



*Florida Department of
Environmental Protection*

*Numeric Nutrient
Criteria:
Technical Discussion*

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Division of Environmental Assessment and Restoration

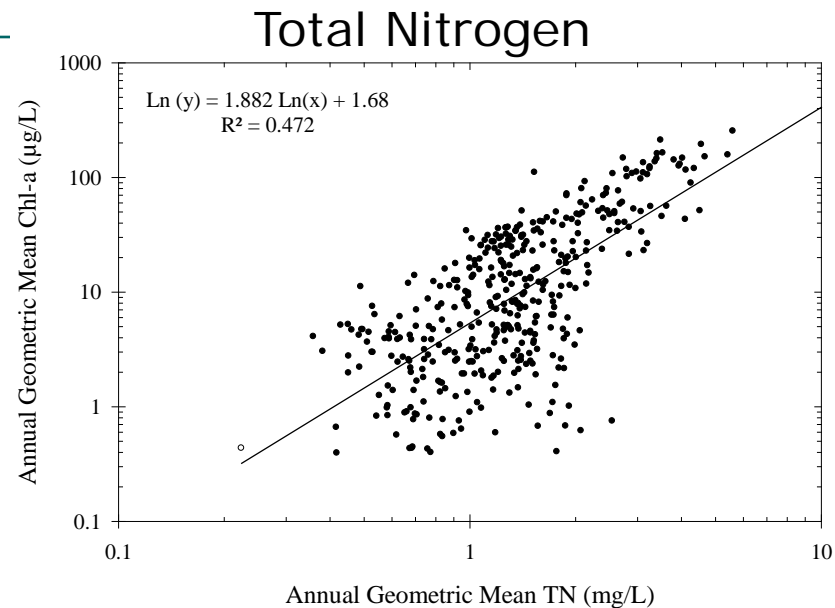
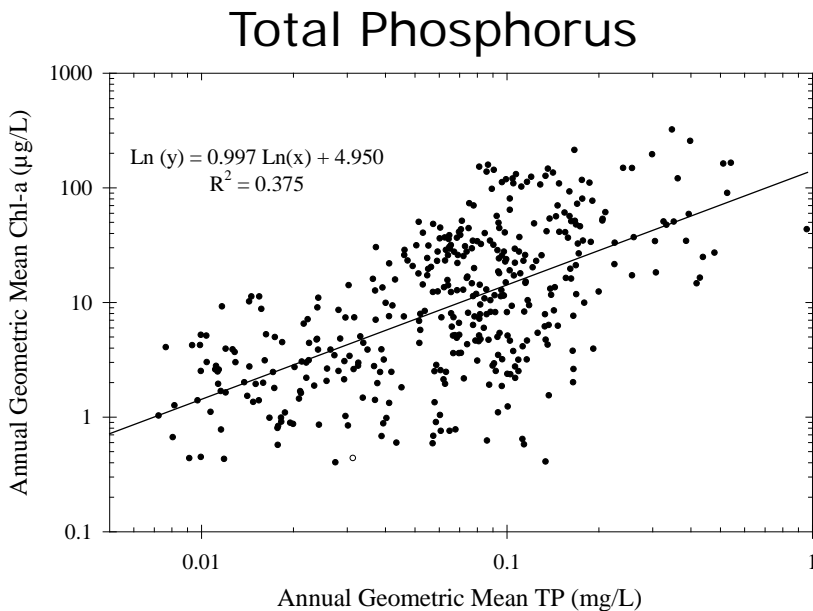


Potential Cause-Effect Criteria (cont.)

- 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)

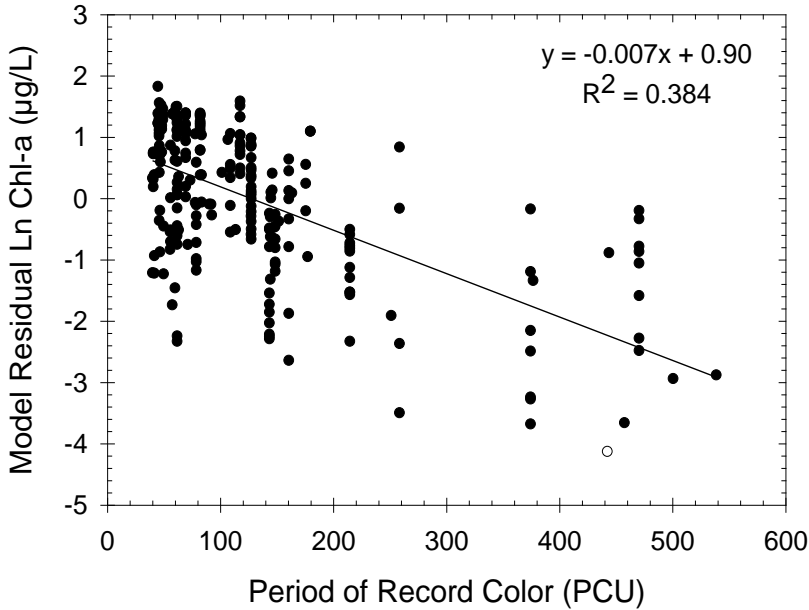


Spearman Correlations (R values)

	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

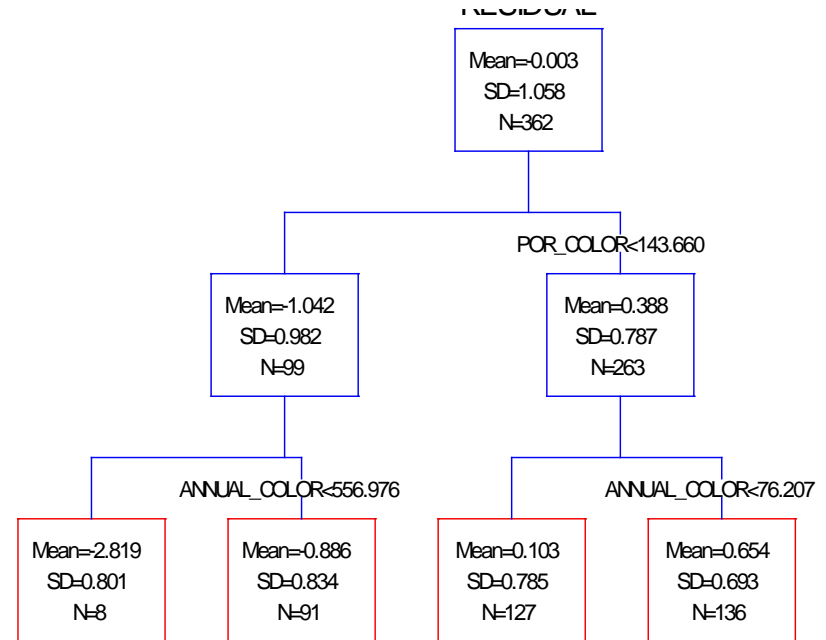


Influence of Color on Chl-a Response in Colored Lakes (May 2009)



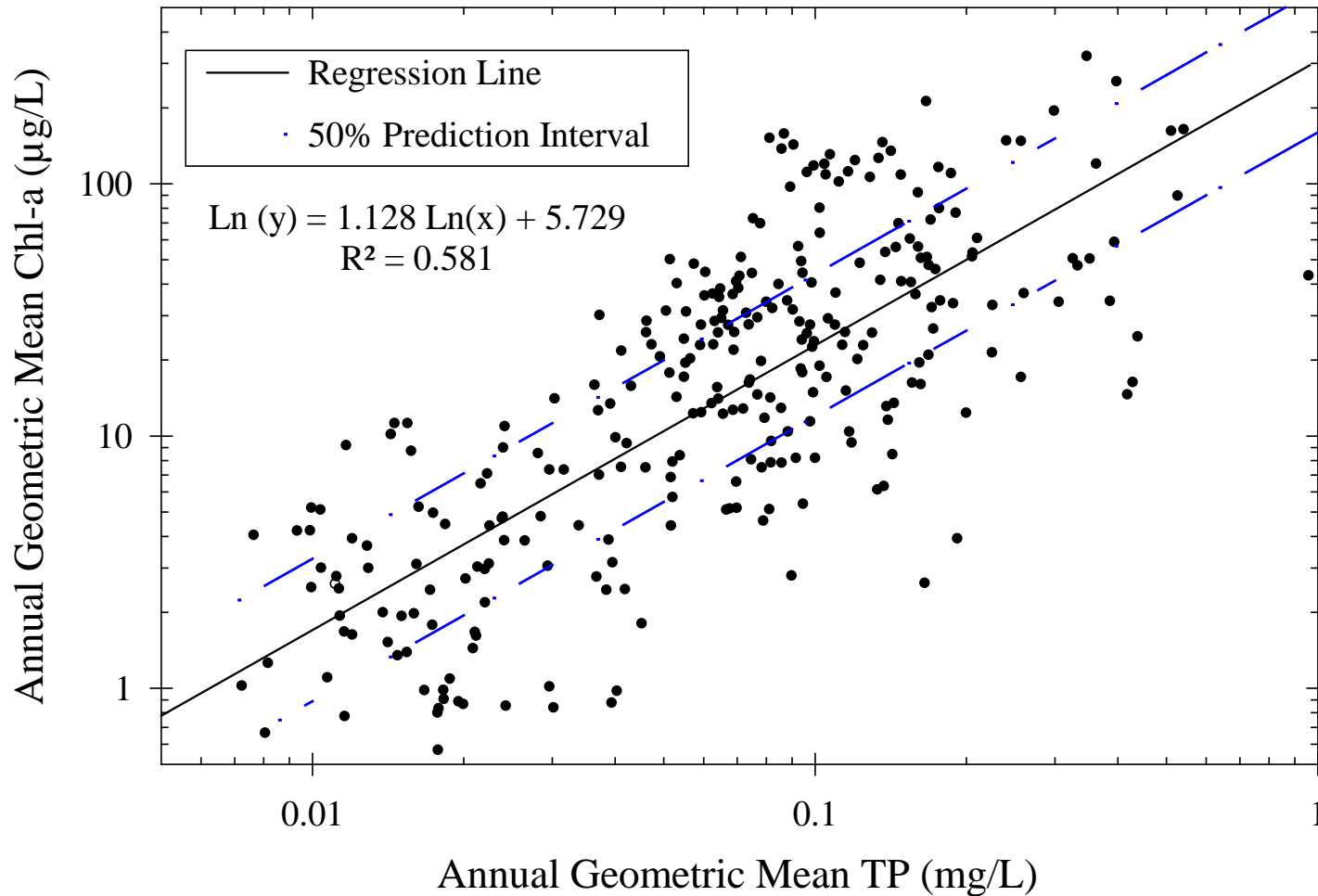
Conclusion: categorize colored lakes into moderately colored (> 40-140 PCU) and highly colored (> 140 PCU)

Classification and Regression Tree Analysis of Residual Error



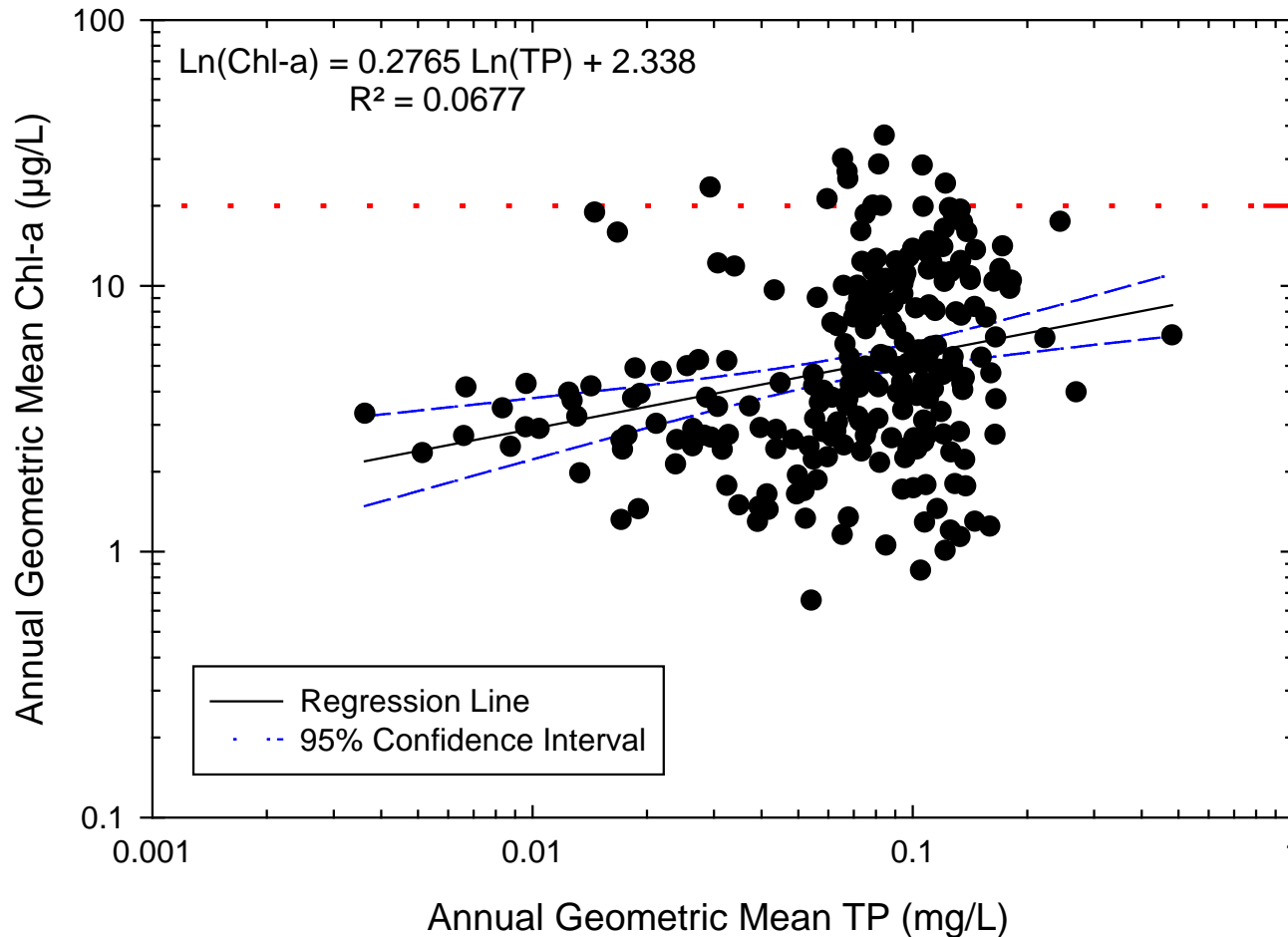
Split	Variable	PRE	Improvement
1	POR_COLOR	0.364	0.364
2	ANNUAL_COLOR	0.432	0.068
3	ANNUAL_COLOR	0.482	0.049

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



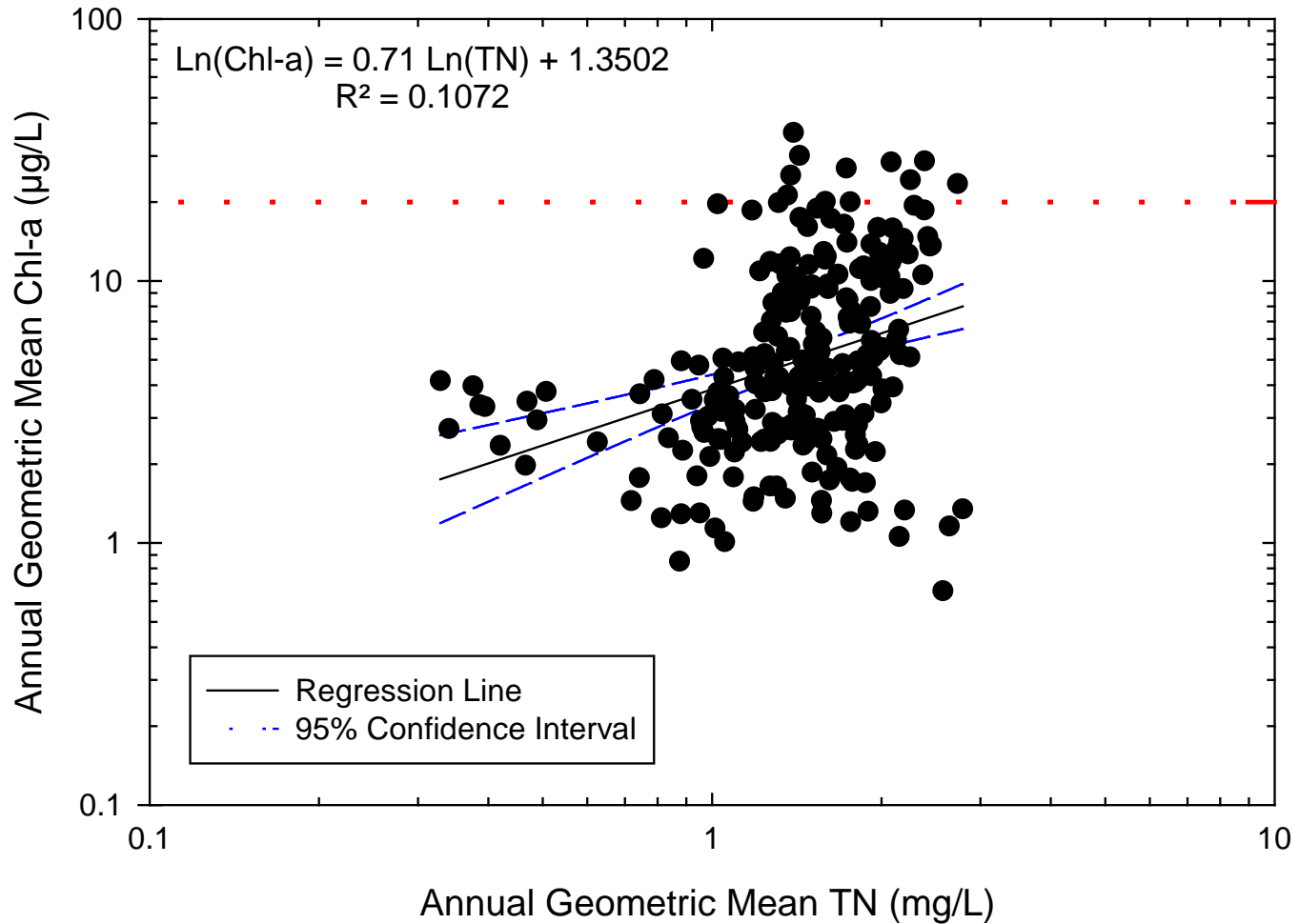


Highly Colored Lake (Color >140 PCU) Chl-a Response to Total Phosphorus





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

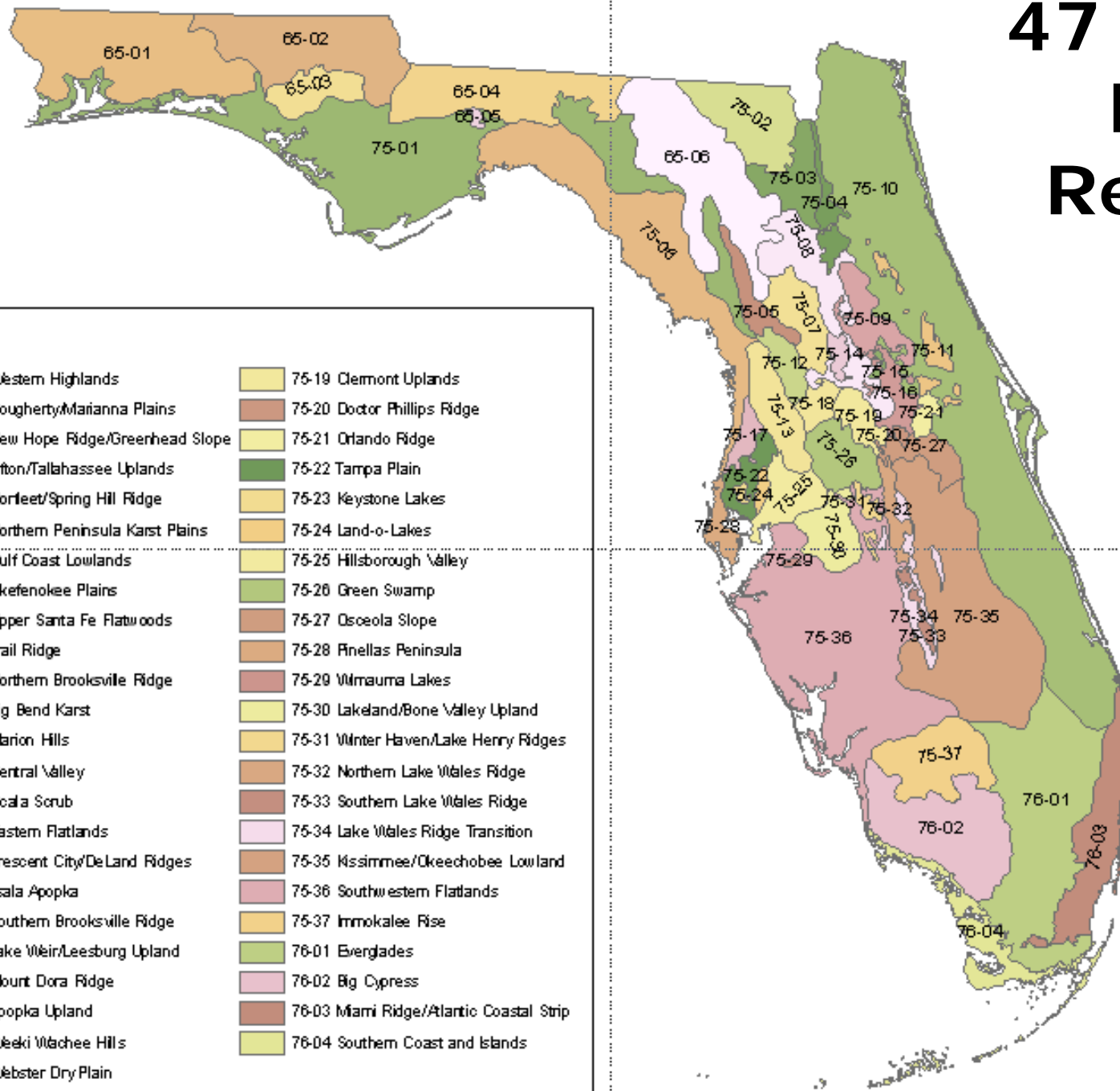




Potential Cause-Effect Criteria (cont.)

- **DEP is re-examining regionalization and morphoedaphic factors (color, alkalinity) to establish more appropriate lake criteria for some situations**
- Paleolimnological 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



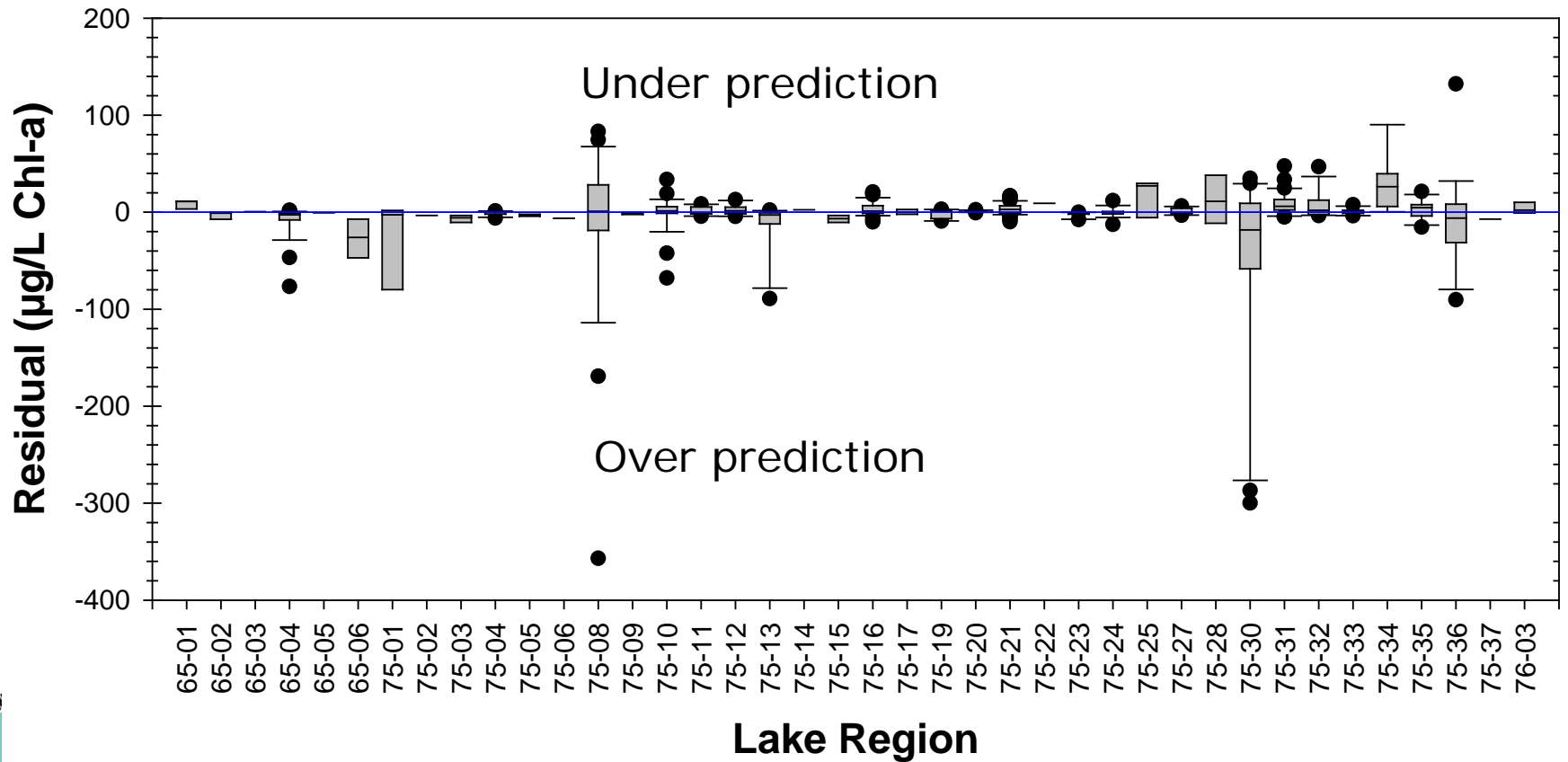
Legend

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



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

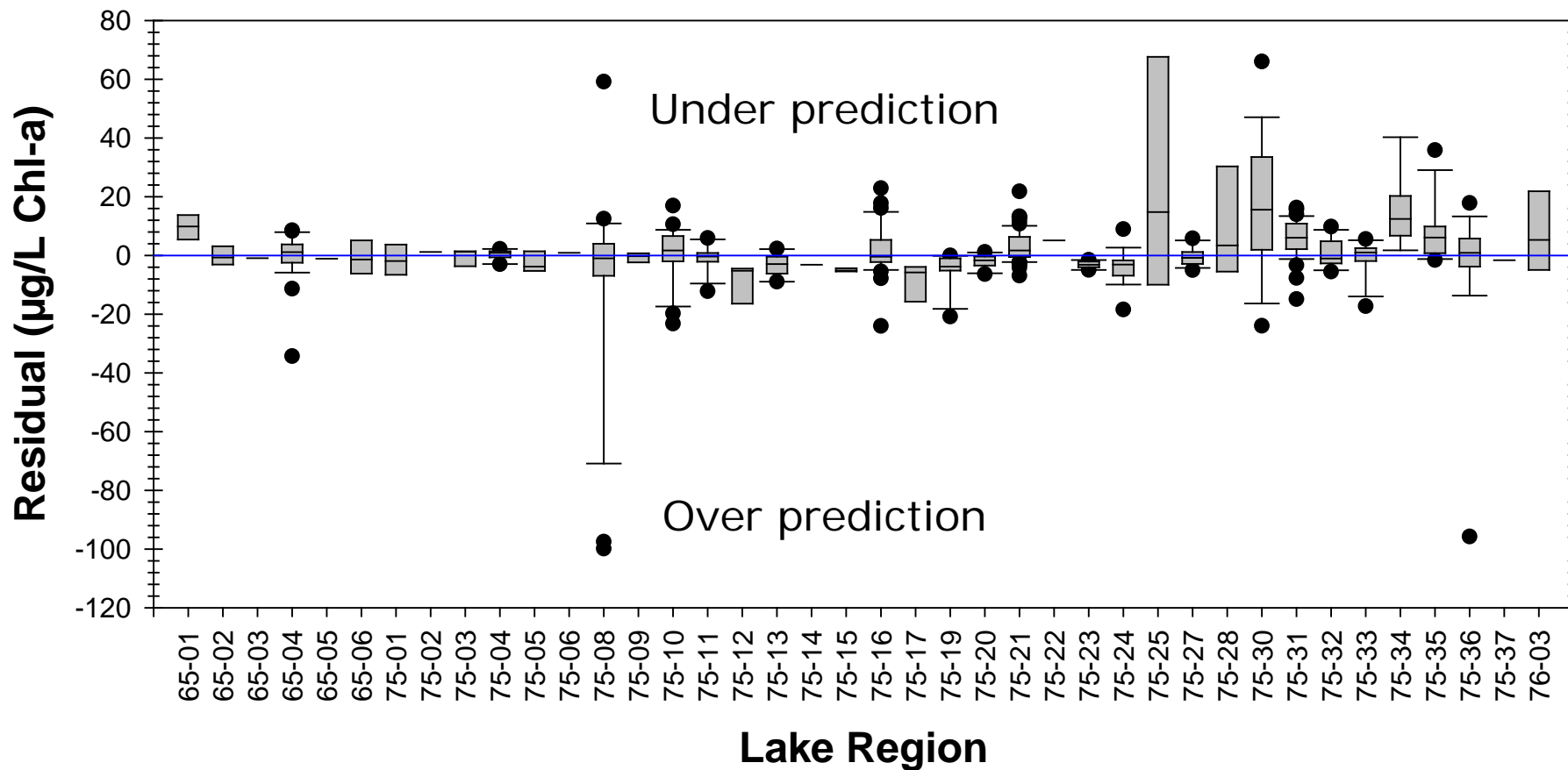
(Data from IWR Run 43)





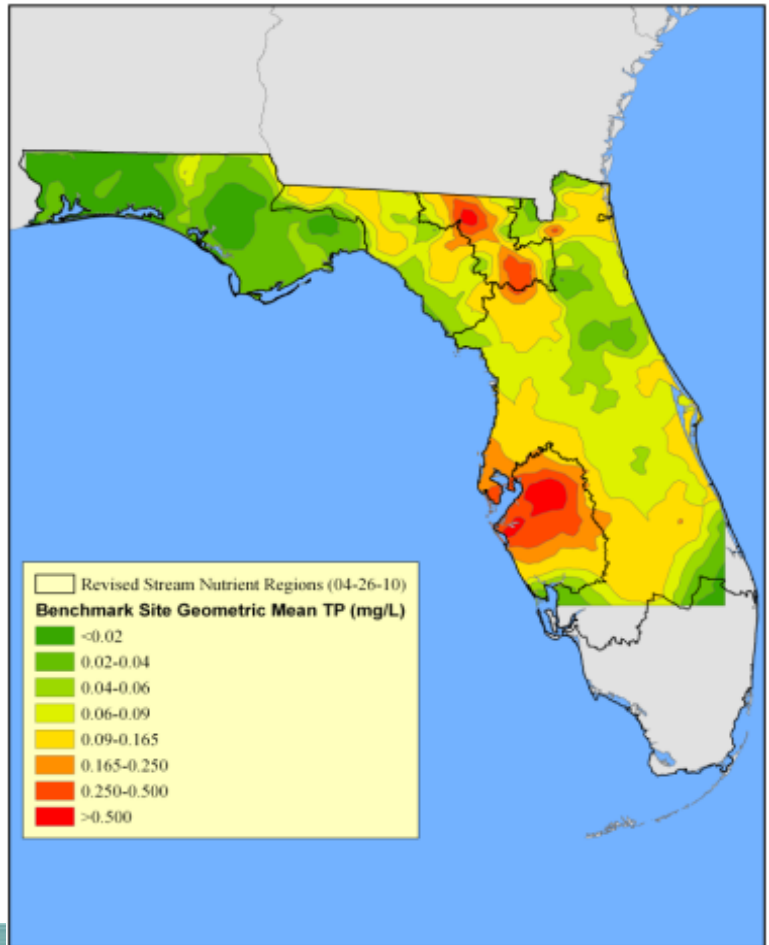
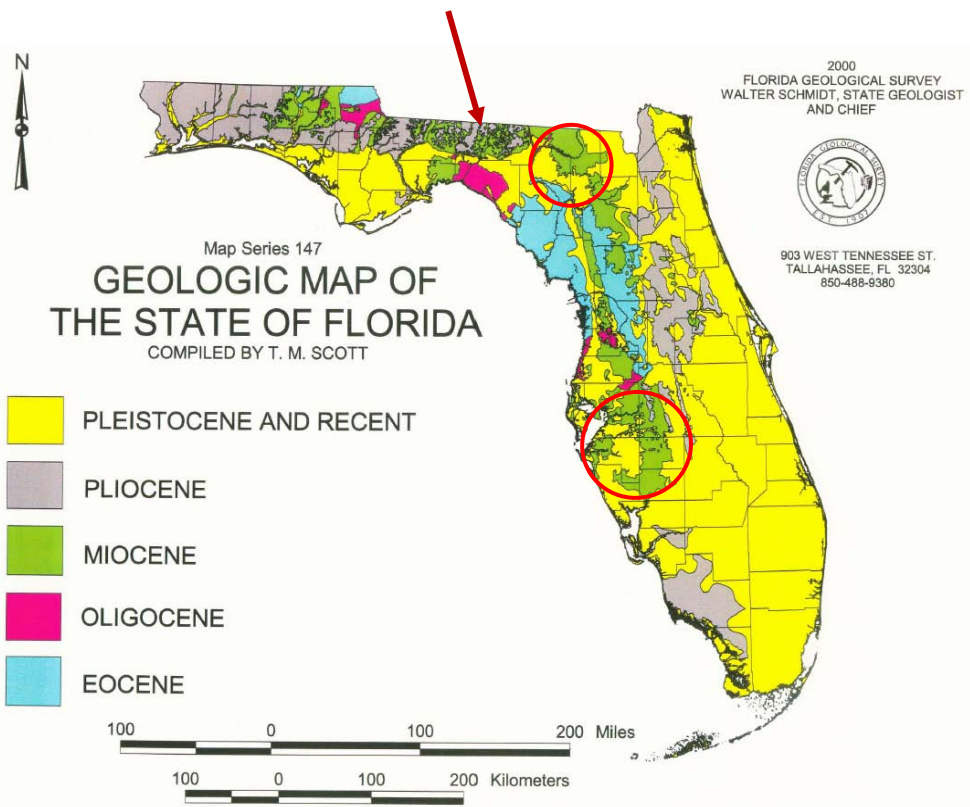
Residuals Analysis of the Lakes TN/Chl-a Regressions by Lake Region

(Data from IWR Run 43)





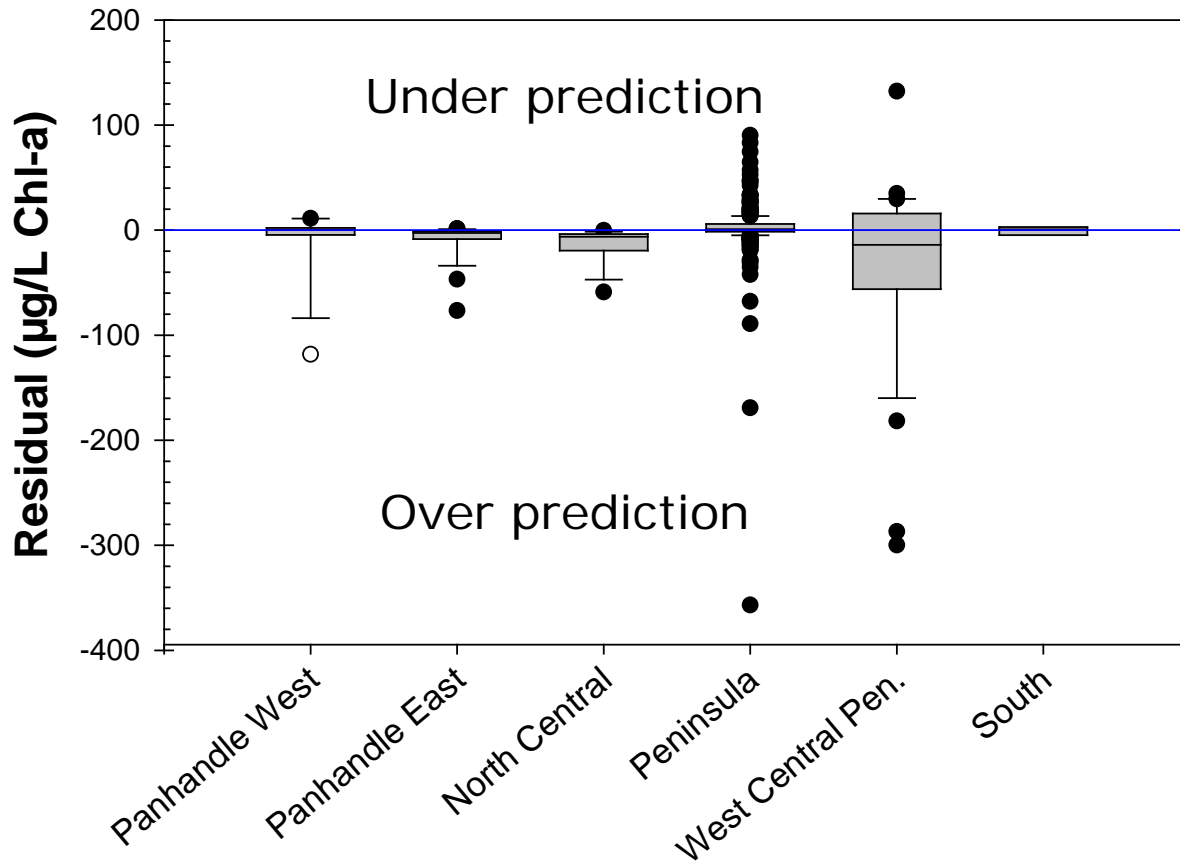
Stream Nutrient Regions were based on Geologic Formations and Stream TP Levels





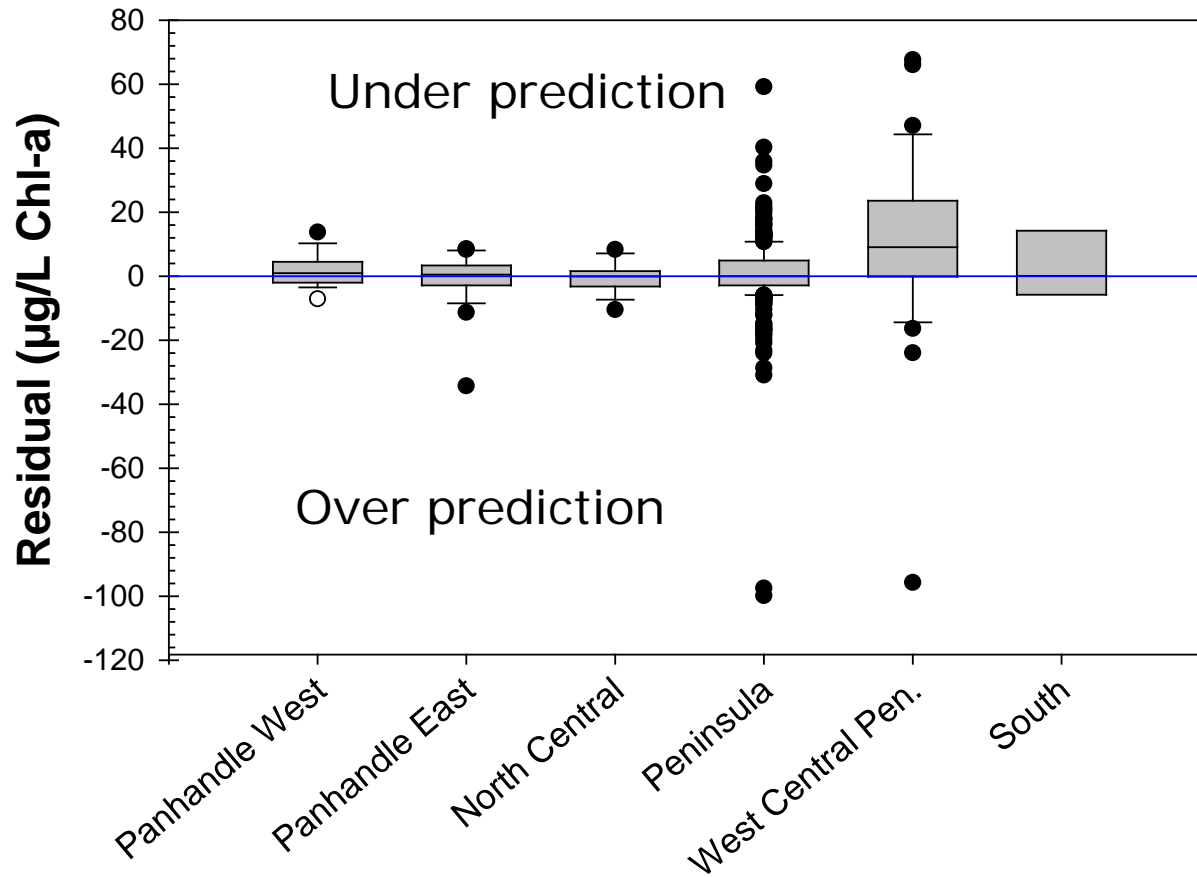
Residuals Analysis of the Lakes TP/Chl-a Regressions by Stream Nutrient Region

(Data from IWR Run 43)



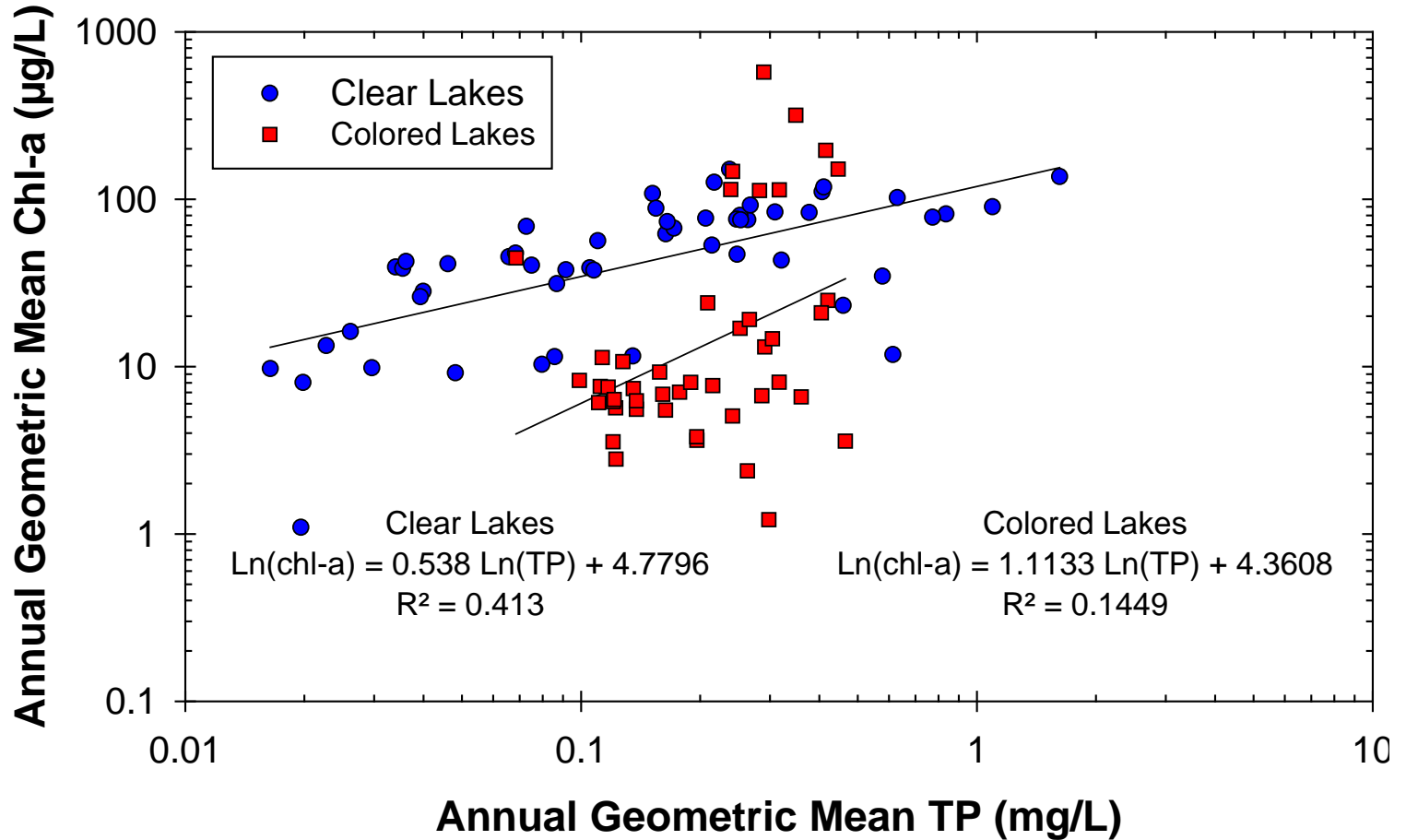


Residuals Analysis of the Lakes TN/Chl-a Regressions by Stream Nutrient Region (Data from IWR Run 43)



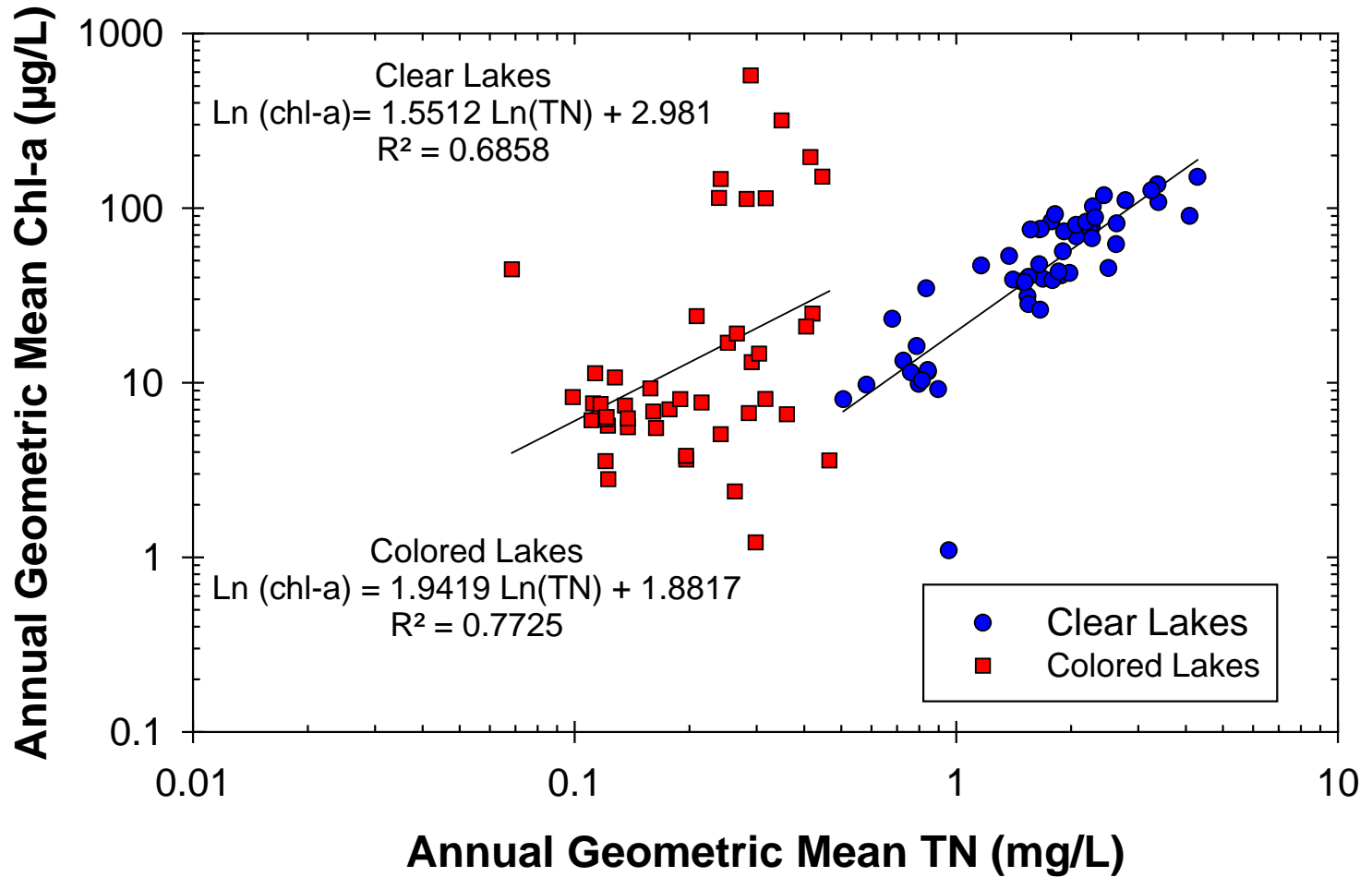


West Central Lake Chl-a Response to TP





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 R²: 0.844

Adjusted squared multiple R²: 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**

