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Natural Resources

Lake Nutrient Lines of Evidence

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NATURAL RESOURCES

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Regressions: ln(Chlorophyll) as Response Variable

Region	Slope	Intercept	R^2
Plains (n = 74)	1.5575*ln(TN)	-7.4961	0.613
	0.9812*ln(TP)	-0.8547	0.674
Ozarks (n = 35)	1.392*ln(TN)	-6.731	0.696
	0.986*ln(TP)	-0.8637	0.846

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Regressions: ln(Secchi Depth) as Response Variable

Region	Slope	Intercept	R^2
Plains	-0.961*ln(TN)	10.9	0.596
	-0.672*ln(TP)	7.04	0.807
Ozarks	-0.818*ln(TN)	10.1	0.664
	-0.609*ln(TP)	6.92	0.891

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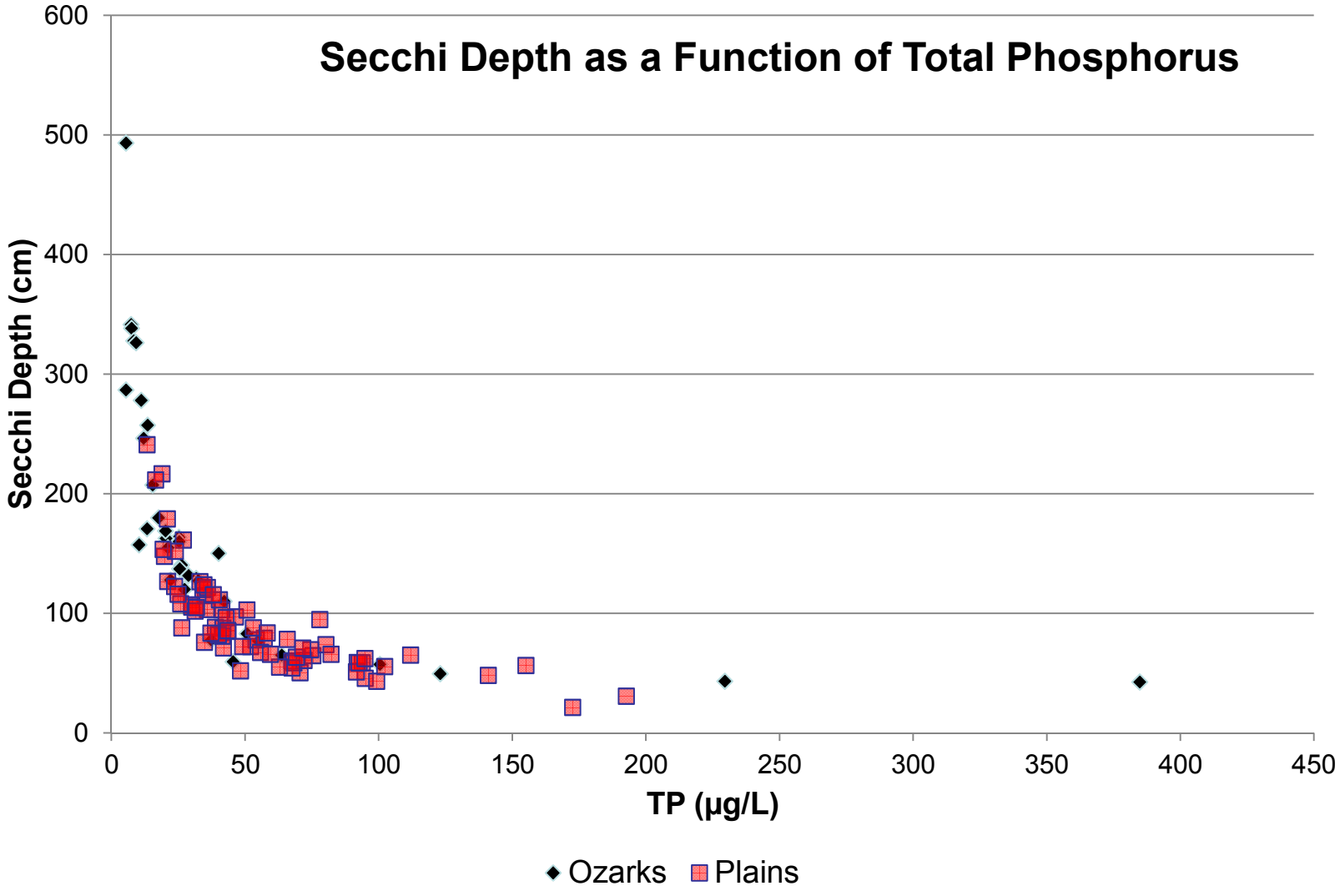

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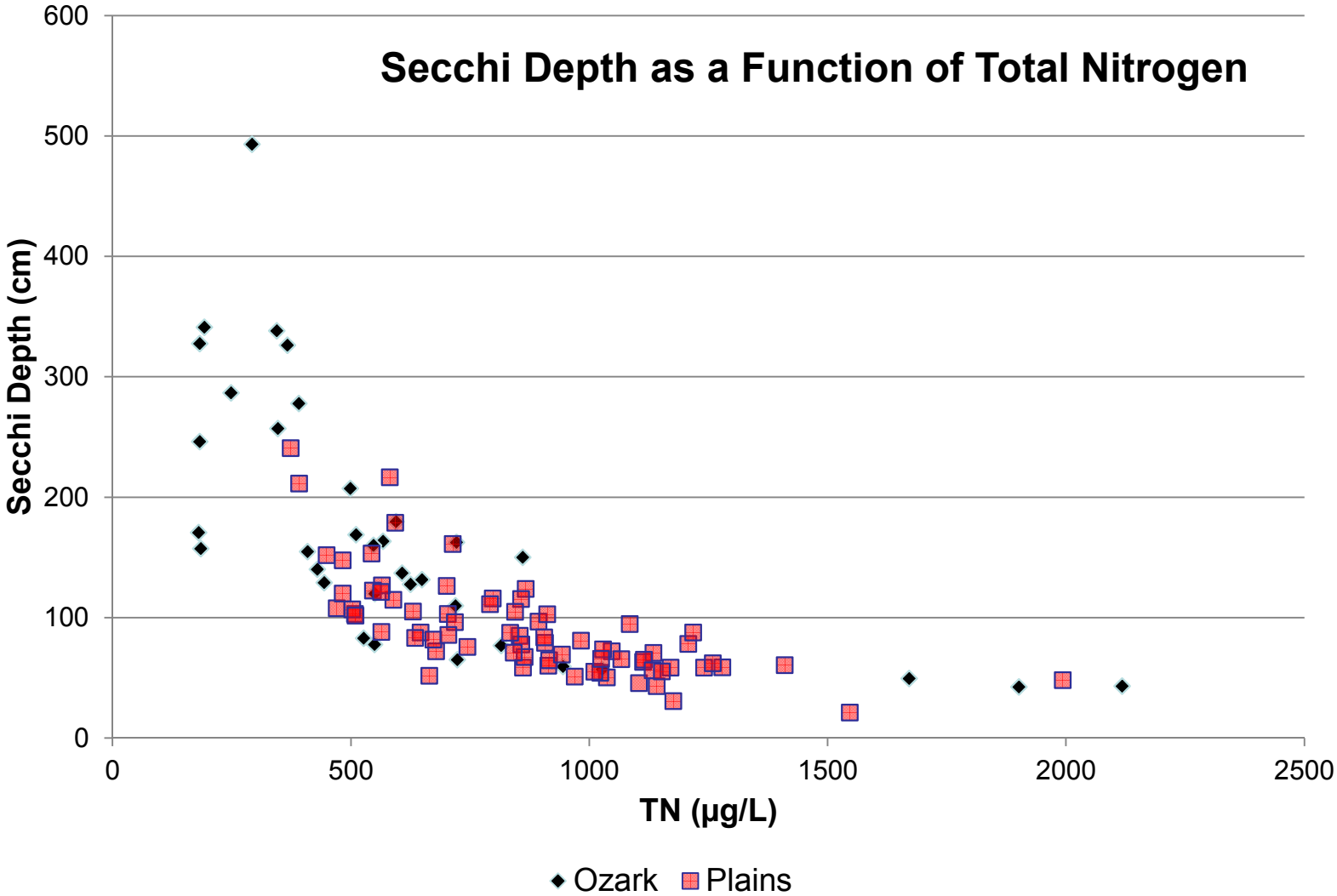

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Nonparametric Change Point Analysis

- $D = \sum_{k=1}^{n} (y_k - \mu)^2$
- $\Delta_i = D - (D_{\leq i} + D_{>i})$
- $D =$ Deviance
- $\Delta_i =$ Deviance Reduction at Candidate Change Point
- y_k =Response Variable at point k
- μ =Mean of all y_k
- (Quian et al. 2003)

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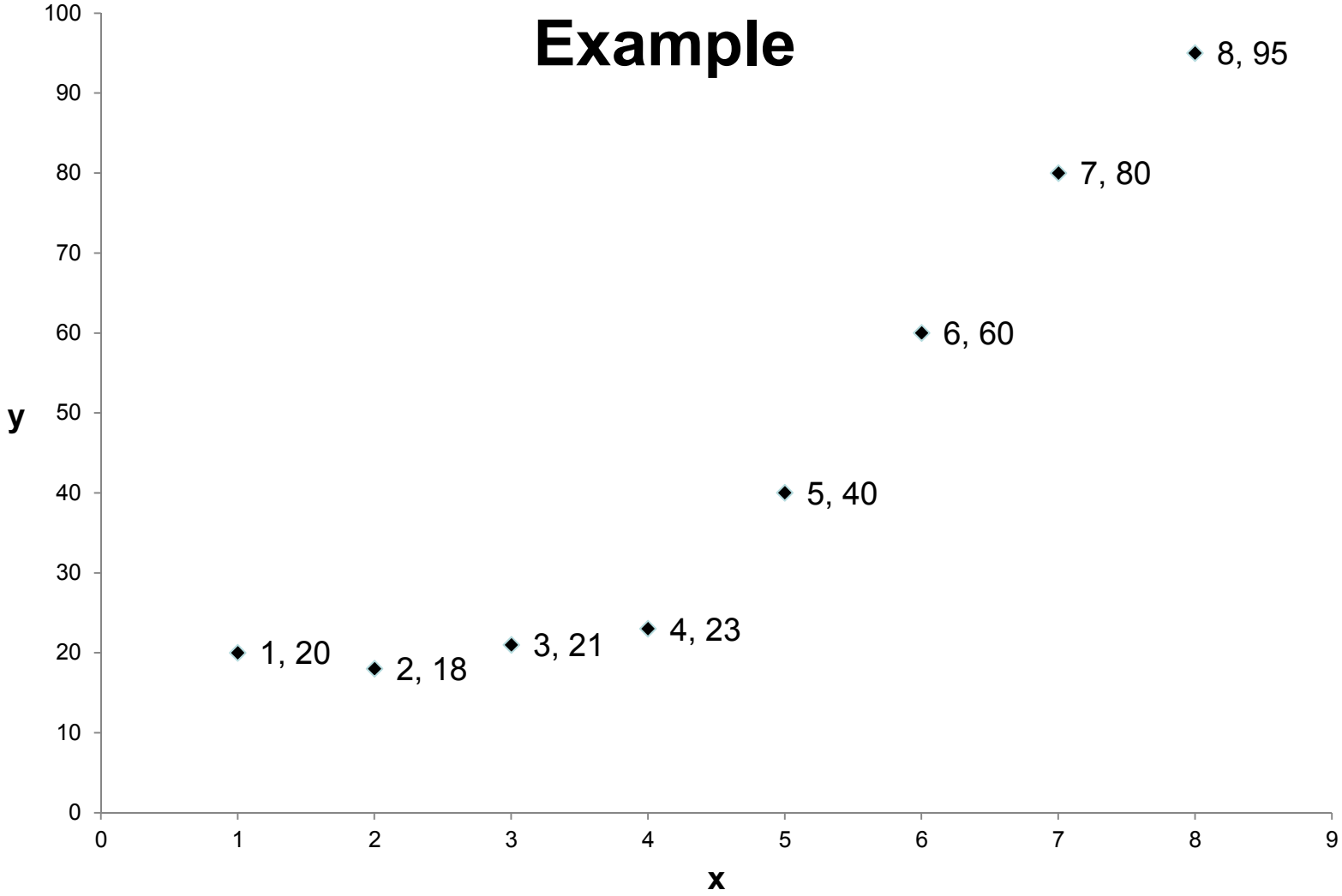
Example



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μ = 44.6; D = 6387.9

X	Y	Δ_i
1	20	693
2	18	1751
3	21	2290
4	23	4656
5	40	**5454**
6	60	4902
7	80	2900
8	95	

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Change Point Summary for Secchi Depth

Region	μ (Secchi Depth)	D	Nutrient	Max Δ_i	X(μg/L)	Y(cm)
Plains (n = 74)	91	125216	TN	57013	797	88
			TP	67275	48	85
Ozarks (n = 35)	171	362953	TN	226930	459	161
			TP	229270	24	132

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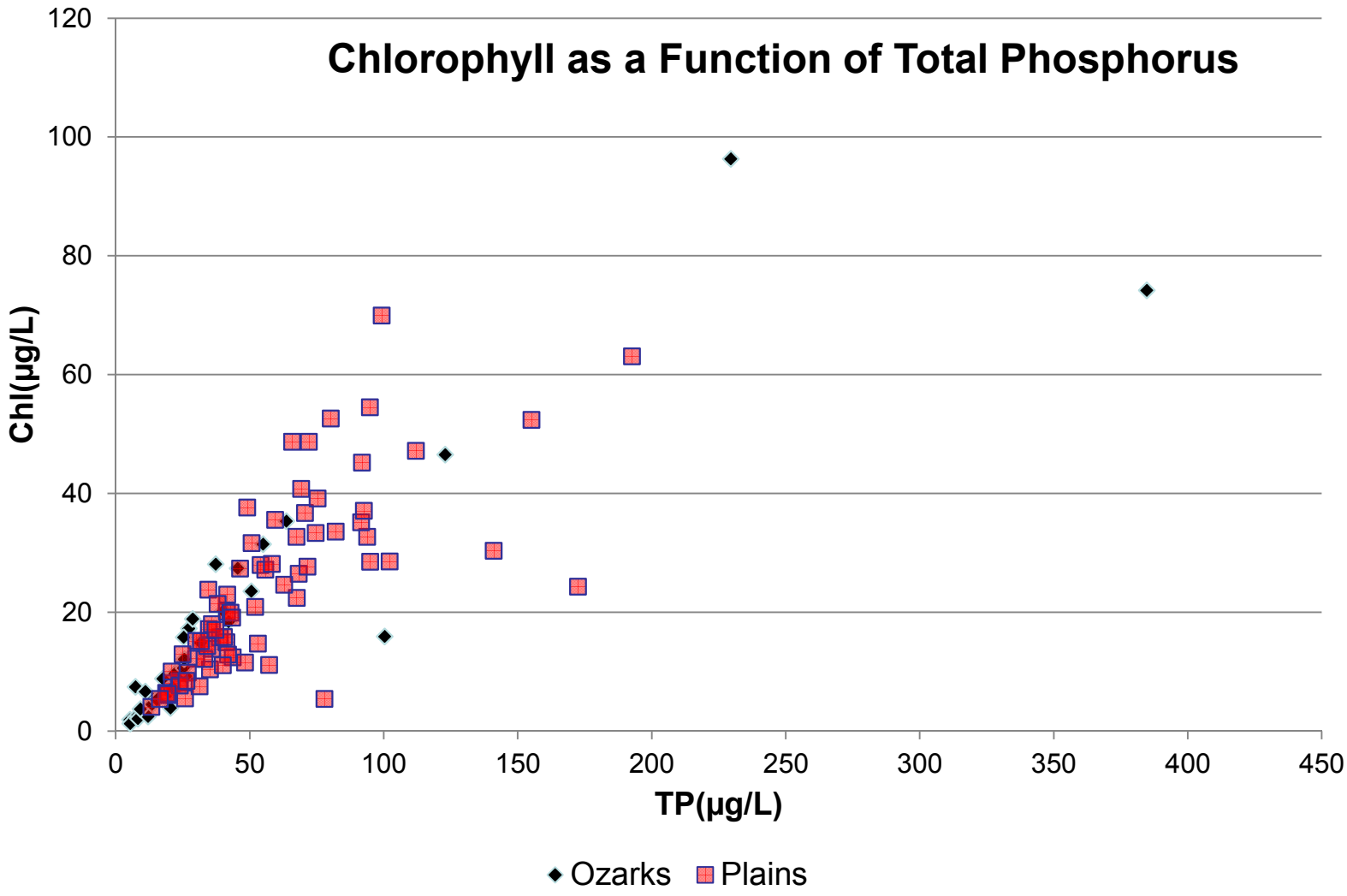

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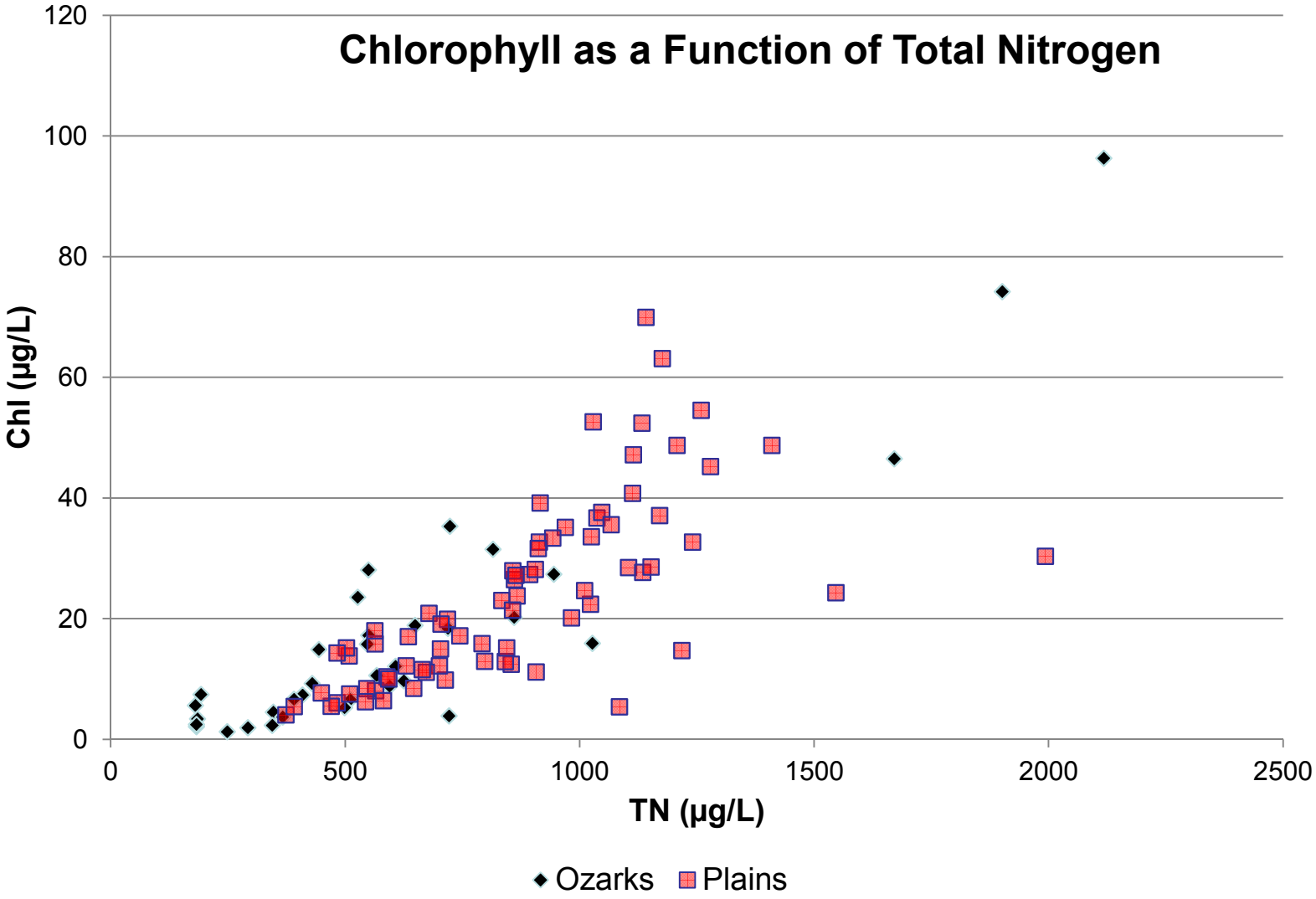

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TP Models (Knowlton & Jones, 2003)

- Plains: $\log_{10}(TP) = 1.954 + (0.085*\text{logit}(\text{cropland})) - (0.306*\log_{10}(\text{mean depth})) + (0.271*\log_{10}(\text{flushing rate}))$ $R^2 = 0.65$
- Ozarks: $\log_{10}(TP) = 2.082 + (0.169*\text{logit}(\text{cropland})) - (0.387*\log_{10}(\text{mean depth})) + (0.095*\log_{10}(\text{flushing rate}))$ $R^2 = 0.74$

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TN Models (Knowlton & Jones, 2003)

- Plains: $\log_{10}(TN) = 0.09 + (0.08*\text{logit}(\text{cropland})) - (0.163*\log_{10}(\text{mean depth}))$ $R^2 = 0.52$
- Ozarks: $\log_{10}(TN) = 0.195 + (0.11*\text{logit}(\text{cropland})) - (0.265*\log_{10}(\text{mean depth}))$ $R^2 = 0.70$

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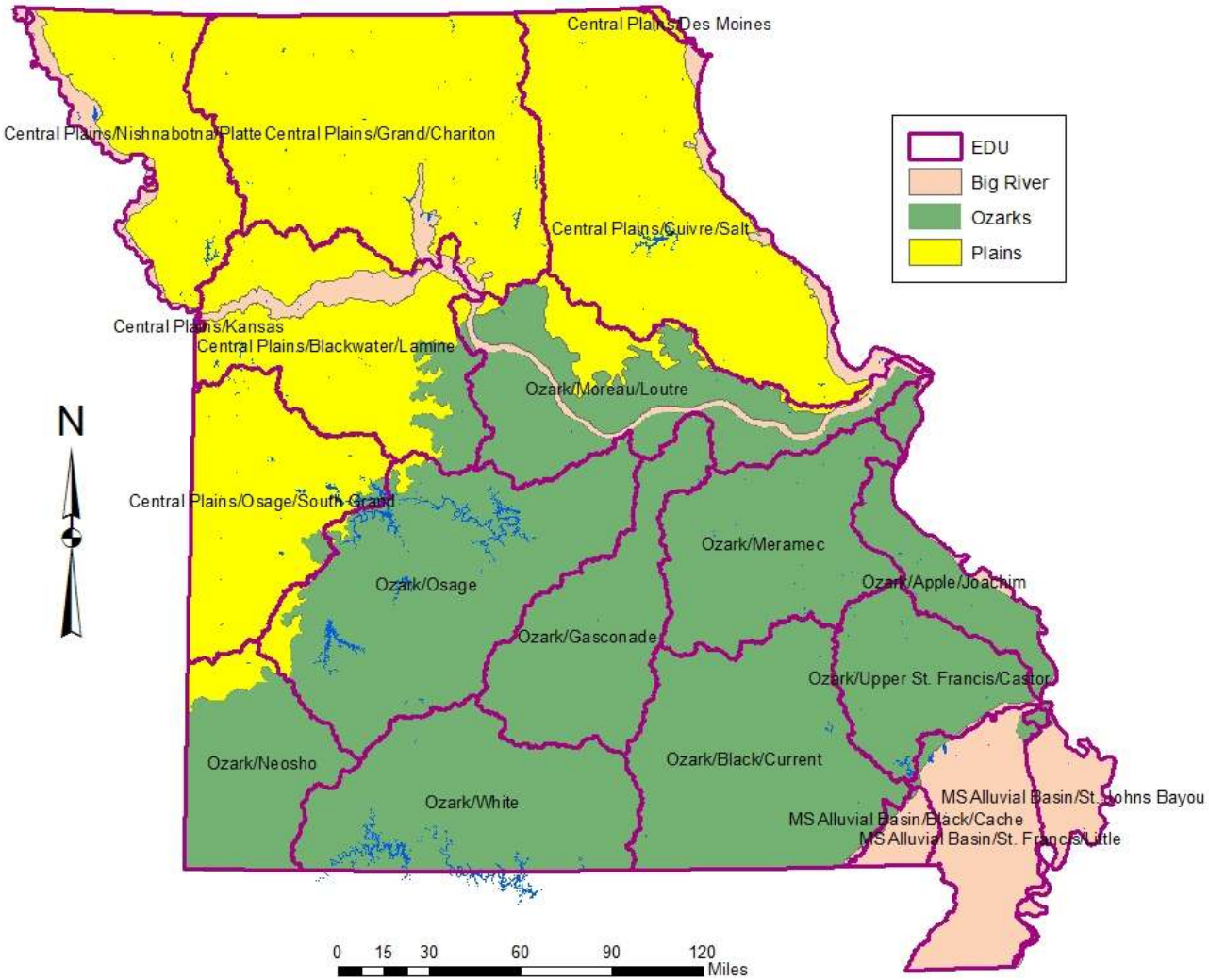
"Background" nutrient concentrations (µg/L) from previous equations estimated by setting percent cropland to zero. (Knowlton & Jones, 2003)

Region		Mean	Min	25th	Med	75th	Max
Plains (n = 82)	TN	350	290	330	350	360	400
	TP	21	10	15	19	25	37
Ozarks (n = 53)	TN	250	160	230	250	280	350
	TP	9	4	7	8	10	15

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