The Plankton O/E Index for the National Lakes Assessment

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The grand challenge: quantifying the biological condition of complex ecosystems with a single number.

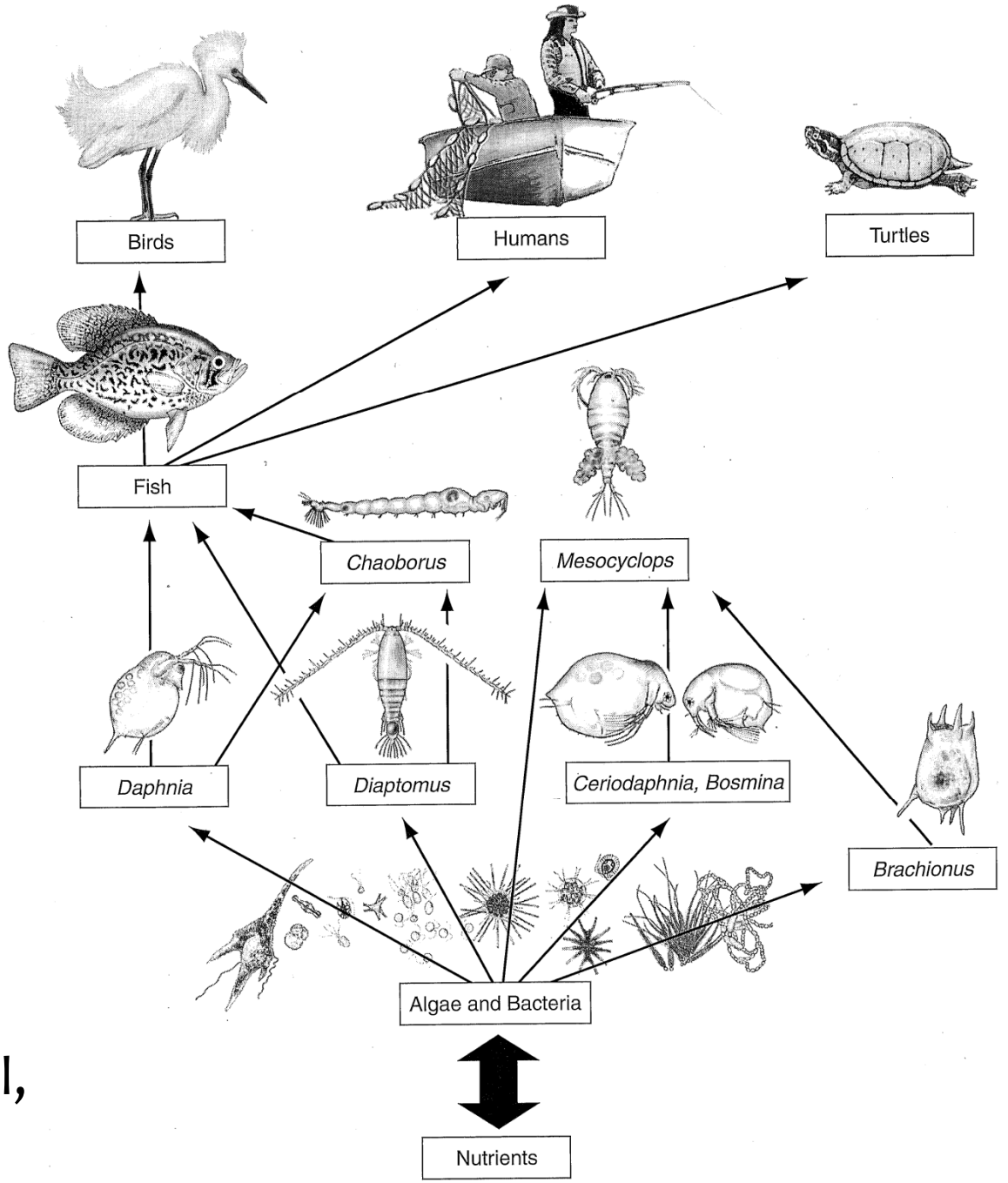
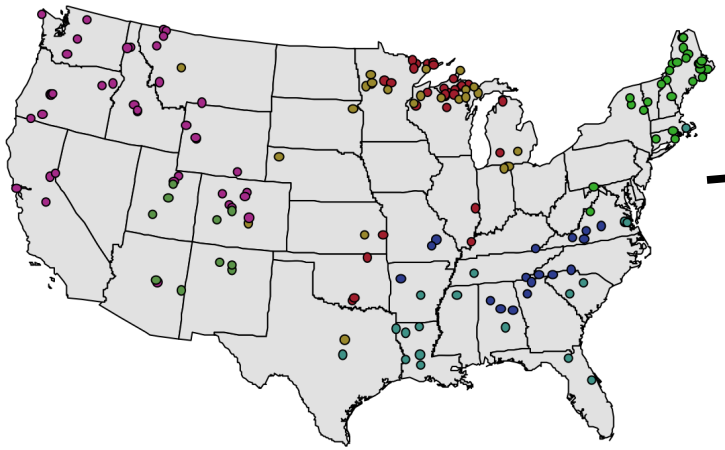


Figure from S. Dodson, 2005. Introduction to Limnology. McGraw Hill, Boston.

The O/E Index

Reference Sites



Site x Taxa
Site x Predictor
Matrices

Model

Assessed Sites

Observed Taxa

Predicted Taxa

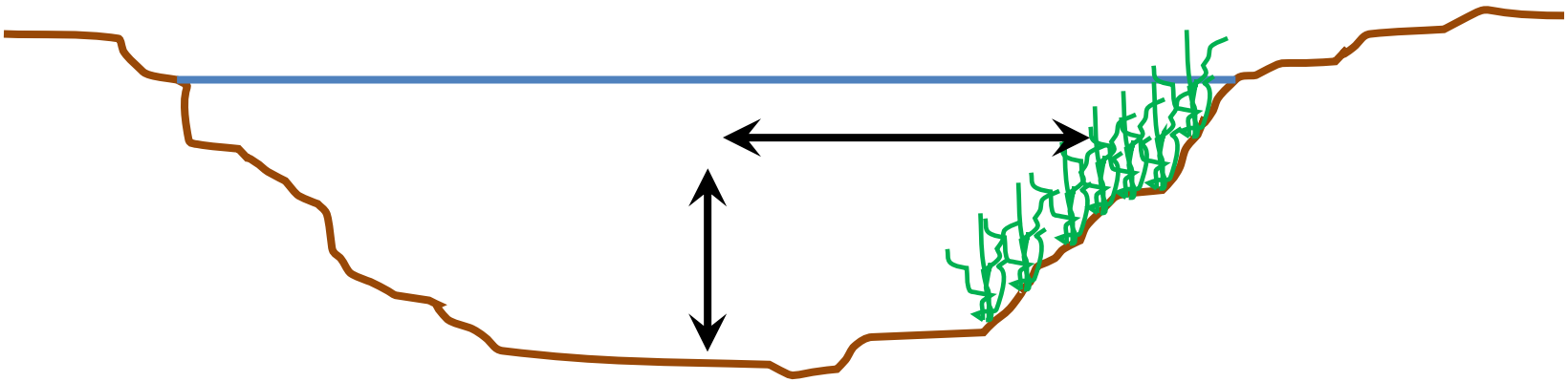
O/E

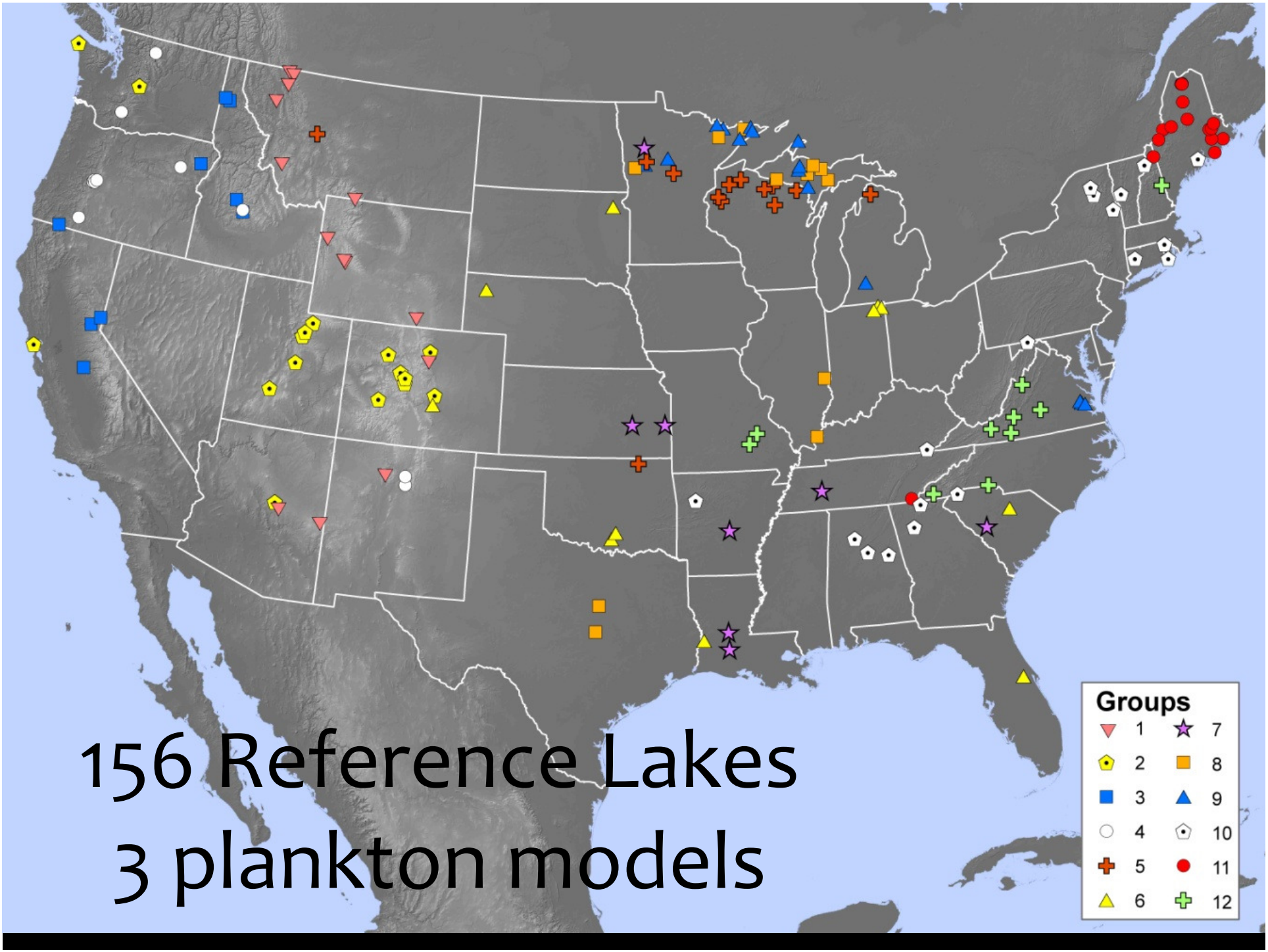
The Plankton
(359 taxa)

Zooplankton	Phytoplankton
(95 taxa)	(264 taxa)
28 Brachionidae	96 Chrysophyta
4 Notommatidae	(66 diatoms)
9 Daphniidae	89 Chlorophyta
3 Sididae	54 Cyanophyta

What is the NLA Plankton?

Plankton tows catch
euplankton + epibenthic + some benthic organisms

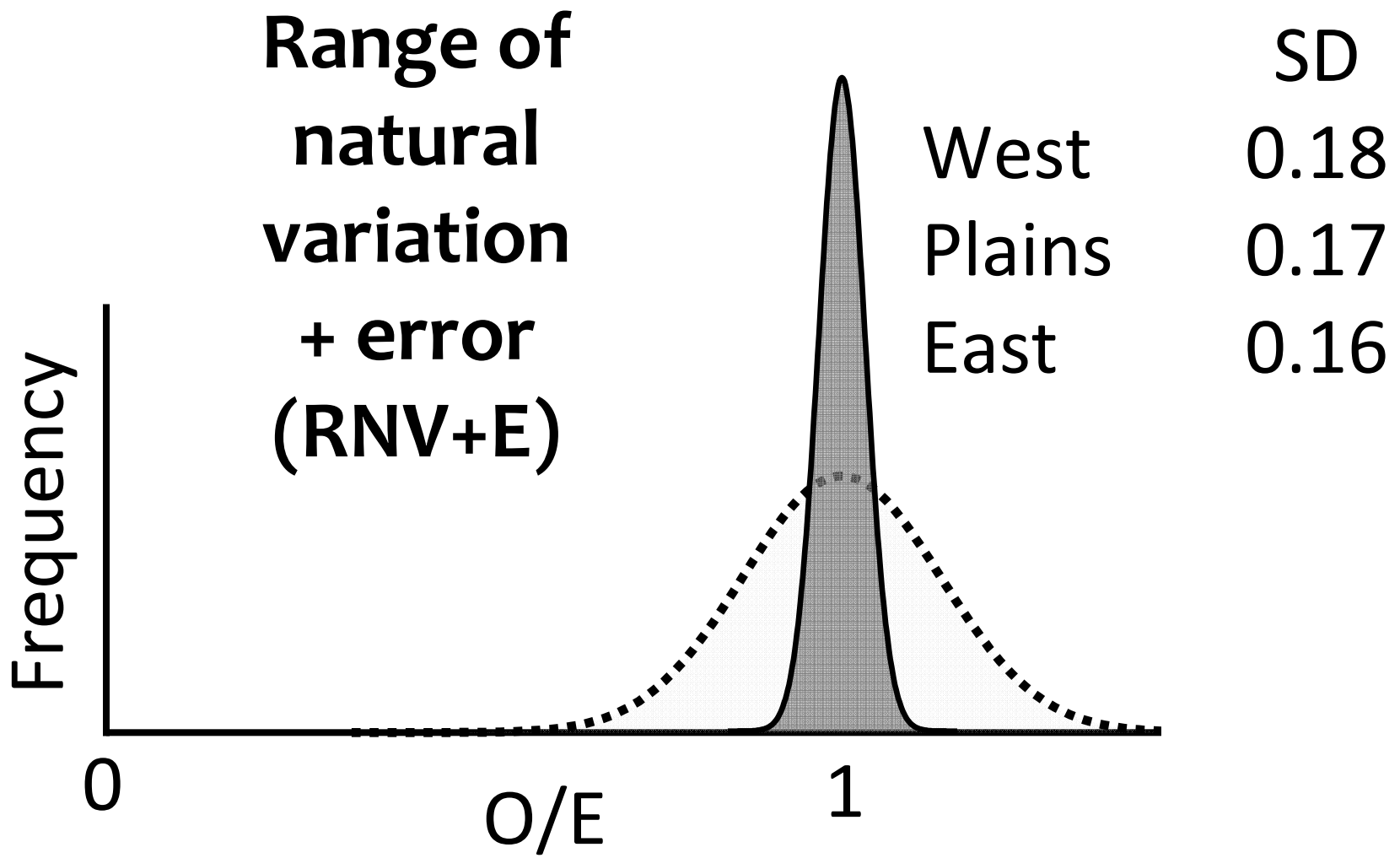



156 Reference Lakes
3 plankton models
Groups
1
2
3
4
5
6
7
8
9
10
11
12

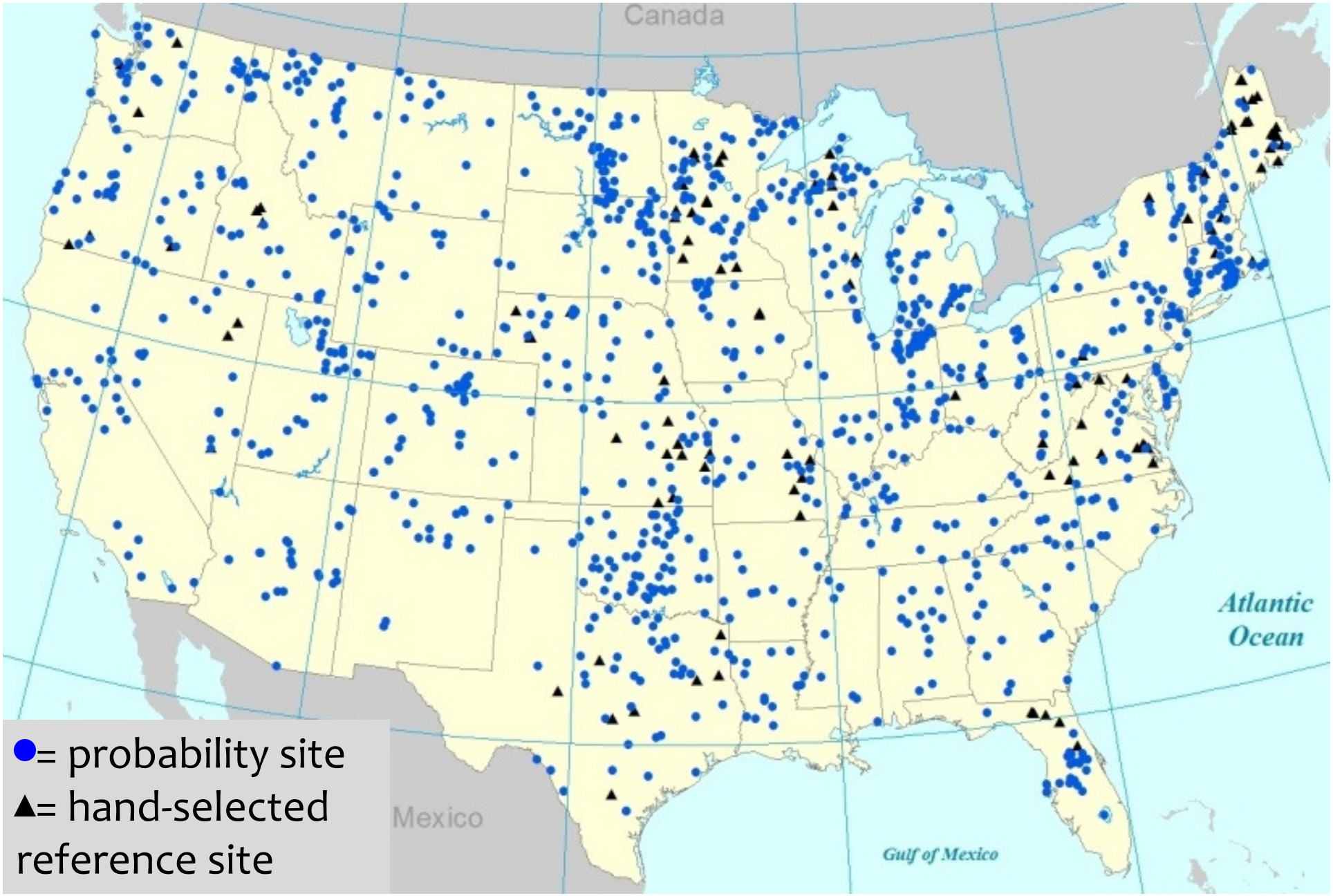
Predictors

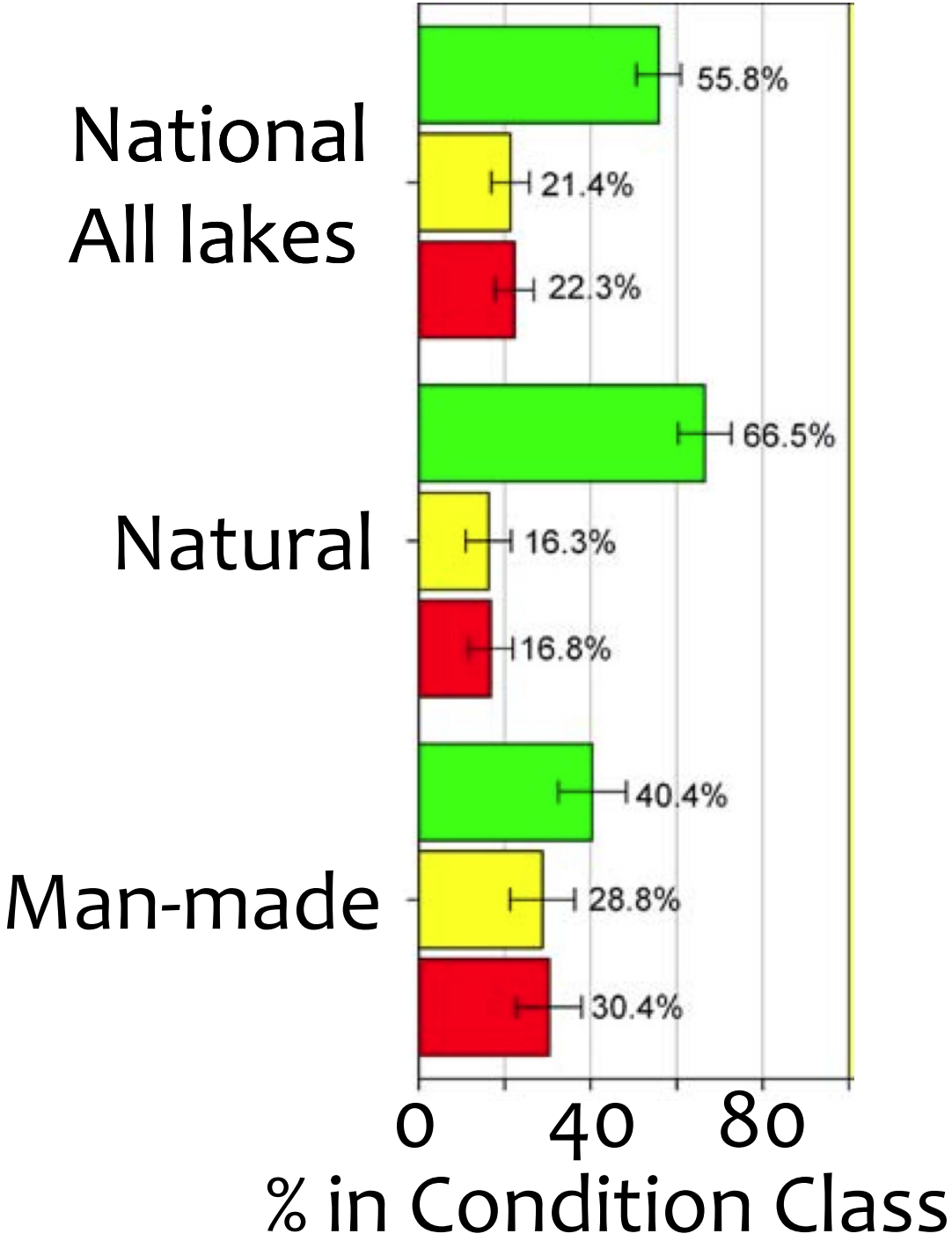
Western Mountains	**Plains & Lowlands**	**Eastern Highlands**
Soil WHC	Temperature	Depth to H2O
Longitude	Nat/Man	Rock Depth
Calcium	Perimeter	Bulk Density
Soil Perm	Precipitation	Soil WHC
Depth to H2O	Basin Size	
	Lake Size	
	Macrophytes	

Model Performance?



909 lakes: 59% natural, 41% constructed





Plankton O/E

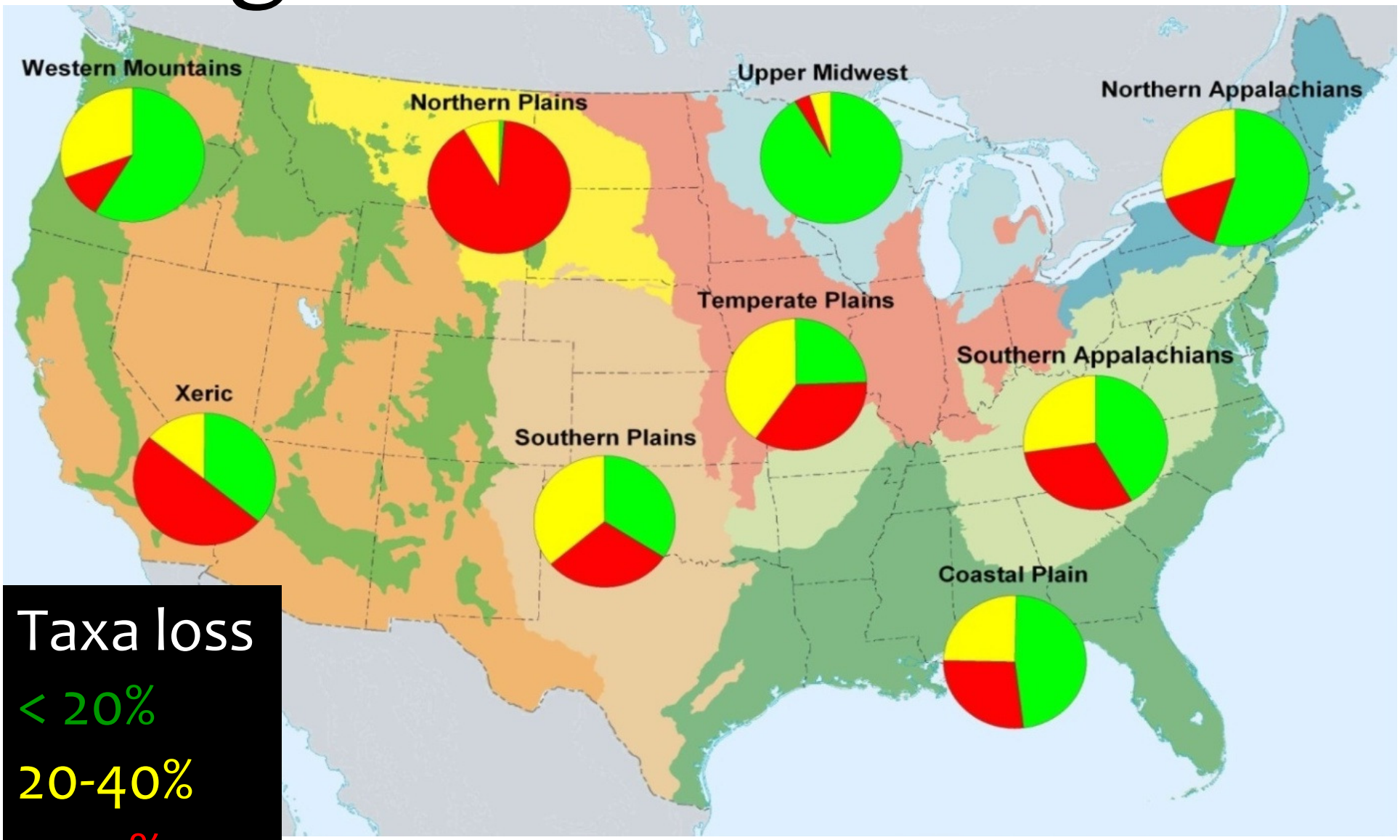
Taxa loss

< 20%

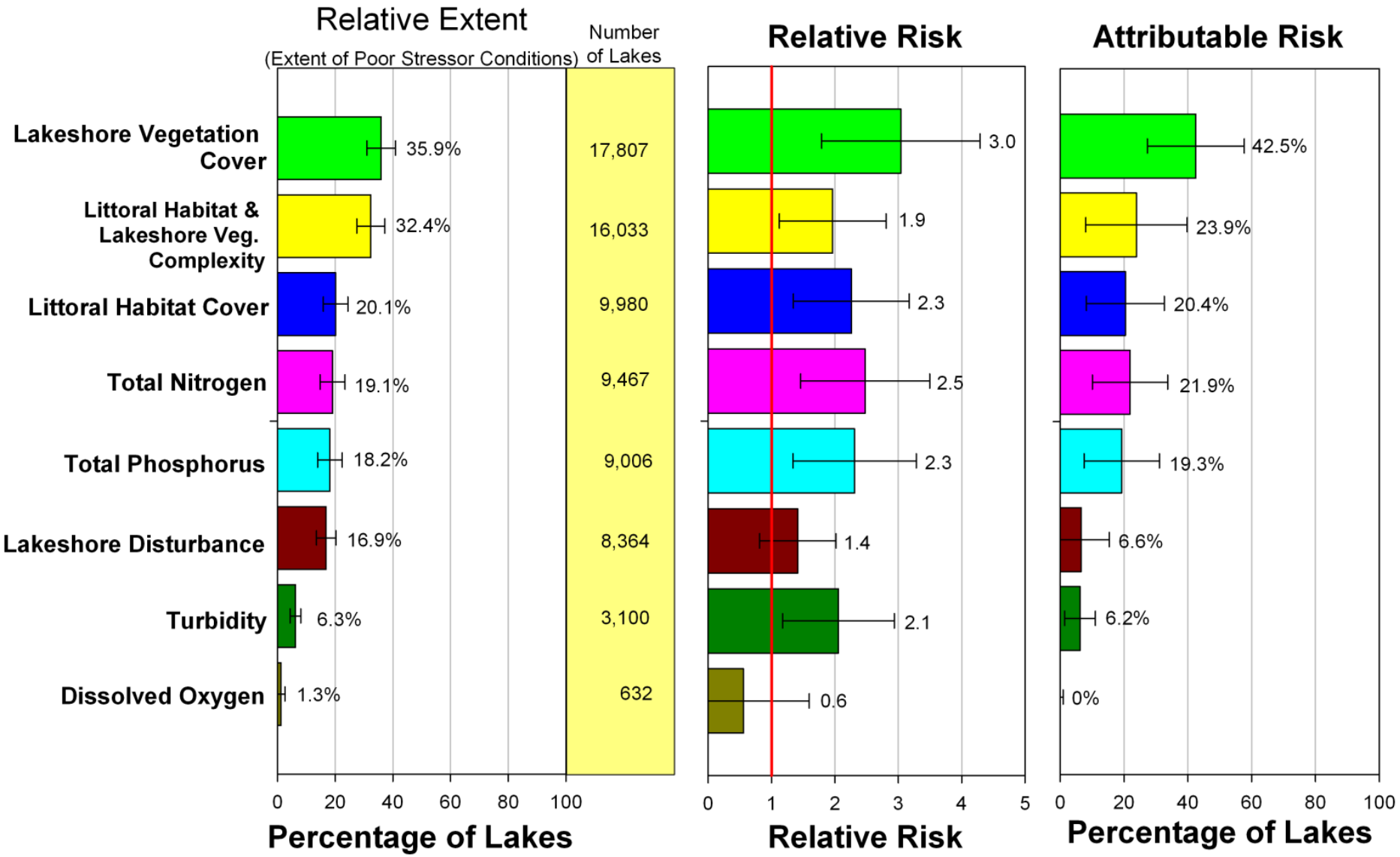
20-40%

> 40%

Regional Variation in O/E



Relative Risk and Attributable Risk
AR = percent of poor biology sites associated with a specific stressor



Biggest Losers/Winners

West	Plains/Low	East
Coliothecidae	Keratella tau.	D. longiremi
Chromulina	Holopedilum	Holopedium
Keratella hiemalis	Gloeotila	Dictyosphaerium
Holopedium	Trichtridae	Quadrigula
Ploesoma	Temoridae	D. calawba/pulex
Pompholyx	B. caudatus	Fragilaria
Ceratium	B. angularis	Mallomonas
Ceriodaphnia	B. havanaensis	Euglena
Trachelomonas	Pediastrum	Synura
Scenedesmus	Aulacoseira	Ceriodaphnia

Caveats/Feedback/Questions?

- Caveat – Observed macrophyte cover is not an ideal predictor – need a surrogate.
  - Some plains lakes may look too good.
- Does the assessment make sense?
  - Yes, but lot of questions re: natural controls on lake plankton communities.
- Would I use the models at state or site level?
  - Maybe.