Florida Department of Environmental Protection

Numeric Nutrient Criteria: Technical Discussion

Ken Weaver, Environmental Administrator

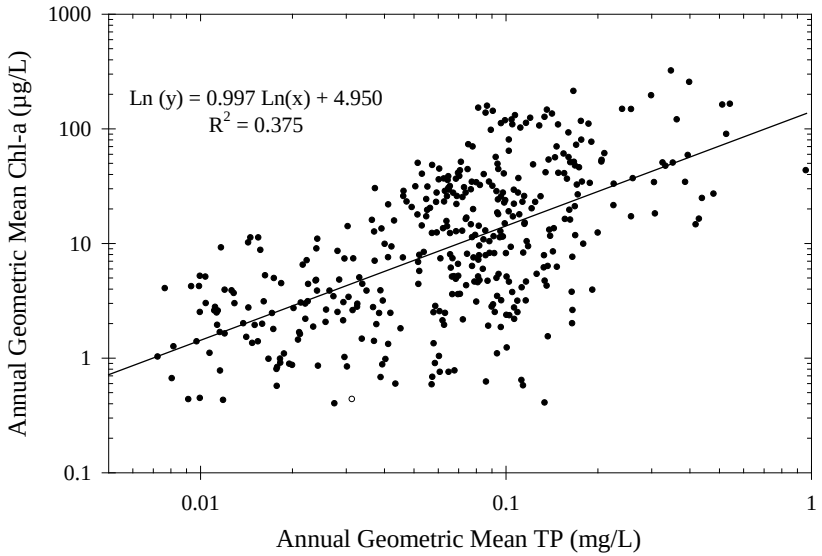
Division of Environmental Assessment and Restoration

Potential Cause-Effect Criteria (cont.)

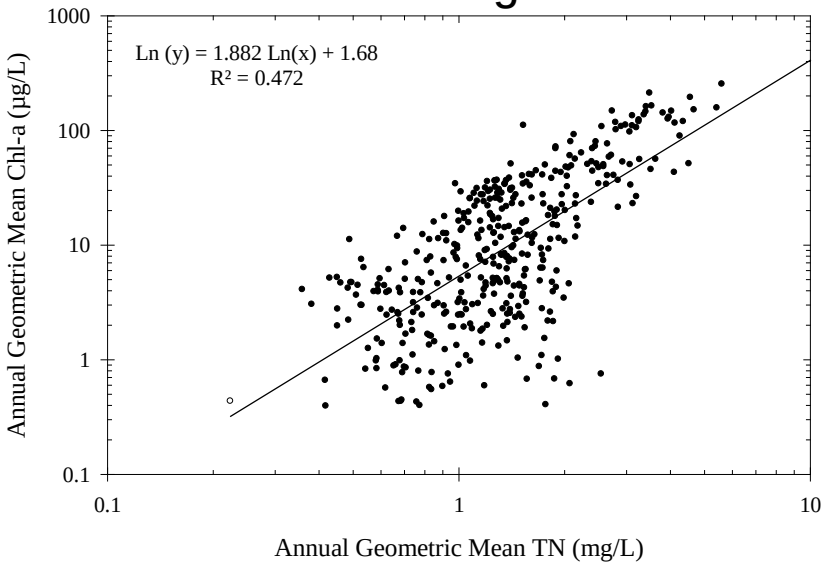
- The scientific bases for the spring and lake criteria have been previously presented in DEP 2009 document, "Development of Numeric Nutrient Criteria for Florida Lakes and Streams"
- **In highly colored lakes (long term average >140 PCU) where there is no longer a cause and effect relationship, the narrative nutrient criteria should continue to apply**

Initial Colored Lake Chlorophyll-a Response (May 2009)

Total Phosphorus



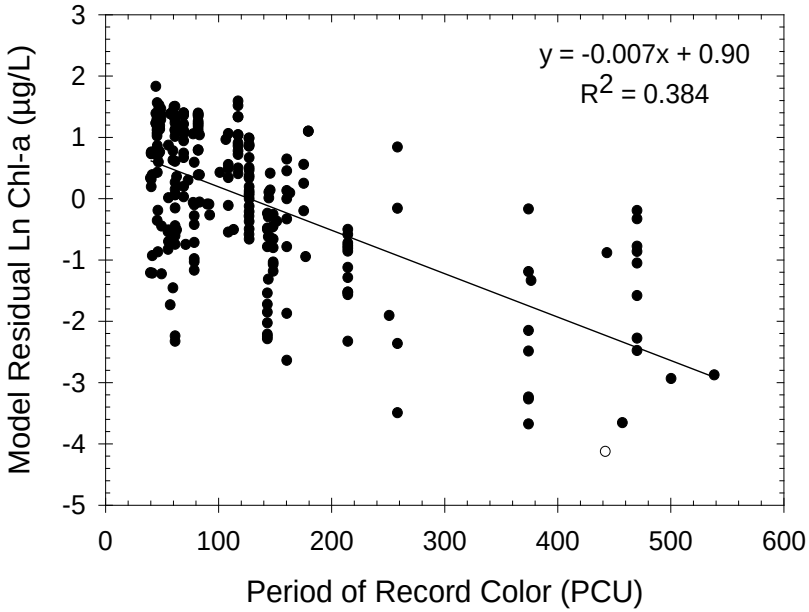
Total Nitrogen



Spearman Correlations (R values)

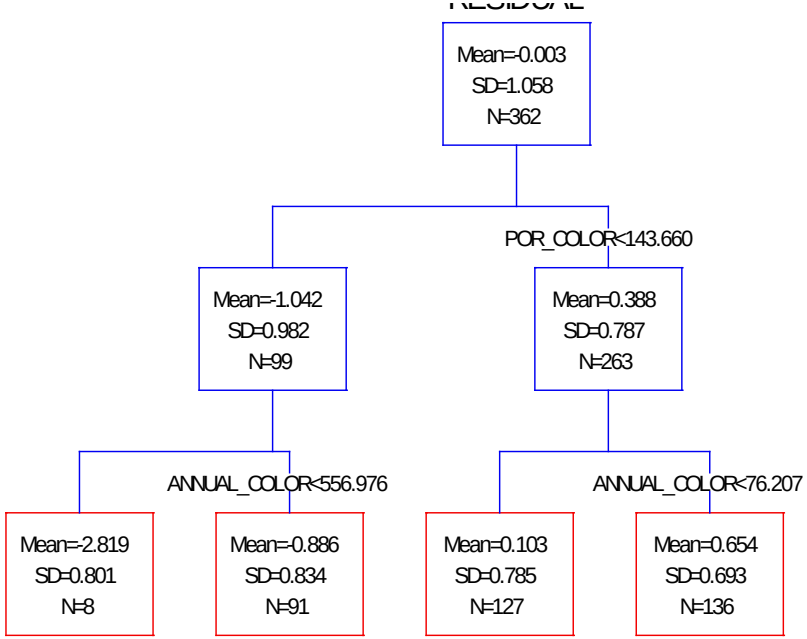
	Chl-a	TP	TN	POR Color	Color
Chl-a	1				
TP	0.56	1			
TN	0.64	0.71	1		
POR Color	-0.25	0.28	0.22	1	
Color	-0.33	0.23	0.17	0.76	1

Influence of Color on Chl-a Response in Colored Lakes (May 2009)



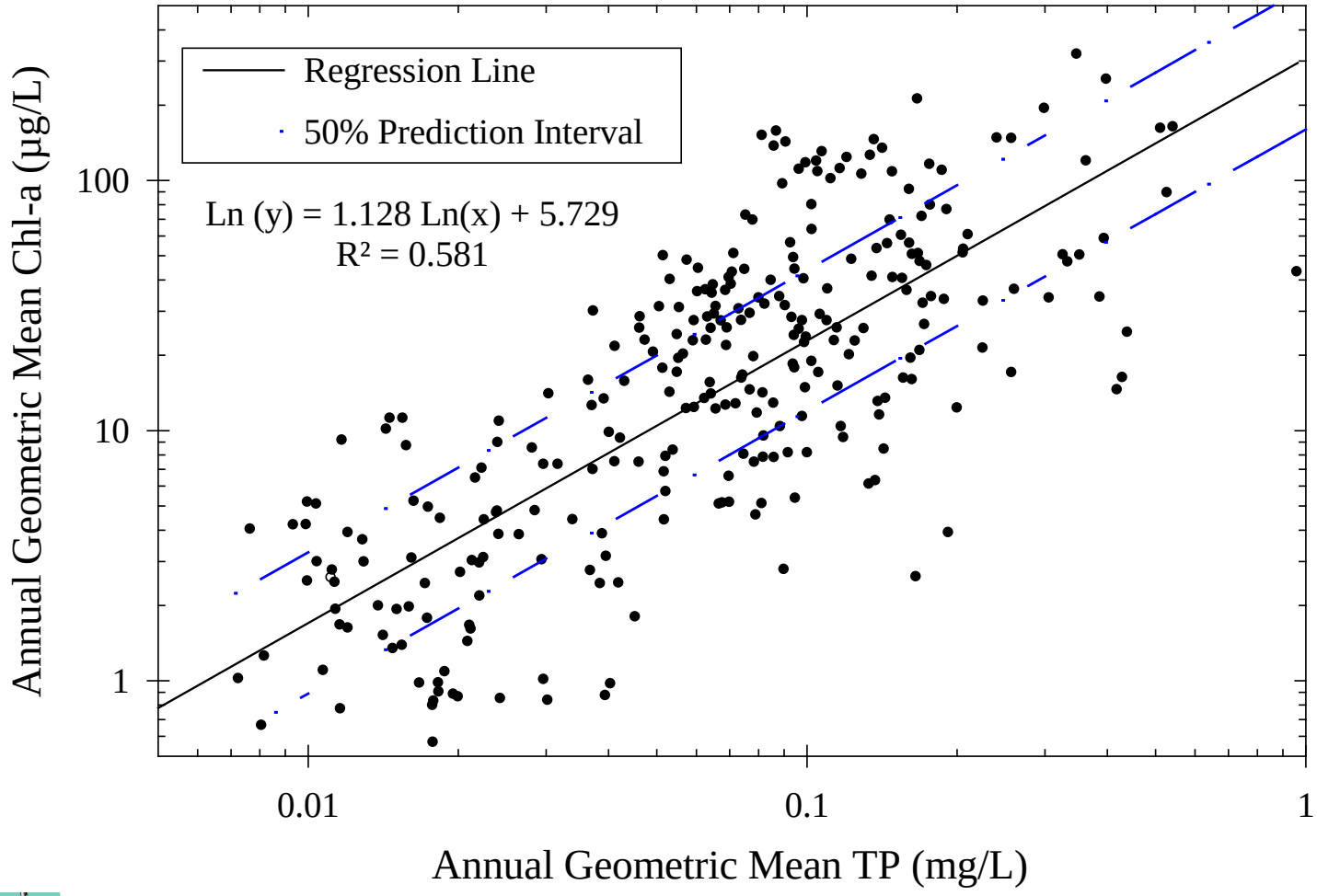
Conclusion: categorize colored lakes into moderately colored (> 40-140 PCU) and highly colored (> 140 PCU)

Classification and Regression Tree Analysis of Residual Error

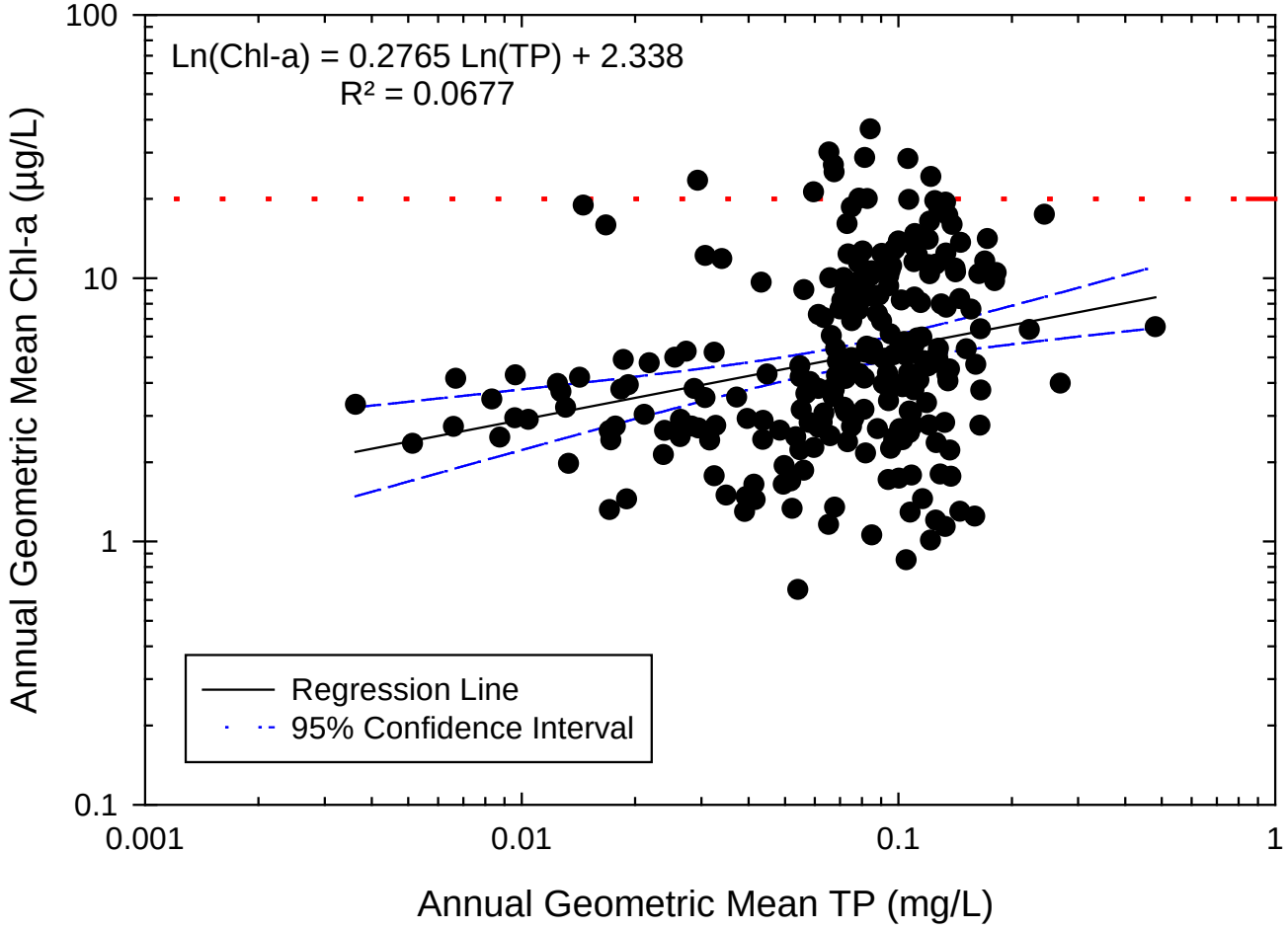


Split	Variable	PRE	Improvement
1	POR_COLOR	0.364	0.364
2	ANNUAL_COLOR	0.432	0.068
3	ANNUAL_COLOR	0.482	0.049

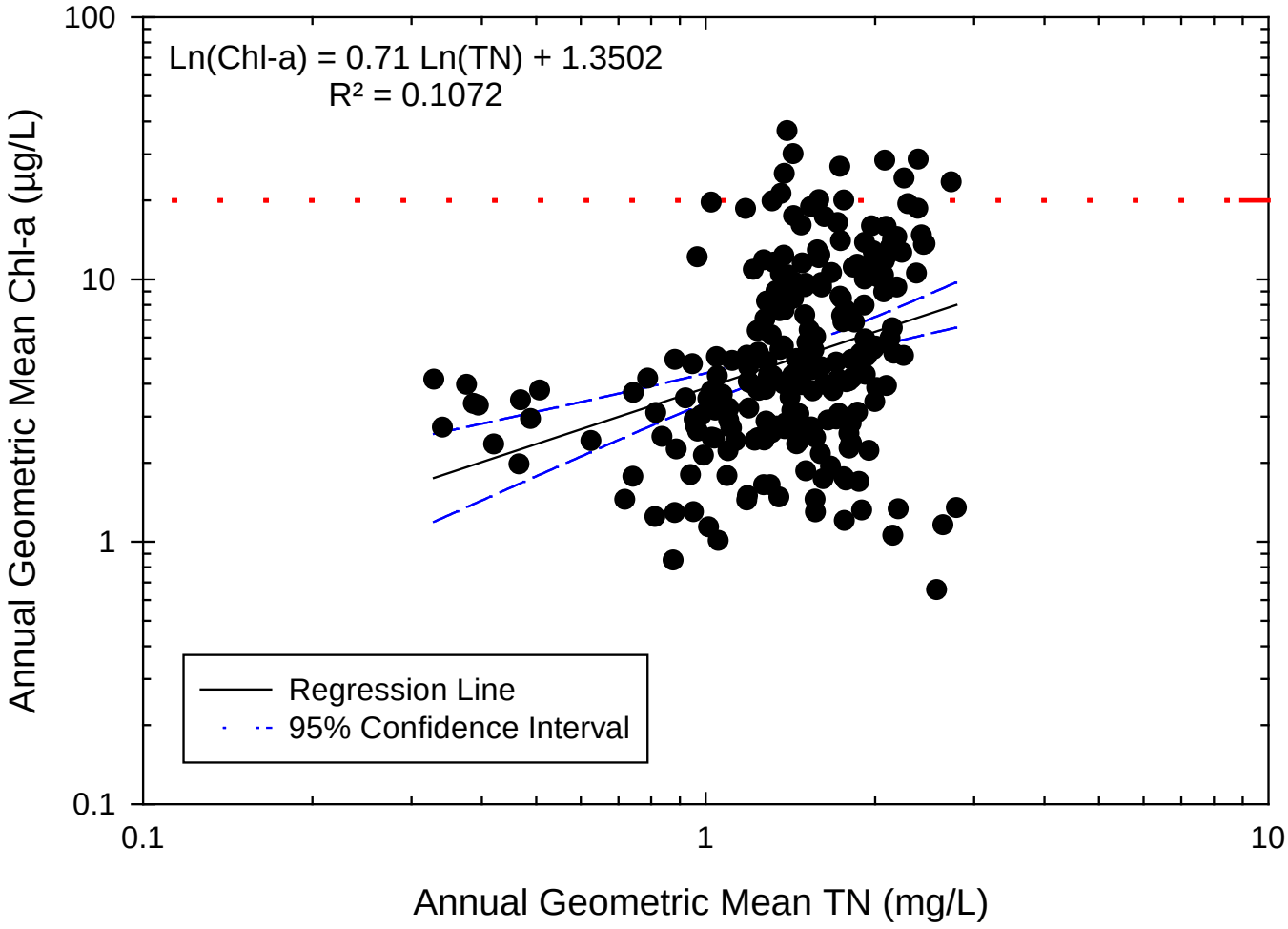
Colored Lake (>40-140 PCU) Chl-a Response to Total Phosphorus



Highly Colored Lake (Color >140 PCU) Chl-a Response to Total Phosphorus



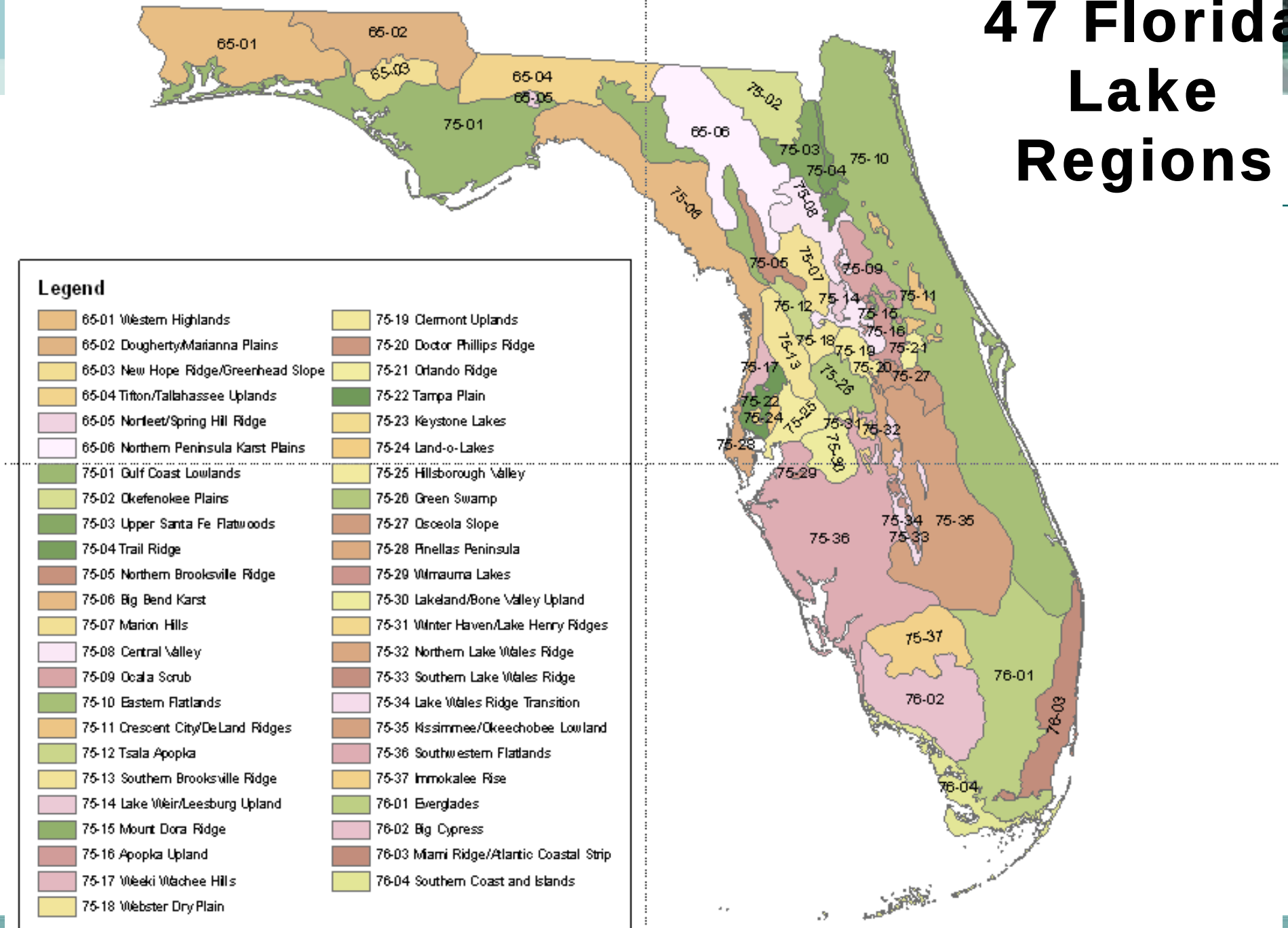
Highly Colored Lake (Color >140 PCU) Chl-a Response to Total Nitrogen



Potential Cause-Effect Criteria (cont.)

- **DEP is re-examining regionalization and morphoedapthic factors (color, alkalinity) to establish more appropriate lake criteria for some situations**
- Paleoliminological evidence may provide the basis for alternate natural chlorophyll targets in many Florida lakes, which could allow adjustment in the acceptable TP and TN using the regression equations

47 Florida Lake Regions

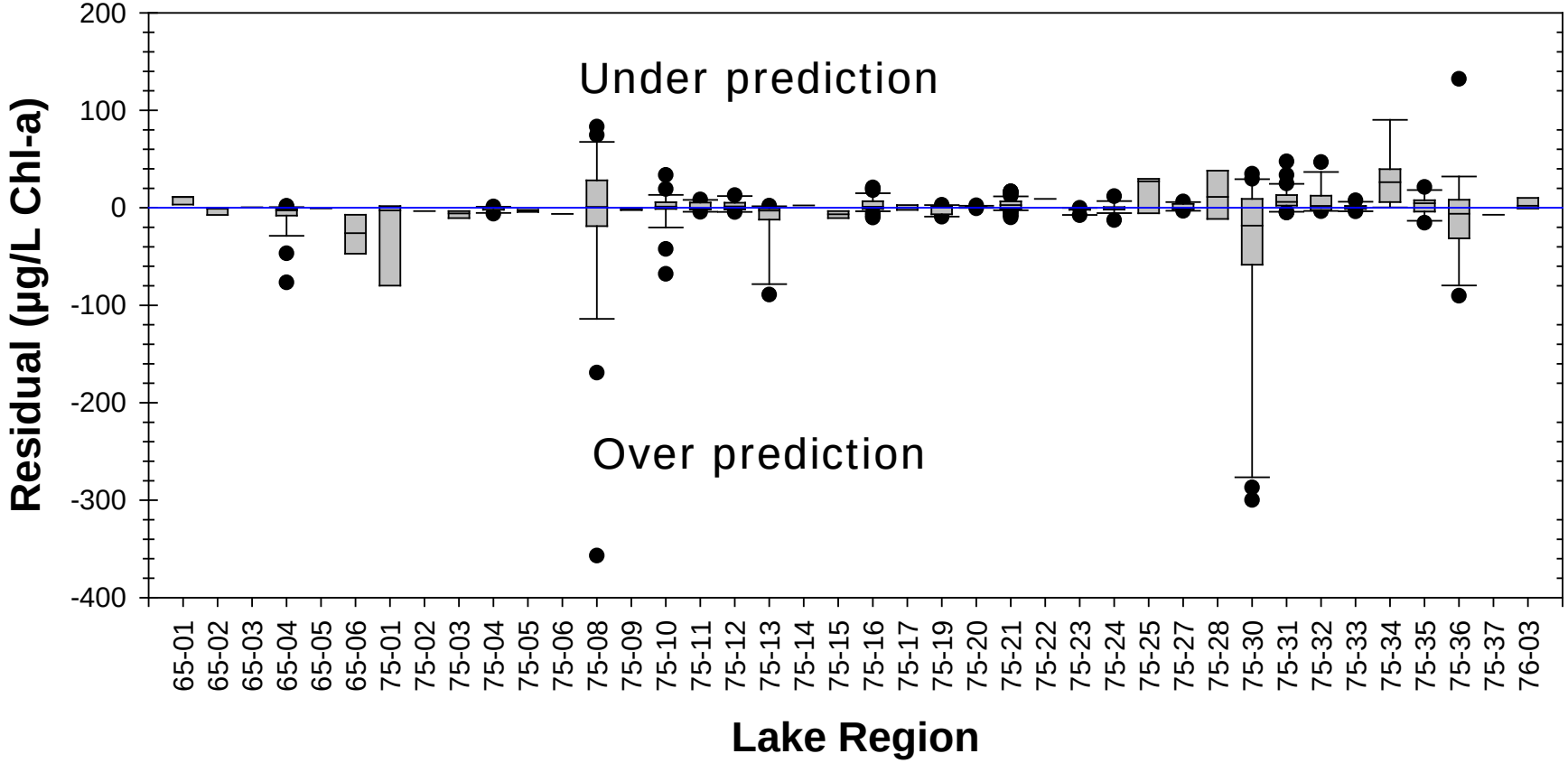


Legend

- 65-01 Western Highlands
- 65-02 Dougherty/Marianna Plains
- 65-03 New Hope Ridge/Greenhead Slope
- 65-04 Tifton/Tallahassee Uplands
- 65-05 Northeet/Spring Hill Ridge
- 65-06 Northern Peninsula Karst Plains
- 75-01 Gulf Coast Lowlands
- 75-02 Okefenokee Plains
- 75-03 Upper Santa Fe Flatwoods
- 75-04 Trail Ridge
- 75-05 Northern Brooksville Ridge
- 75-06 Big Bend Karst
- 75-07 Marion Hills
- 75-08 Central Valley
- 75-09 Ocala Scrub
- 75-10 Eastern Flatlands
- 75-11 Crescent City/DeLand Ridges
- 75-12 Tsala Apopka
- 75-13 Southern Brooksville Ridge
- 75-14 Lake Weir/Leesburg Upland
- 75-15 Mount Dora Ridge
- 75-16 Apopka Upland
- 75-17 Weeki Wachee Hills
- 75-18 Webster Dry Plain
- 75-19 Clermont Uplands
- 75-20 Doctor Phillips Ridge
- 75-21 Orlando Ridge
- 75-22 Tampa Plain
- 75-23 Keystone Lakes
- 75-24 Land-o-Lakes
- 75-25 Hillsborough Valley
- 75-26 Green Swamp
- 75-27 Osceola Slope
- 75-28 Pinellas Peninsula
- 75-29 Wimauma Lakes
- 75-30 Lakeland/Bone Valley Upland
- 75-31 Winter Haven/Lake Henry Ridges
- 75-32 Northern Lake Wales Ridge
- 75-33 Southern Lake Wales Ridge
- 75-34 Lake Wales Ridge Transition
- 75-35 Kissimmee/Okeechobee Lowland
- 75-36 Southwestern Flatlands
- 75-37 Immokalee Rise
- 76-01 Everglades
- 76-02 Big Cypress
- 76-03 Miami Ridge/Atlantic Coastal Strip
- 76-04 Southern Coast and Islands

Residuals Analysis of the Lakes TP/Chl-a Regressions by Lake Region

(Data from IWR Run 43)



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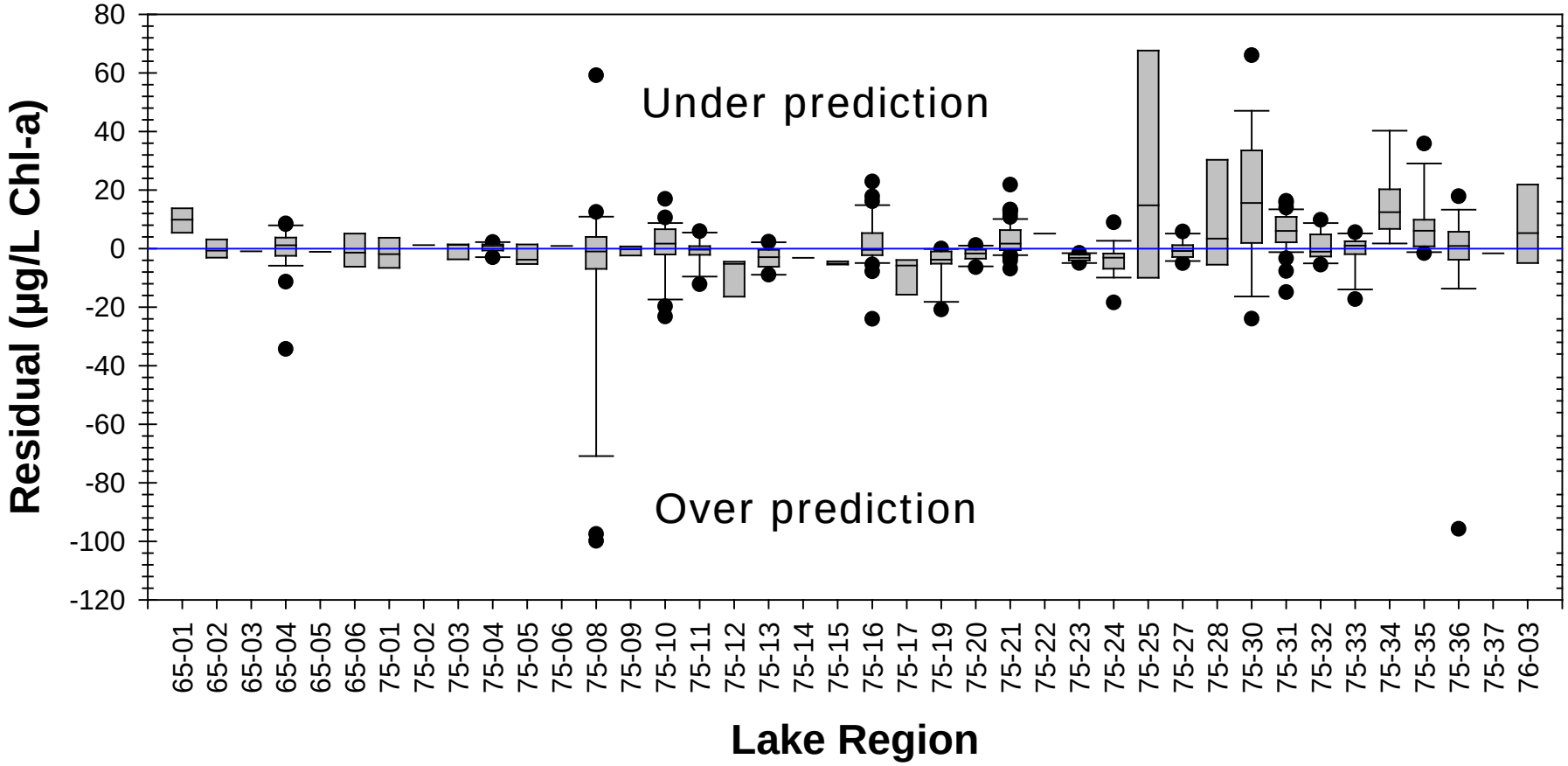
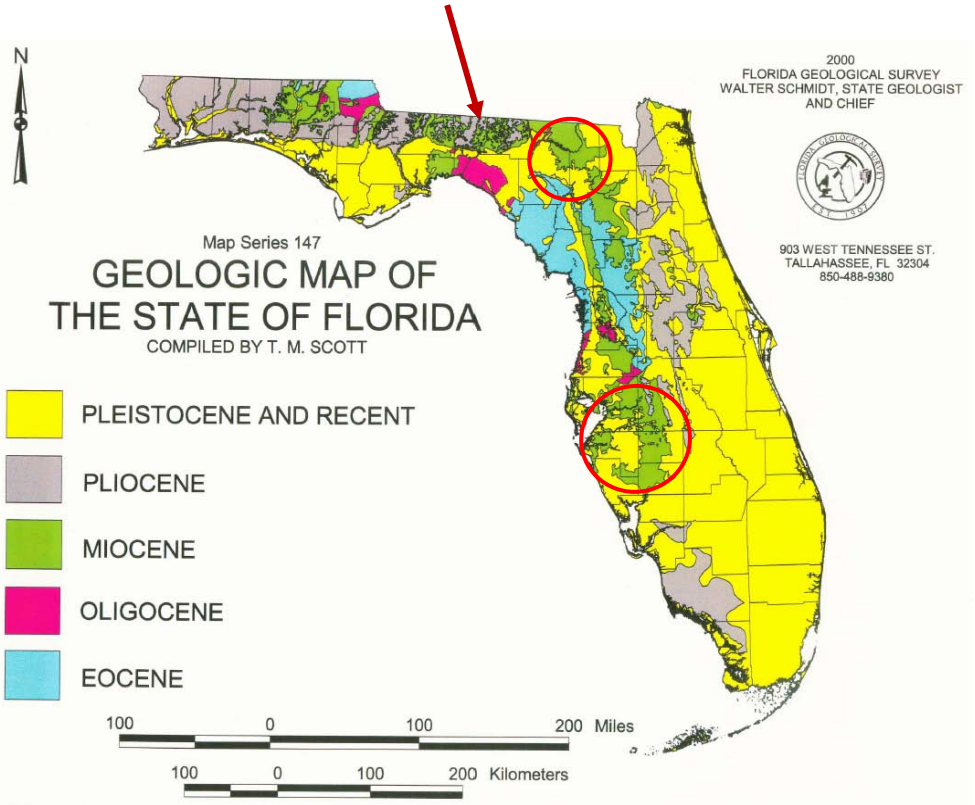
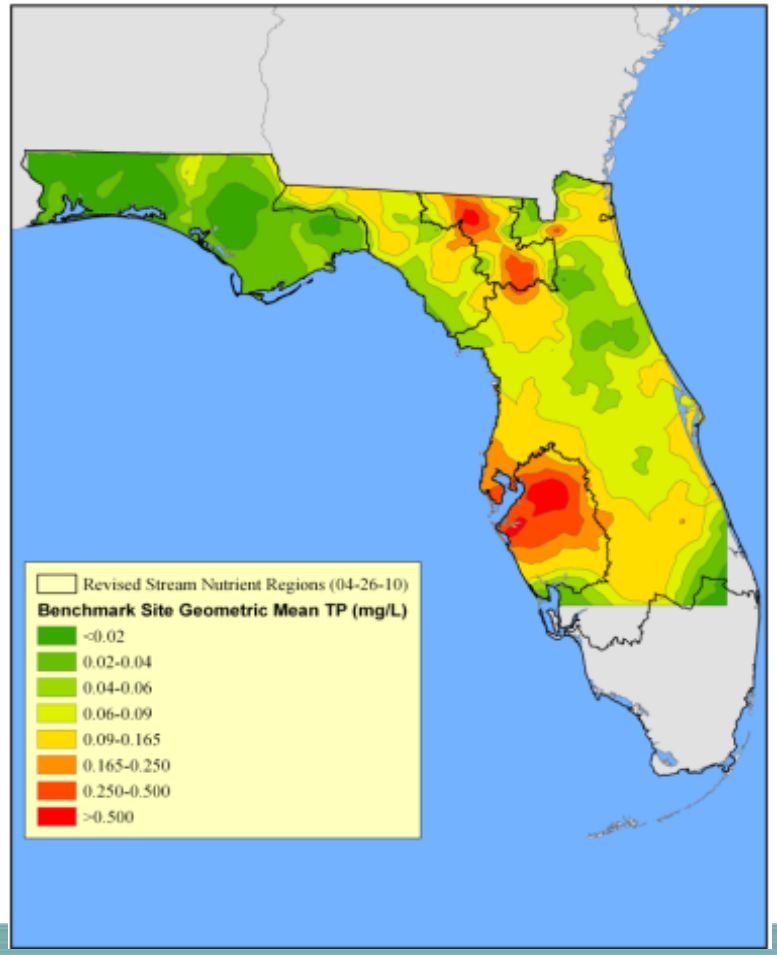


Stream Nutrient Regions were based on Geologic Formations and Stream TP Levels





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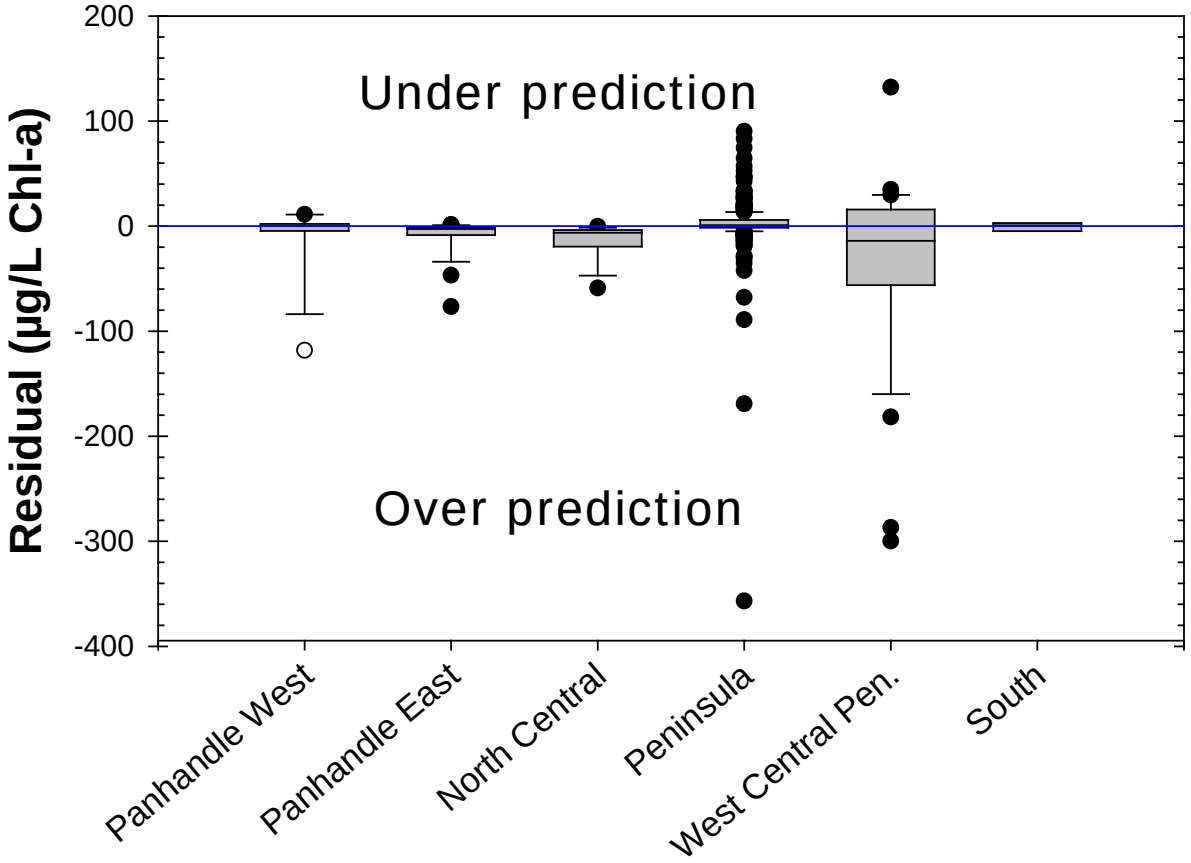

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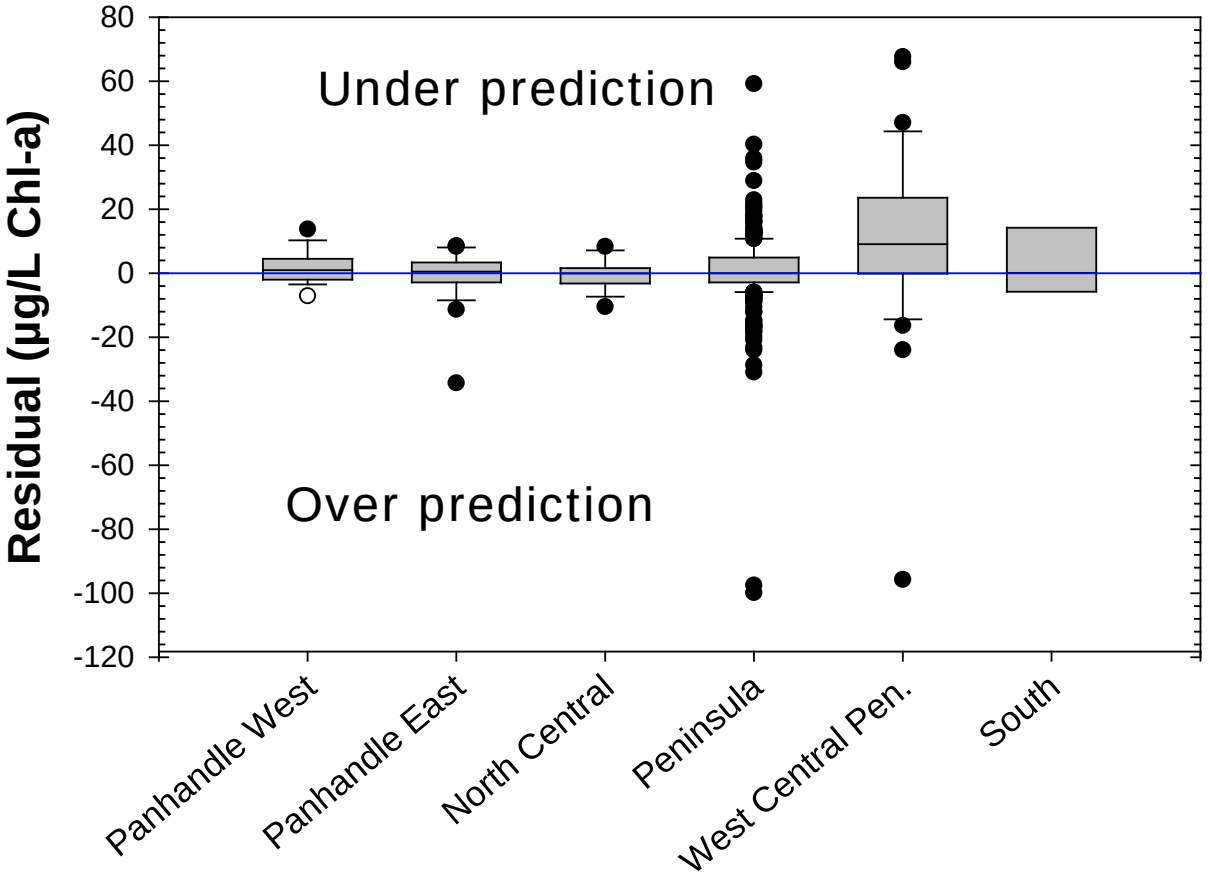
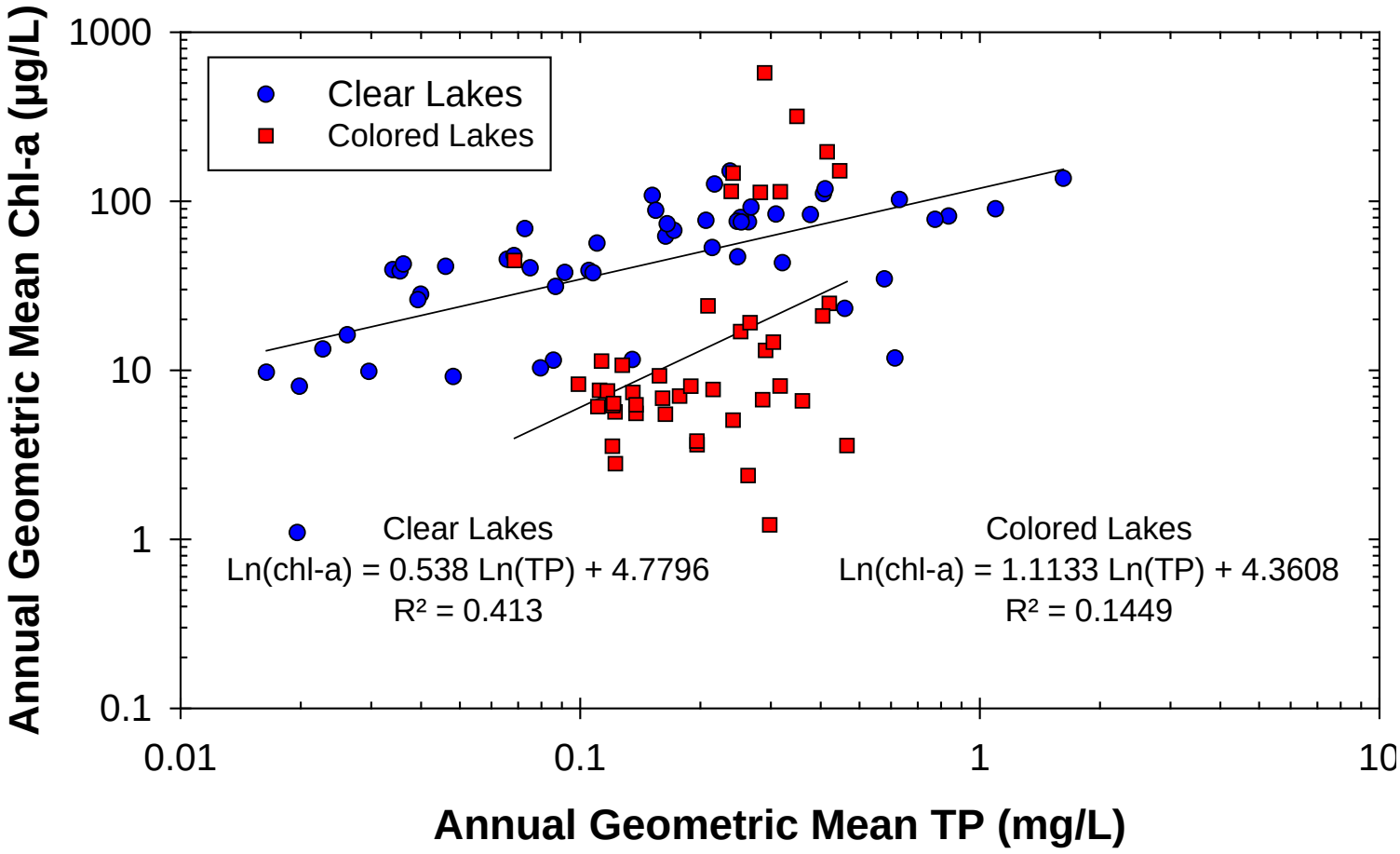
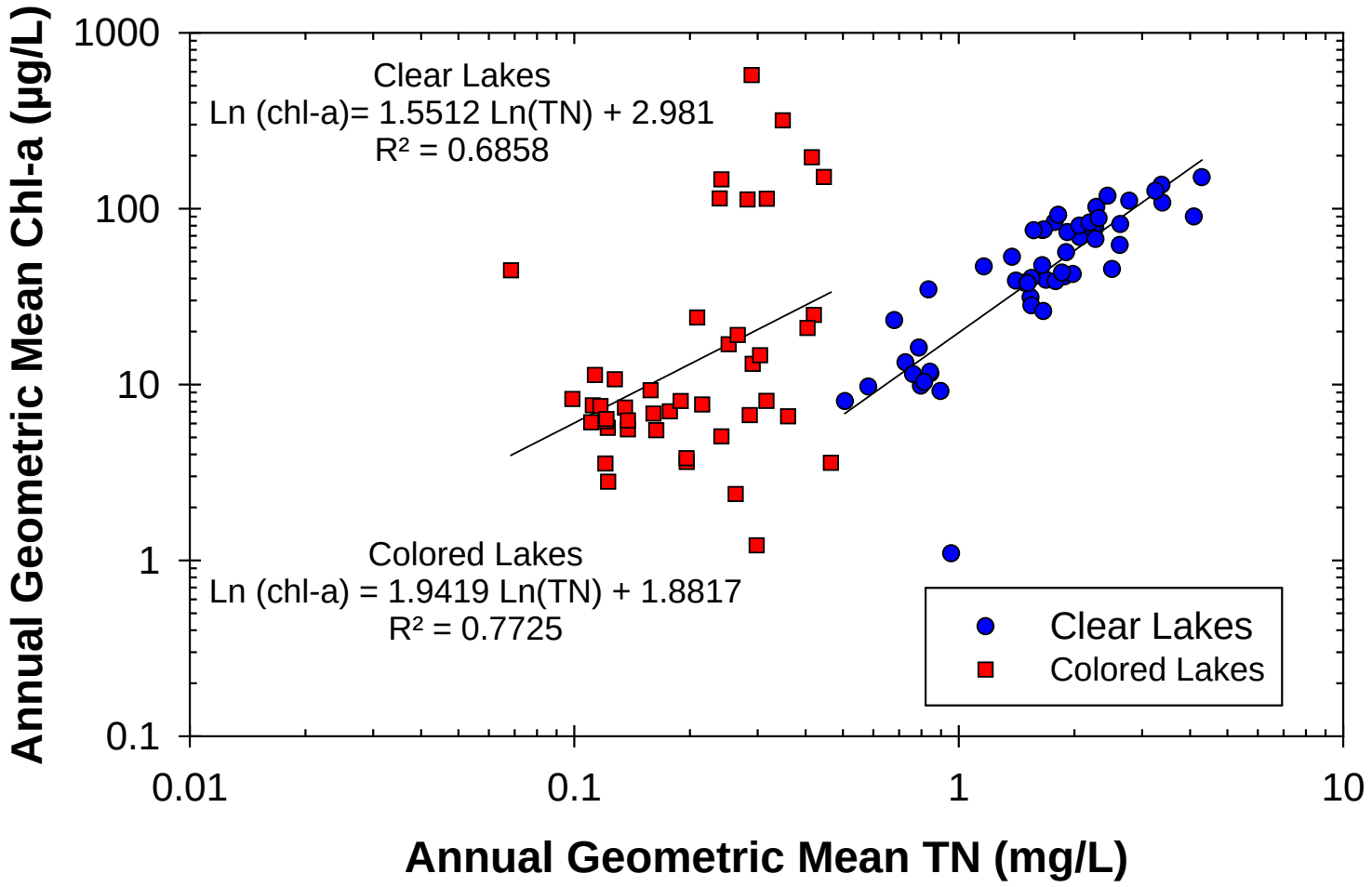


West Central Lake Chl-a Response to TP



West Central Lake Chl-a Response to TN



Investigating Options for West Central Lakes

- **Region specific regression**

Dep Var: Ln (Chl-a) N: 98
Multiple R: 0.91865 Multiple R^2: 0.844
Adjusted squared multiple R^2: 0.839

Effect	Coefficient	Std Error	Std Coef	Tolerance	t	P(2 Tail)
CONSTANT	6.12268	0.36586	0	.	16.73487	0
Ln (Color)	-0.76347	0.07212	-0.48518	0.79036	-1.05E+01	0
Ln (TP)	0.40247	0.06942	0.28198	0.70184	5.79738	0
LN (TN)	1.56457	0.10192	0.68386	0.83671	15.3515	0

- **Alternative chlorophyll-a threshold greater than 20 µg/L**