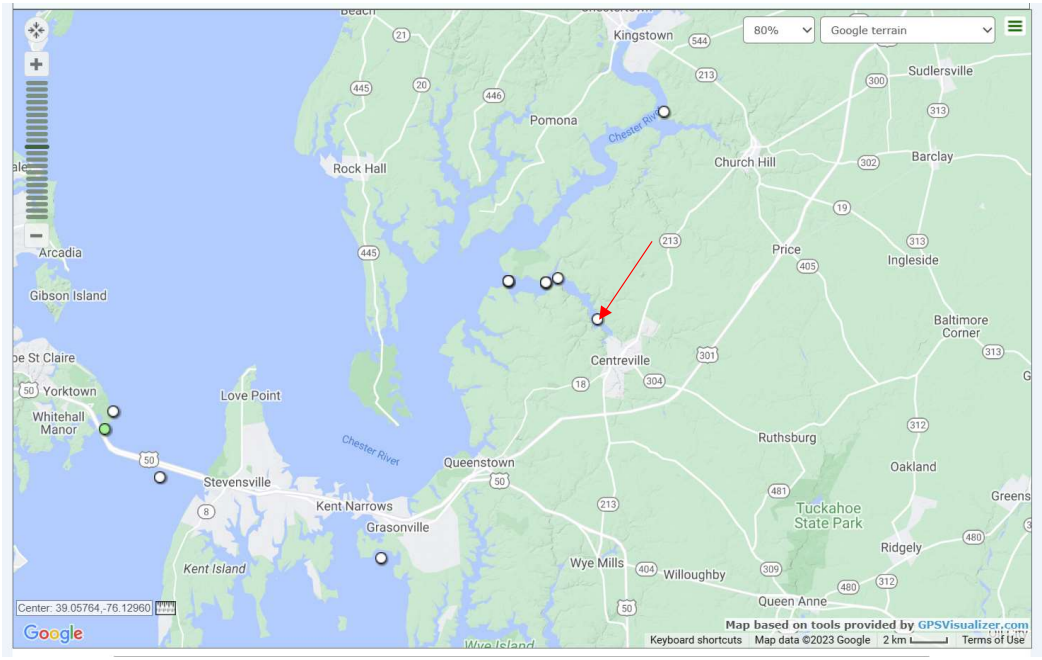


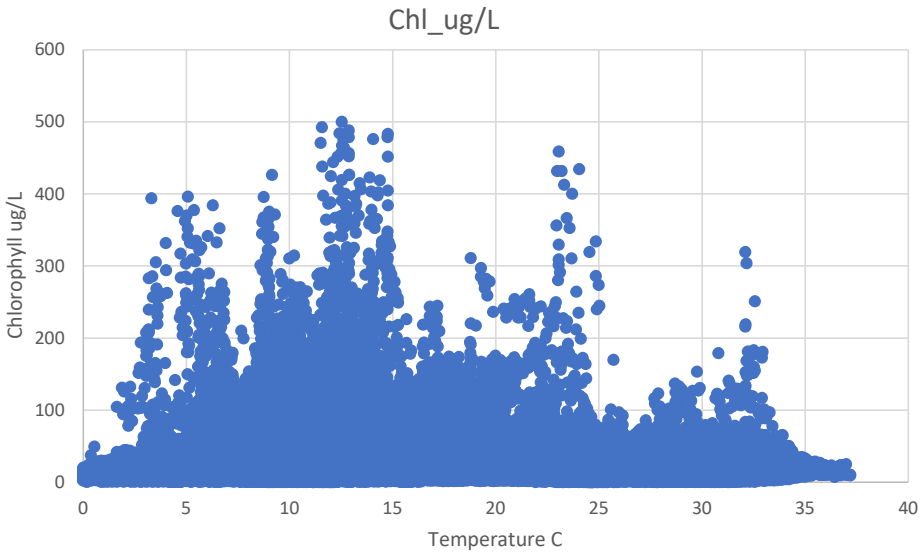
Possum Point, Corsica River



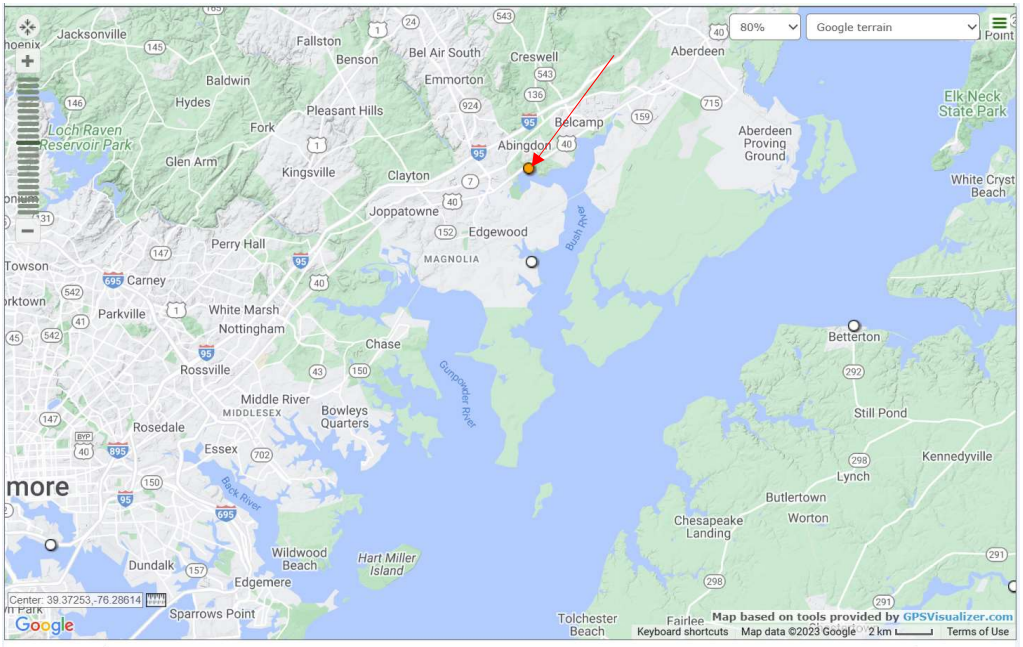


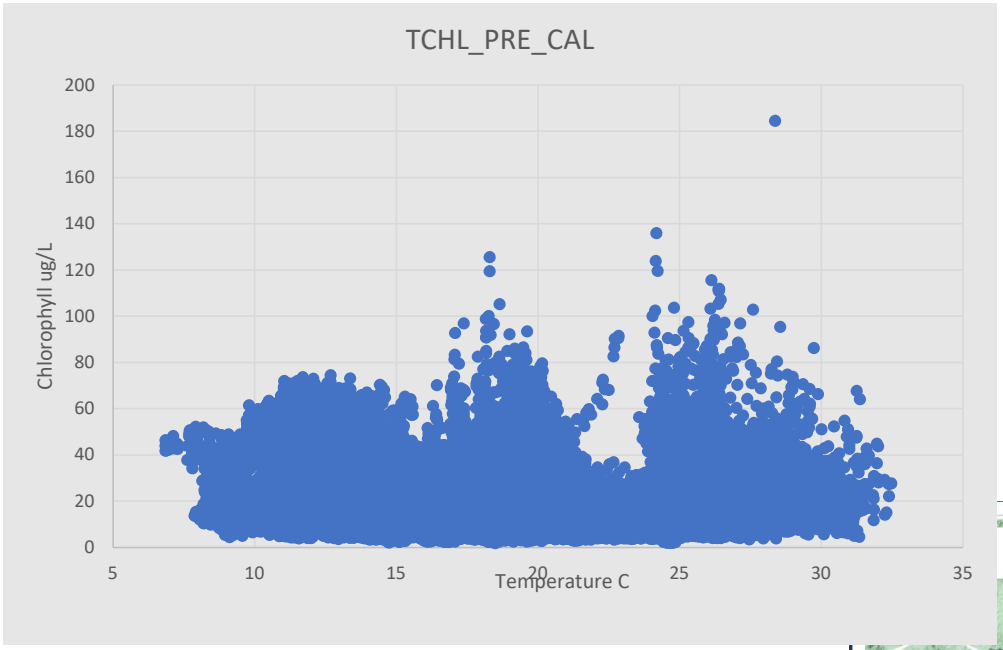
Sycamore Pt., Corsica River



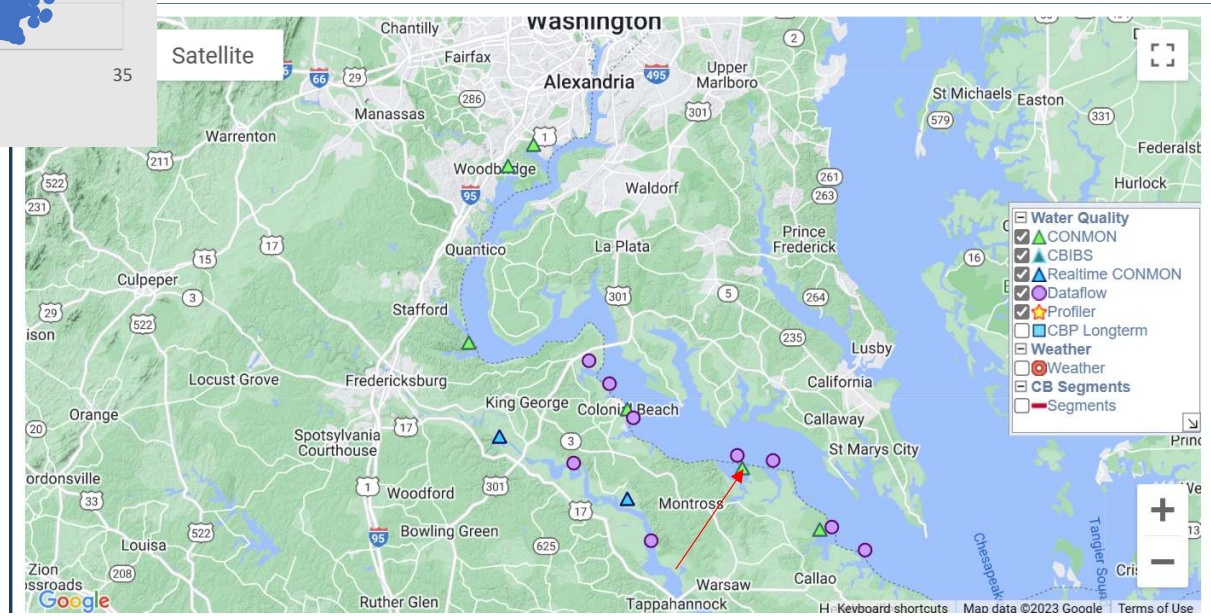


Otter Pt., Bush River




TCHL_PRE_CAL
Chlorophyll ug/L
Temperature C
0
20
40
60
80
100
120
140
160
180
200
5
10
15
20
25
30
35

Nomini Bay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Fairfax
Alexandria
Upper Marlboro
Manassas
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Quantico
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Easton
Federalsburg
Hurlock
Culpeper
Stafford
Fredericksburg
Locust Grove
King George
Colonial Beach
Lusby
California
Callaway
St Marys City
Orange
Spotsylvania Courthouse
Woodford
Montross
Bowling Green
Louisa
Warsaw
Callao
Tappahannock
Ruther Glen
Water Quality
CONMON
CBIBS
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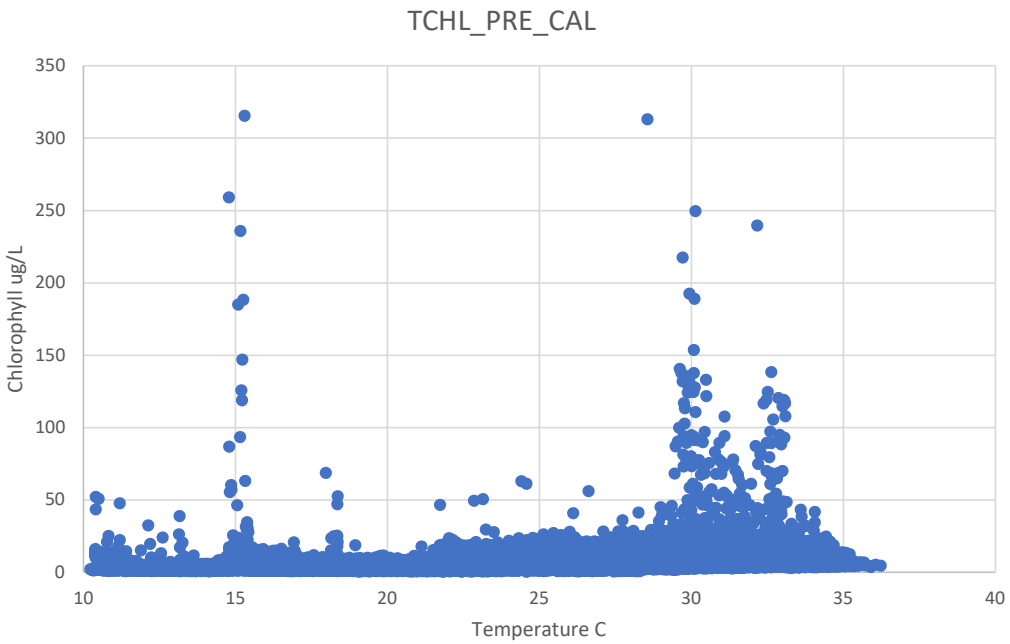
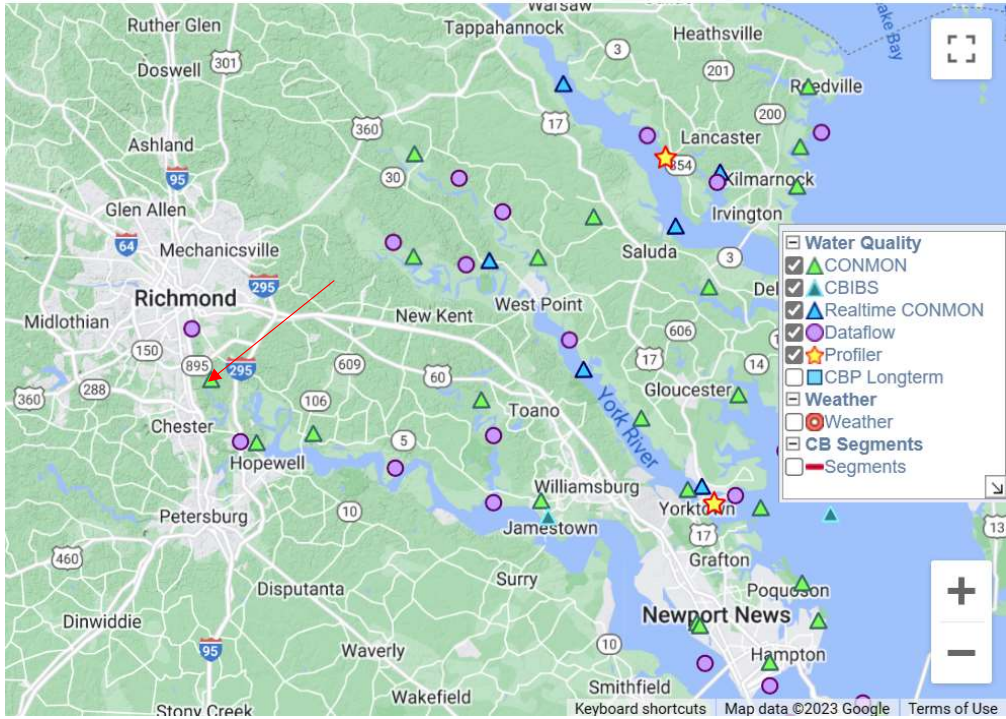


Osborne Landing, James River



Conclusions

The existing data shows that chlorophyll concentration declines above ≈32 C.

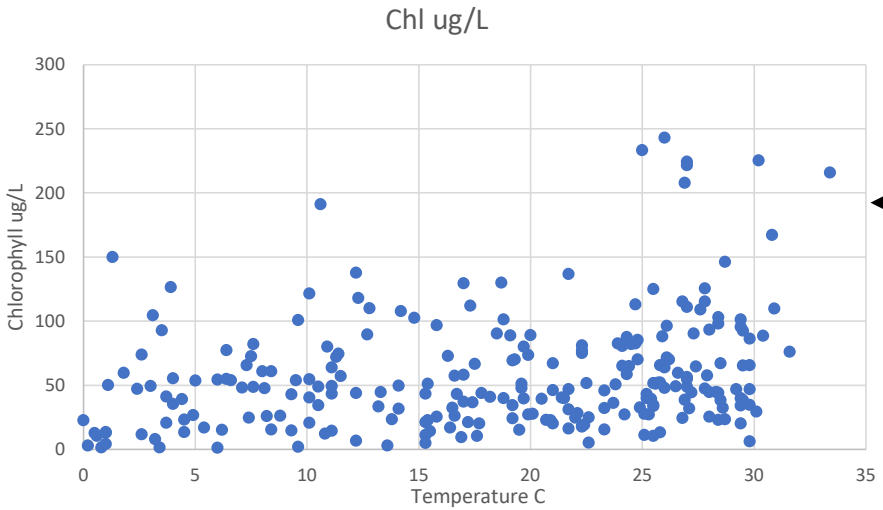
Use of a growth-temperature relationship in which growth increases continuously with temperature is probably not a good one for climate change scenarios.

Hesitations

We are looking at chlorophyll concentration. Concentration may be viewed as the result of growth minus respiration. We don't have any indication of the shape of these two independent functions.

Our results are for the present biota in the Chesapeake. In the case of climate change, will these biota be replaced by species adapted to higher temperatures?

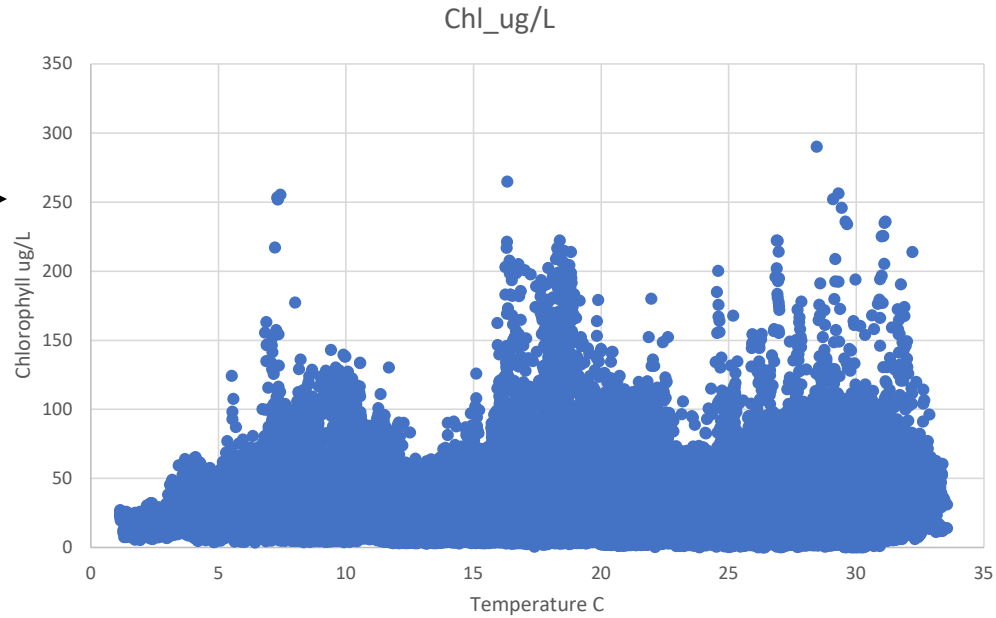
Right now, we can't say much about the mainstem bay and lower tributaries.



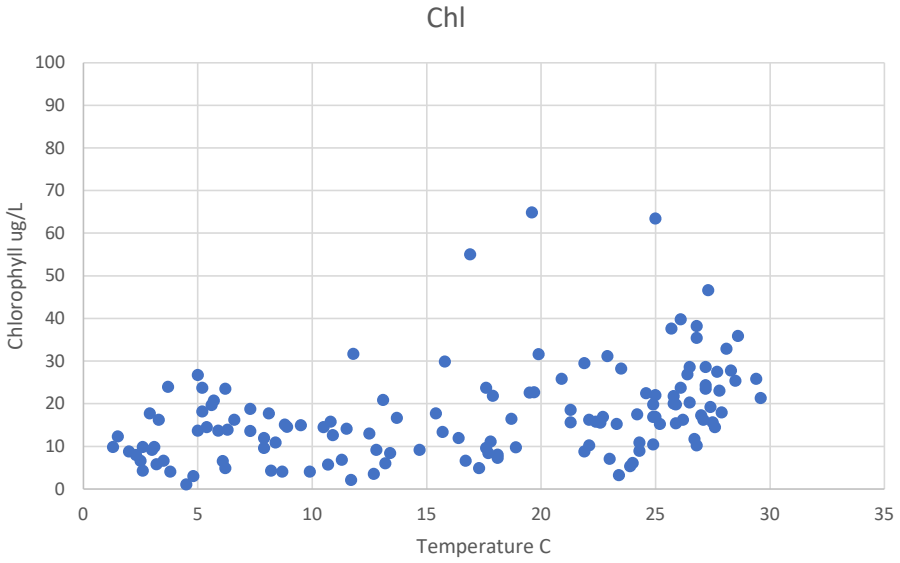
Discrete

Possum Point

Continuous



Discrete data can be misleading, difficult to interpret.


Chl
Chlorophyll ug/L
Temperature C
0
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70
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90
100
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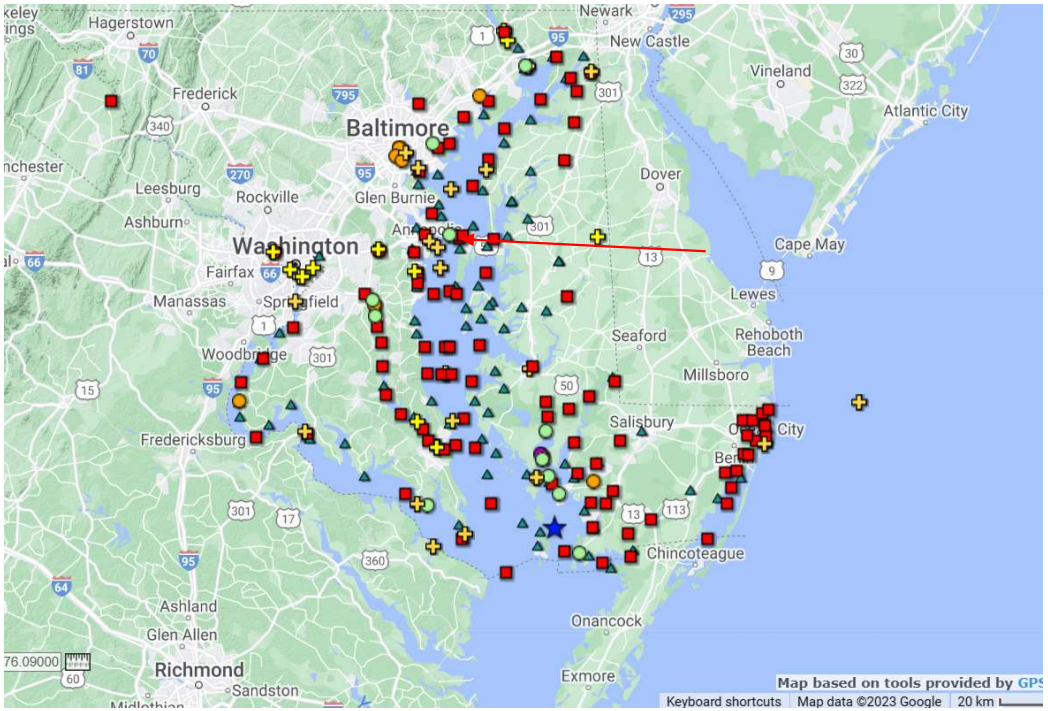
CB3.3C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Manassas
Cape May
Lewes
Seaford
Rehoboth Beach
Millsboro
Salisbury
Fredericksburg
Chincoteague
Ashland
Glen Allen
Richmond
Sandston
Onancock
Exmore
Map based on tools provided by GPS
Keyboard shortcuts
Map data ©2023 Google
20 km

Next Steps

Due to diurnal fluctuations, the continuous data is a smear. Try looking at daily averages. Do we see any trends? Are conclusions the same?

Spend more time on some mainstem stations. Can we find any indications?

Investigate the high chlorophyll concentrations at low temperatures in freshwater tributaries. Do we need a distinct algal group for these blooms?

Longer Term

For climate change, we will use the same temperature relationships that we use in the calibration. These will be based on observations to the greatest extent possible. Production will likely decline above 32 to 33 C.

If the Modeling Workgroup agrees we will implement these changes and report out on our progress and testing at the October Quarterly. The intent is to take the updated algal growth curve to the upcoming STAC Climate Change Workshop 3.0 for review. We expect the STAC workshop to take place within the first two quarters of 2024.