# The 2007 National Lakes Assessment

## *Just How Good are the Nation's Lakes?*

*Water Quality, Recreational Suitability, and Ecological Integrity of Lakes and Reservoirs*

*Key Findings and Significant Advances*

USEPA Office of Water
Monitoring Branch

National Water Quality Monitoring Council
Portland, OR

7-21-2009

# National Lakes Assessment

- **First national-scale survey of US lakes and ponds since 1975**
- **Component of National Aquatic Resource Survey Initiative**
- **Report on the condition of the Nation's Lakes**
  - Statistically valid design that represents the condition of all lakes
  - Regional and national estimates of the condition of lakes, option for State-scale estimates
  - Use consistent sampling and analysis procedures to ensure the results can be compared across the country

- **Promote State and Tribal capacity for monitoring and assessment**
- **Promote consistency in cross-jurisdictional assessment of water quality**

# National Lakes Assessment: Objectives

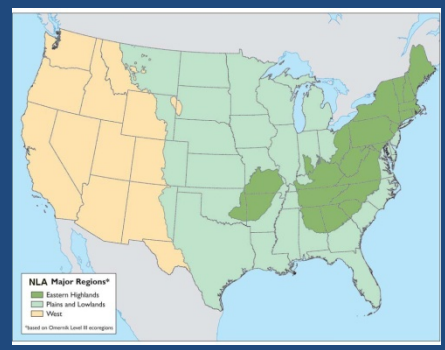
- Report on the condition of lakes across the lower 48 states (± 5%)
- Report on the condition of lakes in ecoregional groups (+/-15%)
- Indicators measured represent biological , recreational, and habitat condition, and trophic status
- Report on changes in lakes quality
  - Using sediment core studies
  - Comparing to National Eutrophication Survey results

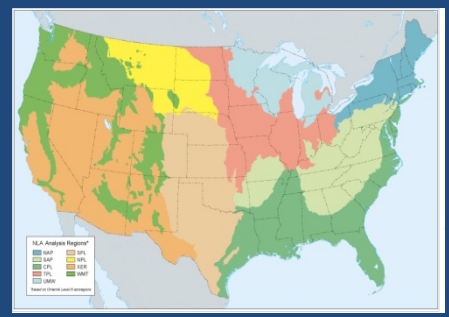
# National Lakes Assessment: Partnerships

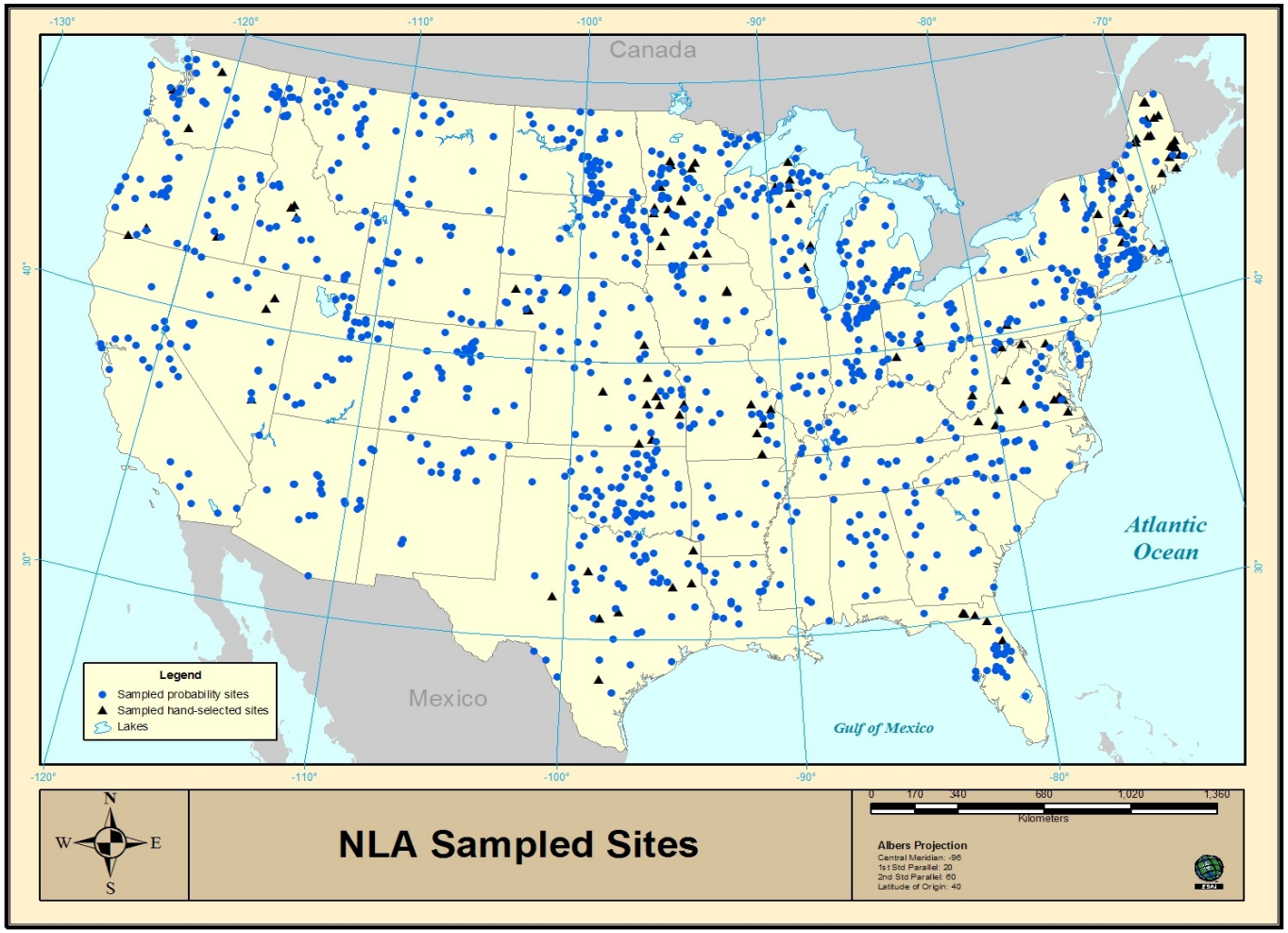
- Survey conducted in partnership with states and tribes.
- Involvement by several EPA Offices: OWOW, OST, ORD, OAQ
- Participation by USGS for two indicator areas.
- Logistics team assisted by several large contractors.
- Analysis team comprised of a wide range of scientists from EPA, states, and academia.

# National Lakes Assessment: Design

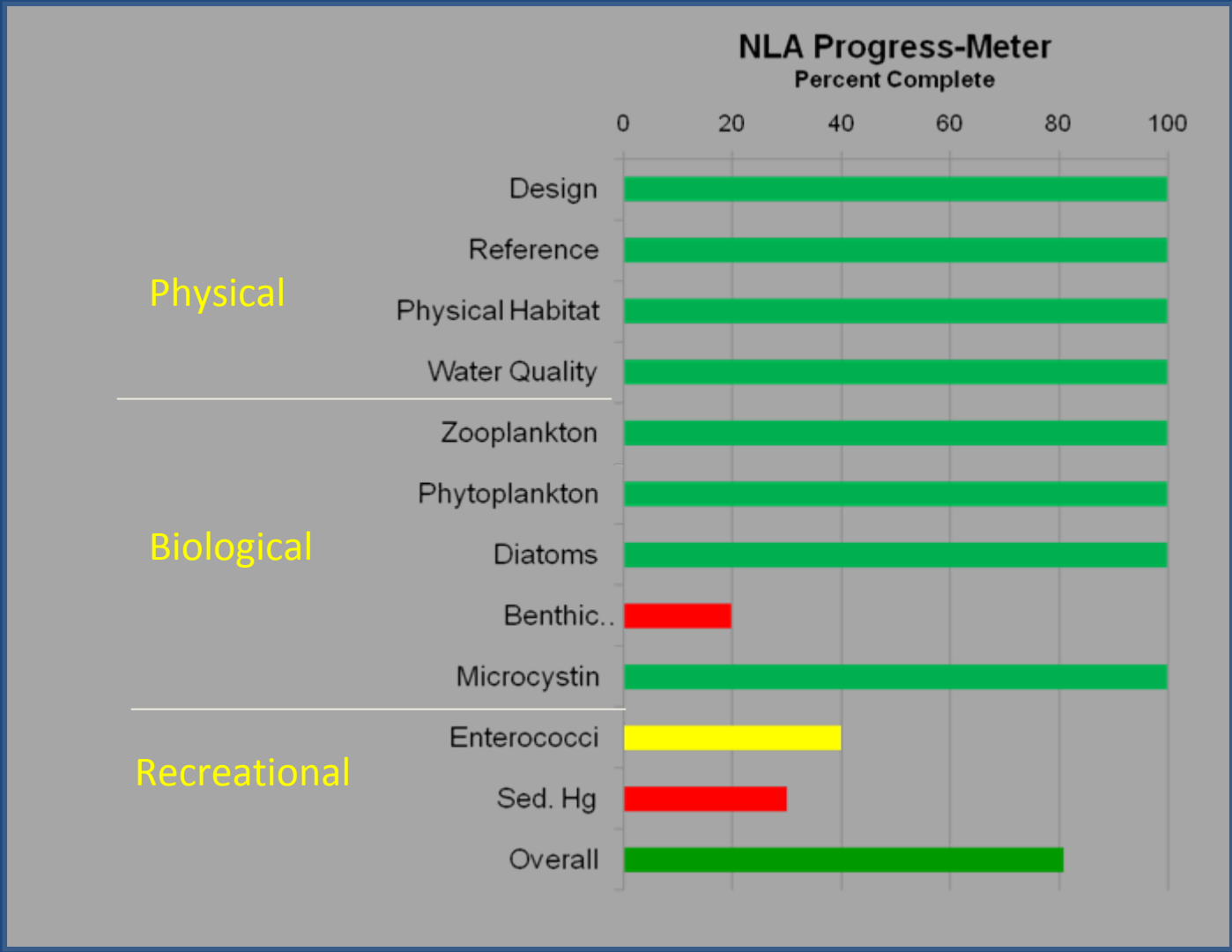
- Random probability survey of lakes
  - Sample Frame: NHD+
  - Target Lake ≥4ha, ≥1m, ≥0.1Ha open, exclusions: (tidal, aquaculture, quarry, disposal)
  - 1,028 lakes sampled (+ 124 hand-selected reference lakes)
  - Sample draw represents 49,564 lakes across the nation.
- Several reporting regions




Canada
Mexico
Atlantic Ocean
Gulf of Mexico
Legend
Sampled probability sites
Sampled hand-selected sites
Lakes
NLA Sampled Sites
N
W
E
S
0 170 340 680 1,020 1,360
Kilometers
Albers Projection
Central Meridian: -96
1st Std Parallel: 20
2nd Std Parallel: 60
Latitude of Origin: 40

# National Lakes Assessment: Indicators



# Reference Conditions and Indicator Thresholds

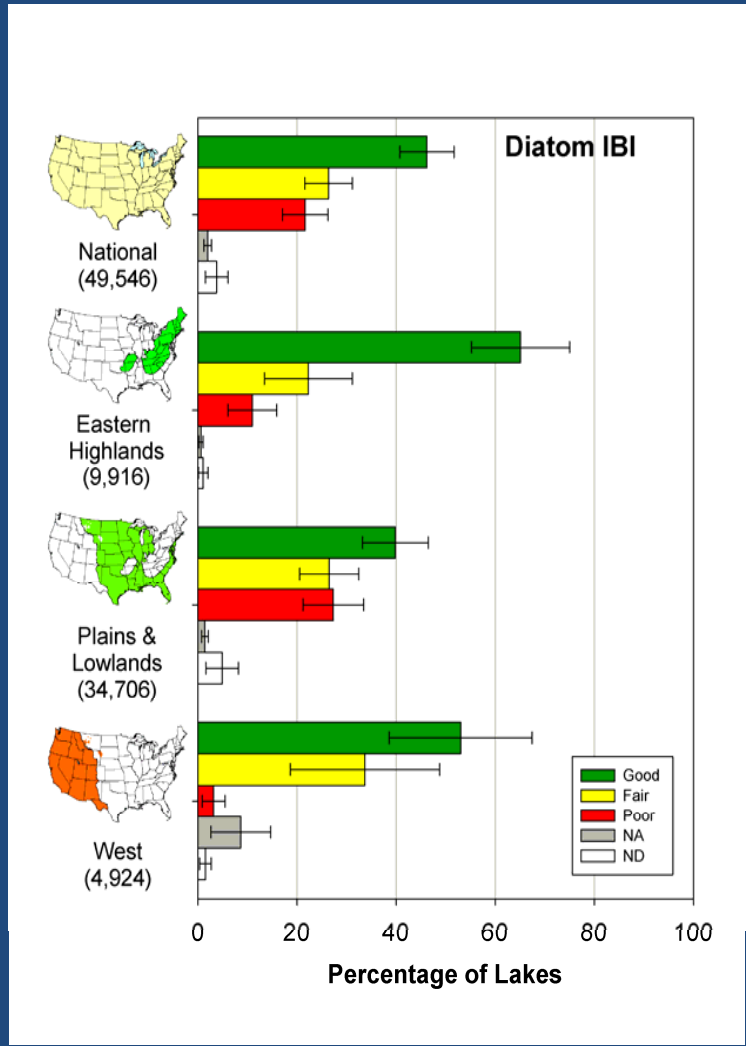
- ***Two sets of ref. lakes***
  - Biological
  - Nutrient
- Reference lakes identified in two steps:
  - Classify into types
  - Screen using regionally explicit criteria
  - All lakes screened (probability and hand-selected)

- ***Two types of thresholds***
- Regionally reference-based
  - Best 75$^{th}$ and 95$^{th}$ percentile defines good:fair and fair:poor
  - Applied to bioindicators, some habitat indicators and some stressors
- Nationally consistent
  - Trophic state
  - Recreational condition

# National Lakes Assessment: Major Findings

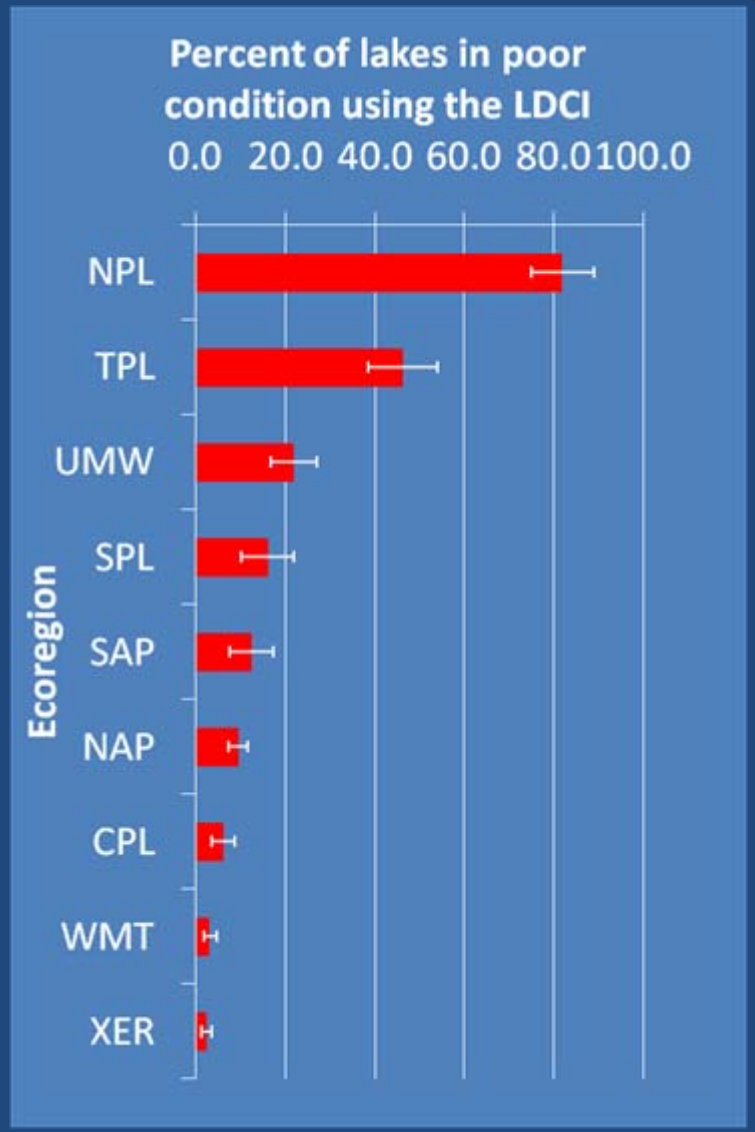
# Biological Integrity: Lake Diatom Condition Index

- IBI constructed from surficial sediment diatoms using national set of reference lakes
- Nationally, 48% of lakes are in good condition.
- Plains and lowlands have highest % lakes in poor condition.



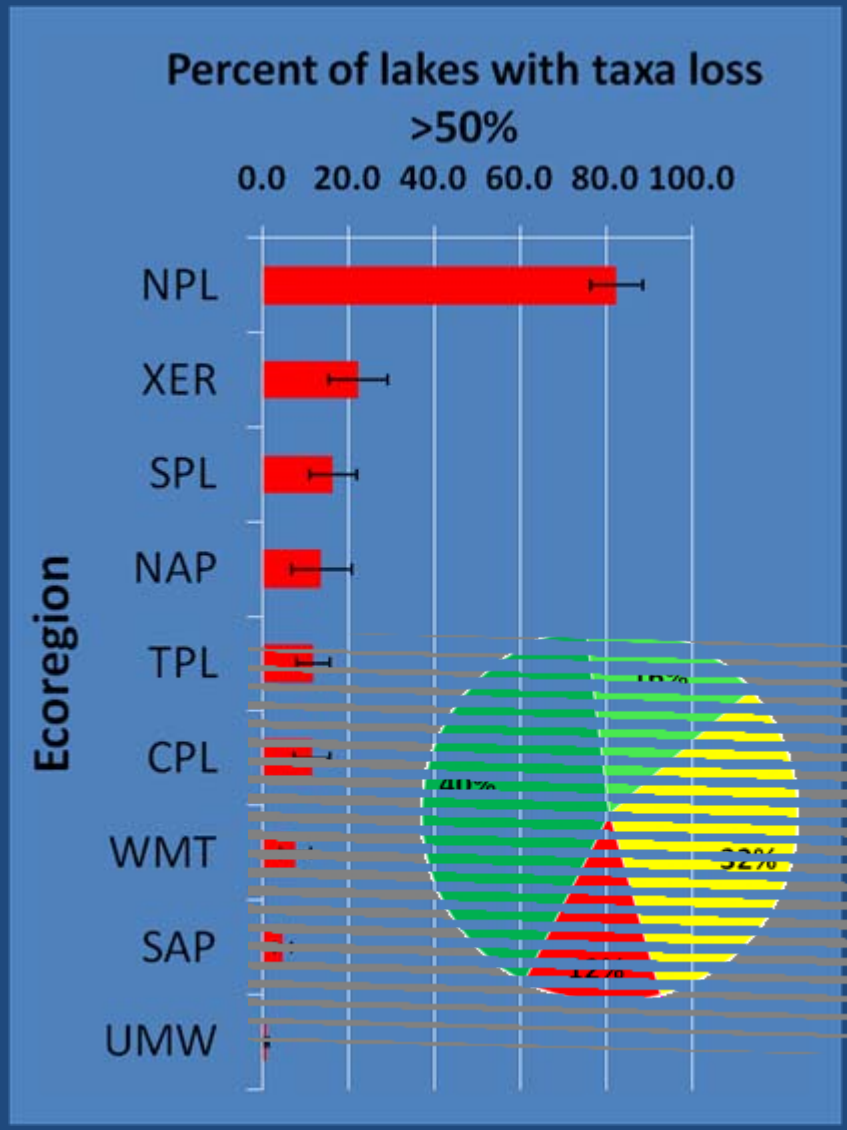
# Ecoregional results

- NPL ecoregion in worst condition, followed by TPL and UMW.
- CPL, WMT, XER all exhibit < 10% of lakes in poor condition.



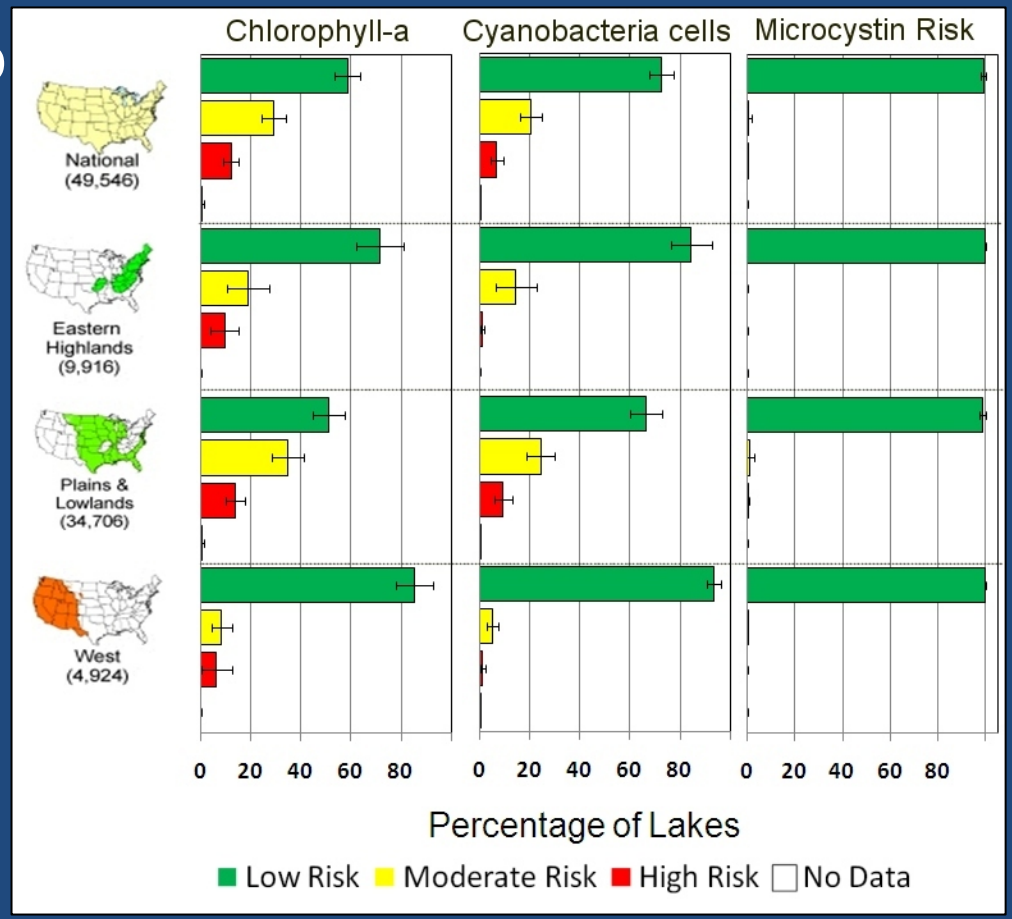
# Biological Integrity: Taxa Loss

- O/E model constructed using merged phytoplankton and zooplankton taxa lists
- Used same set of reference lakes as for LDCI
- Results similar across major regions
- O/E model provides an independent assessment at the ecoregional level



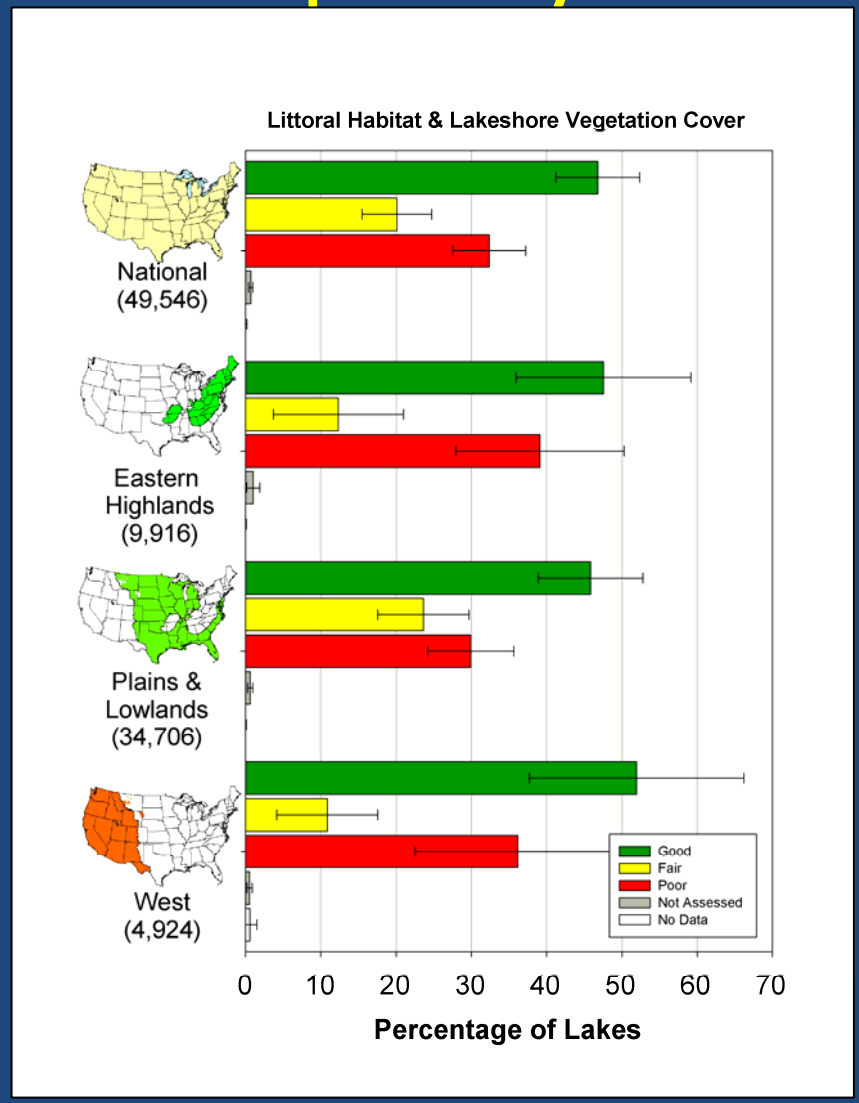
# Recreational Indicator: Cyanobacteria and cyanotoxins

- Three indicators used to infer risk of exposure using WHO thresholds
- ***Microcystin*** present in ***30% of lakes***, although levels are in low-risk category for most lakes.
- Greatest proportion of lakes with moderate or high risk occurs in TPL and NPL.



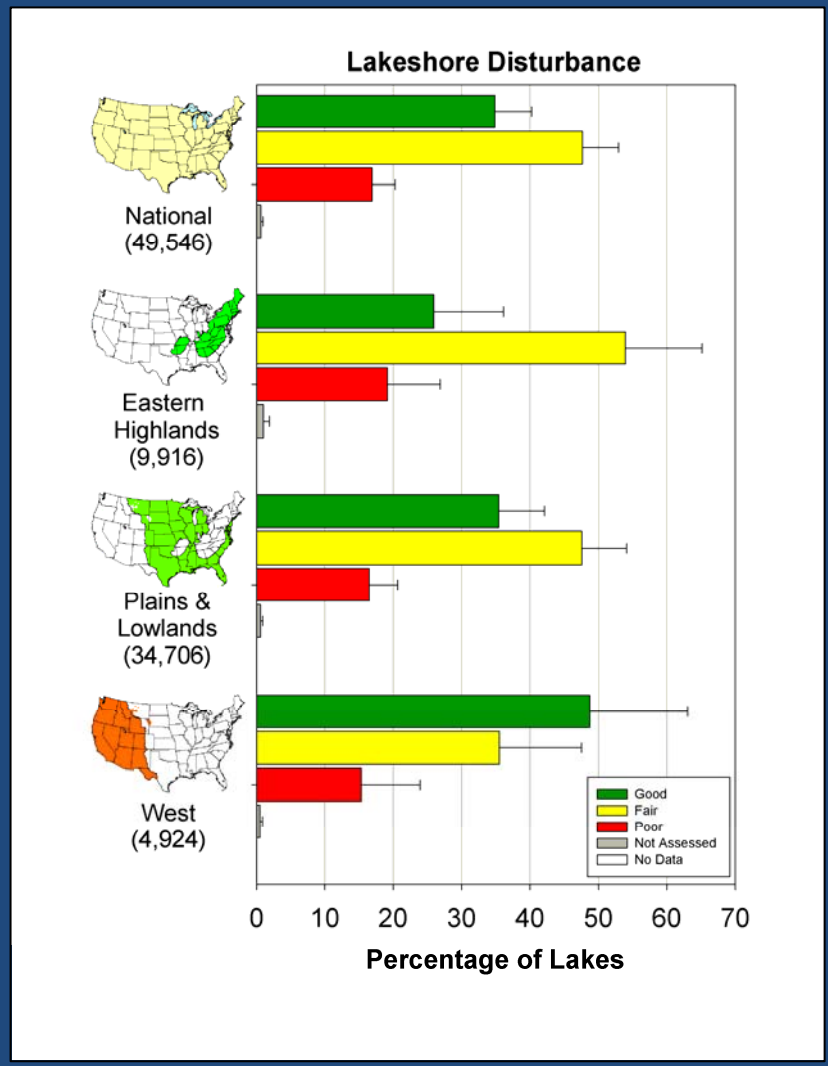
# Habitat Indicator: Riparian and littoral complexity

- Habitat quality is significantly compromised relative to regionally-explicit reference conditions
- Habitat is in fair or poor condition on 54% of lakes



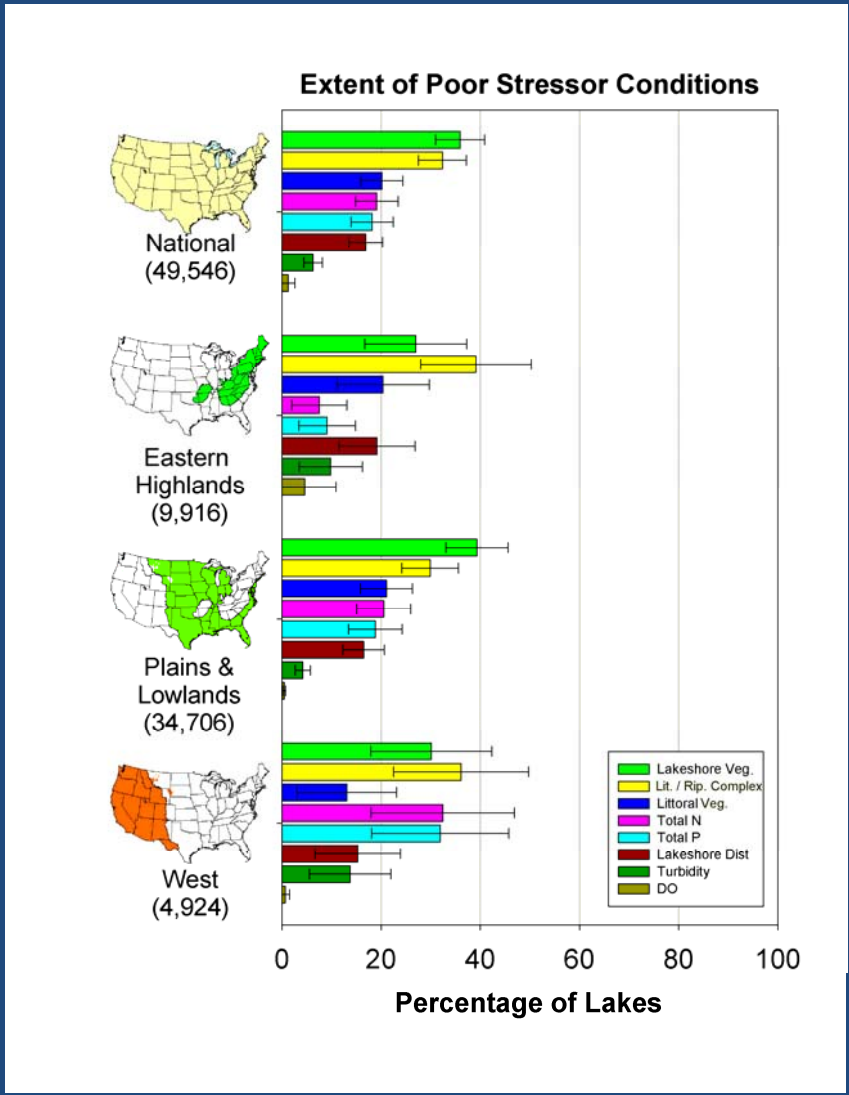
# Habitat Stressor:
## Development intensity / extensiveness

- Lakeshore disturbance assessed using nationally-consistent thresholds.
- Development levels are low on only 35% of lakes.
- Across all ecoregions, at least 43% of lakes have moderate or high disturbance levels
- NPL, SPL, SAP show the highest overall disturbance levels.



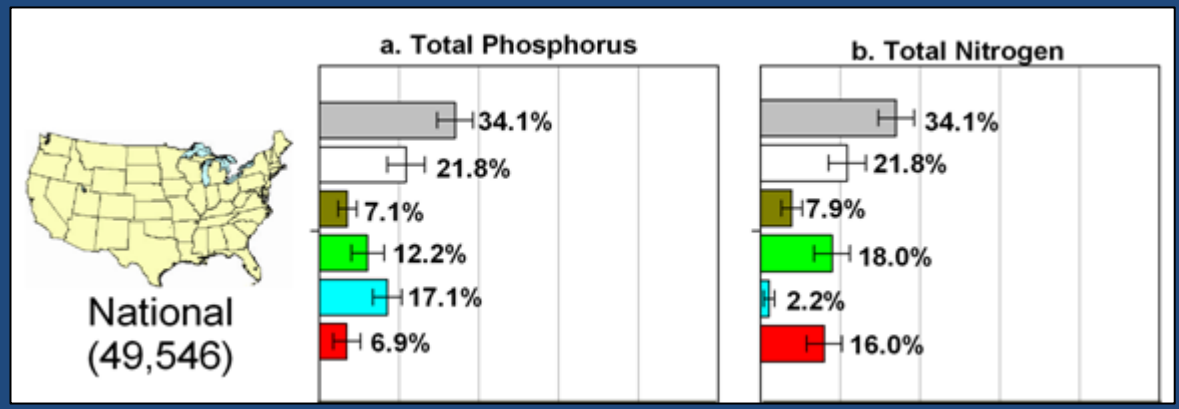
# National extent of stressors

- Nationally, habitat indicators are poor in the largest proportion of lakes
- Nutrients are intermediate, ~20% of lakes with poor nutrient levels.
- Turbidity, DO, acidity poor in relatively few lakes.
- Relative risk assessment forthcoming.

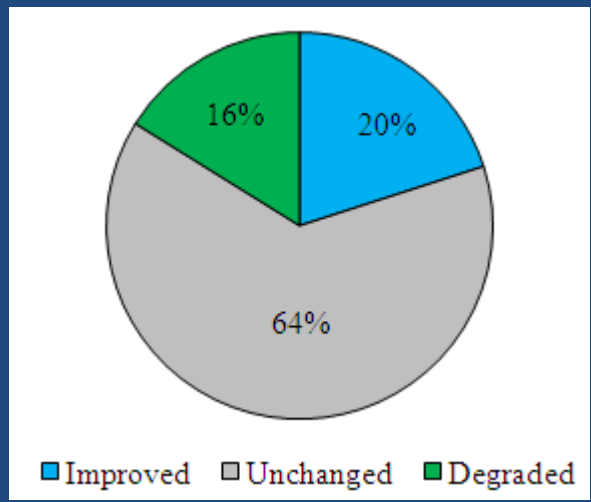


# Trends: Sediment diatoms and NES→NLA

Based on sediment diatom inferences, 12% of lakes are improving, and 7% are degrading.

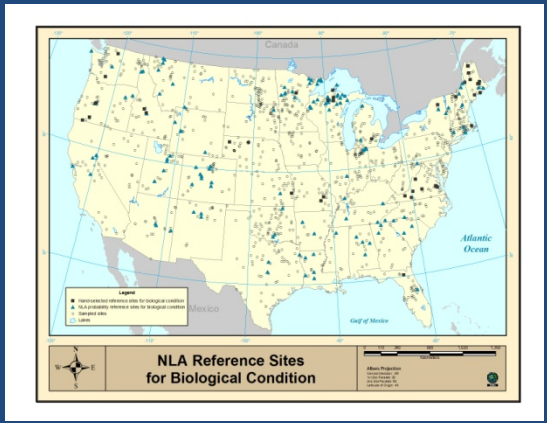



Using the NES→NLA comparison, 20% of NES lakes have improved, while 16% have degraded.

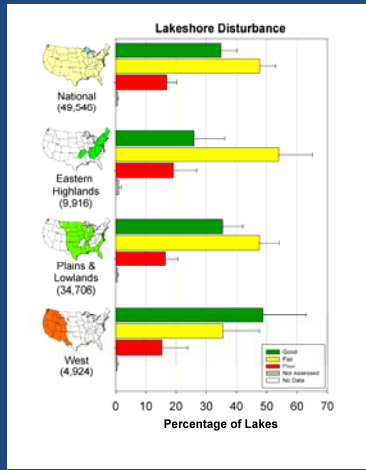


# National Lakes Assessment: Report

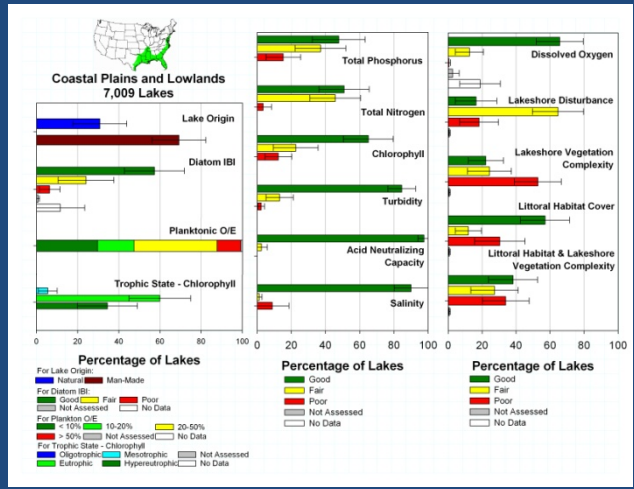
## Intro and design



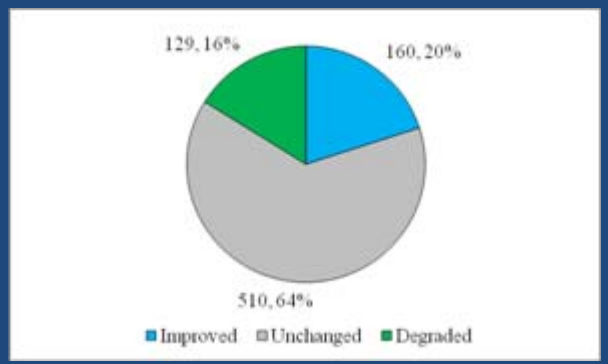

## National Findings



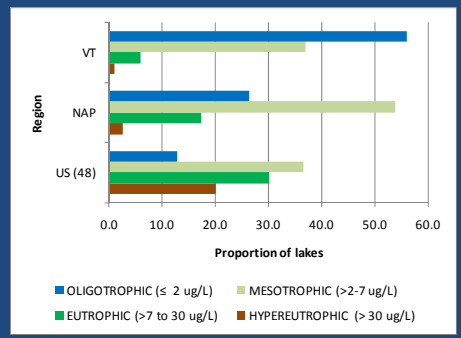

## Ecoregional Findings




## Change over time




## Uses of the NLA Results




## Future challenges –2012

# Report Issuance Schedule

- Draft Assessment report in State Review until 8/19/09
- Peer-review and public review draft mid-September
- Final report by end of December, 2009

# National Lakes Assessment: Significant Advances

- First-ever national-scale assessment of lakes of this scale.
- National IBI based on sediment diatoms
- National Taxa Loss model based on plankton
- National perspective on extent of microcystin occurrence
- Consistent assessment of habitat condition
- Support evaluation of nutrient criteria recommendations for lakes

# Future directions

- Technical publications
- “Canned” presentations for partners to use with stakeholder groups
- Modifications to sampling approach for NLA-2 (in 2012)

Toolkit for states to analyze and interpret state-scale probability survey data