Oligotrophication of the Tidal Freshwater Potomac River in a Changing Climate

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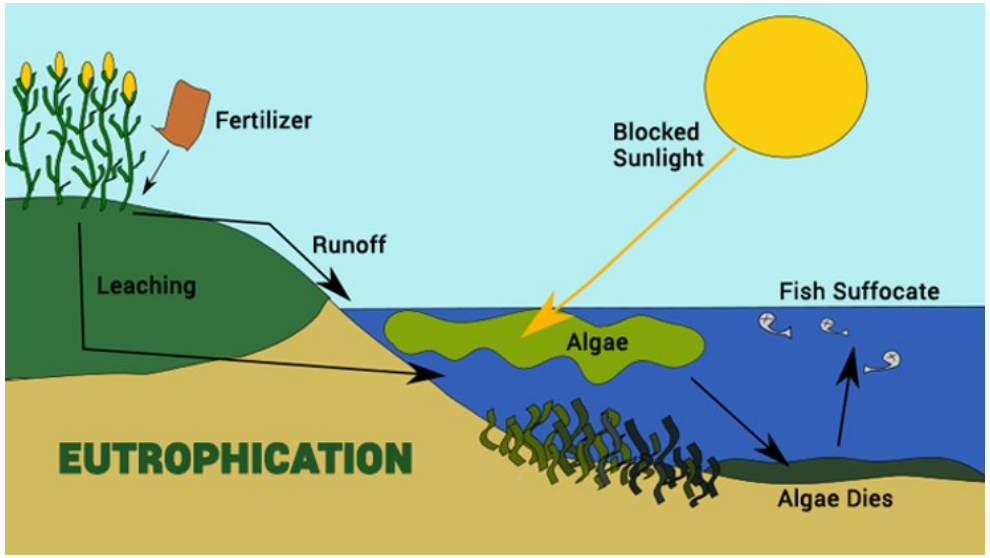
Oligotrophication (Ecosystem "Diet")

Reversing eutrophication naturally or via human intervention (e.g., nutrient management).

Becoming less nutrient-enriched and/or support less plant and animal production.

(Burkholder & Glibert 2022)

https://doi.org/10.1016/B978-0-12-822562-2.00052-9



https://www.greeningforward.org

Tidal Freshwater River

Transition Zone

Low Flow → Lakish

High Flow → Riversh

Bountiful & Popular

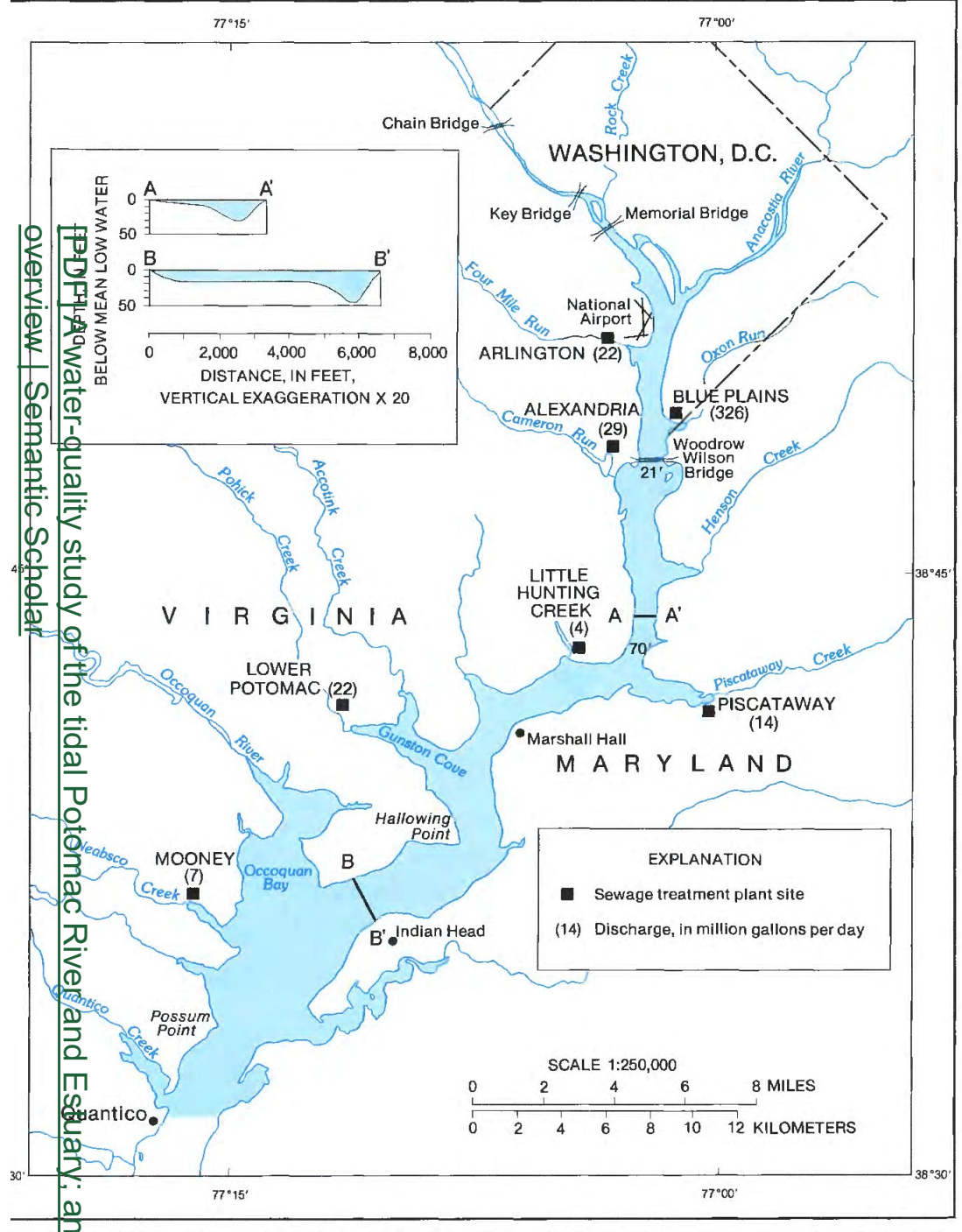
Food x Flush Services

DC Growth Impacts

Drinking Water & Hard Surfaces Divert Flows

Wastewater, Farms & Lawn Feed & Fertilize Aquatic Microbes

Extreme Weather Disrupts



gure 3. The tidal Potomac River, showing representative cross sections and the location of sewage treatment plants discharging in

[PDF] Water-quality study of the tidal Potomac River and Estuary; an overview | Semantic Scholar

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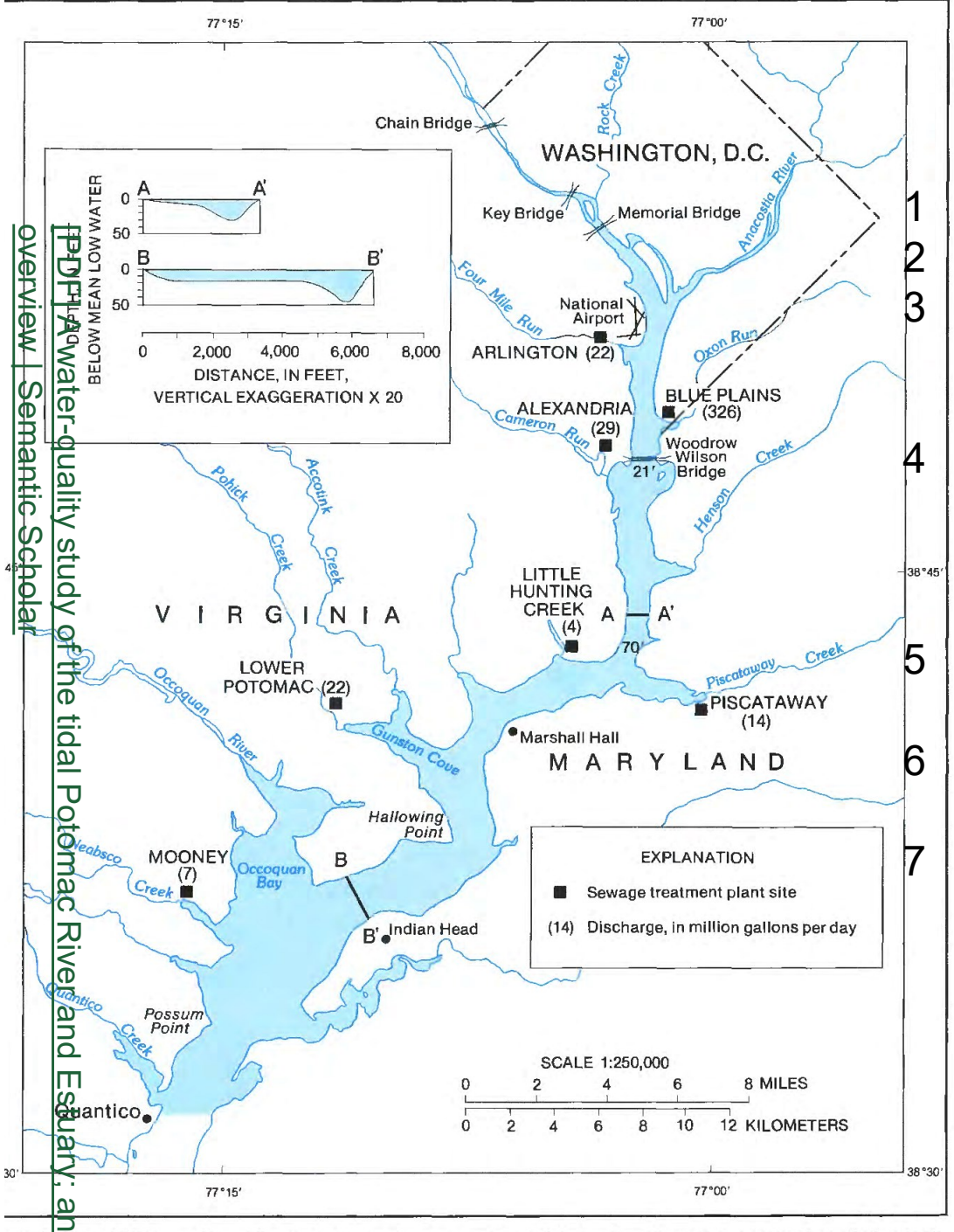

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Indicators of TFW River's Trophic State

OLIGOTROPHIC		MESOTROPHIC		EUTROPHIC
TP (mg/L)	0.010		0.035	TP (mg/L)
TN (mg/L)	0.350		0.650	TN (mg/L)
Chl a (ug/L)	2.5		8	Chl a (ug/L)
Max Chl a (ug/L)	8		25	Max Chl a (ug/L)
Secchi Disk (m)	6.00		3.OO	Secchi Disk (m)

(Sklarew 2000)

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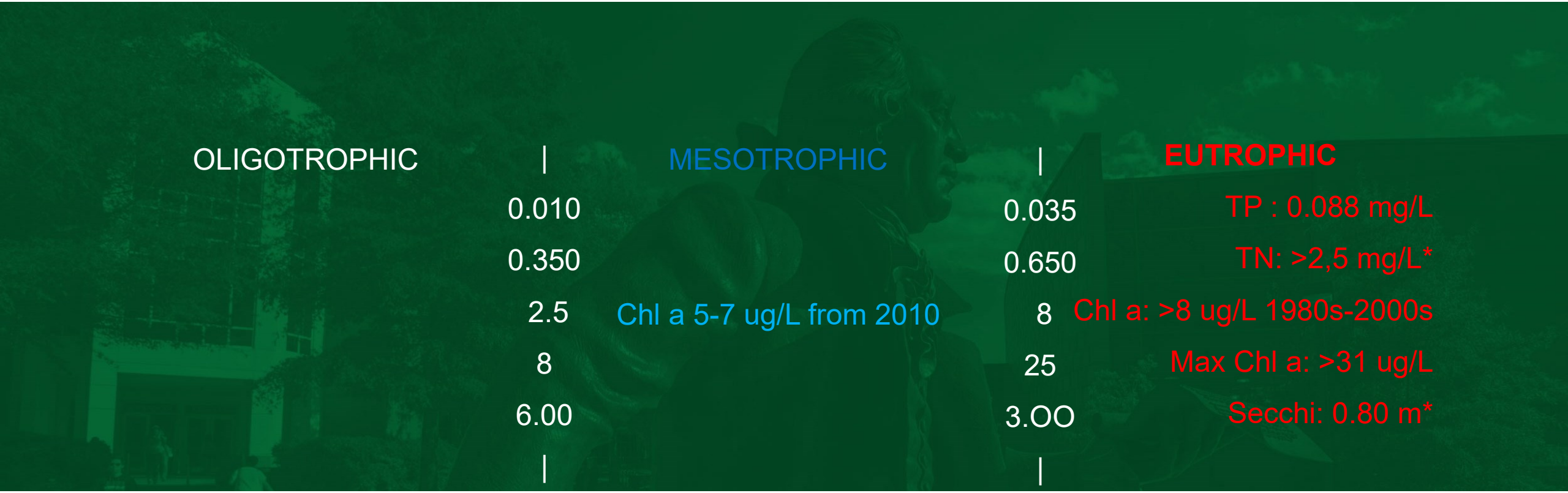
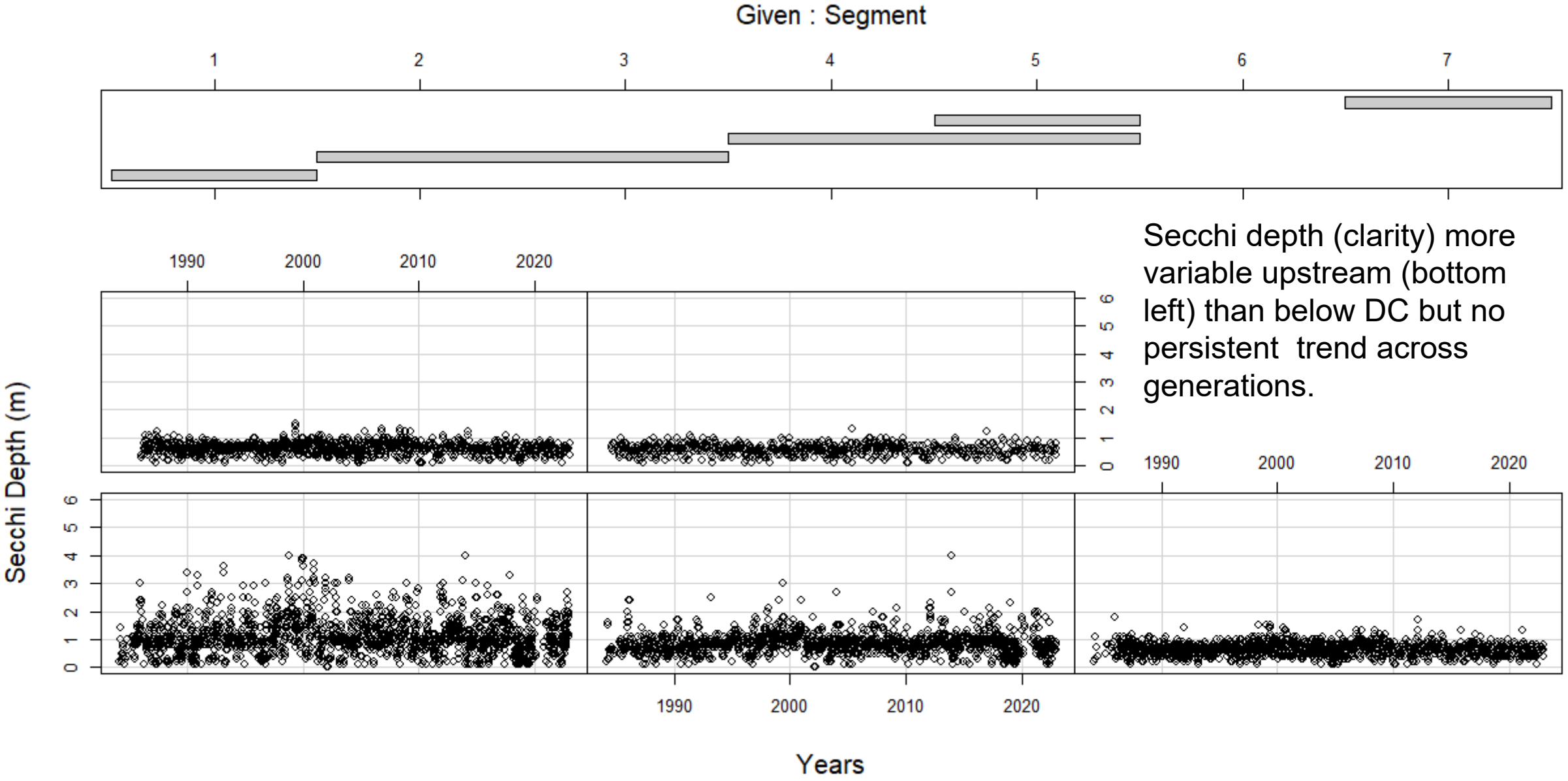
Indicators of TFW Potomac's Trophic State



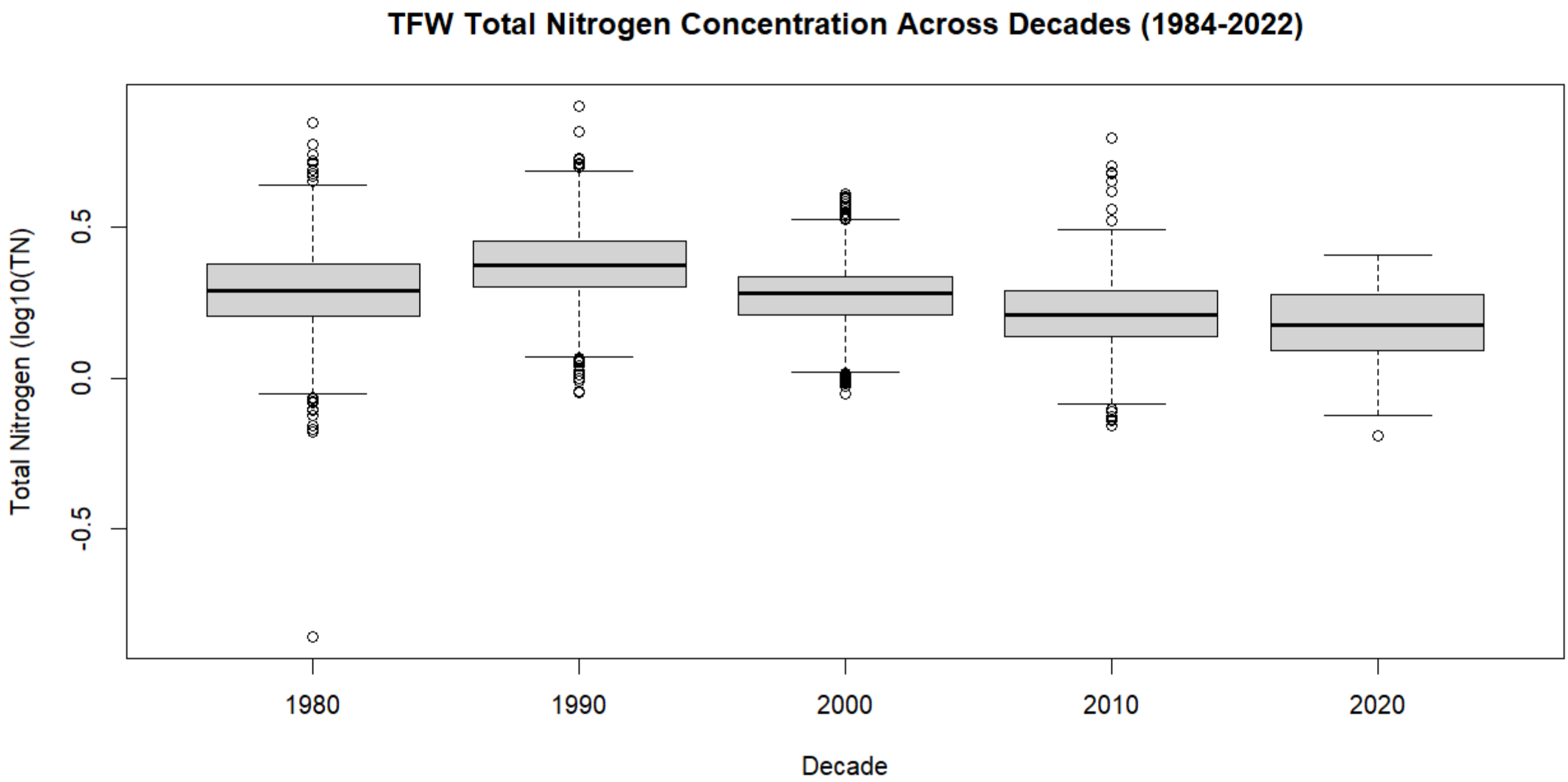
OLIGOTROPHIC		MESOTROPHIC		EUTROPHIC
	0.010		0.035	TP : 0.088 mg/L
	0.350		0.650	TN: >2,5 mg/L*
	2.5	Chl a 5-7 ug/L from 2010	8	Chl a: >8 ug/L 1980s-2000s
	8		25	Max Chl a: >31 ug/L
	6.00		3.OO	Secchi: 0.80 m*

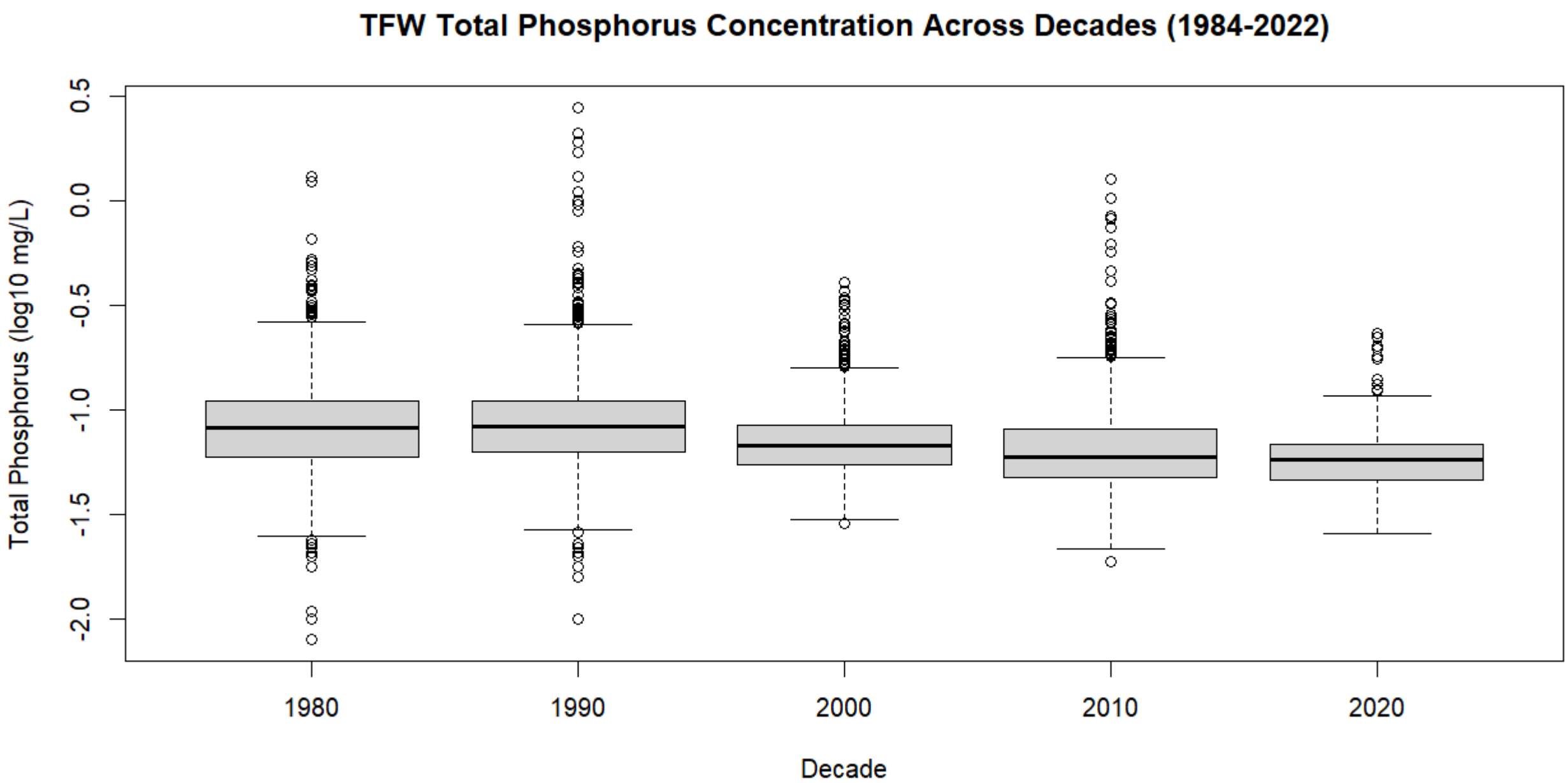
DataHub - Home (chesapeakebay.net)

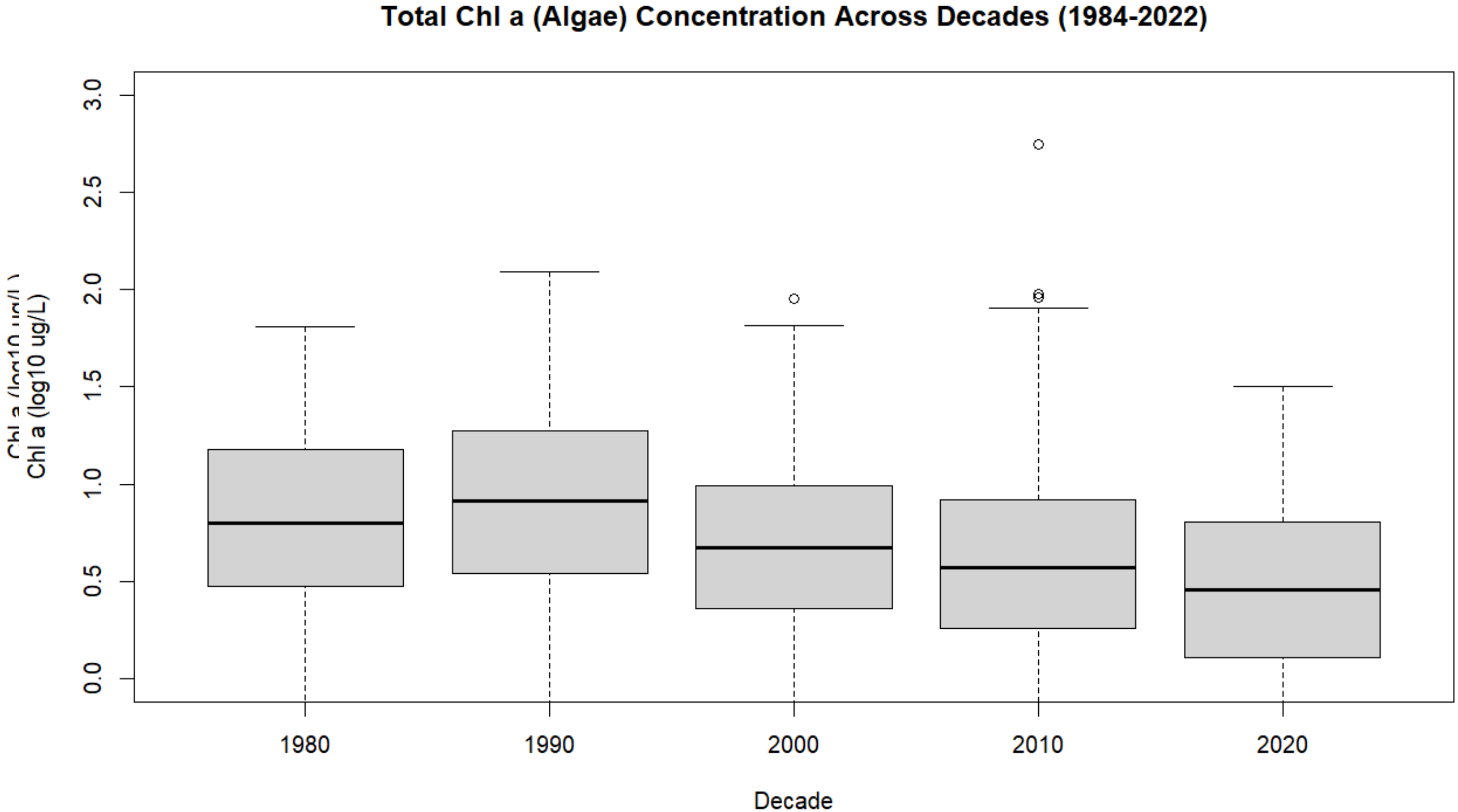
* Hypereutrophic

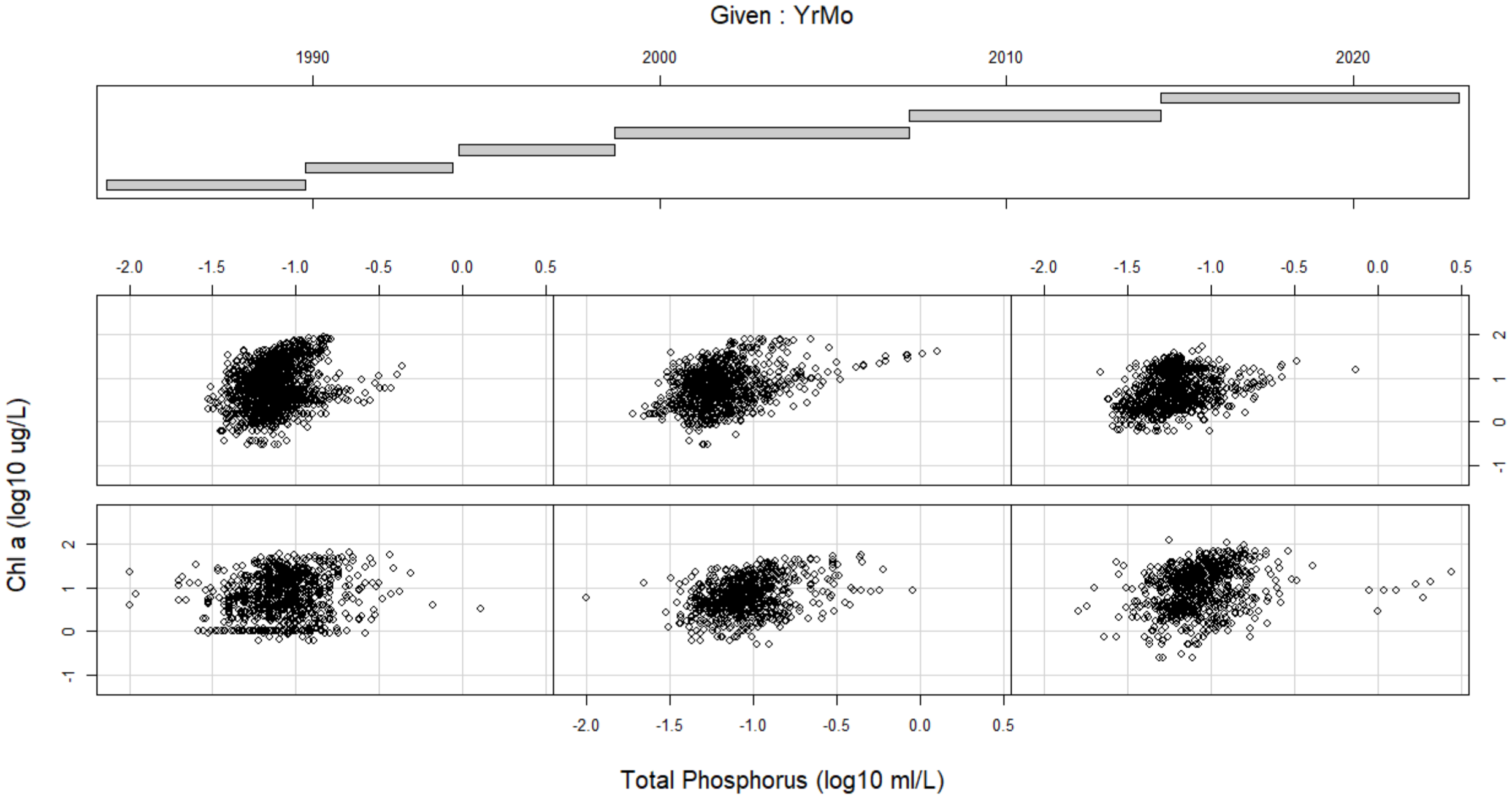


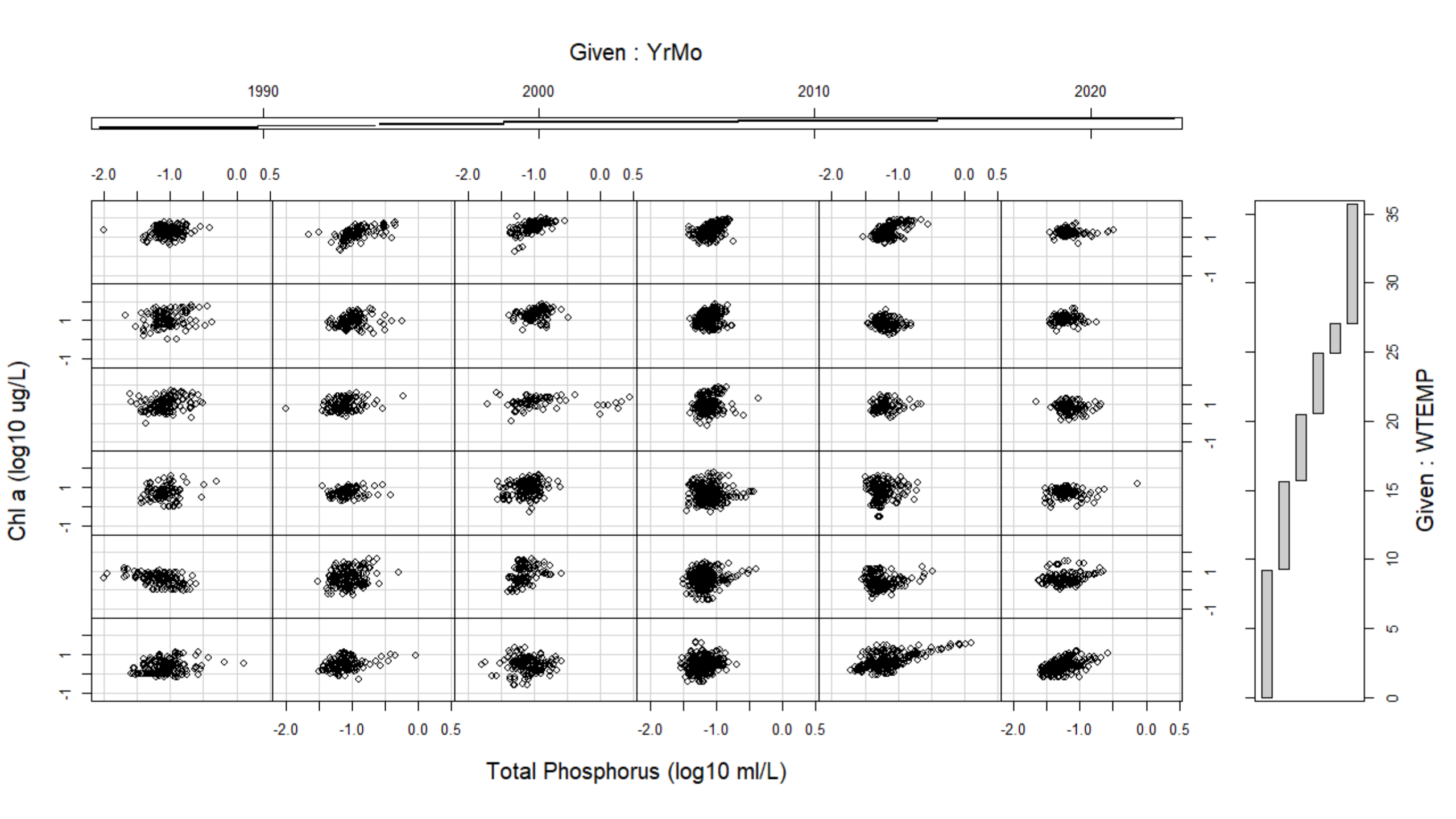
Secchi depth (clarity) more variable upstream (bottom left) than below DC but no persistent trend across generations.


TFW Total Nitrogen Concentration Across Decades (1984-2022)
Total Nitrogen (log10(TN))
0.5
0.0
-0.5
1980
1990
2000
2010
2020
Decade


TFW Total Phosphorus Concentration Across Decades (1984-2022)
Total Phosphorus (log10 mg/L)
0.5
0.0
-0.5
-1.0
-1.5
-2.0
1980
1990
2000
2010
2020
Decade


Total Chl a (Algae) Concentration Across Decades (1984-2022)
Chl a (log10 ug/L)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1980
1990
2000
2010
2020
Decade


Given : YrMo
1990
2000
2010
2020
-2.0
-1.5
-1.0
-0.5
0.0
0.5
2
1
0
-1
Chl a (log10 ug/L)
Total Phosphorus (log10 ml/L)


Given : YrMo
1990
2000
2010
2020
-2.0
-1.0
0.0
0.5
1
-1
Chl a (log10 ug/L)
Total Phosphorus (log10 ml/L)
Given : WTEMP
0
5
10
15
20
25
30
35

Oligotrophication of TFW Potomac River

The TFW Potomac River has progressed towards oligotroptication.

We're proceeediring gradually and steadily with respect to N and P,

with some notable, but not irreversible declines in HAB-impaired waters,

e.g., 7/11/11, when hot soupy, drought conditions catalyzed aa large bloom that did not dissipate until flushed by a large storm event.

As predicted for our region, these altered weather patterns extreme hydrometeoriolgical events, if more prevalent, may slow or even reverse our hard-earned successs to date.

We need to better understand and adapt to the role that C, CO2, CH4, N2O may play in our watershed and global sustainable development success!