

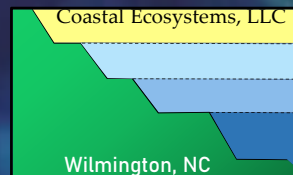
Water Quality Patterns and Trends in Lake Worth Lagoon and Northern Biscayne Bay

Christopher Buzzelli, PhD

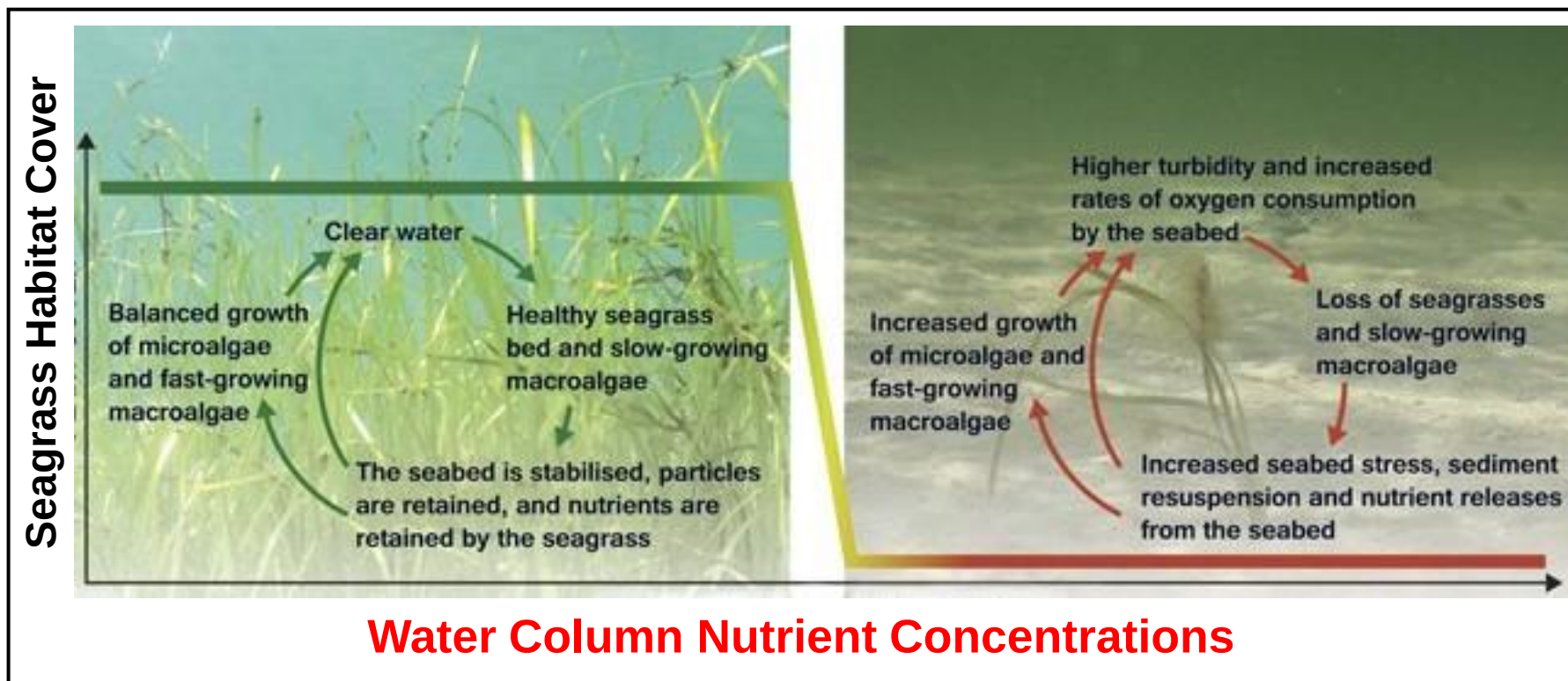
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LOSS OF SEAGRASS HABITAT



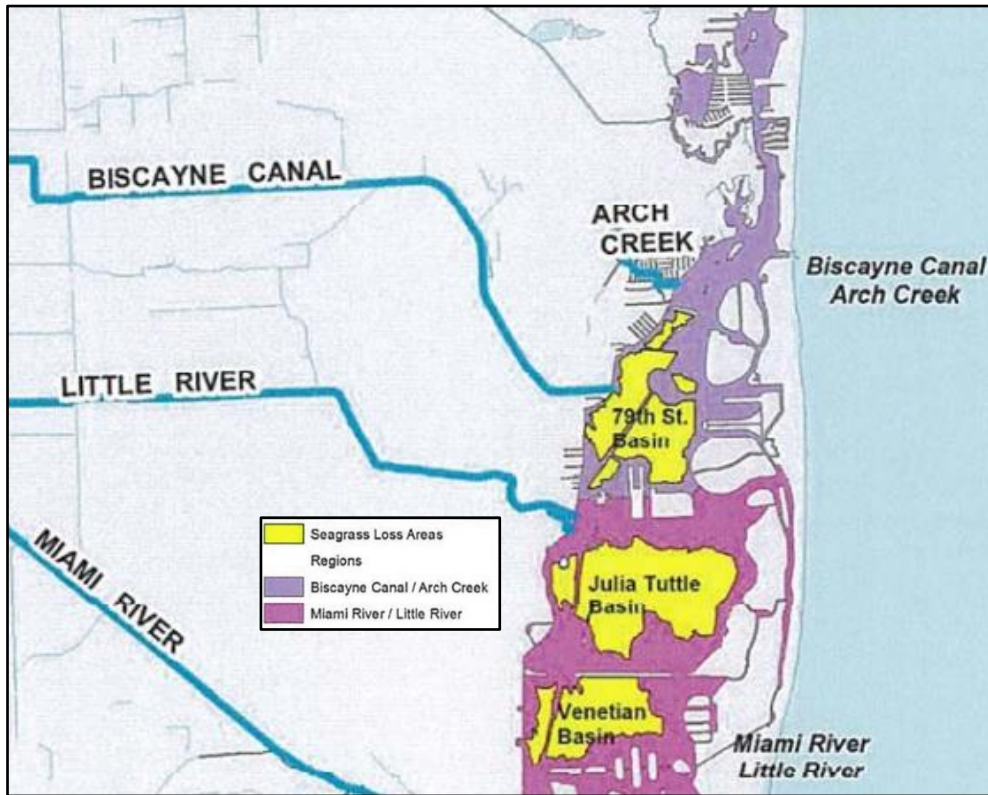
Seagrass Habitat = Good



Loss of Seagrass Habitat = Bad



NORTH BISCAYNE BAY SEAGRASS LOSS



Location	Total Area (Acres)	Area of Seagrass Reduction (Acres)	% Decrease in Seagrass
79th Street Basin	1,441	1,291	89.61%
Julia Tuttle Basin	2,503	1,942	77.60%
Venetian Basin	1,232	968	78.56%

OBJECTIVES

- Assess patterns of water quality in LWL & NBB
- Evaluate frequency of elevated CHL and TP in LWL & NBB
- Explore trends for water quality in LWL & NBB



Lake Worth Lagoon (~36.0 km)

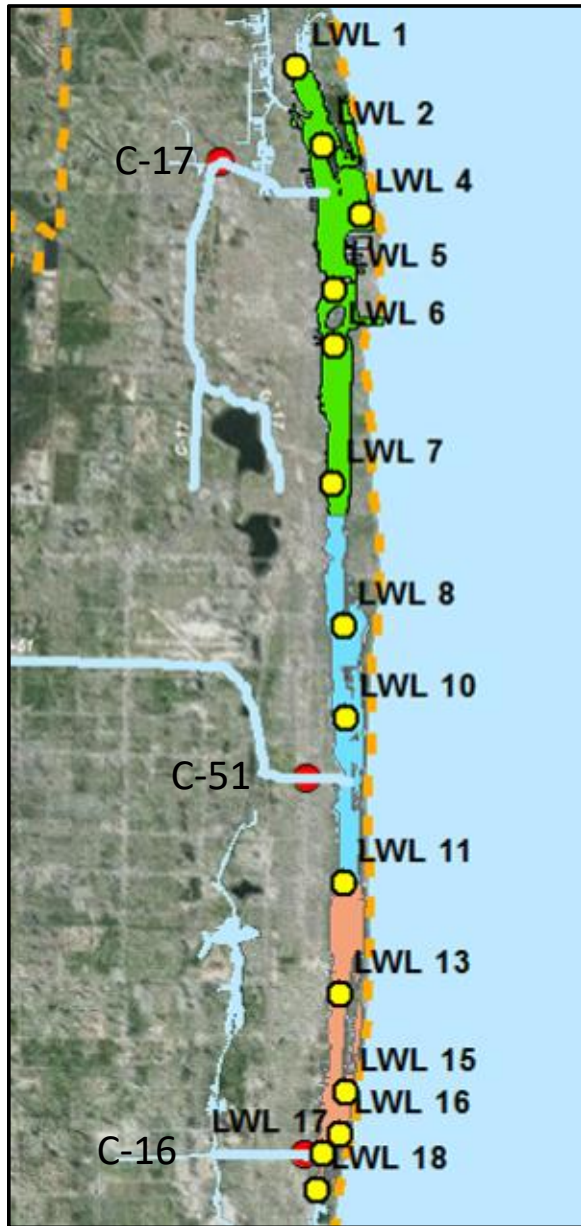
3 FL
Water
Body IDs
(WBIDs)

3 Canals

North
C-17

Central
C-51

South
C-16



North Biscayne Bay (~25.7 km)

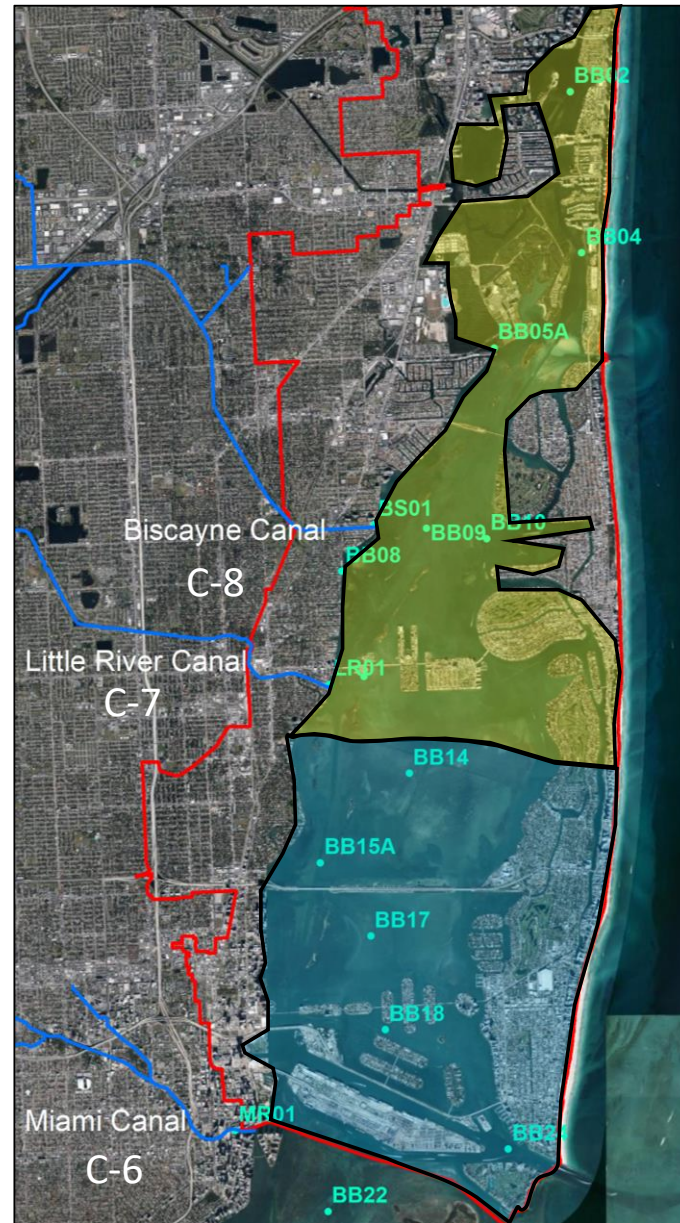
2 FL
Water
Body IDs
(WBIDs)

North NBB
South NBB

3 Canals
Biscayne
Canal
C-8

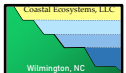
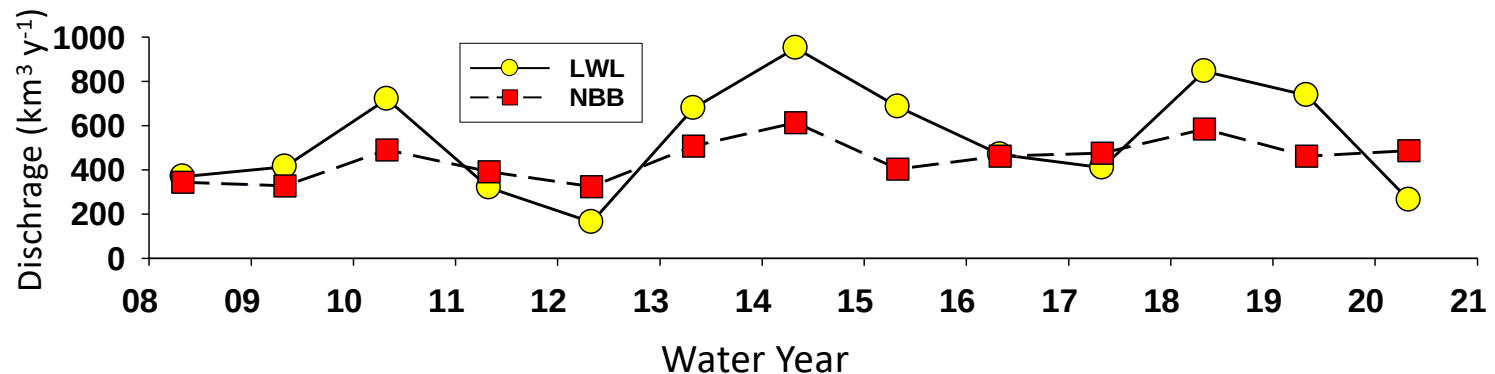
Little River
Canal
C-7

Miami
Canal
C-6



LWL & NBB ATTRIBUTES

	LWL	NBB
Watershed Size (km ²)	1237	575
Estuary Length (km)	36.0	25.7
Estuary Area (km ²)	29.8	62.0
Avg Depth (m)	3.8 $\pm$ 2.1	3.1 $\pm$ 3.1
Volume (km ³)	0.07	0.13
Total Shoreline (km)	173.8	?
% Shoreline Hard Structure	69%	?
Water Quality Stations (#)	14	12
Loss/Change of Seagrass Habitat	yes	yes
Water Quality Degradation	probably	probably
Inflow Canals	3	3
FL WBIDs	North, Central, South	North NNB, South NNB



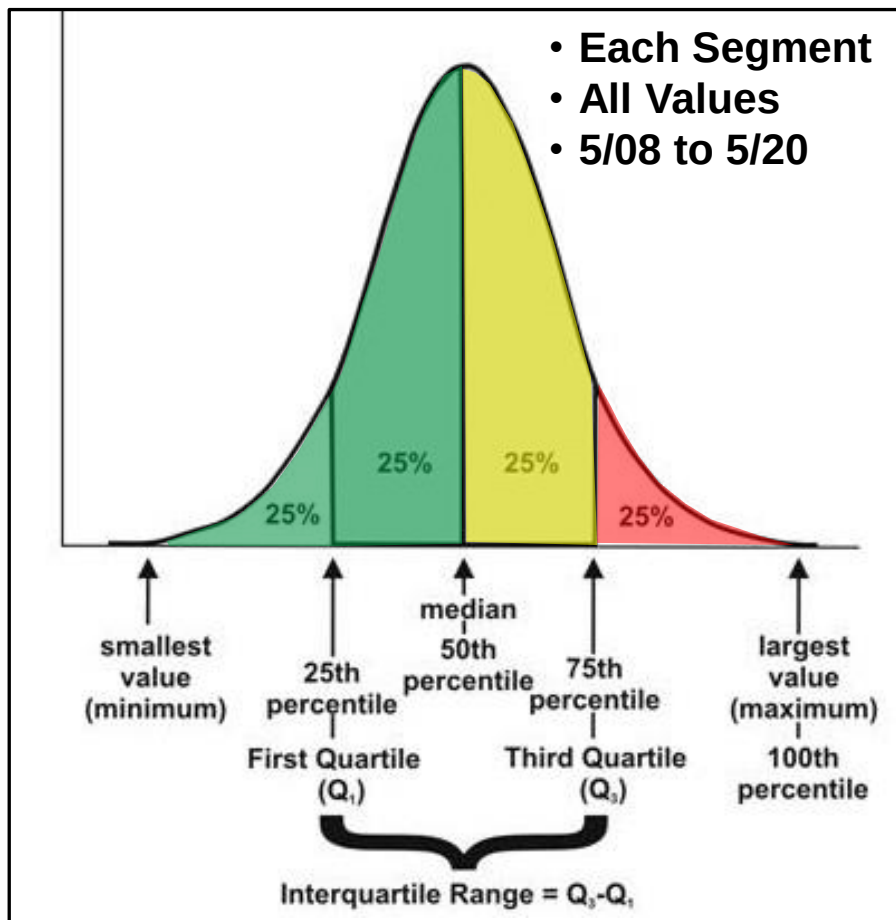
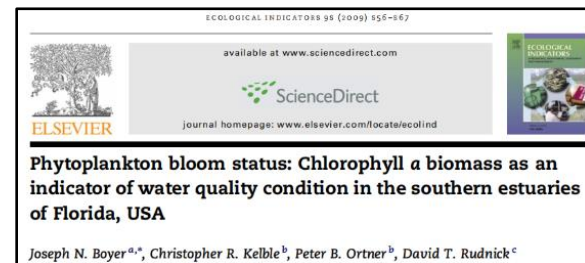
WATER QUALITY - FREQUENCY OF HIGH VALUES

Green = less than median = all values below 50th percentile

Yellow = values between 50th and 75th percentiles

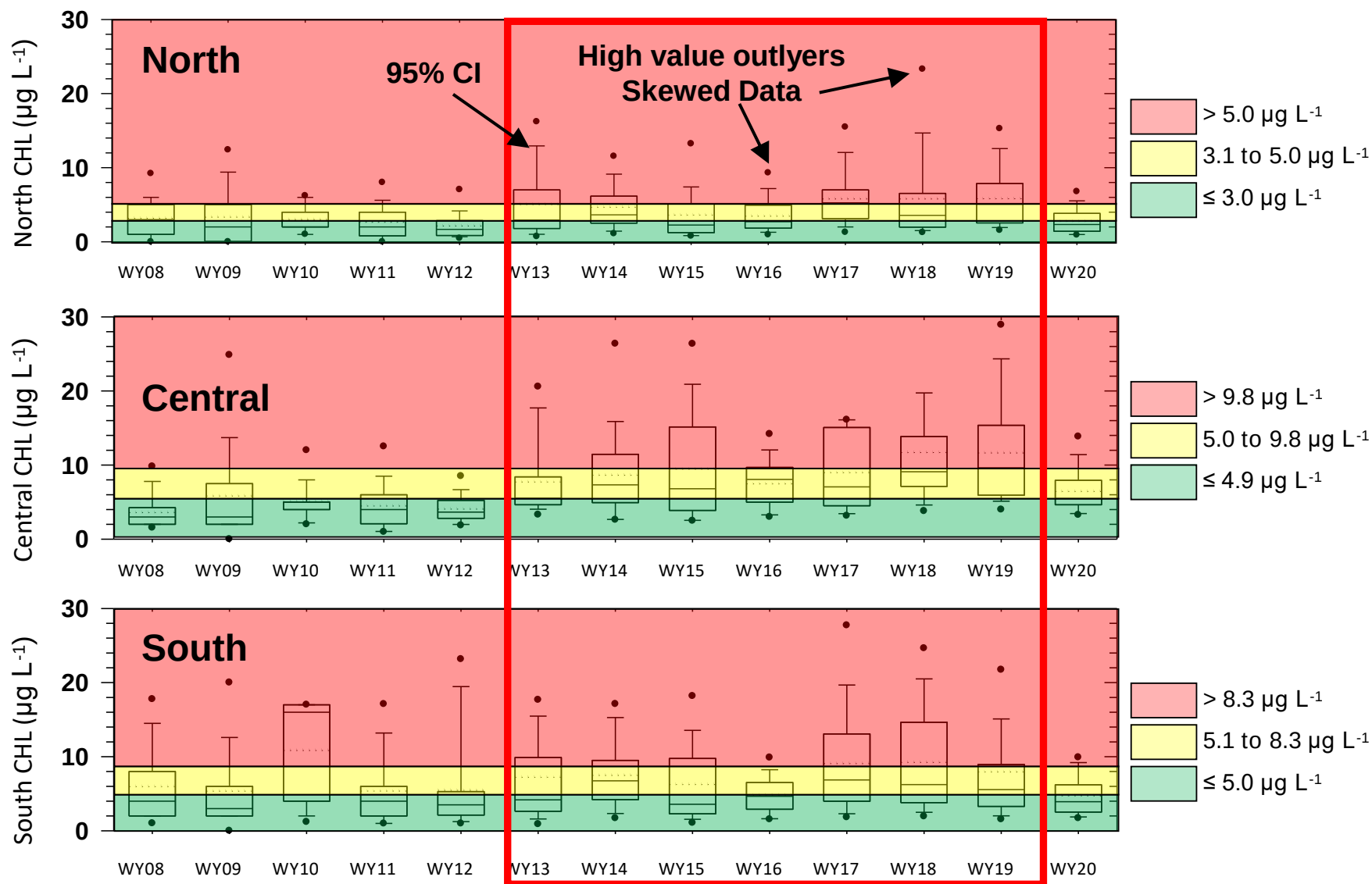
Red = values greater than the 75th percentile

Percentage of red zone values by segment and water year

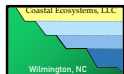


**Data
distributions
can be skewed
and/or kurtotic**

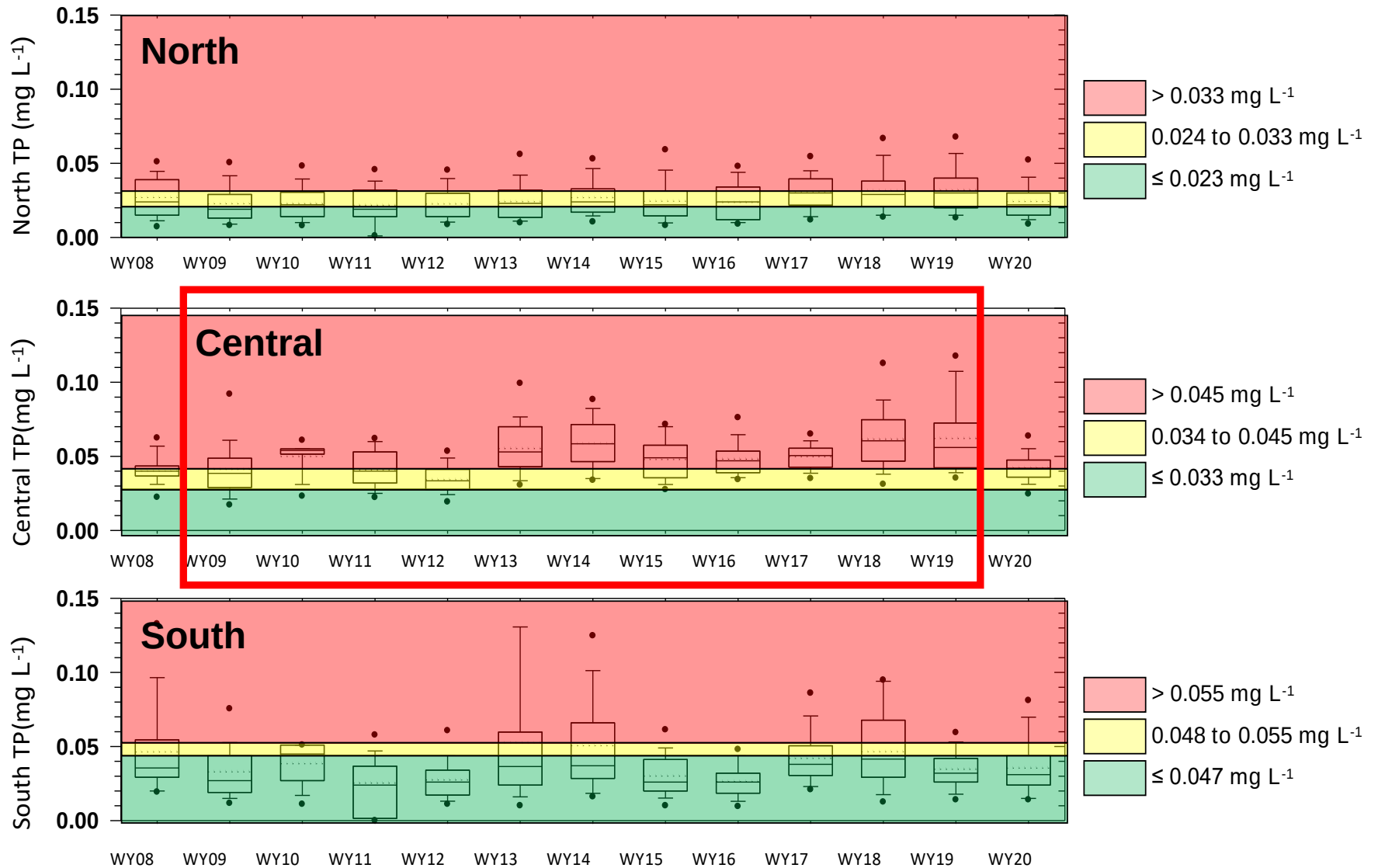
WATER QUALITY - LWL CHL



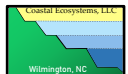
26-52% of values in Red Zone from WY2013-WY2019 in all 3 segments



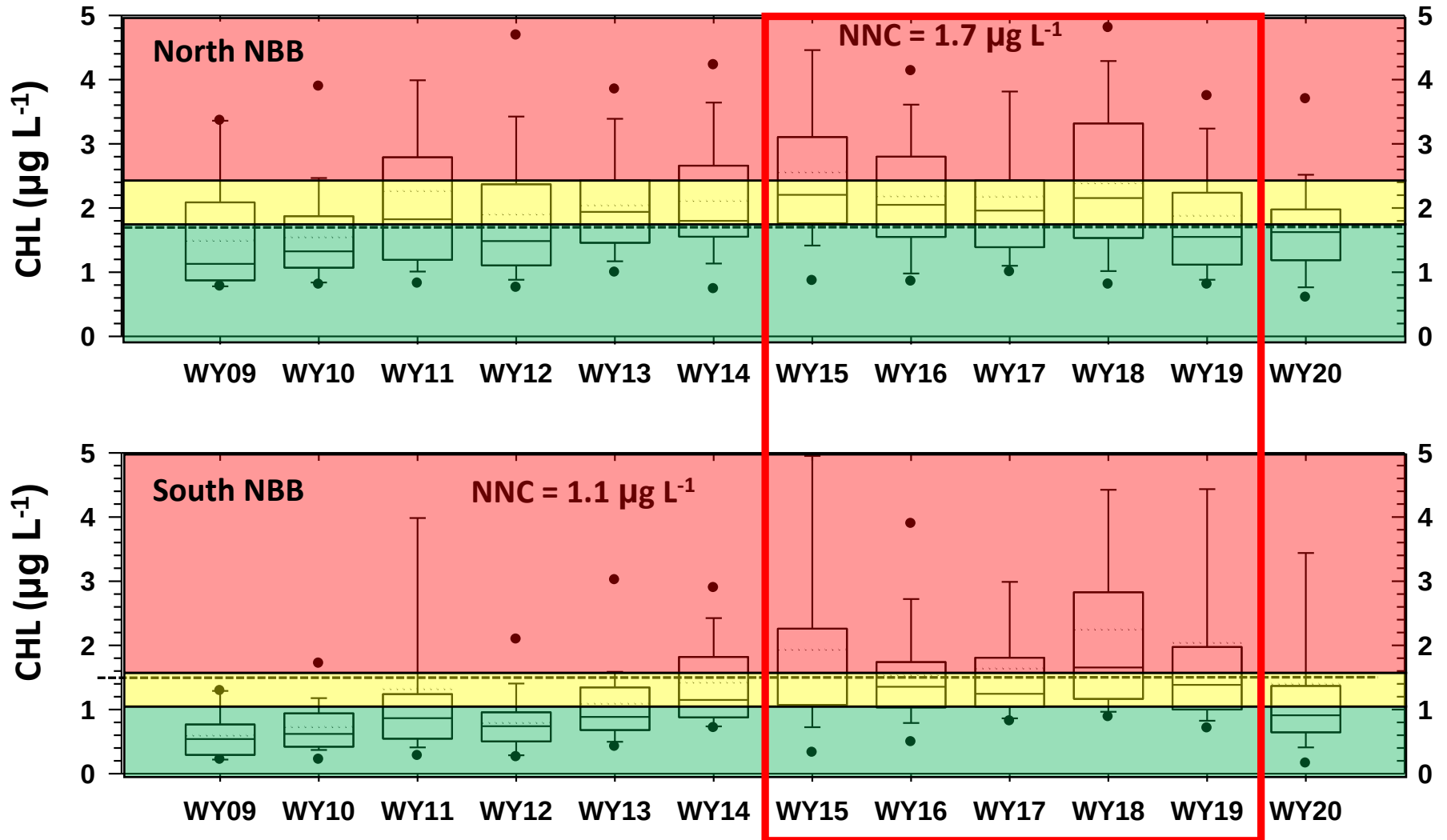
WATER QUALITY- LWL TP



35-80% of values in Central Segment in Red Zone over most WY's

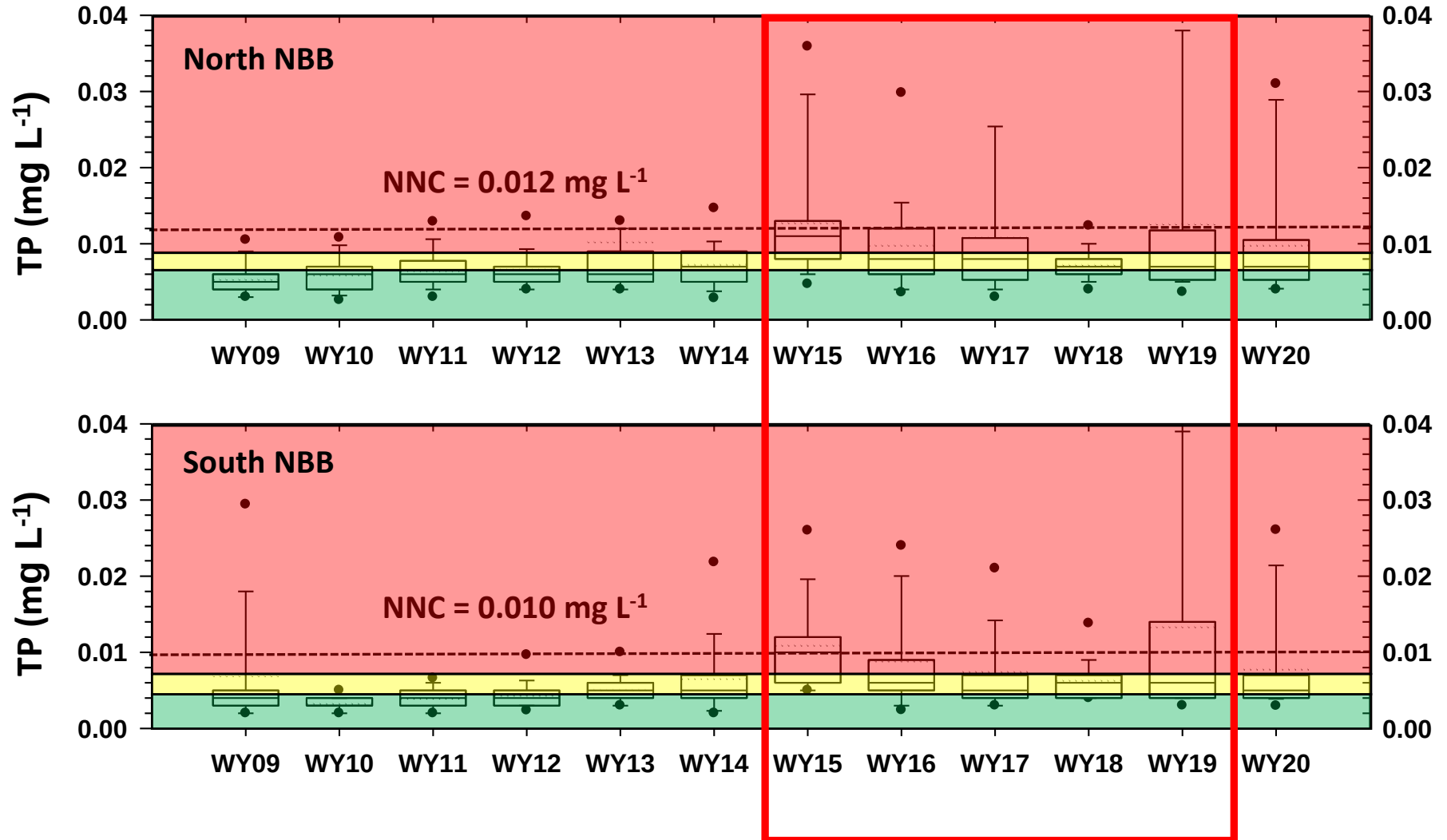


WATER QUALITY - NBB CHL



25-57% of values in Red Zone from WY2015-WY2019 in both segments

WATER QUALITY - NBB TP



25-72% of values in Red Zone from WY2015-WY2019 in both segments

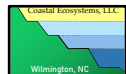
WATER QUALITY- LWL

CHL ($\mu\text{g L}^{-1}$)

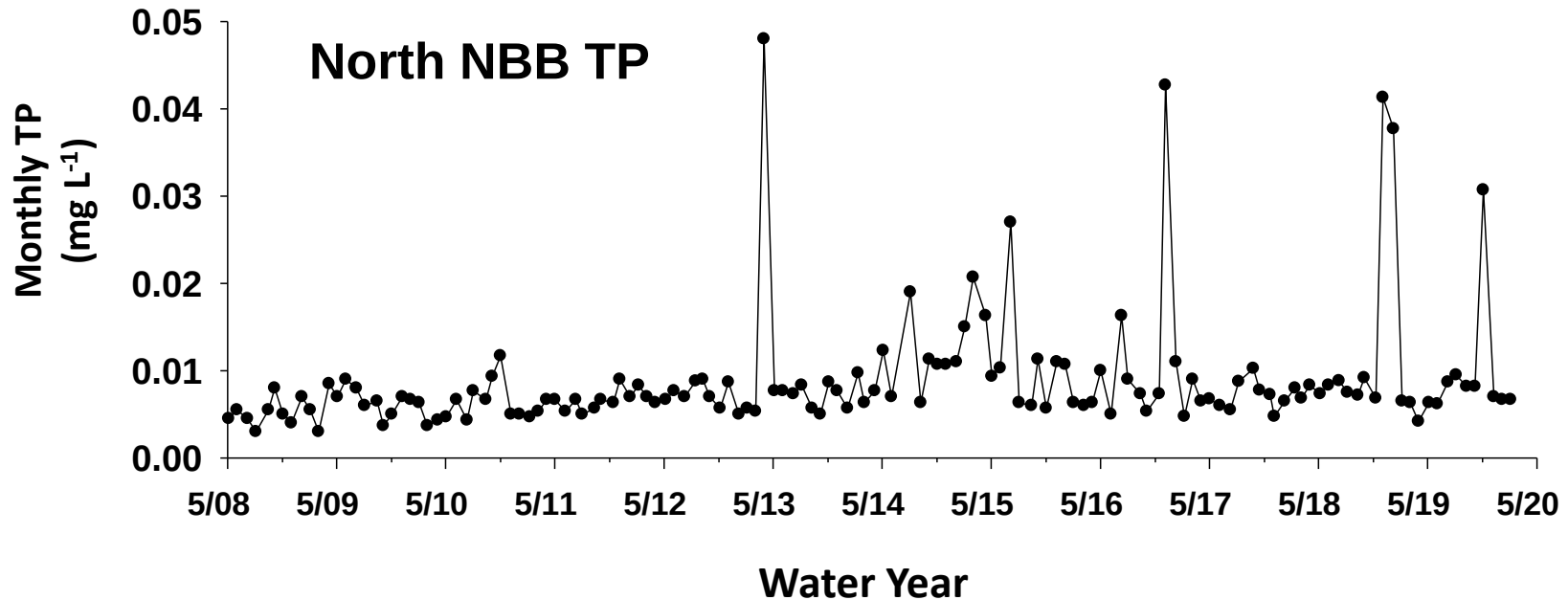
TP (mg L^{-1})

WY	North	Central	South	WY	North	Central	South
2008				2008	33.3%		
2009	30.2%			2009		30.0%	
2010			59.3%	2010		79.2%	
2011				2011		37.0%	
2012				2012			
2013	27.3%		28.8%	2013		67.7%	
2014	34.4%	32.1%	28.9%	2014		78.6%	33.3%
2015	26.3%	34.5%	26.0%	2015		55.2%	
2016				2016	27.5%	56.0%	
2017	52.9%	44.4%	44.0%	2017	44.1%	72.2%	
2018	39.2%	40.0%	38.6%	2018	38.5%	80.0%	40.9%
2019	51.6%	50.0%	29.2%	2019	40.3%	65.6%	35.4%
2020				2020		35.1%	

> 25% of annual samples in red zone



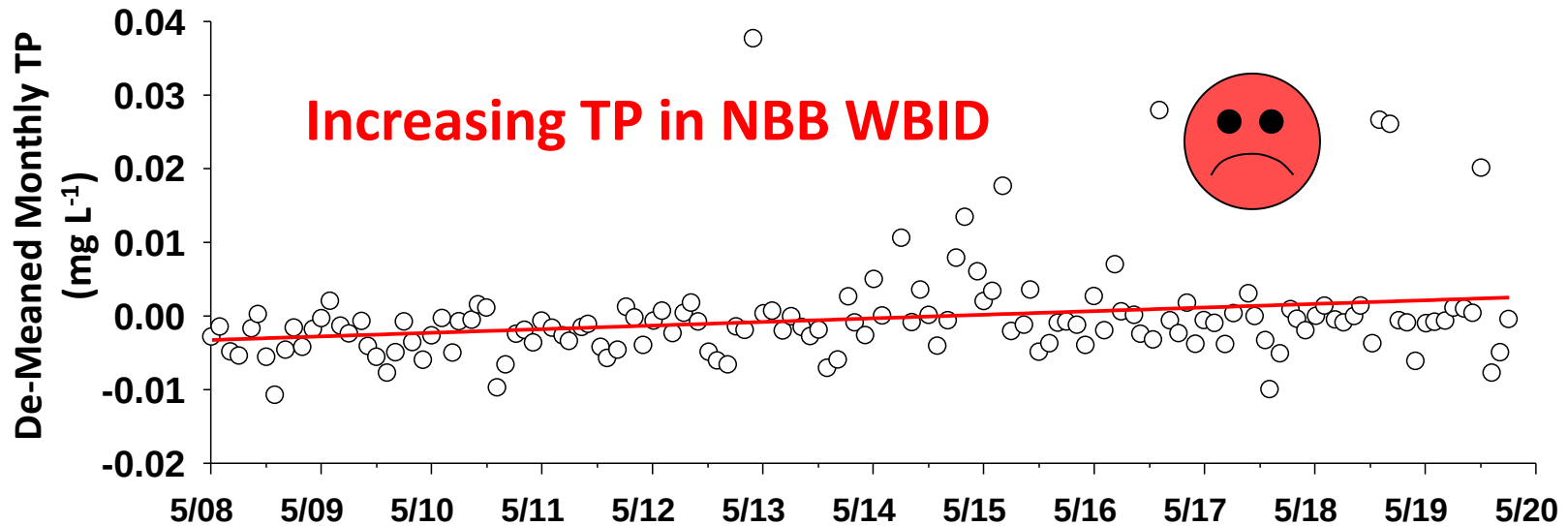
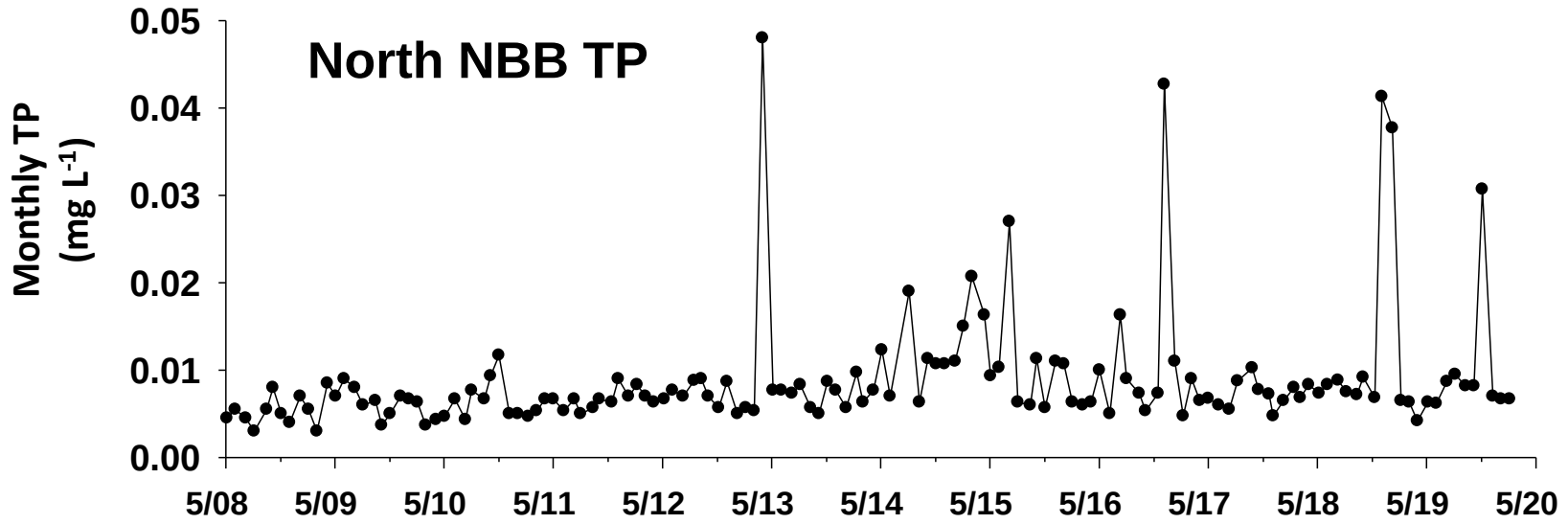
WATER QUALITY TRENDS



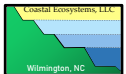
METHOD

- LWL (3 segments; Discharge, salinity, CHL, TN, TP, TSS, NTU)
- NBB (2 segments; Salinity, CHL, TN, TP)
- Subtract long-term average for each month from monthly average (de-meaning)
- Least squares regression; **Significant slope ($p \leq 0.05$) = trend**

WATER QUALITY TRENDS



Water Year



WATER QUALITY TRENDS - LWL & NBB

	LWL			NBB	
	North	Central	South	North	South
Discharge					
Salinity					
CHL					
TN					
TP					
TSS					
TURB					

Blank = No Trend

Grey = Not analyzed



= Significant Increasing Trend

SUMMARY

Seagrass habitat loss in both LWL and NBB

Physical Attributes (LWL vs NBB)

Length (36.0 km vs 25.7 km); Area (29.8 km² vs 62.0 km²); Volume (0.07 km³ vs 0.13 km³)

LWL (3 FL WBIDs); NBB (2 FL WBIDs)

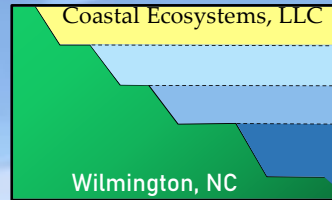
3 canal inflows; Total annual freshwater discharge for both (200-1000 km³ y⁻¹)

Increased frequency of high TP and CHL in both estuaries 2014-2020

TN, TP, CHL increasing in North LWL, Central LWL, South NBB 2008-2020



THANKS FOR LISTENING!



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