



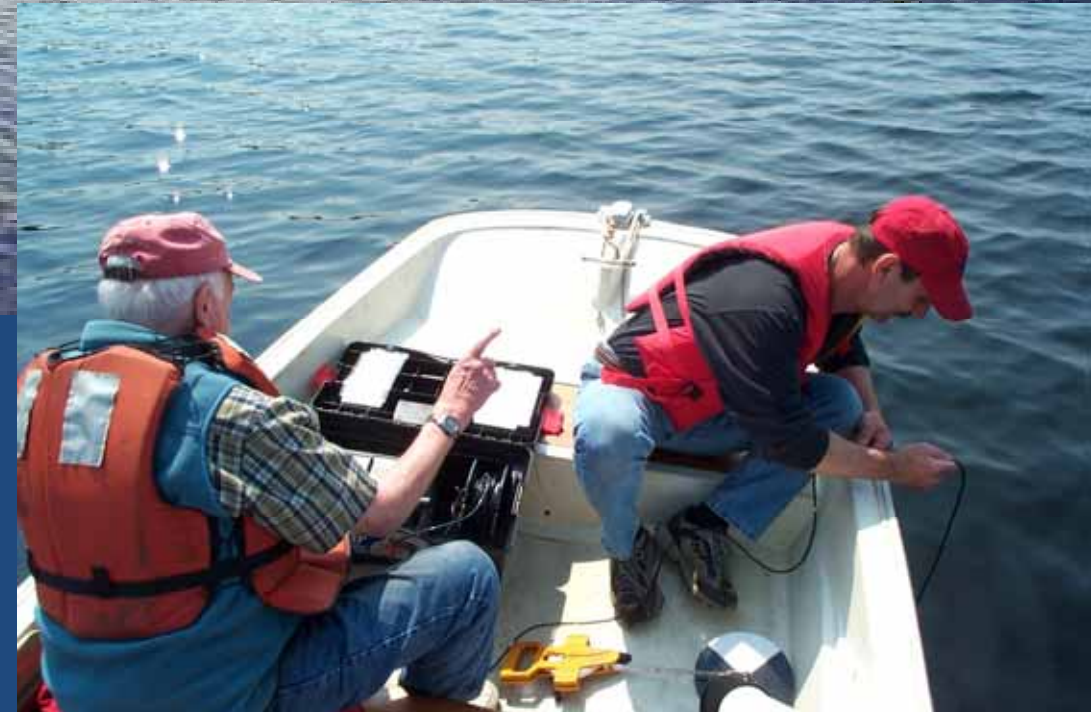
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of
Land & Water Quality

STATE OF MAINE

Maine and the National Lakes Assessment: Where Does Maine Stand ??

With Apologies to Neil Kamman



Basic Components of Surveys

*Randomized design to report on

- Biological and habitat condition
- Recreational condition
- Trophic state

*1,028 lakes sampled + 124 reference lakes

*Standard protocols

*Nationally consistent and regionally relevant analyses



Lake Conditions Assessed by Region

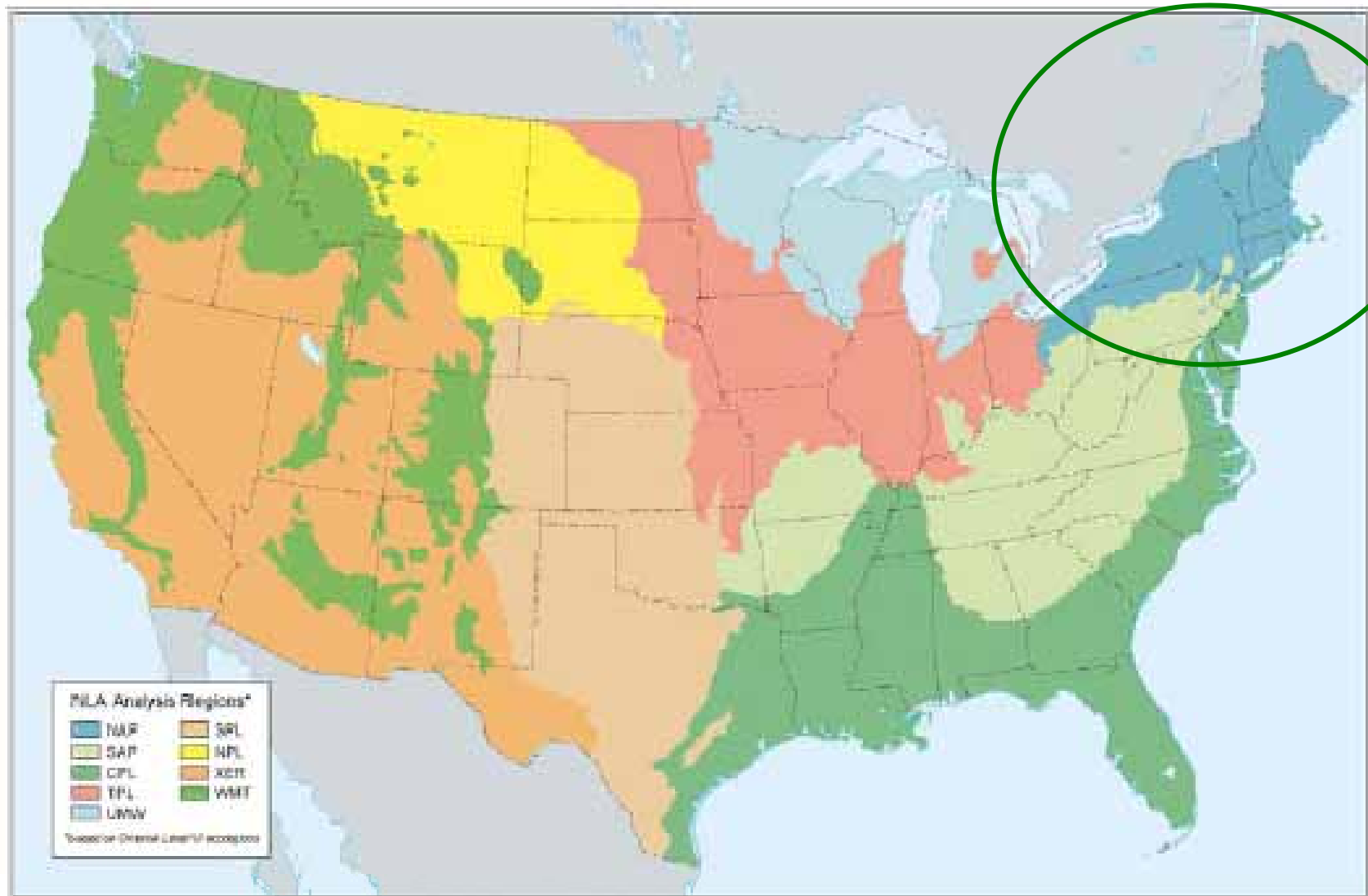
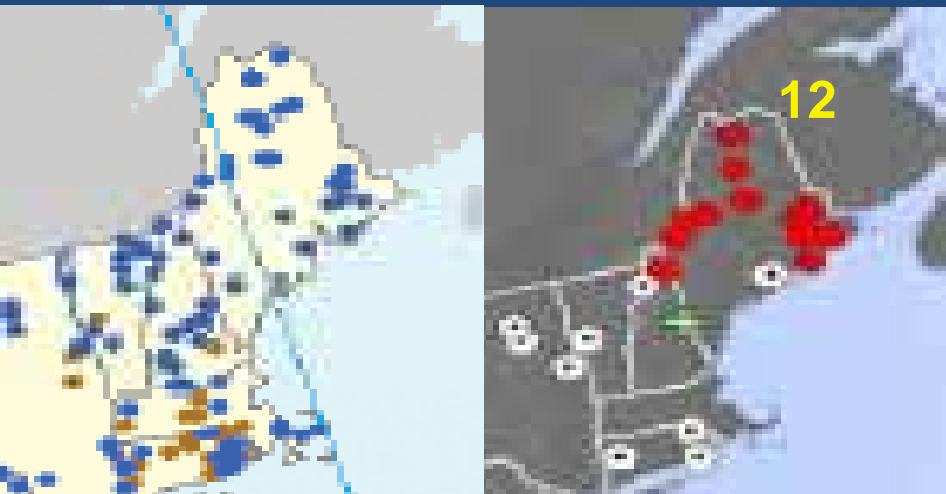
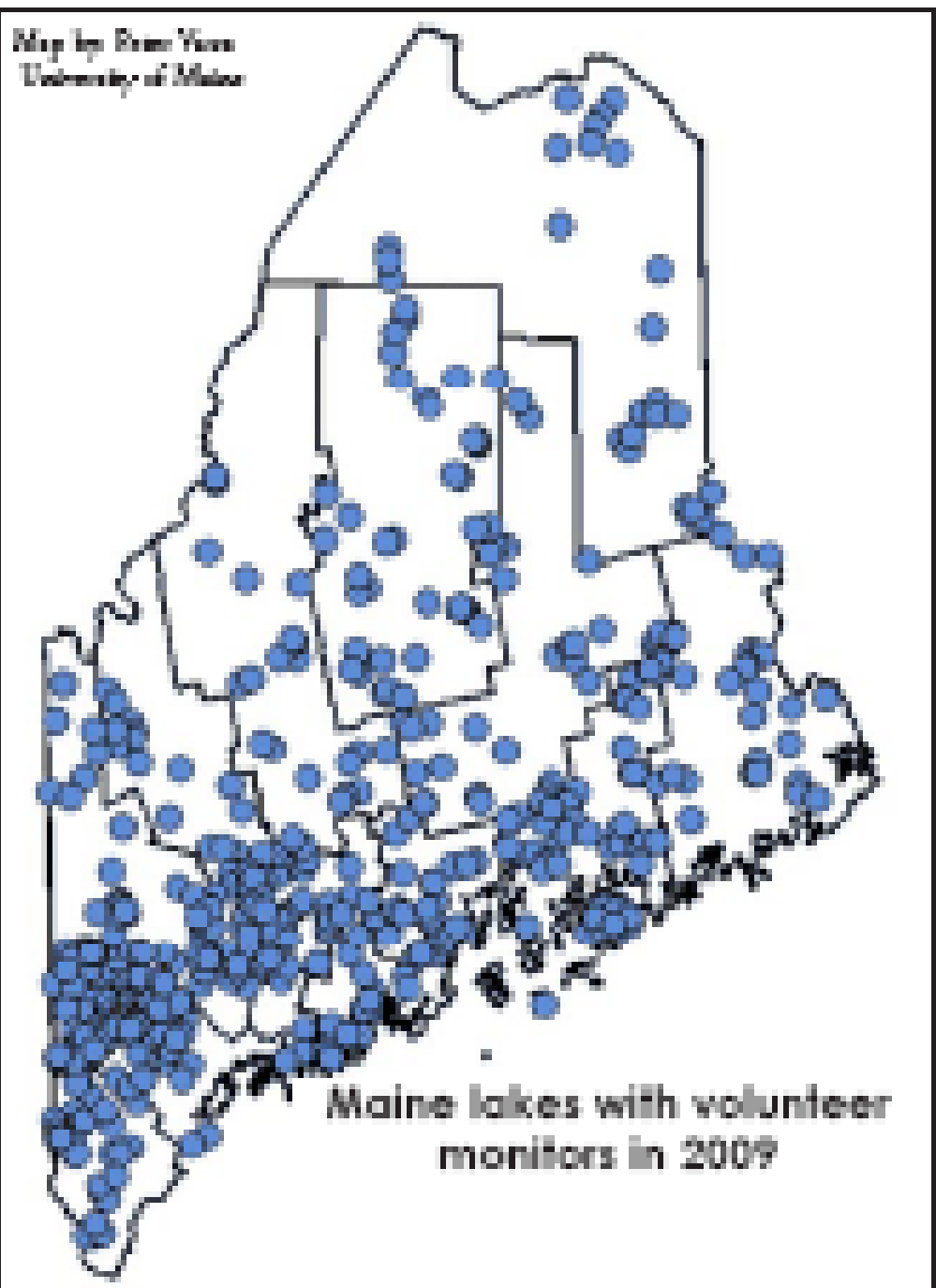


Figure 20. Ecoregions used as part of the National Lakes Assessment.

The NLA represents: • 49,560 “lakes”

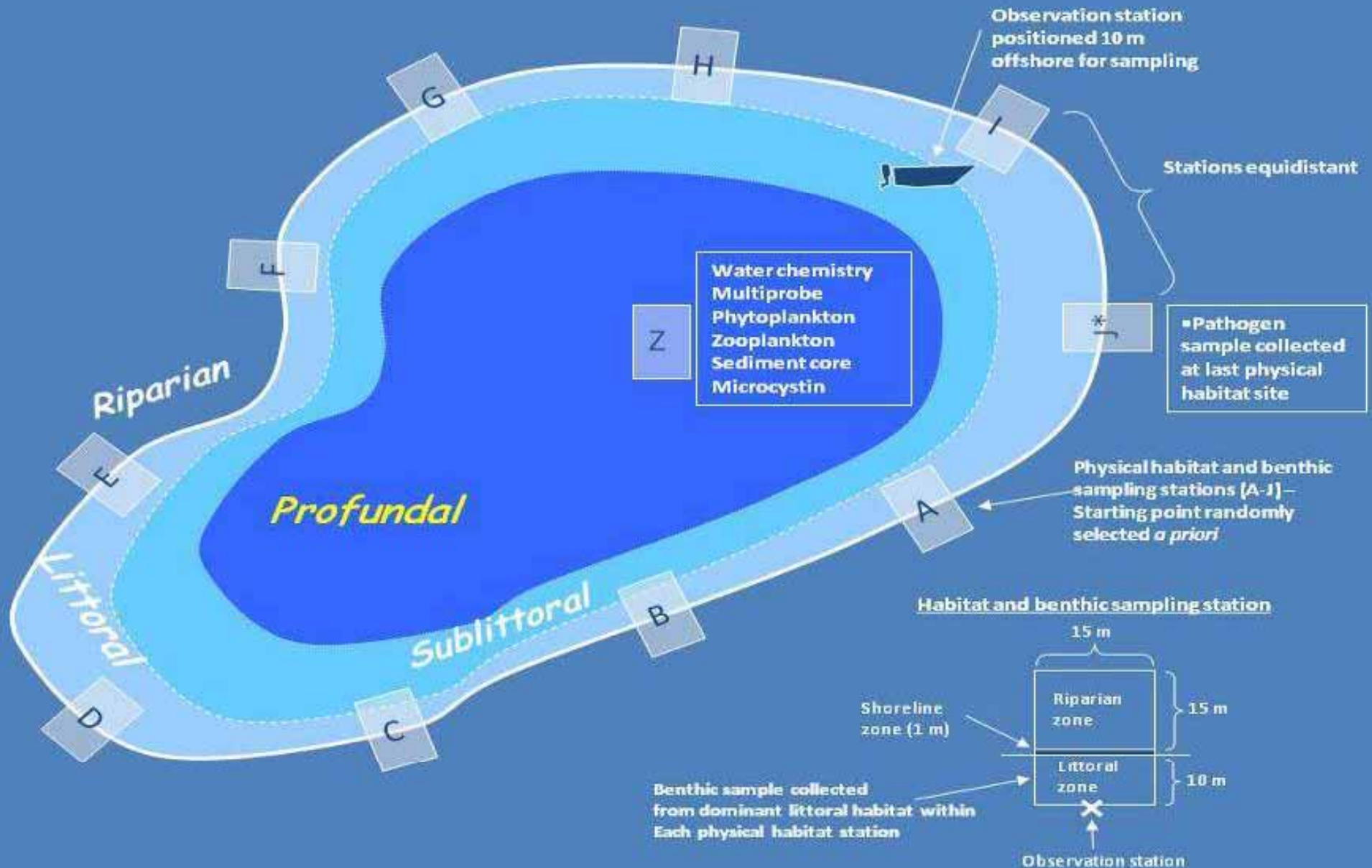


National Lakes Assessment:

- 
- **Biology**
 - Ecological integrity
 - **Habitat Quality**
 - Disturbance and integrity
 - **Trophic State**
 - Enrichment
 - **Chemical stressors**
 - Nutrients, Acid and DO
 - **Recreational Use**
 - Cyanotoxins
 - **Change over time**
 - Sediments and nutrients

JUL 28 2007

National Lakes Assessment: Sampling Approach



Condition of the Nation's Lakes: Habitat

- 55 individual habitat attributes captured at each site (550/lake).
- Metrics reduced to four indices of habitat quality:
 - Human Disturbance on Lakeshores
 - Riparian Zone Integrity
 - Littoral Zone Integrity
 - Complexity of Riparian/Littoral Interface
- Disturbance index scores assessed against nationally consistent thresholds
- Riparian/littoral indices assessed against regionally-explicit reference conditions (*corrects for expected regional differences*)

Extent of Stressors and Resulting Risk: What Impacts Biological Condition?

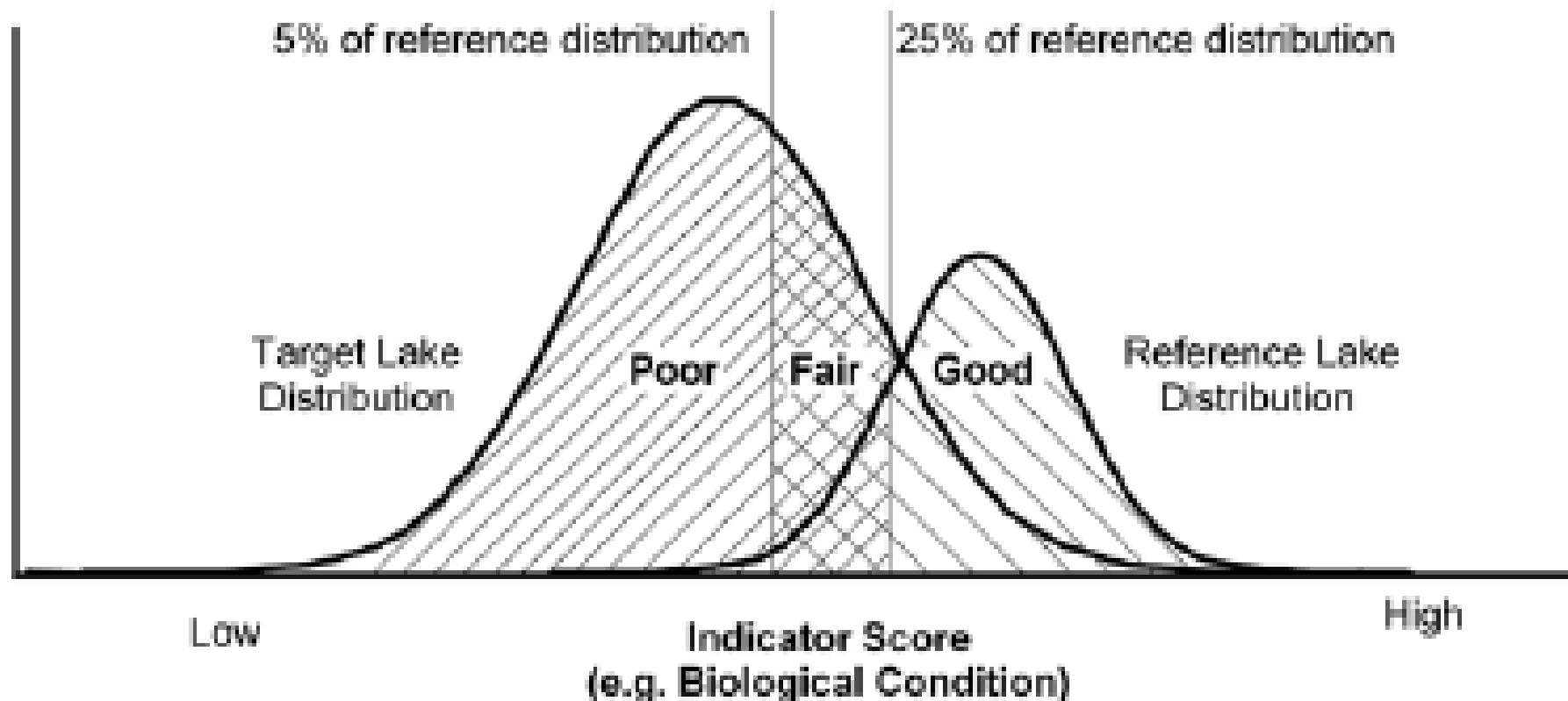


Figure 5. Reference condition thresholds used for good, fair, and poor assessment.

Chemical Stressors : DO, Acidity, Nutrients

- Lake conditions with respect to dissolved oxygen and acidification were assessed using fixed national thresholds
- Nutrient levels were assessed using regionally-varying thresholds.

Oxygen (upper 2 m water column)	High	Moderate	Low
	≥ 5ppm	3-5 ppm	<3 ppm
Acidification	Non acidic	Acidic natural	Acidic Anthropogenic
	>50 ueq. ANC	≤50 ueq ANC (DOC ≤5 ppm)	≤0 ueq. ANC (DOC ≤ 5ppm)

Maine data (acid.)

> 92%

----- <1-- 6.5% ----

• Northeast Lakes

• EPA Thresholds

Maine Guidance

	TP	Chl_a		TP	Chl_a	SD
Good	< 16.5	< 3.6	Oligo.	< 4.5	<1.5	>8
Poor	> 7.6	> 12.5	Eutro.	>20	>7	<4

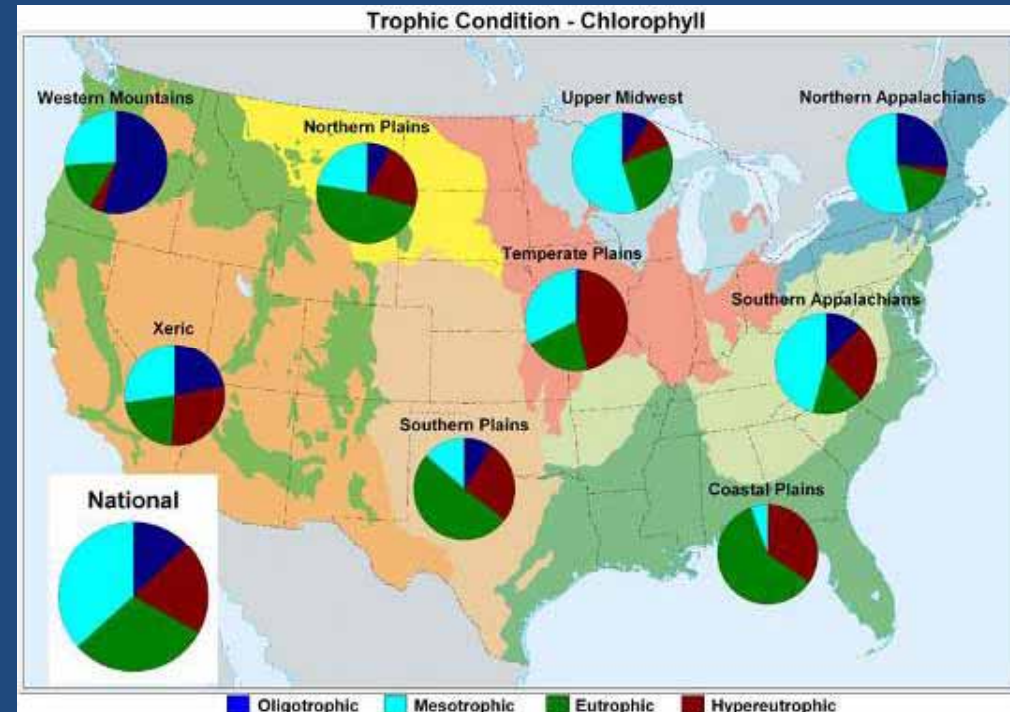
Trophic State

National Region Maine Maine

(32 Lks) 305(b)

Oligotrophic	15 %	26 %	75%	7 %
Mesotrophic	42 %	54%	22%	59 %
Eutrophic/hyper	43 %	20%	3%	34 %

Primarily used chlorophyll-a
Also used total phosphorus,
total nitrogen, Secchi.

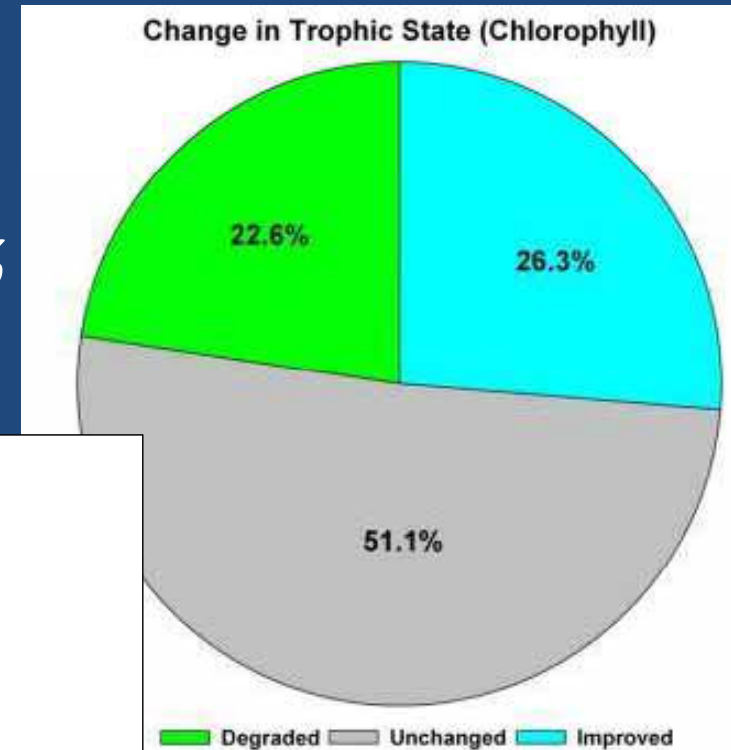


Trends: National Eutrophication Survey and NLA: Change Between 1972 and 2007

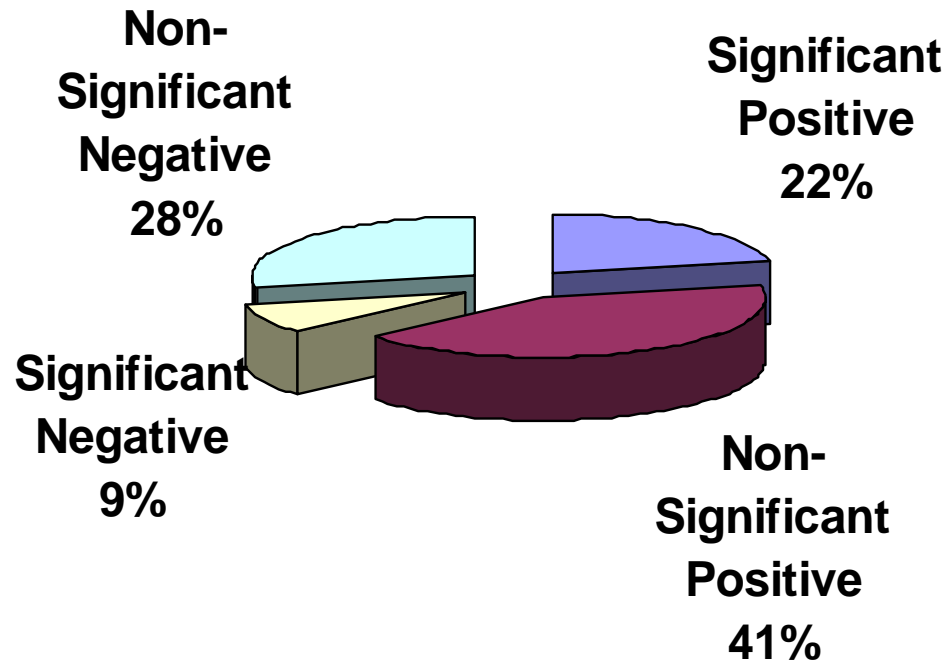
- 26% of NES lakes improved
- 51% of NES lakes showed no change

P improved in 50% & trophic state in 26%

Due to wastewater treatment and NPS ++ ?



Maine 2001 review 184 Lakes 10 Years June, July, August, September



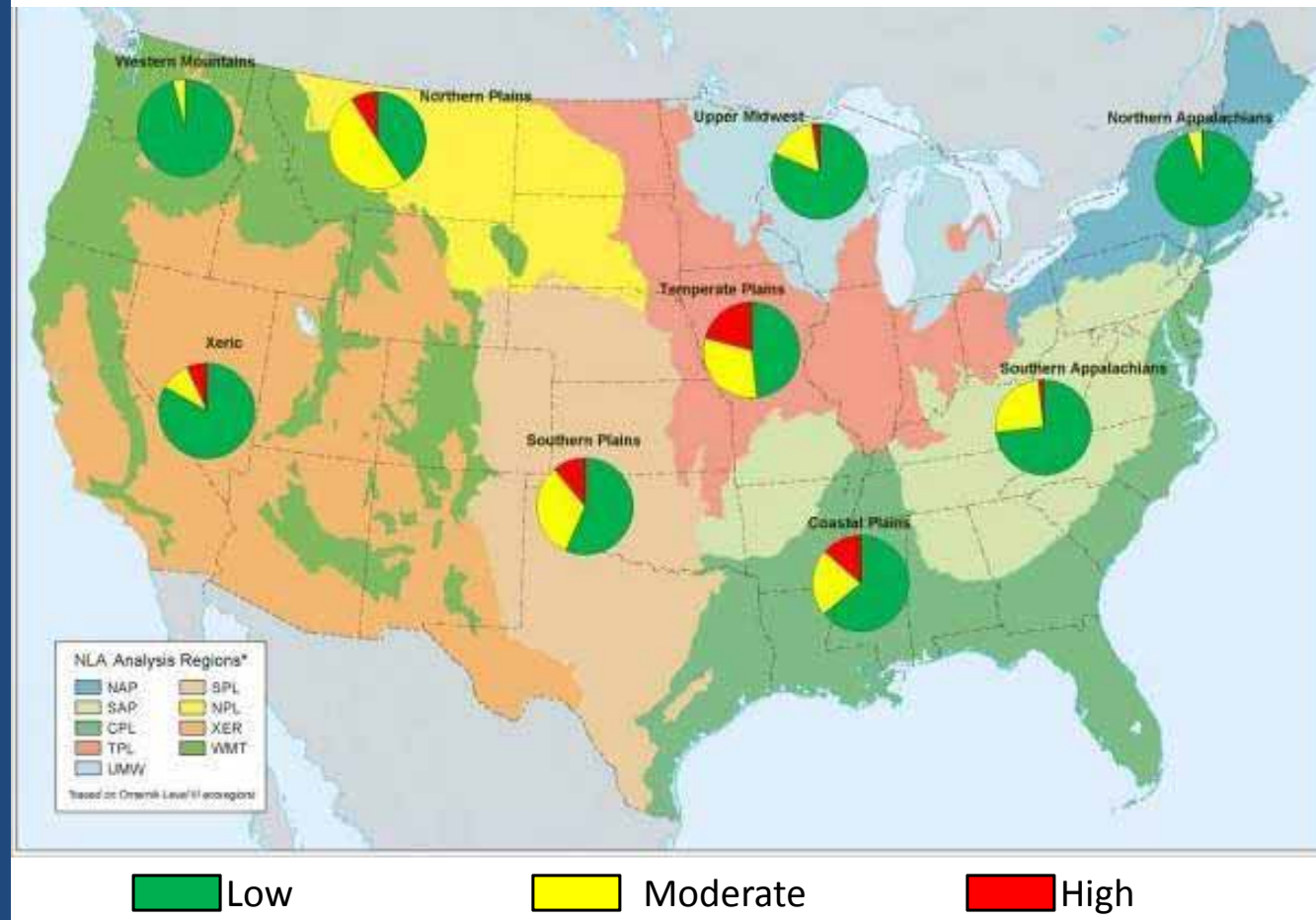
son of change in trophic status of
es

Recreational Condition of the Nation's Lakes: Algal Toxins

National Summary:

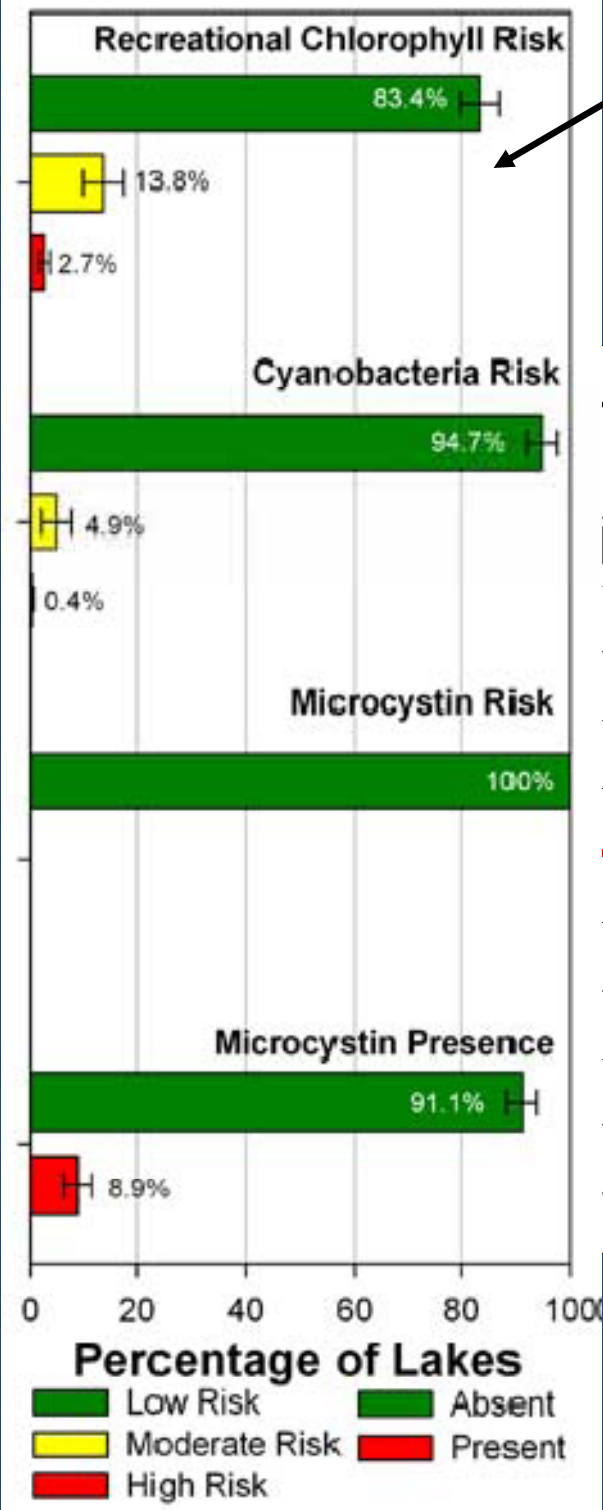
- Microcystin detected in 30% of lakes and at levels of concern in 1%
- Exposure risk based on cyanobacteria:
 - 73% of lakes exhibit low risk
 - 20% moderate risk
 - 7% high risk
- WHO thresholds for cyanobacteria:
 - Low risk (<20K) cells
 - Mod. risk (<100K) cells
 - High risk (>100K cells)

Risk of cyanotoxin exposure based on measured cyanobacteria



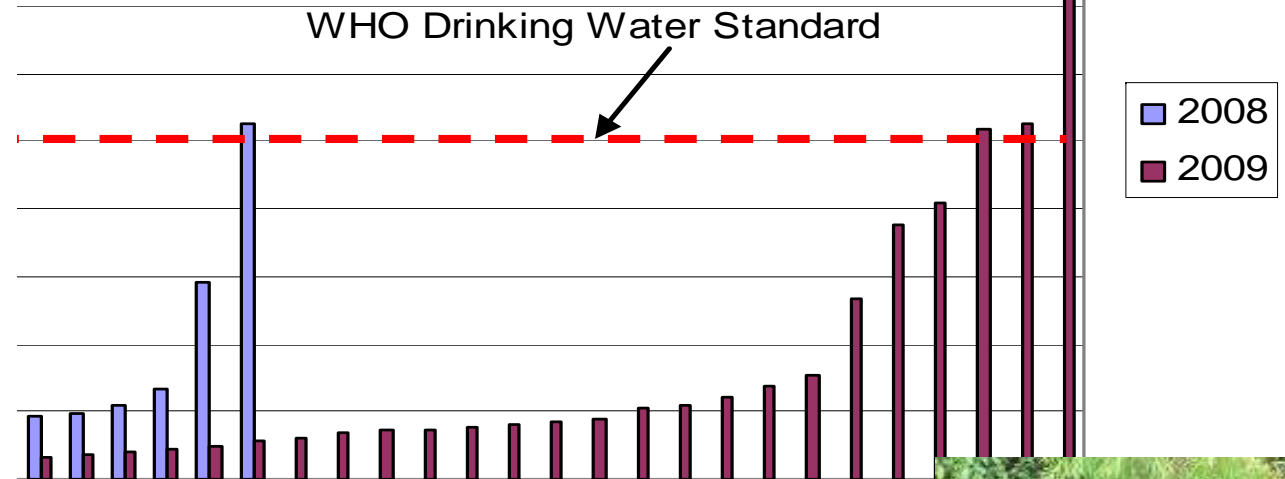
Northeast Results 2007

Lakes and Cyanotoxins



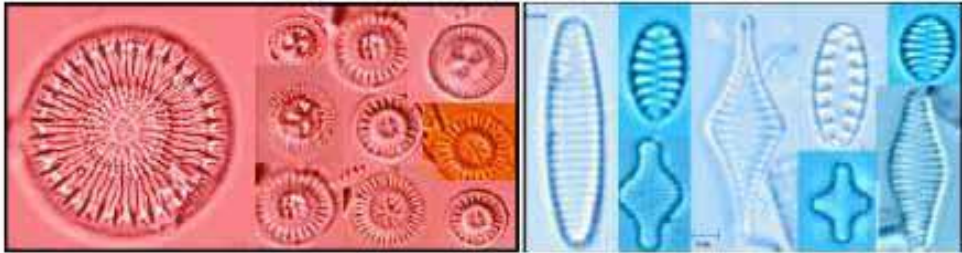
-09 Microcystin Positive Lake Samples

NLA : 84% (27) were non-detect in Maine
 DEP : 60% (72) were non-detect

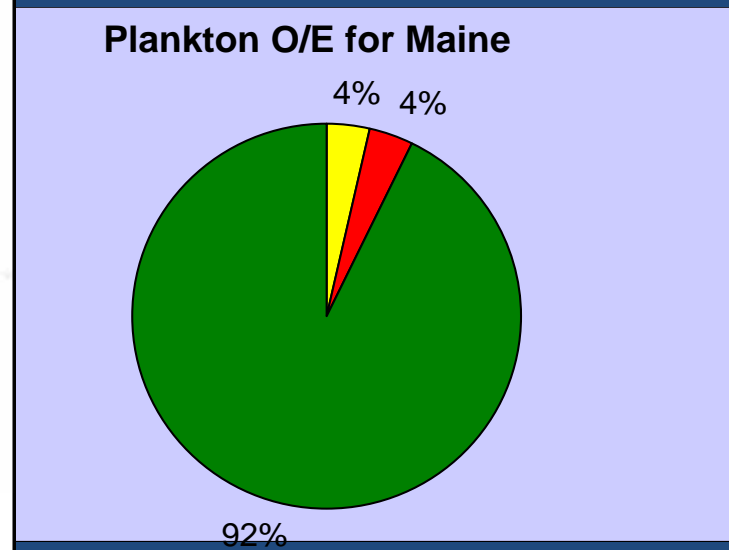
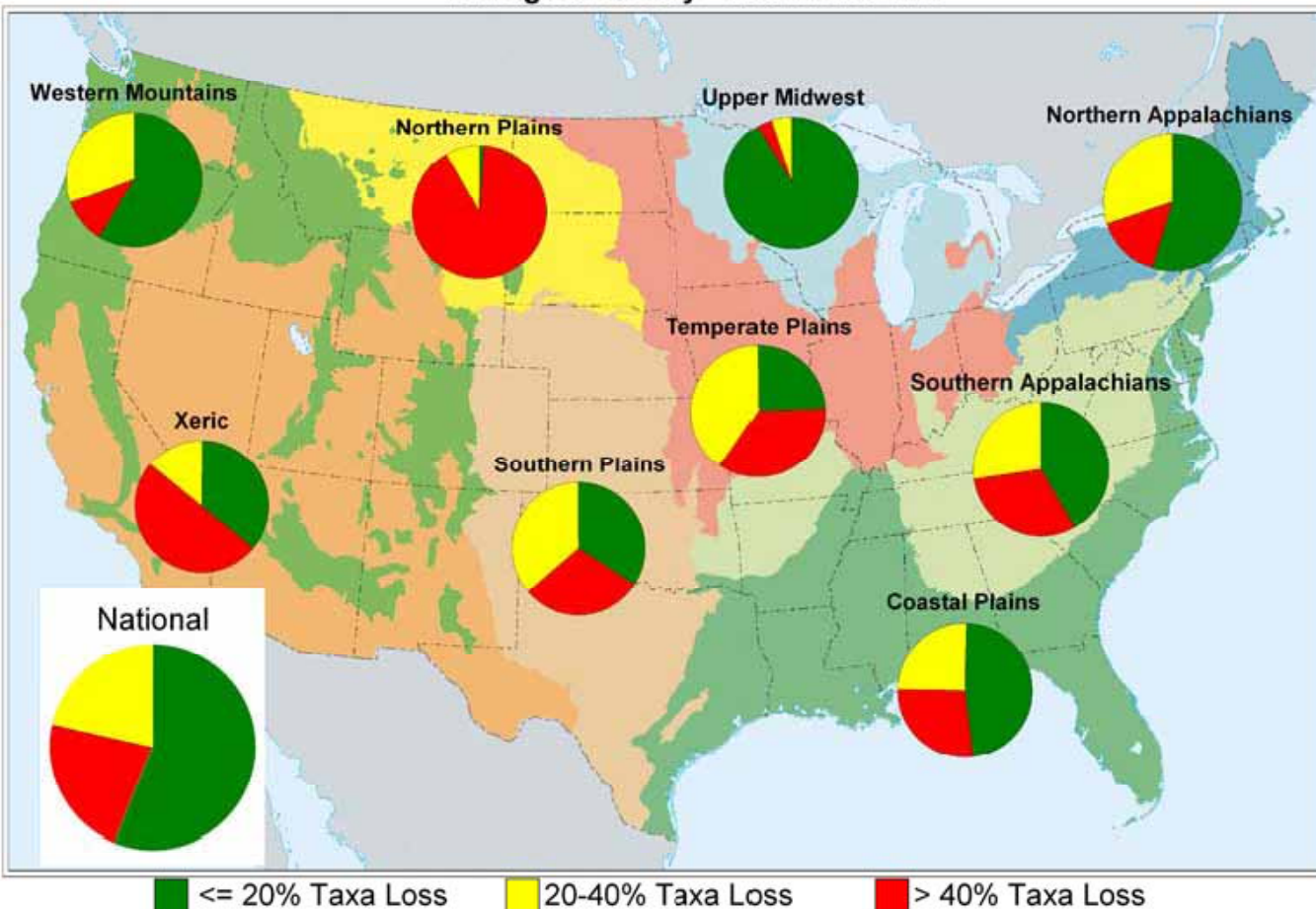


Biological Condition

- Index of Biotic Integrity – sediment diatoms
- Model of Species Loss – open lake



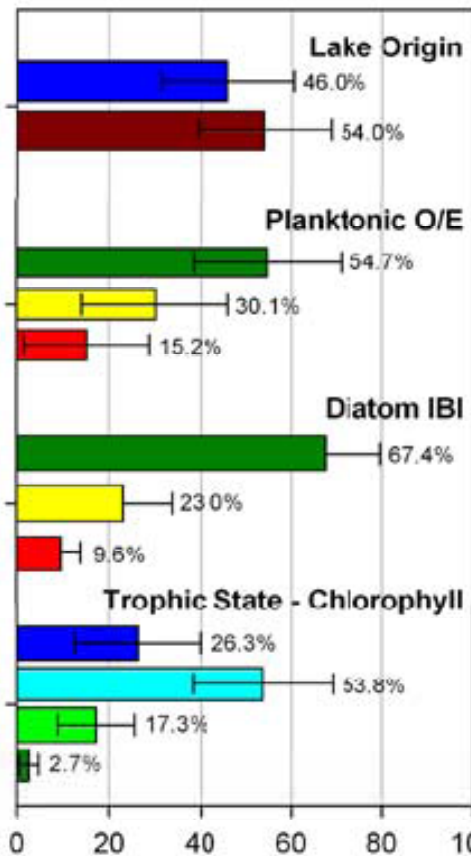
Biological Quality - Planktonic O/E



Stressors in the Northeast



Northern Appalachians
5,226 Lakes

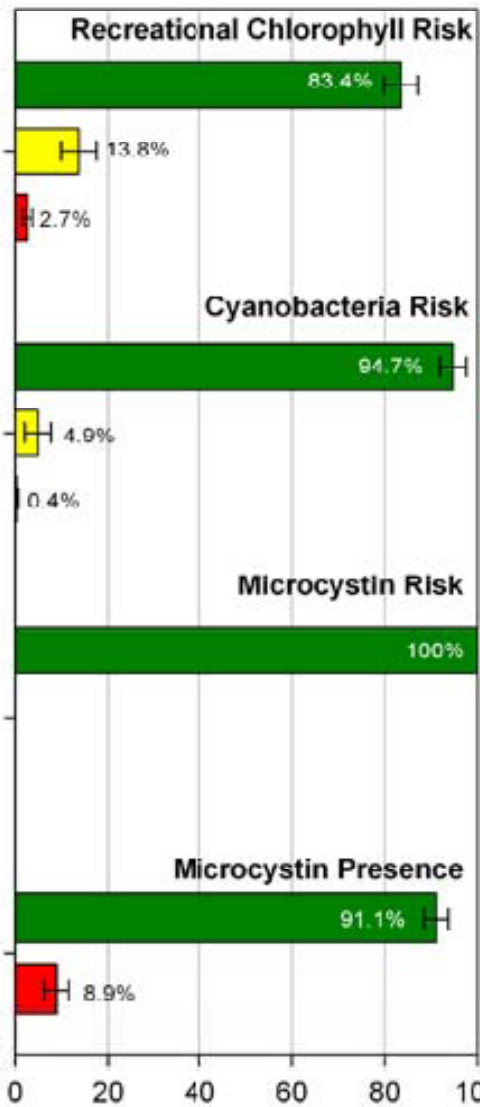


Percentage of Lakes

For Lake Origin:
 Blue Natural Red Man-Made

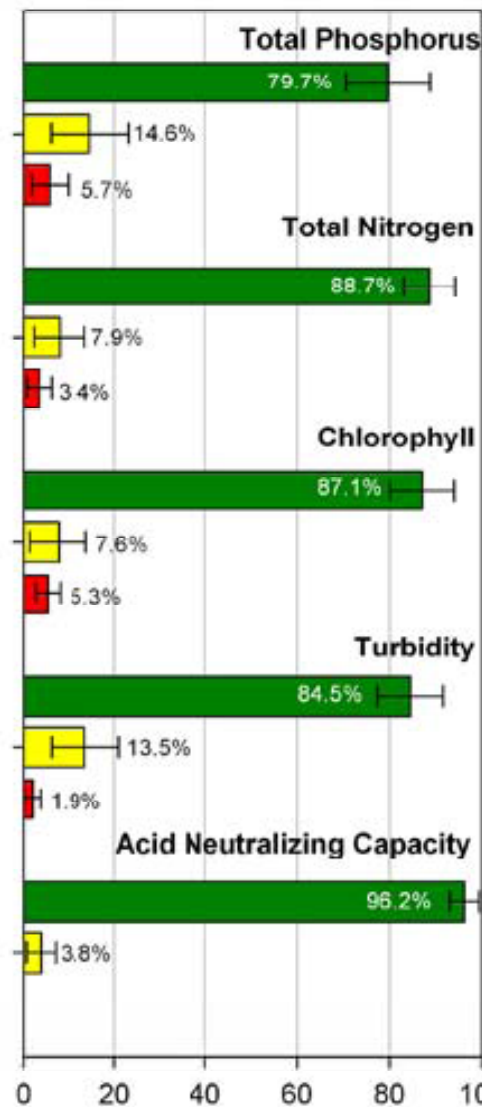
For Plankton O/E

Green < 20% Taxa Loss Yellow 20-40% Taxa Loss
 Red > 40% Taxa Loss



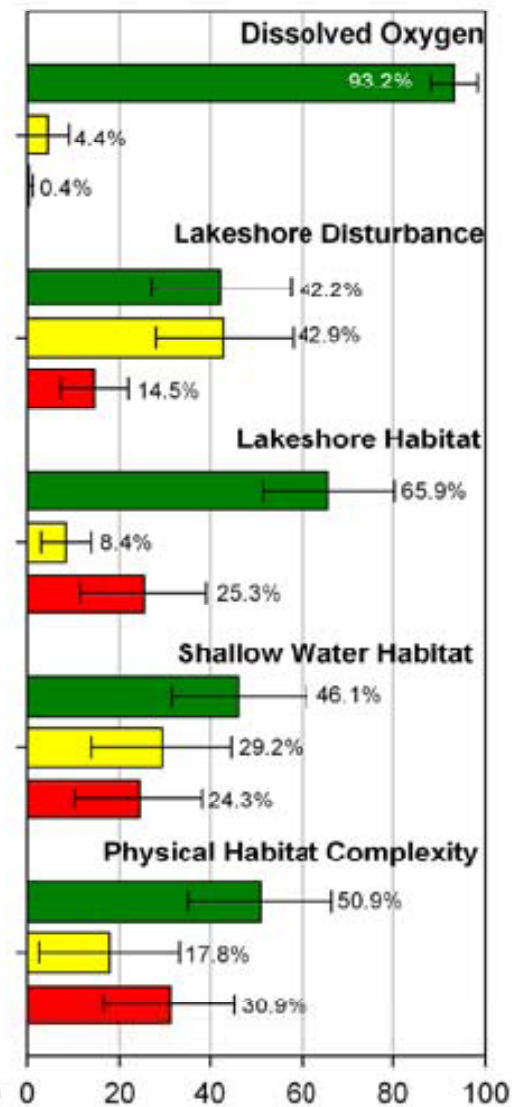
Percentage of Lakes

Green Low Risk Green Absent
 Yellow Moderate Risk Red Present
 Red High Risk



Percentage of Lakes

Green Good
 Yellow Fair
 Red Poor

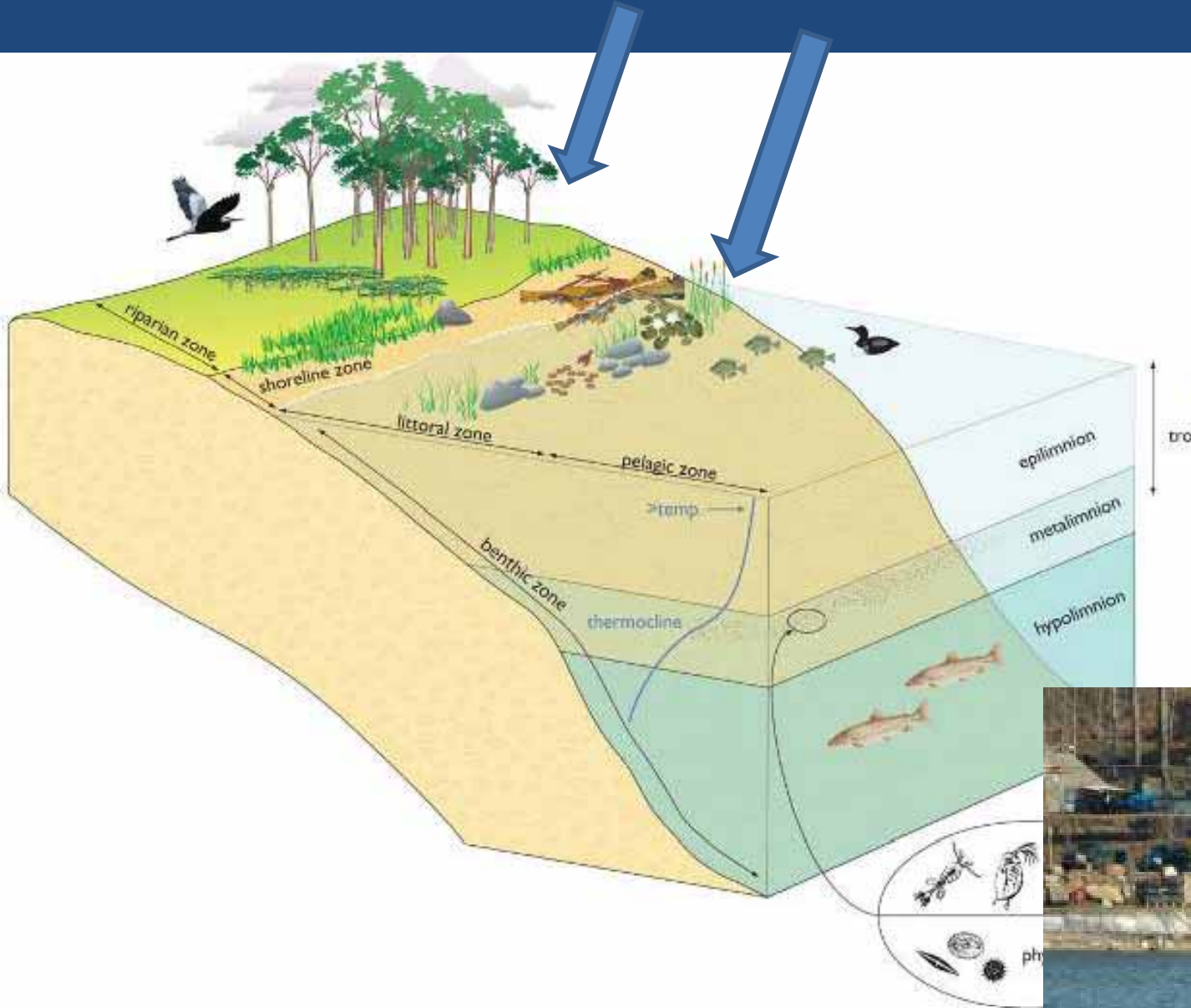


Percentage of Lakes

Green Good
 Yellow Fair
 Red Poor

Lakeshore zone

Shallow zone



Complexity:
The degree to which both lakeshore and shallow zones are intact. Complex habitats facilitate movement of food into and out of lakes.

Disturbance:



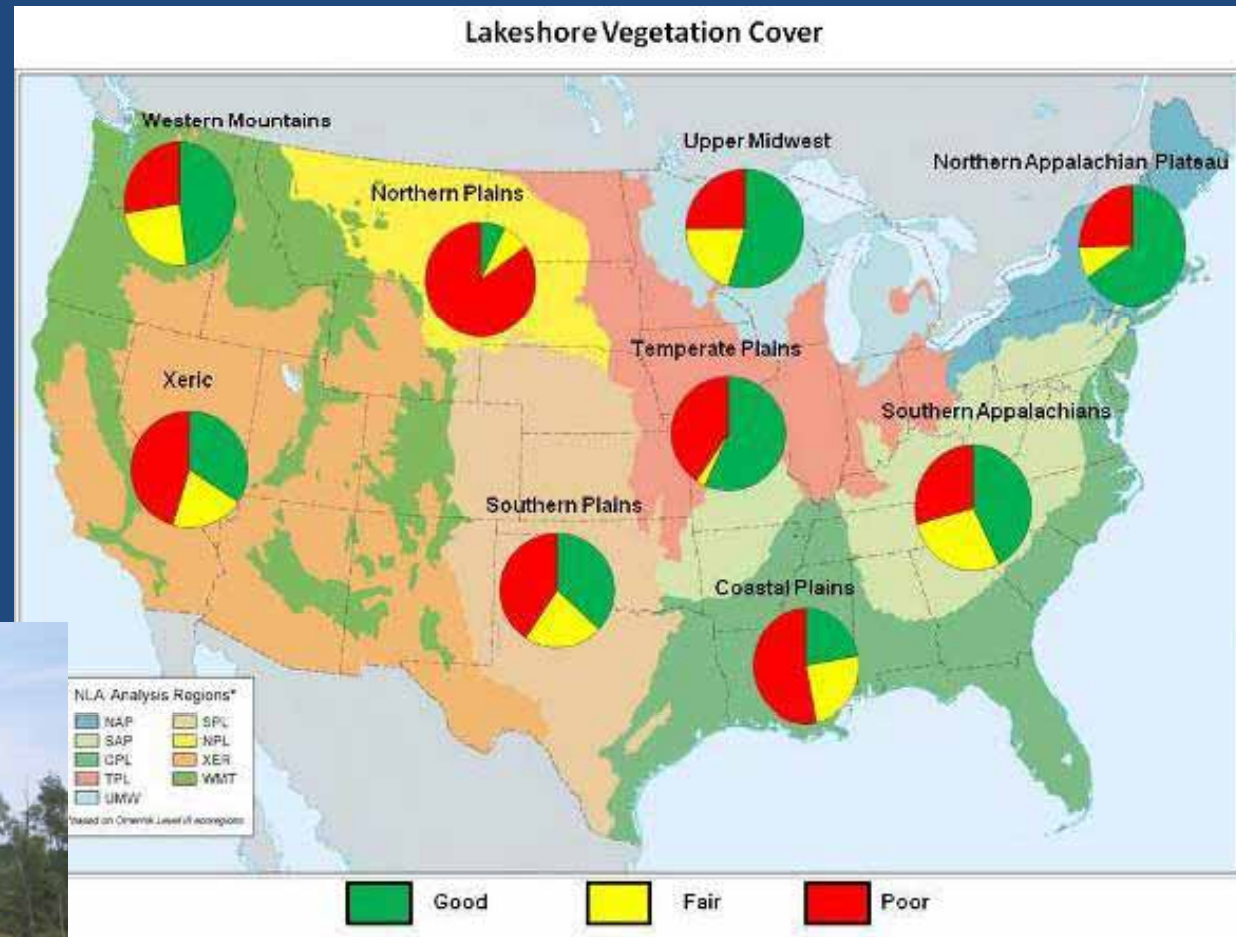
All Shorelines May be “Created” Equal



But this does not last

Poor Biology is Three Times More Common when Lakeshore Habitat is Poor

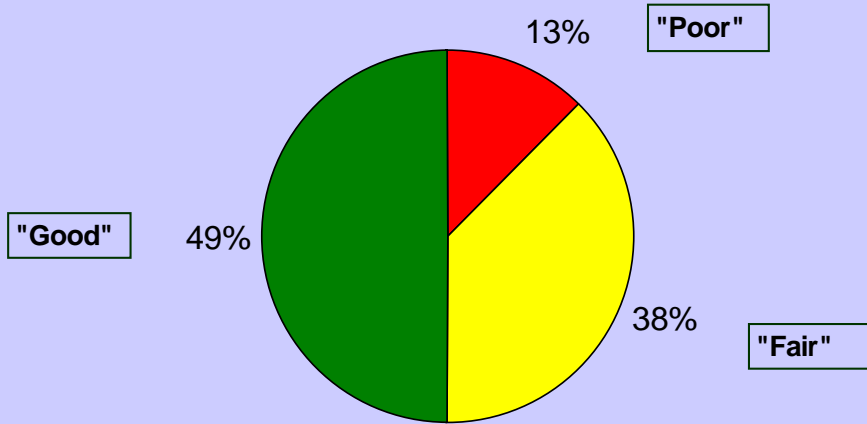
- Northern Plains, Coastal Plains and Xeric have highest proportion of lakes with poor habitat conditions
- Upper Midwest exhibits a high proportion of lakes with high-quality habitat, but > 25% of lakeshores are in poor condition



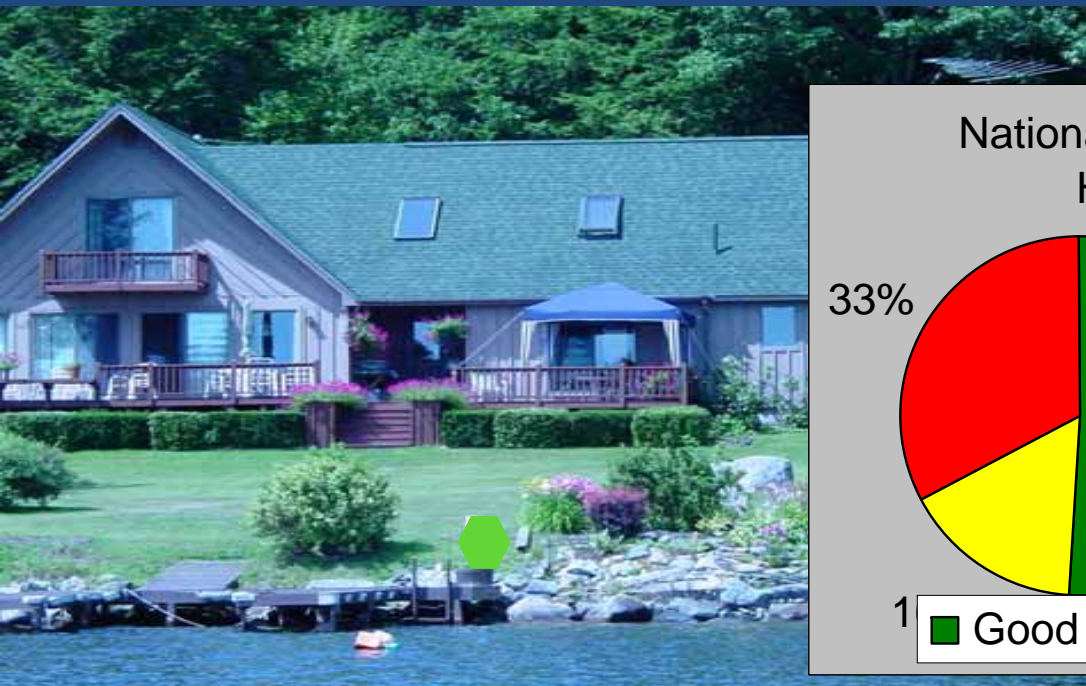
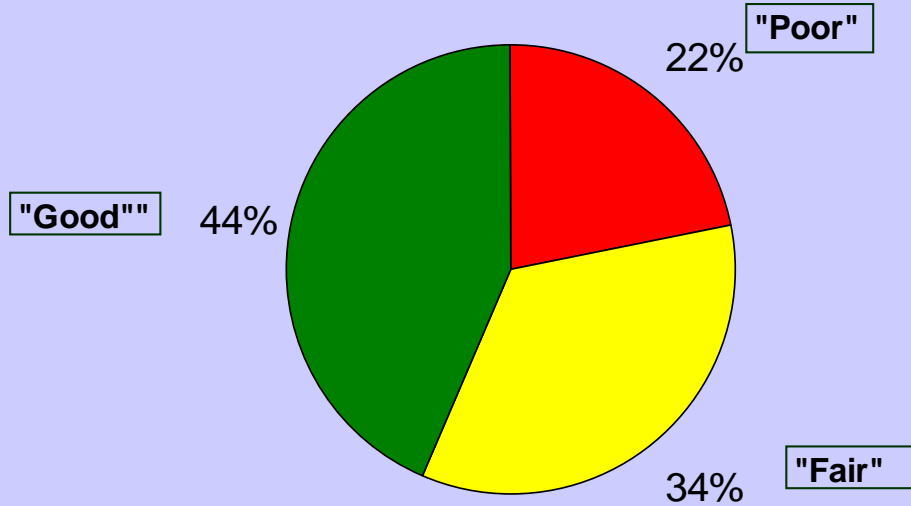
"We appear to be loving our lakes too much!"

Near Shore Habitat

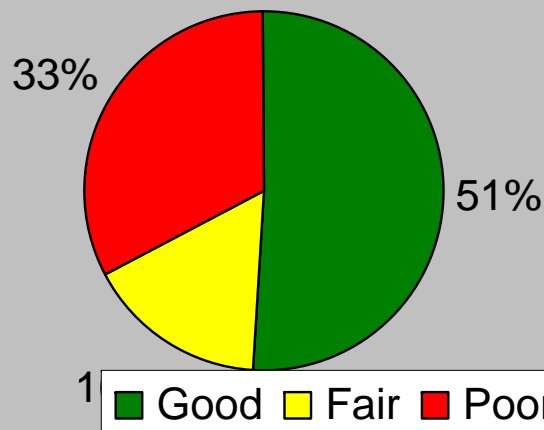
Lakeshore Habitat in Maine



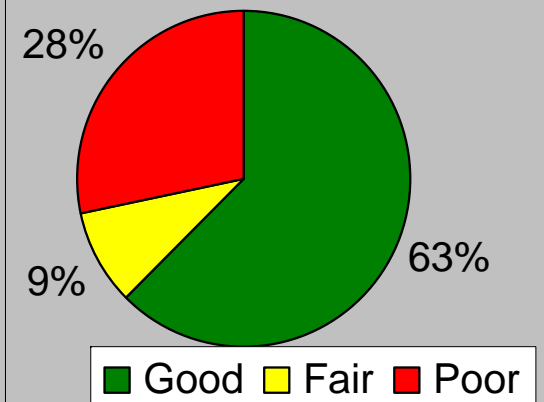
Littoral Cover + Lakeshore Vegetation in Maine



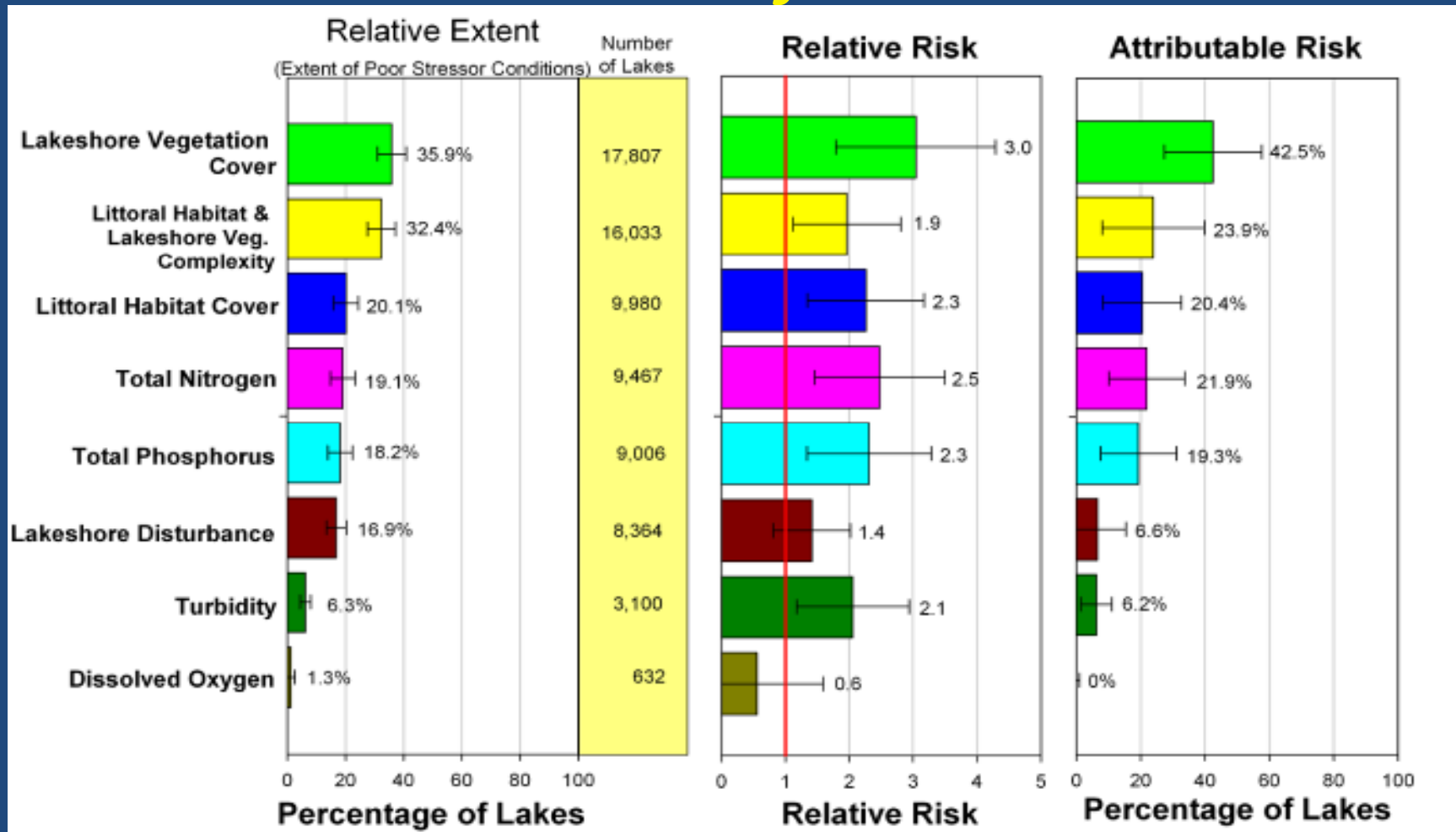
National Lakeshore Habitat



Regional Lakeshore Habitat



Relative Risks from Stressors



- *#1 – Lakeshore vegetation: Poor biology is three times more common when lakeshore vegetation cover is in poor condition. This affects 36% of lakes.*
- *#2 – Nutrients: Poor biology is 2.5 times more common when nutrients are high. This affects about 20% of lakes.*

A Point to Remember

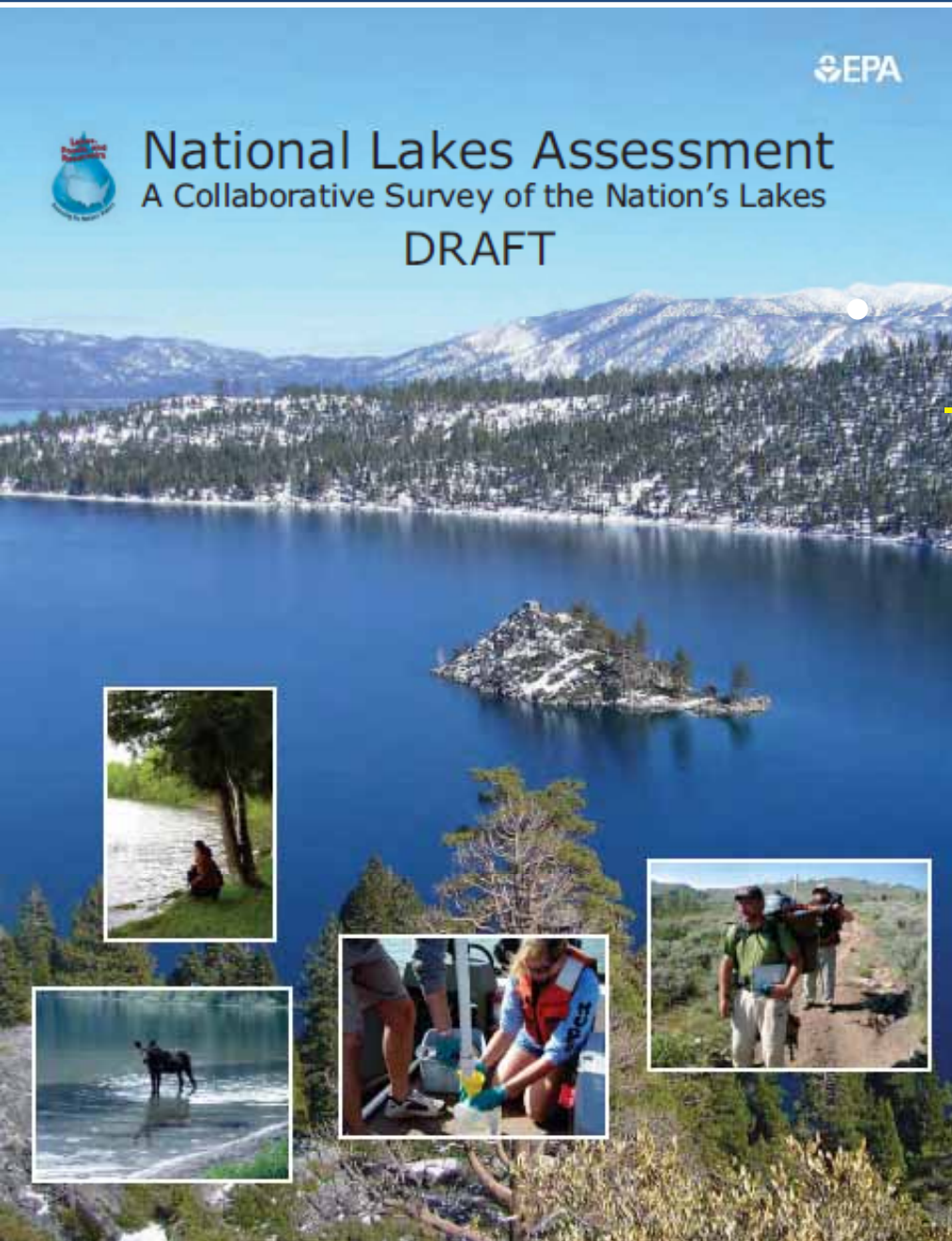
“NLA reinforced and expanded the geographic extent of earlier findings for Northeastern U.S. that although stressors such as non-native fish introductions, mercury contamination, and shoreline alteration were not generally considered subjects for environmental management, they were as widespread as eutrophication, and more extensive than acidification.... ”

Policy Implications of the NLA Report

- **Support for Low Impact Development**
- **Habitat alteration is the most important measured stressor in lakes.**
- **Supports need to address mitigation of lakeshore habitat impacts.**

NLA Report available:

<http://www.epa.gov/lakessurvey>



• Aquatic Resource Surveys:

– <http://www.epa.gov/aquaticsurveys>



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*You Have Questions?
Only Karnak Has the Answers !!*



