DETECTING LAND-BASED SIGNALS IN THE NEARSHORE ZONE OF LAKE ERIE DURING SUMMER 2009

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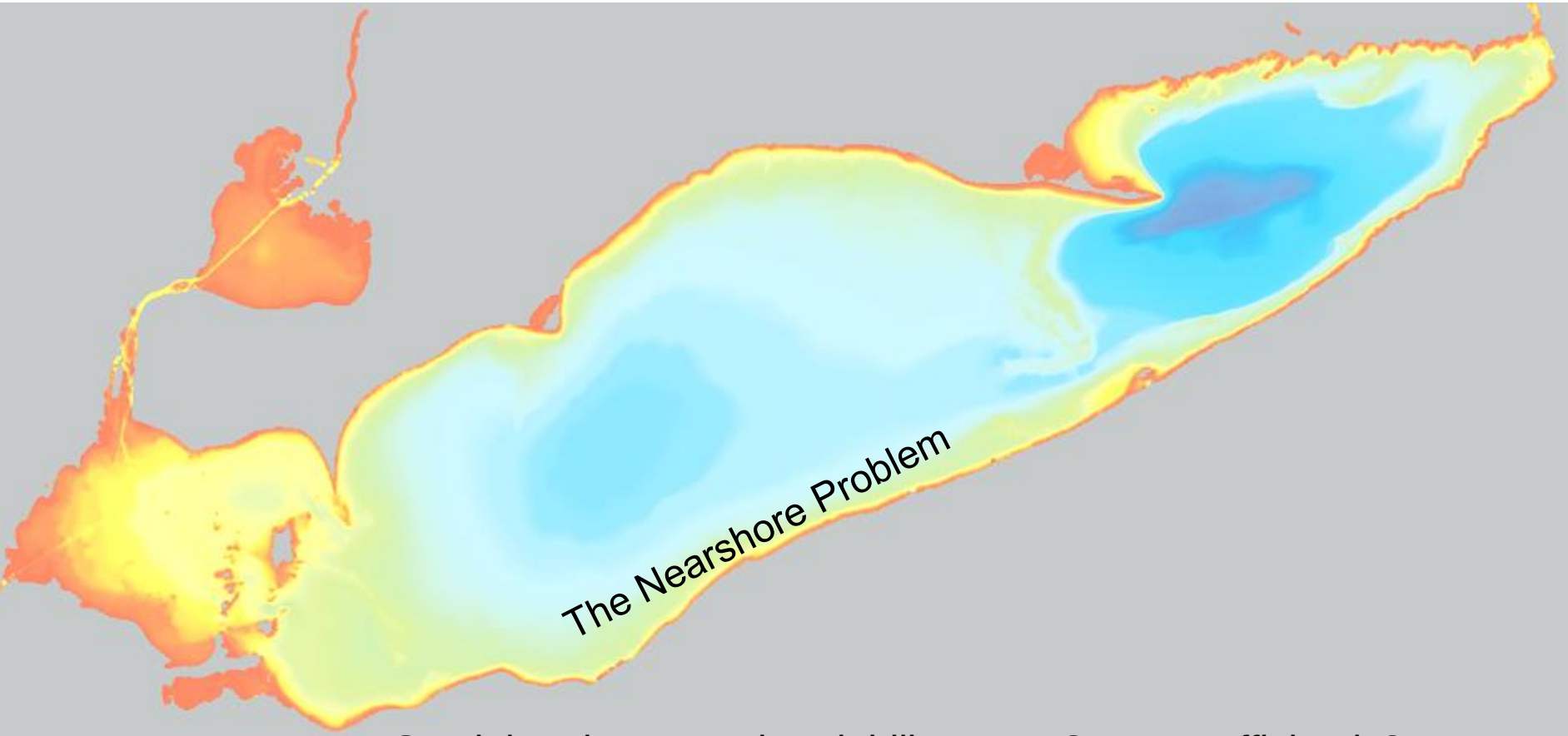
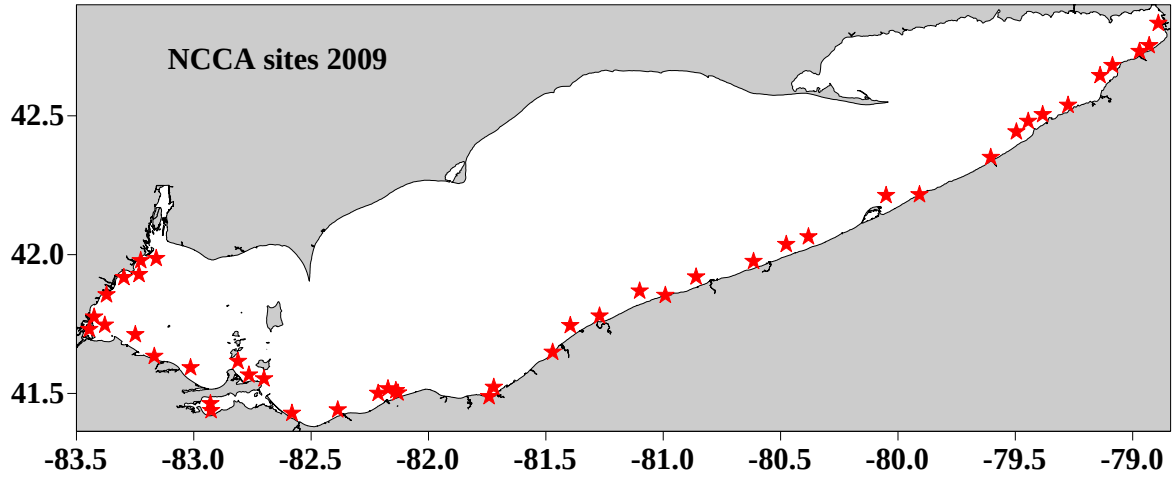


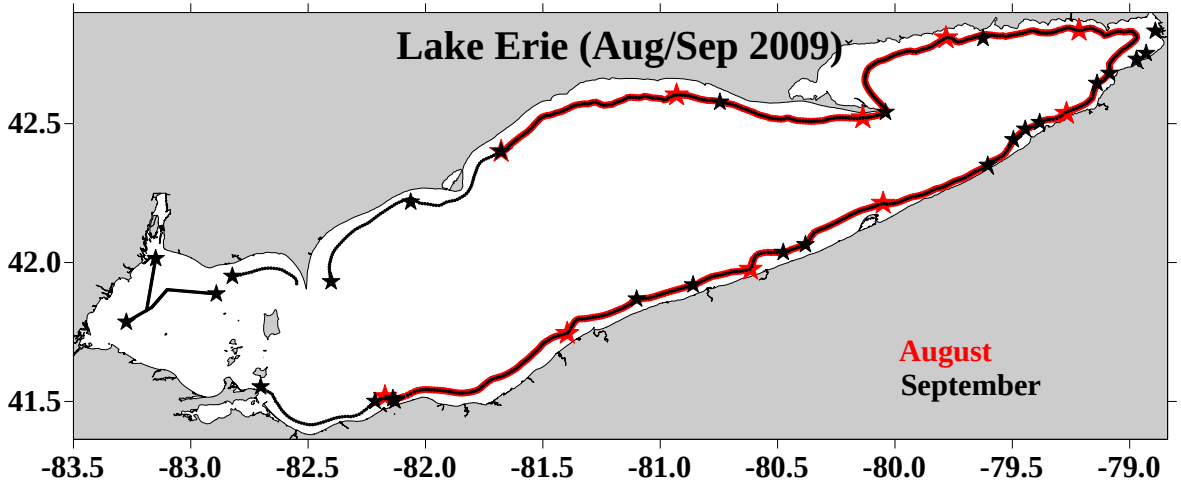
-Spatial and Temporal Variability, How Capture Efficiently?
-Open System, Weakened Expression of Landscape Signals

Two sampling styles 2009

Spatially balanced random probability survey: 45 sites mid-Aug to mid-Sept



Towing survey: *In situ* sensors continuously sample through whole water column along 10-15 m contour, mid Aug and Sept



Lake Erie Nearshore conditions in 2009 estimated from the Spatially Balanced Survey (NCCA design)

Mean values, US Nearshore

TP = 34.6 µg/L (26%)

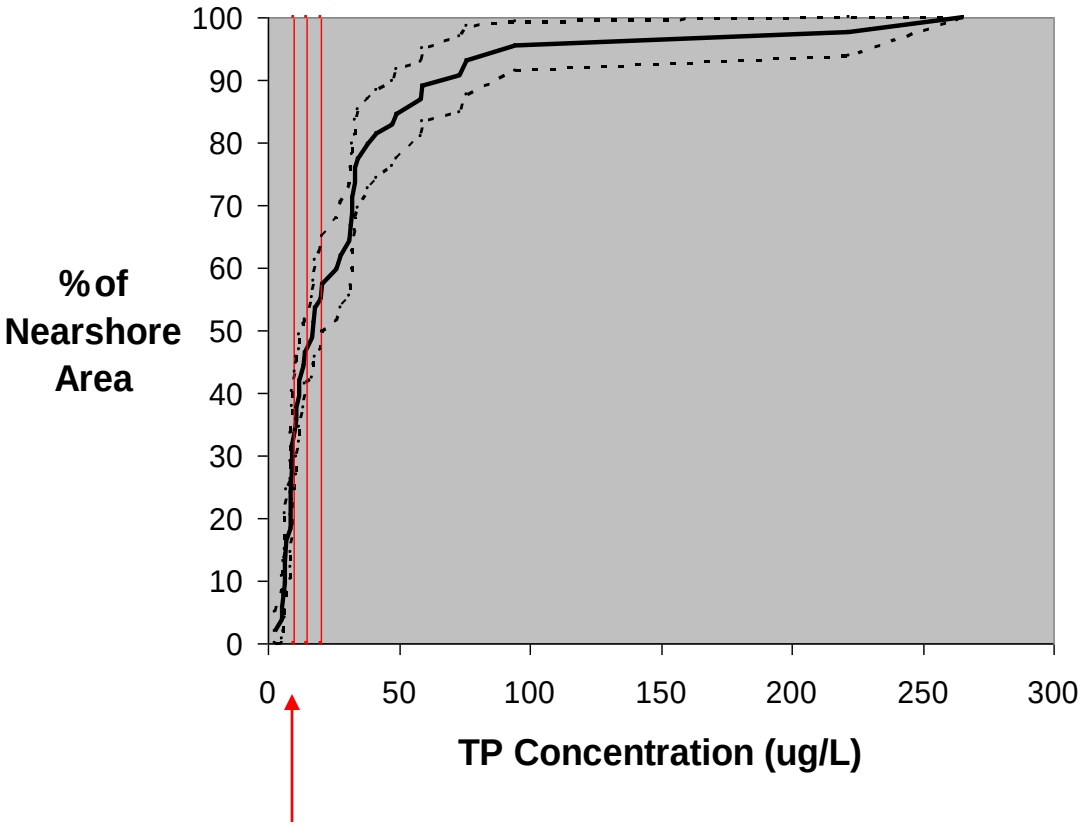
TN = 518 µg/L (16%)

Chl a = 17.7 µg/L (55%)

Secchi depth = 3 m (10%)

72% (17%) of the entire US nearshore area had live Dreissenid mussels

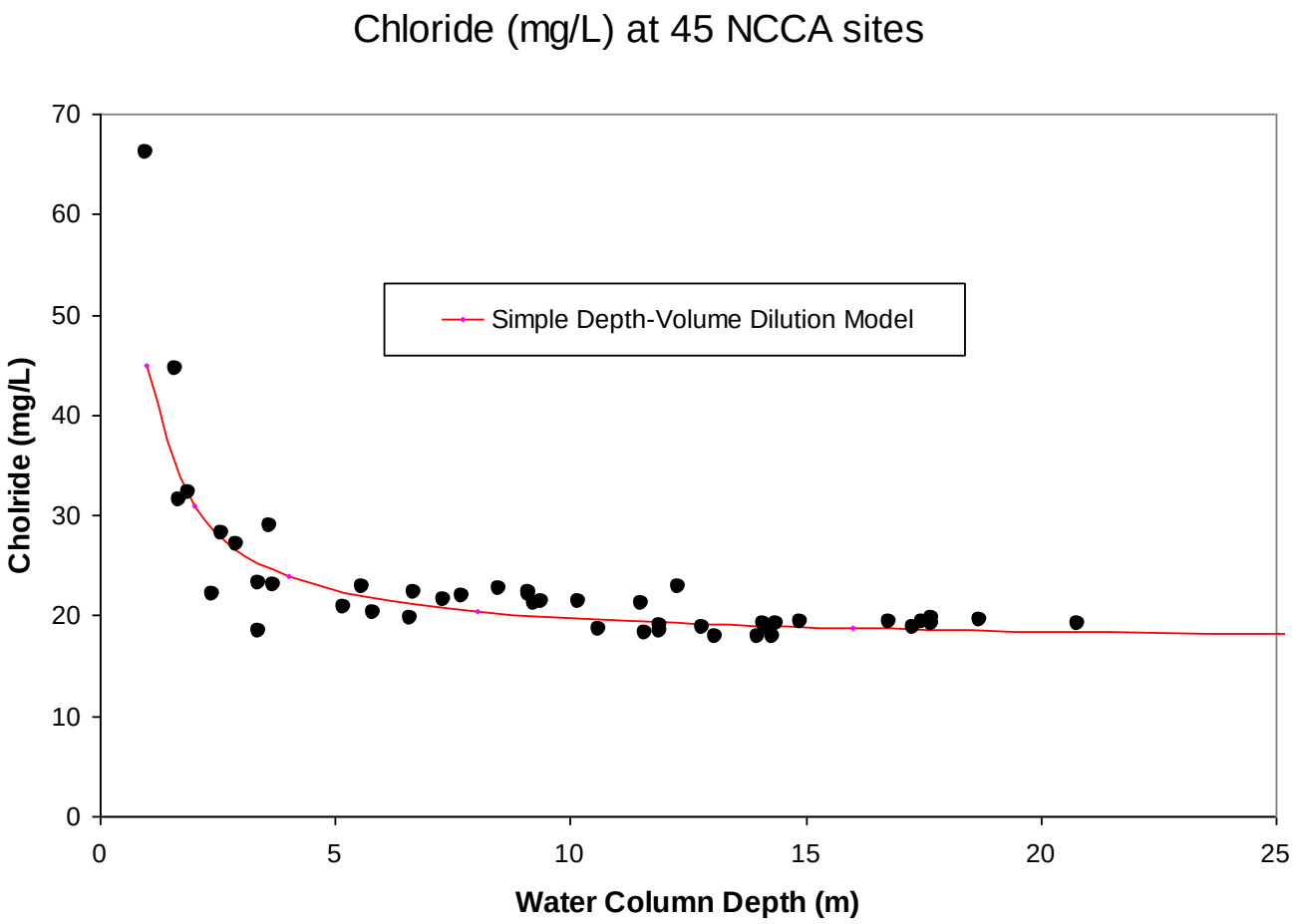
Cumulative distribution frequency with 95% confidence limits



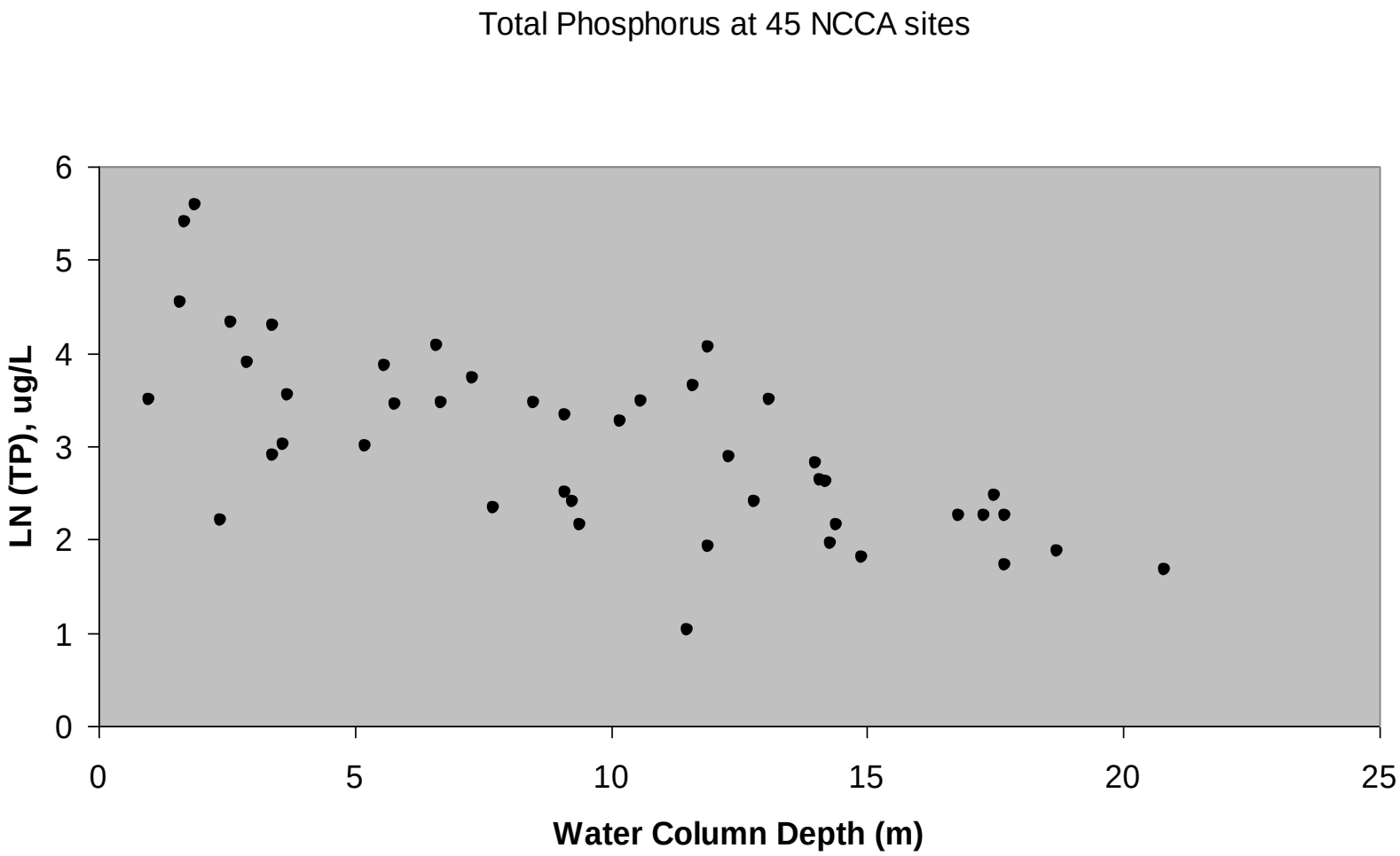
10, 15 and 20 µg/L WQ thresholds

Building a Model with Probability Survey Data

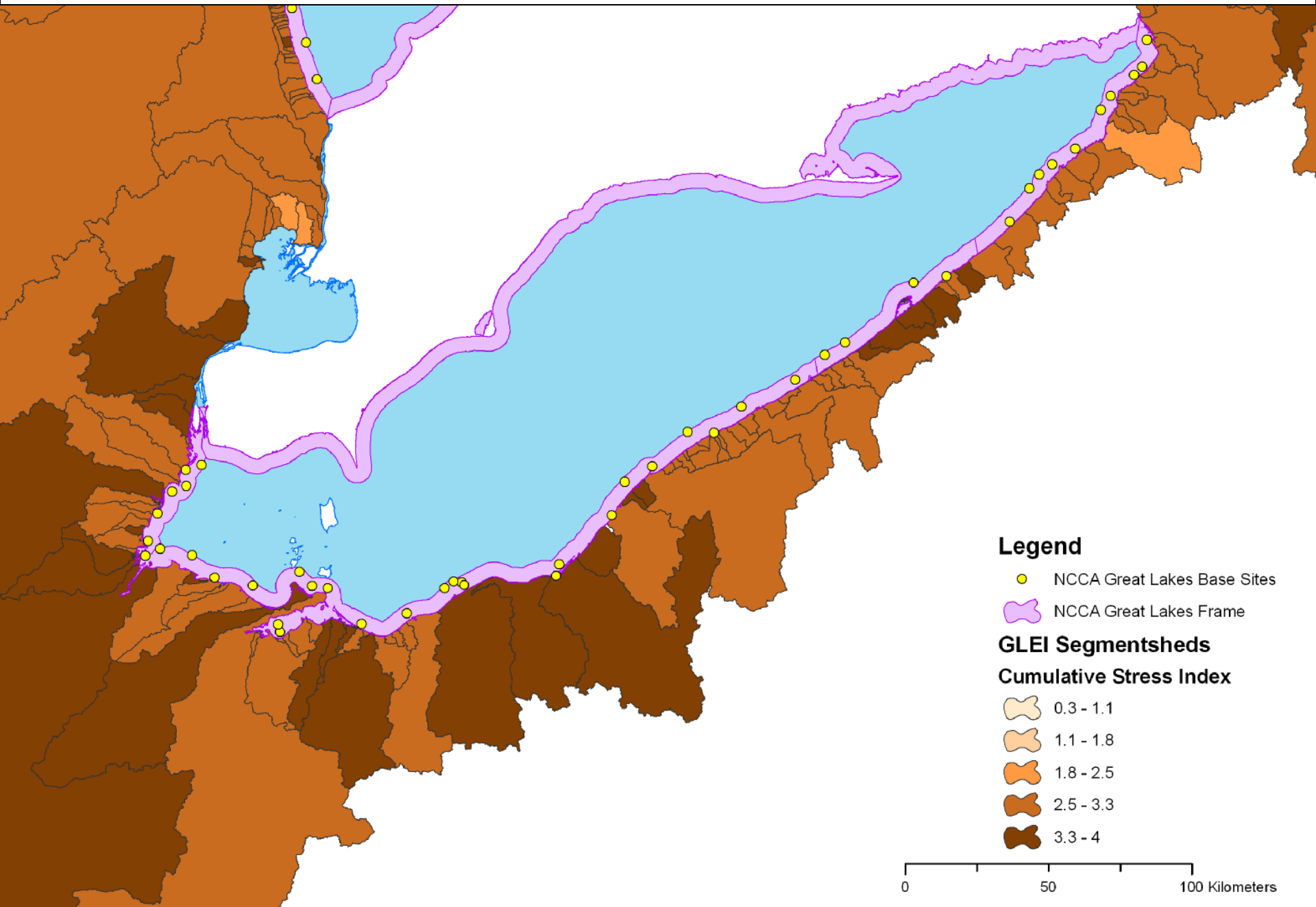
Logarithmic Decay Function: Conservative Element with Increasing Water Depth



Logarithmic decline of TP with Water Depth



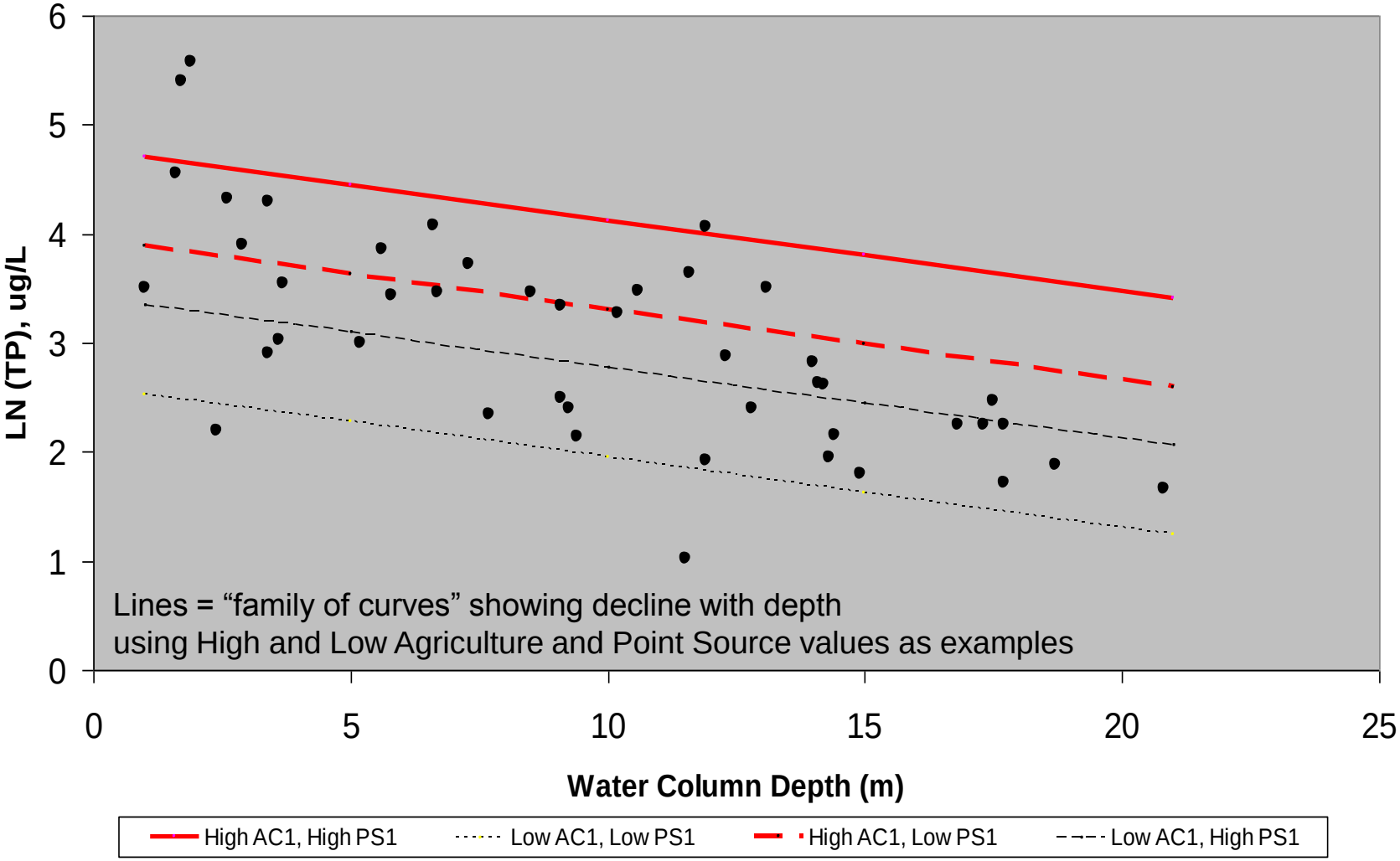
We also related the 45 probability survey sites to adjacent coastal segmentsheds and their related landscape metrics from the GLEI project (from Danz et al. 2007)



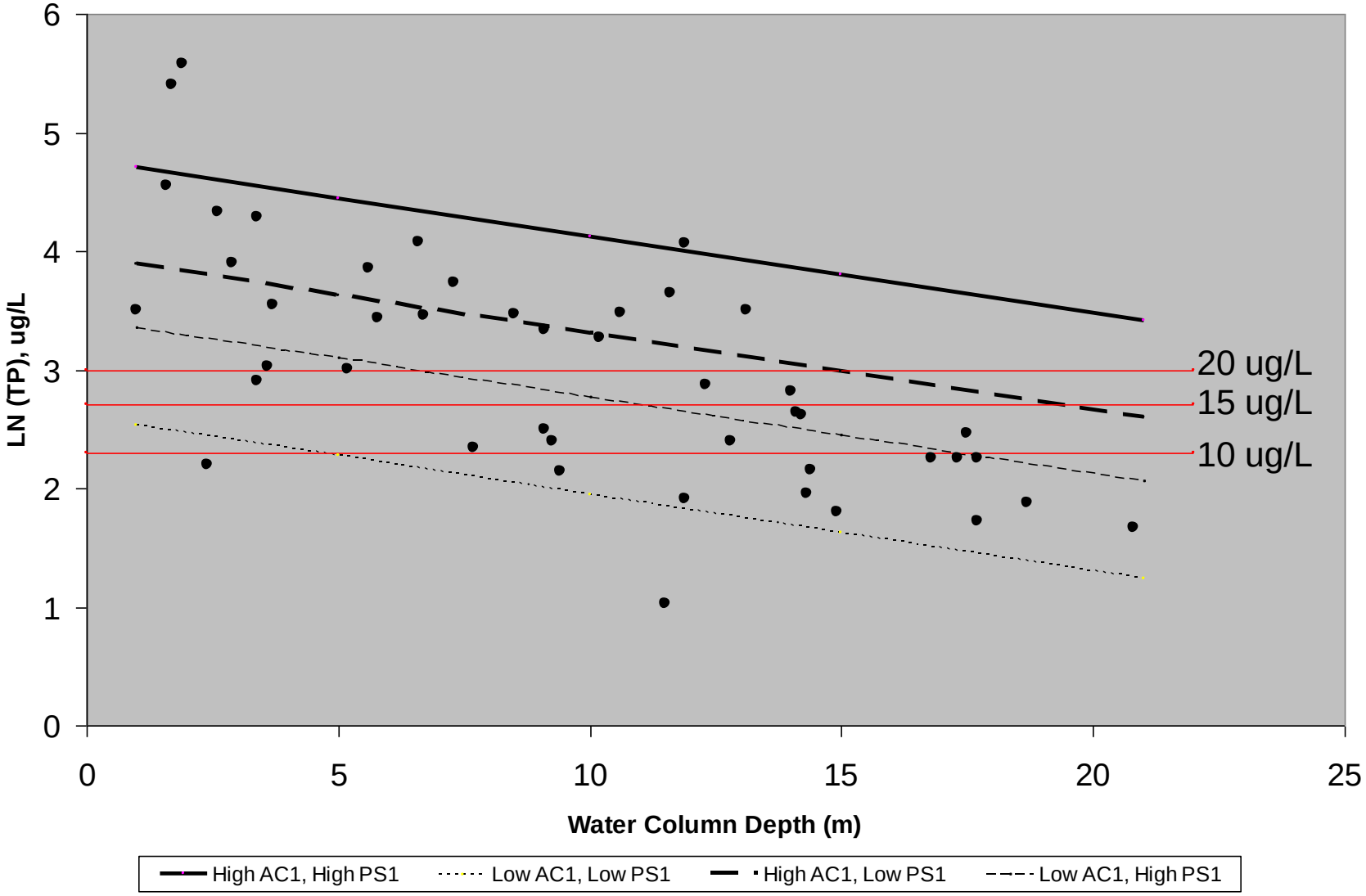
Multivariate Regression Model with Landscape Metrics Explains 74% of Variance

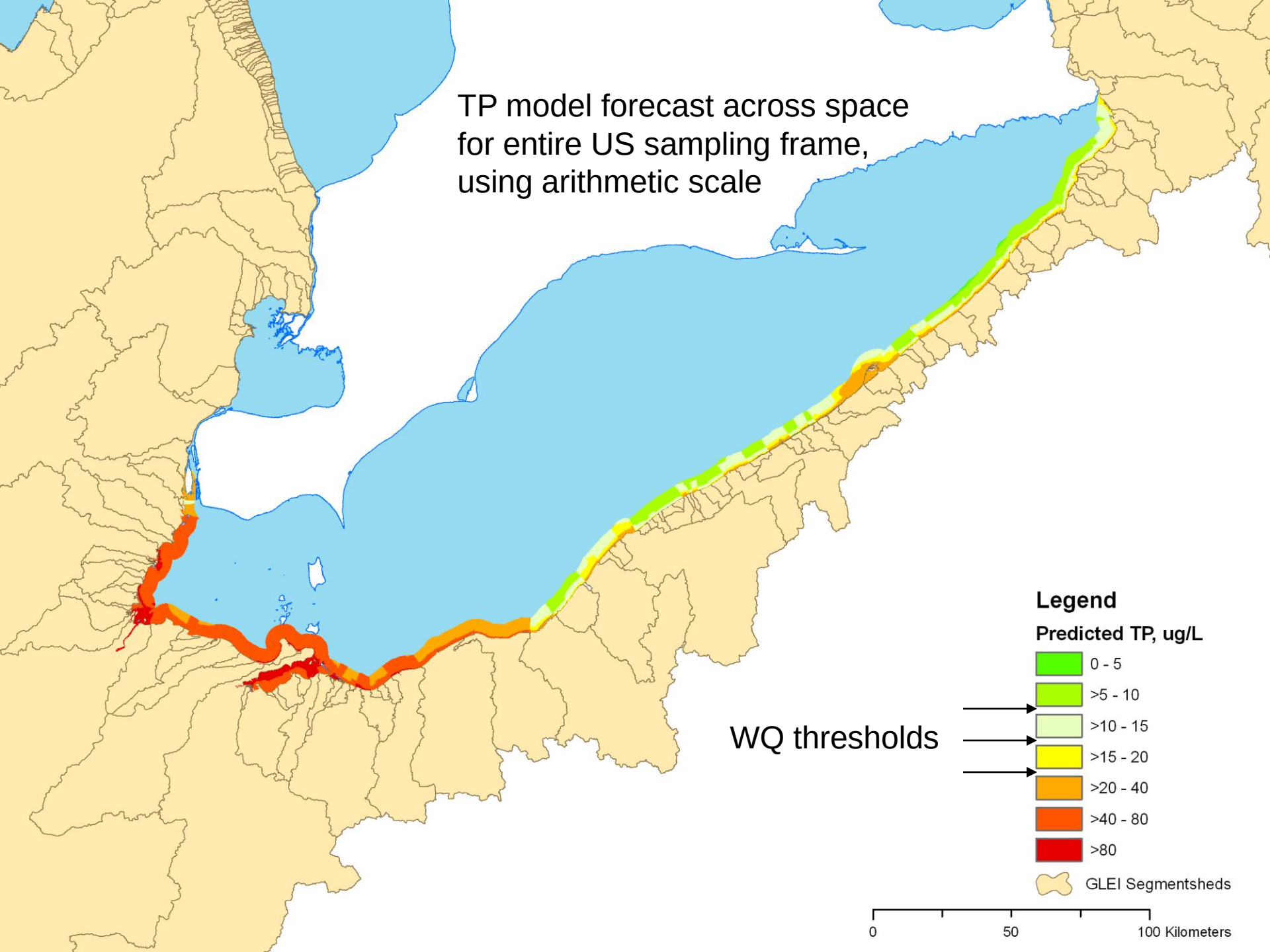
LN (TP) = 2.297 - 0.064 (Water column depth)
+ 1.317 (Agriculture (AC1) metric) + 0.210 (Point source (PS1) Metric)

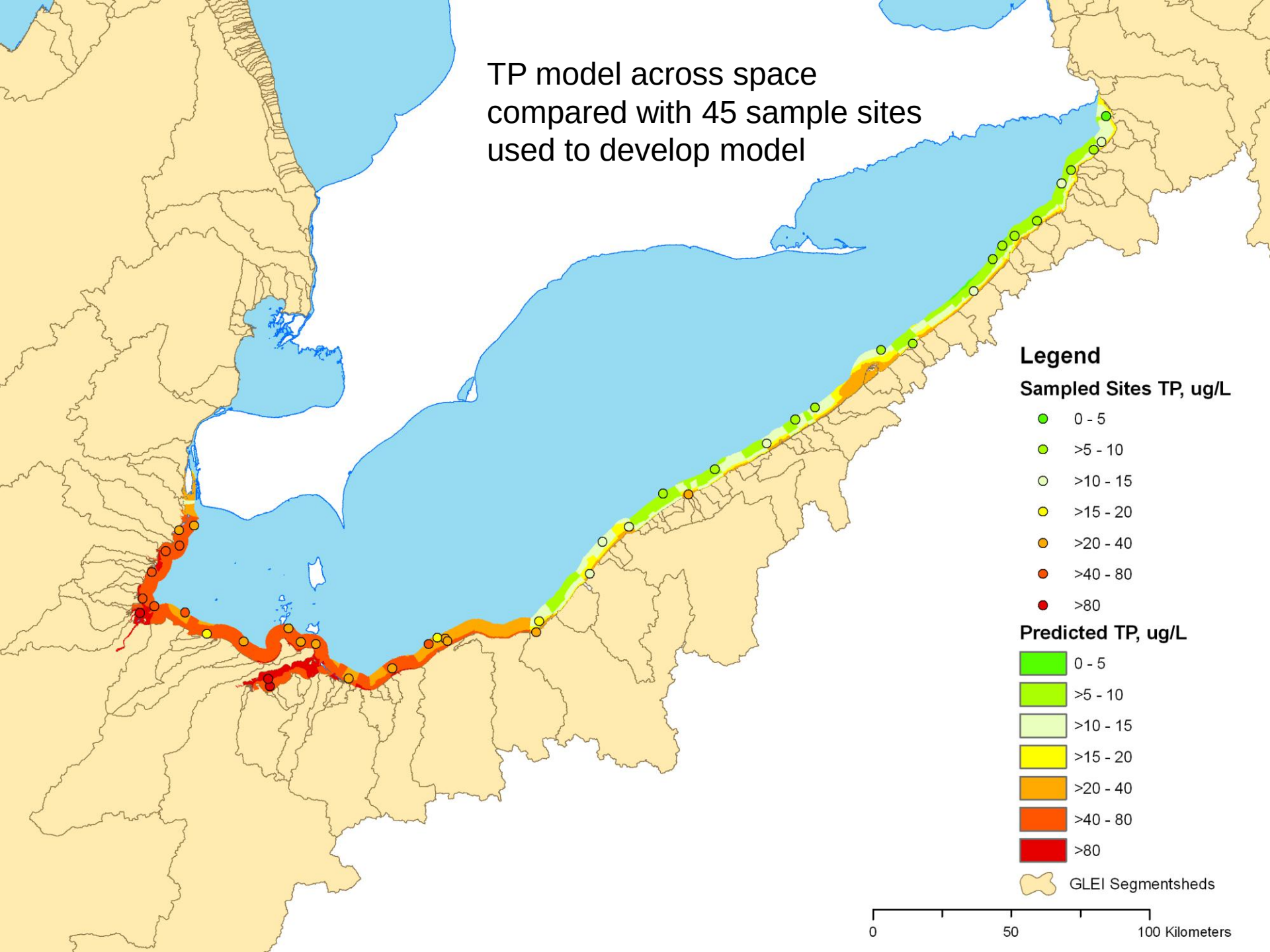
Overall Model R^2 = 0.74, N= 45 US NCCA sites

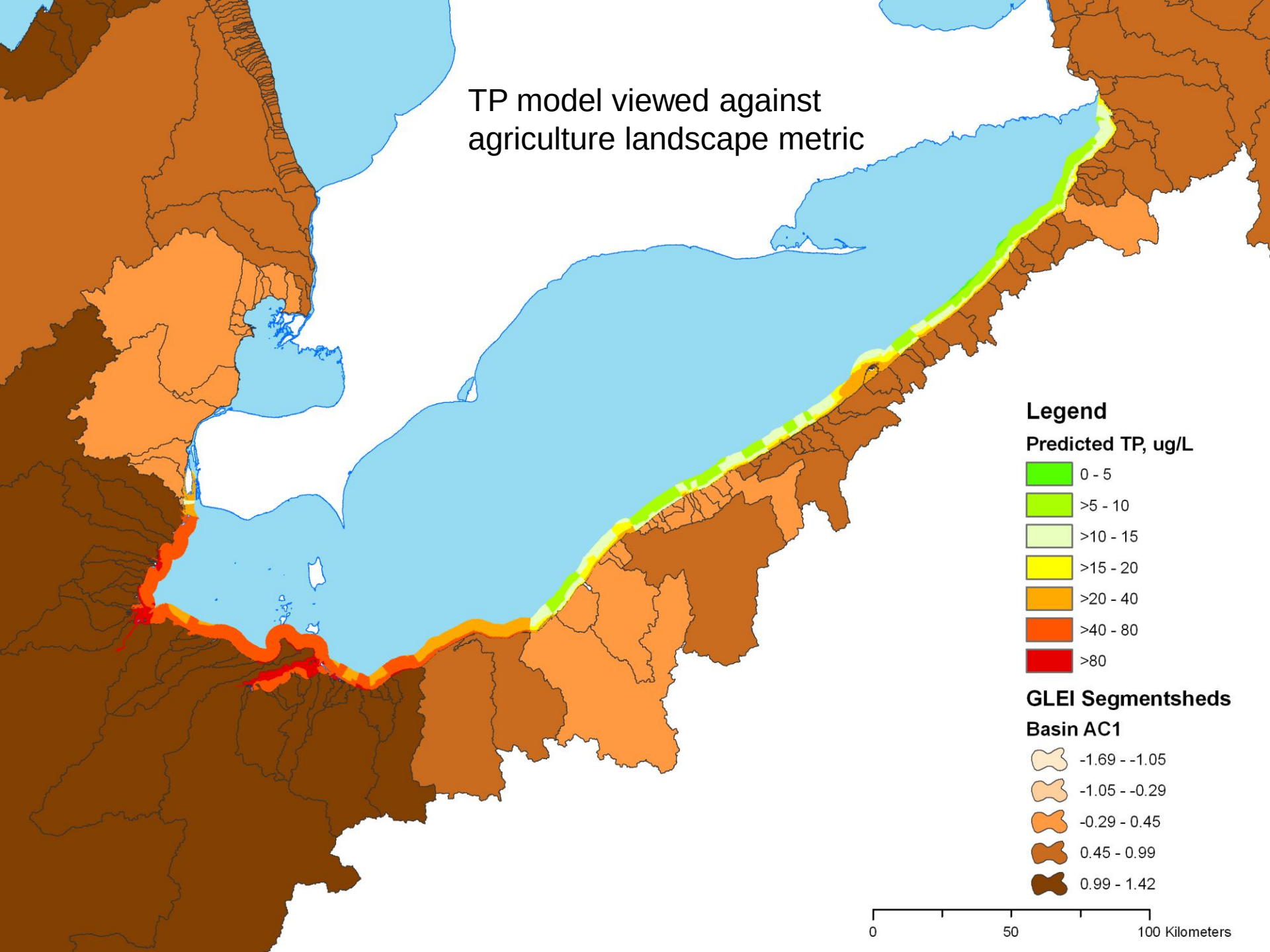


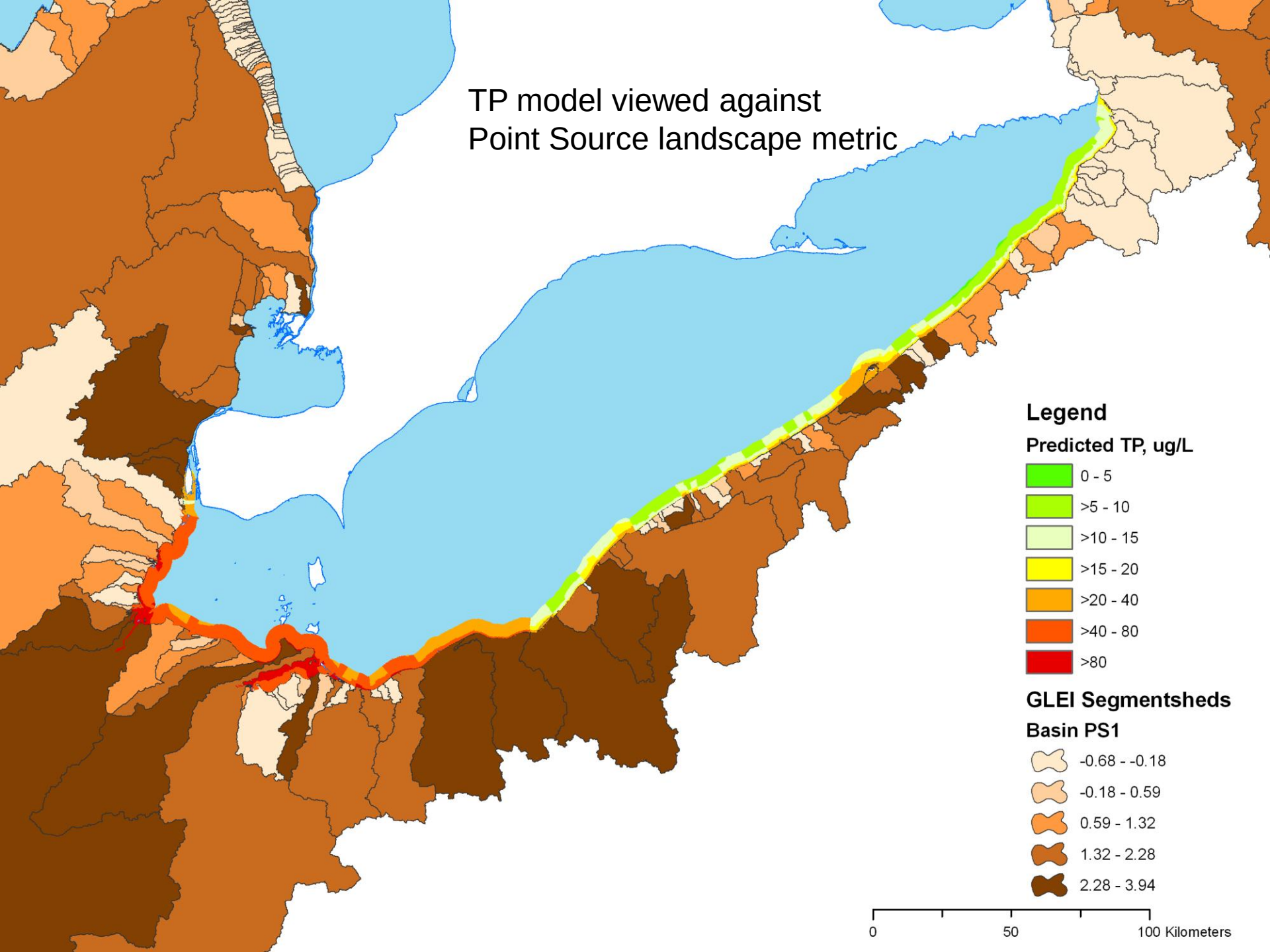
TP Concentrations and Model Stressors as Related to TP Thresholds

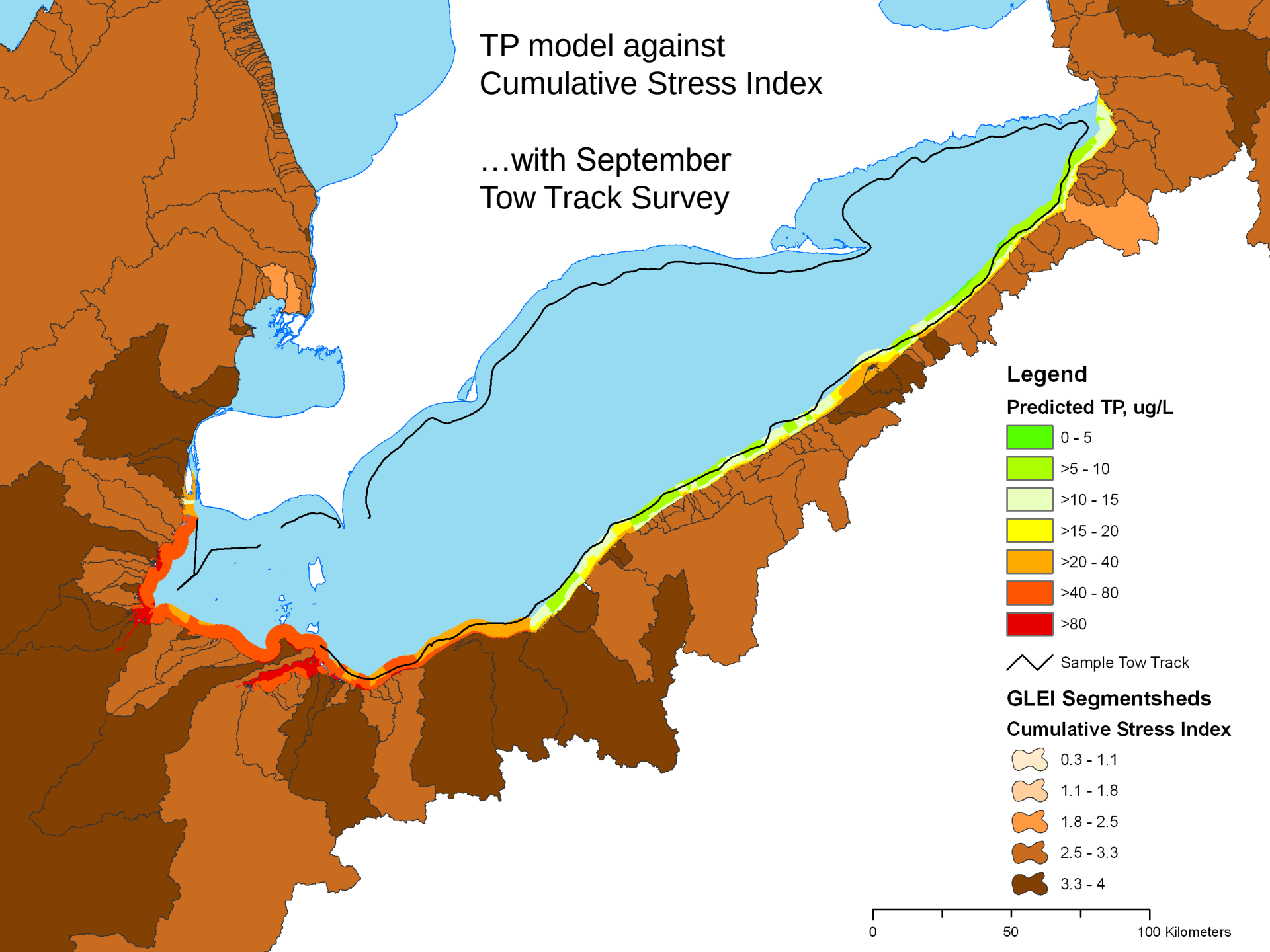


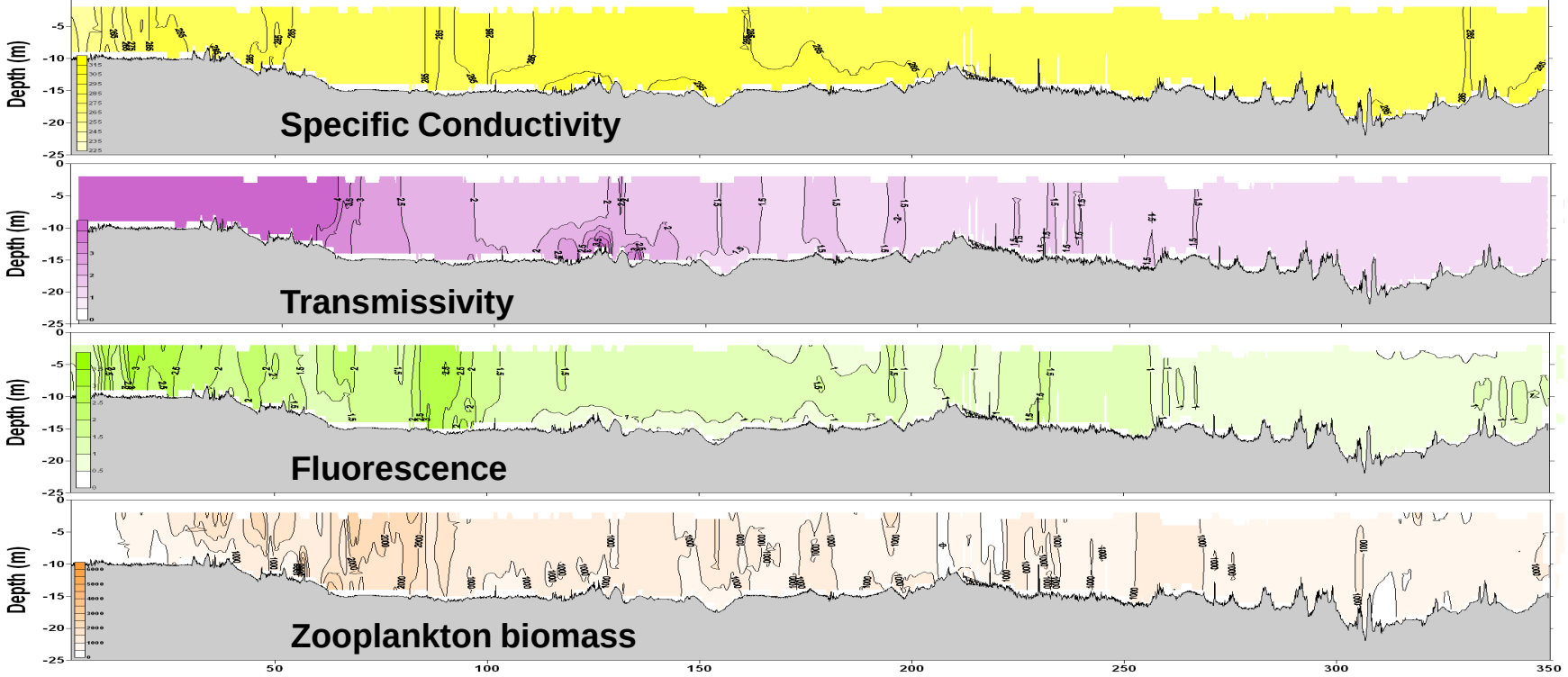

TP model forecast across space
for entire US sampling frame,
using arithmetic scale
WQ thresholds
Legend
Predicted TP, ug/L
0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 40
>40 - 80
>80
GLEI Segmentsheds
0
50
100 Kilometers

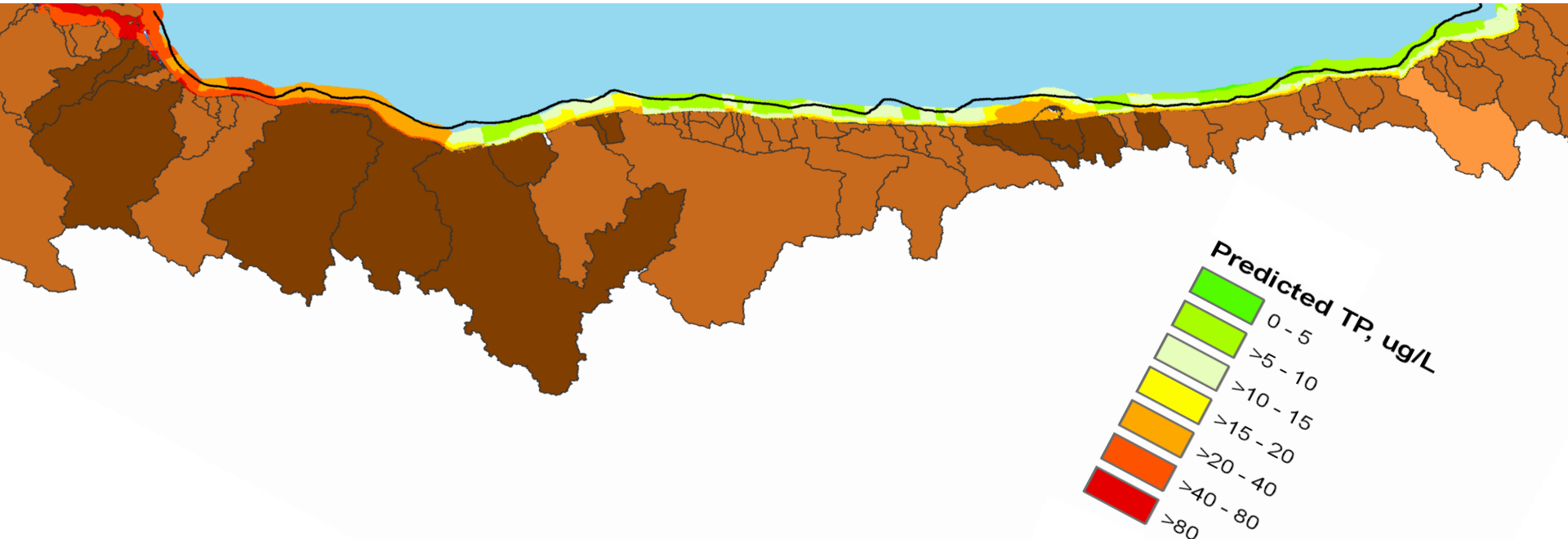

TP model across space
compared with 45 sample sites
used to develop model
Legend
Sampled Sites TP, ug/L
0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 40
>40 - 80
>80
Predicted TP, ug/L
0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 40
>40 - 80
>80
GLEI Segmentsheds
0
50
100 Kilometers


TP model viewed against
agriculture landscape metric
Legend
Predicted TP, ug/L
0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 40
>40 - 80
>80
GLEI Segmentsheds
Basin AC1
-1.69 - -1.05
-1.05 - -0.29
-0.29 - 0.45
0.45 - 0.99
0.99 - 1.42
0
50
100 Kilometers

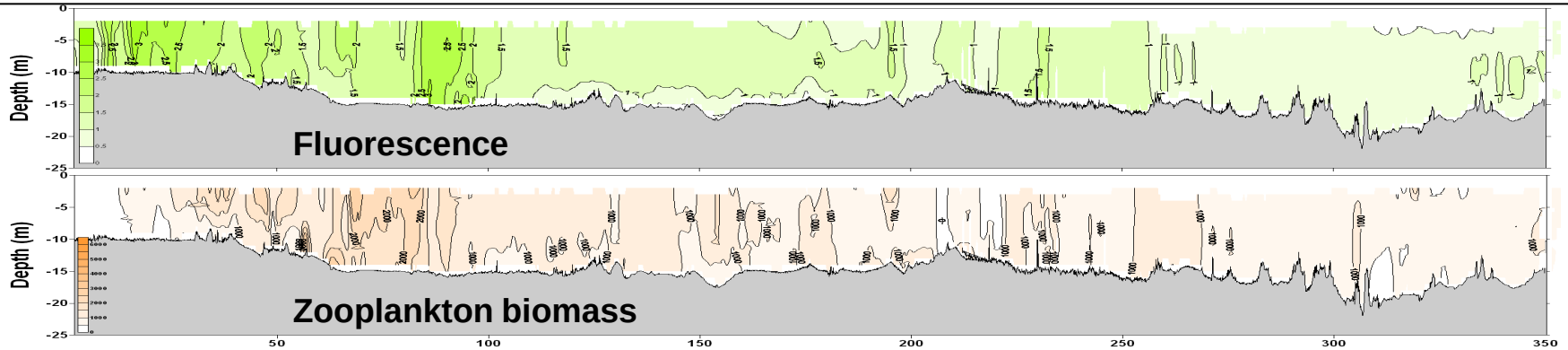

TP model viewed against
Point Source landscape metric
Legend
Predicted TP, ug/L
0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 40
>40 - 80
>80
GLEI Segmentsheds
Basin PS1
-0.68 - -0.18
-0.18 - 0.59
0.59 - 1.32
1.32 - 2.28
2.28 - 3.94
0
50
100 Kilometers


TP model against
Cumulative Stress Index
…with September
Tow Track Survey
Legend
Predicted TP, ug/L
0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 40
>40 - 80
>80
Sample Tow Track
GLEI Segmentsheds
Cumulative Stress Index
0.3 - 1.1
1.1 - 1.8
1.8 - 2.5
2.5 - 3.3
3.3 - 4
0
50
100 Kilometers


Depth (m)
Specific Conductivity
Transmissivity
Fluorescence
Zooplankton biomass
50
100
150
200
250
300
350


Predicted TP, ug/L
0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 40
>40 - 80
>80

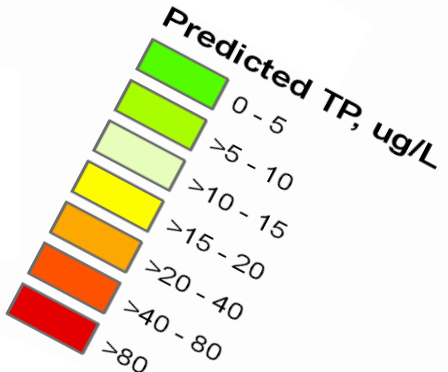
Integrated Nearshore Observing/Model System

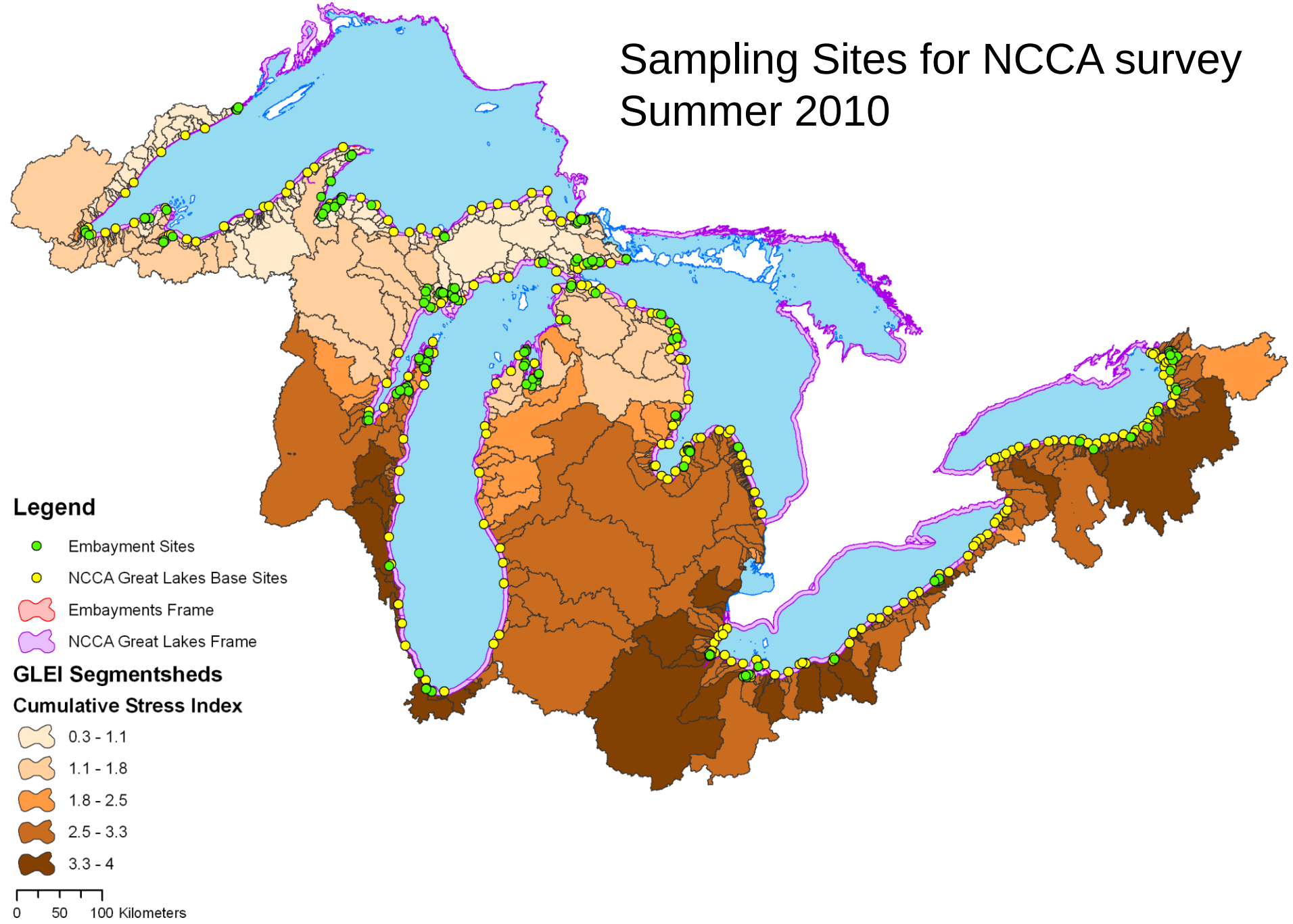


Synoptic survey results aligned with shoreline and Tow track

GLEI landscape characterization

TP spatial model from NCCA survey results




Sampling Sites for NCCA survey
Summer 2010
Legend
Embayment Sites
NCCA Great Lakes Base Sites
Embayments Frame
NCCA Great Lakes Frame
GLEI Segmentsheds
Cumulative Stress Index
0.3 - 1.1
1.1 - 1.8
1.8 - 2.5
2.5 - 3.3
3.3 - 4
0
50
100 Kilometers