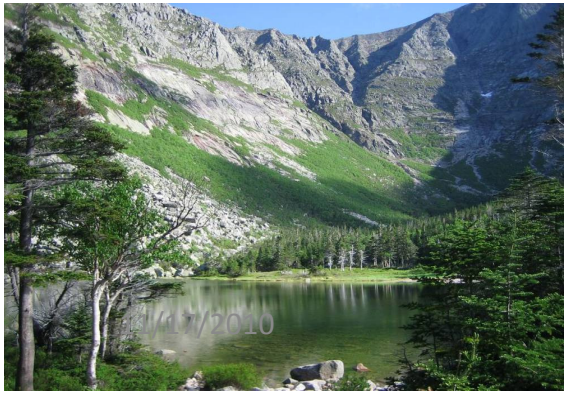
National Lakes Assessment

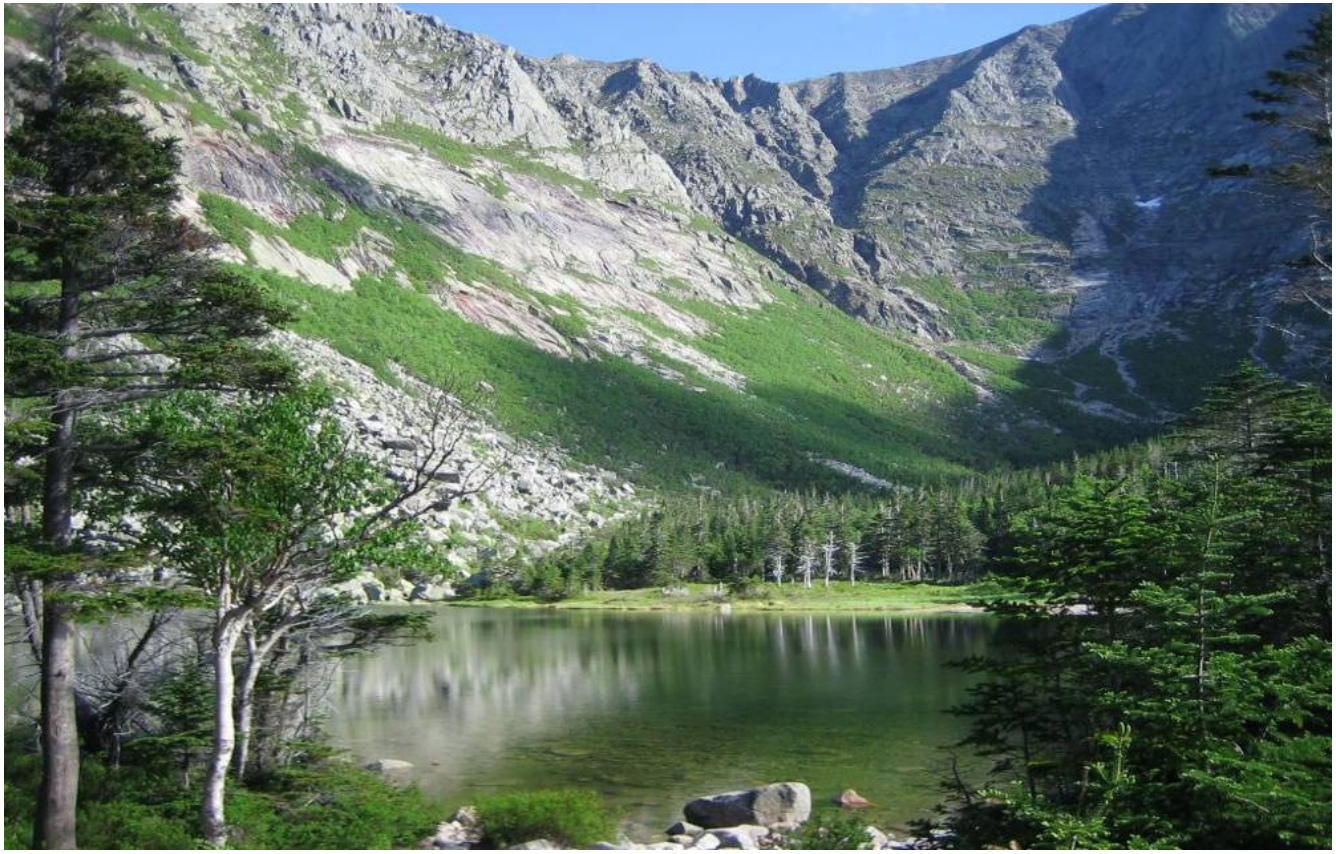
Water Quality, Recreational Suitability, and Ecological Integrity of Lakes and Reservoirs

Amina Pollard



What is the Condition of the Nation's Lakes?

The National Lakes Assessment (NLA) provides an unbiased national baseline of the ecological condition of freshwater lakes, ponds, and reservoirs AND improves the technical capacity of states to conduct lake monitoring

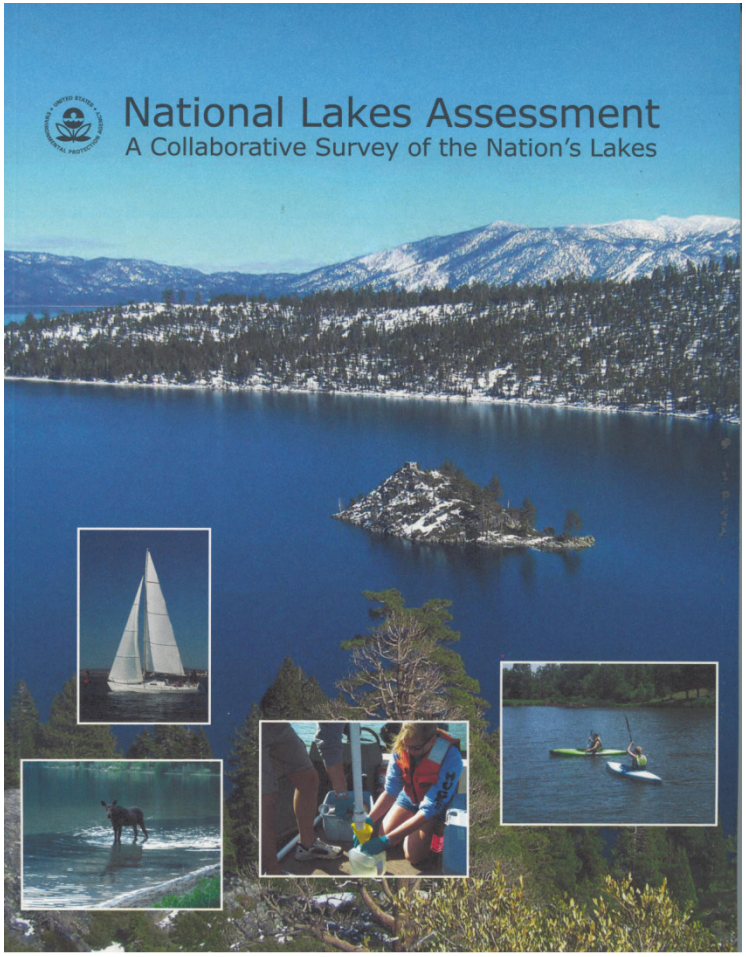


2007 NLA

Report released : 4/2010

www.epa.gov/lakessurvey

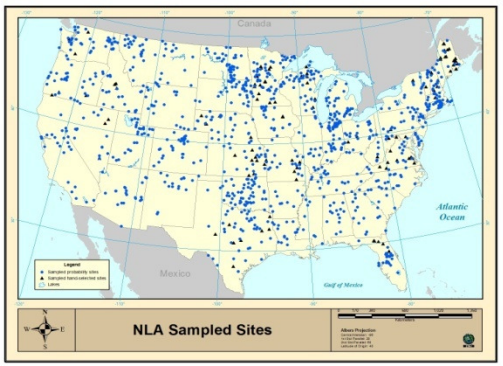
- report
- data
- related activities



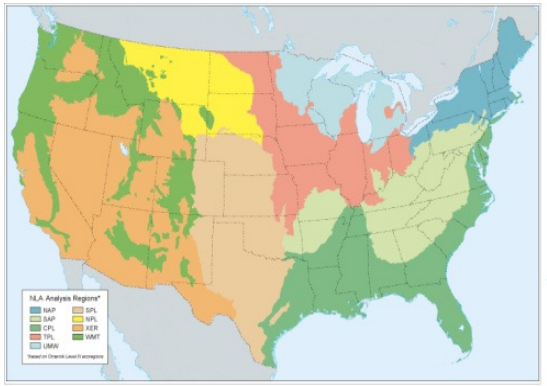
2007 NLA design

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
- Initiative captures condition of the population, not condition of individuals.



Nine reporting regions



2007 NLA indicators

Biological Integrity
- **Index of Taxa Loss**
- Index of Biotic Integrity

Trophic State

Recreational Use
- Risk of cyanotoxin exposure
- Occurrence of microcystin
- Enterococci

Habitat Quality
- **Lakeshore Vegetation Cover**
- Littoral Quality
- Human shoreline disturbance

Chemical stressors
- Water quality
  - Phosphorus
  - Nitrogen
- Sediment mercury

2007 NLA reference

Two sets of reference 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
  - Fixed percentile defines good:fair and fair:poor
  - Applied to bioindicators, some habitat indicators and some stressors
- Nationally consistent
  - Trophic state
  - Recreational condition

2007 NLA key findings

Condition of the nation's lakes

- 56% support healthy biological communities
- Microcystin detected in 30% of lakes; more than 25% of lakes pose moderate or high risk of exposure to algal toxins

Key stressors affecting quality

- 36% of lakes have poor shoreline habitat; 3 times more likely to have poor biology
- 20% percent of lakes have high levels of nitrogen or phosphorus; 2 times more likely to have poor biology

Trends of National Eutrophication Survey (NES) (1972→2007)

- 50% of NES lakes showed decreases in phosphorus concentrations

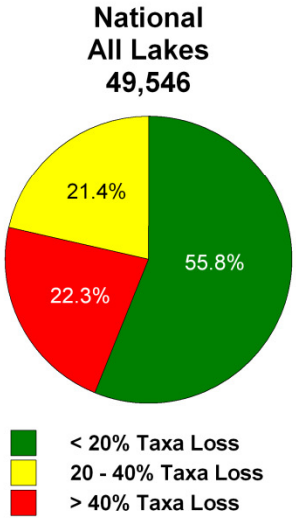
Condition of the Nation's Lakes
Biological Condition using taxa loss index

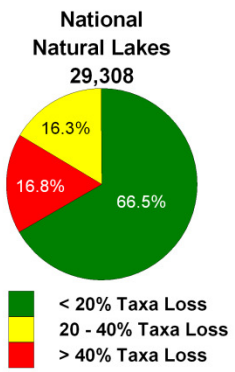
National Summary:

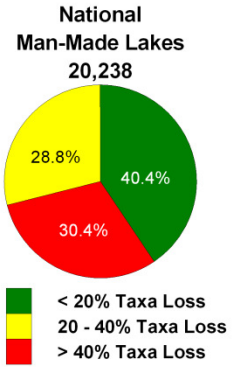
- 56% good
- 21% fair
- 22% poor

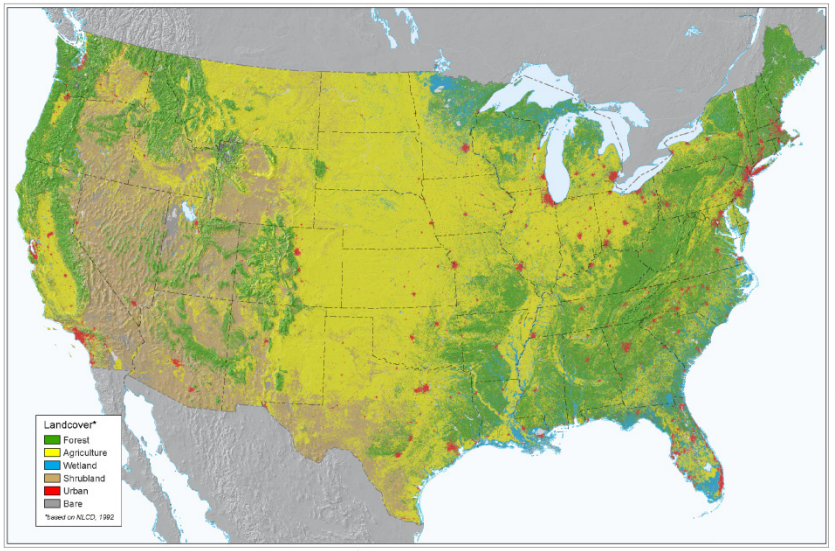
Taxa loss model computed using combined phyto and zooplankton assemblage

Consistent thresholds based on lake class-specific reference expectations.

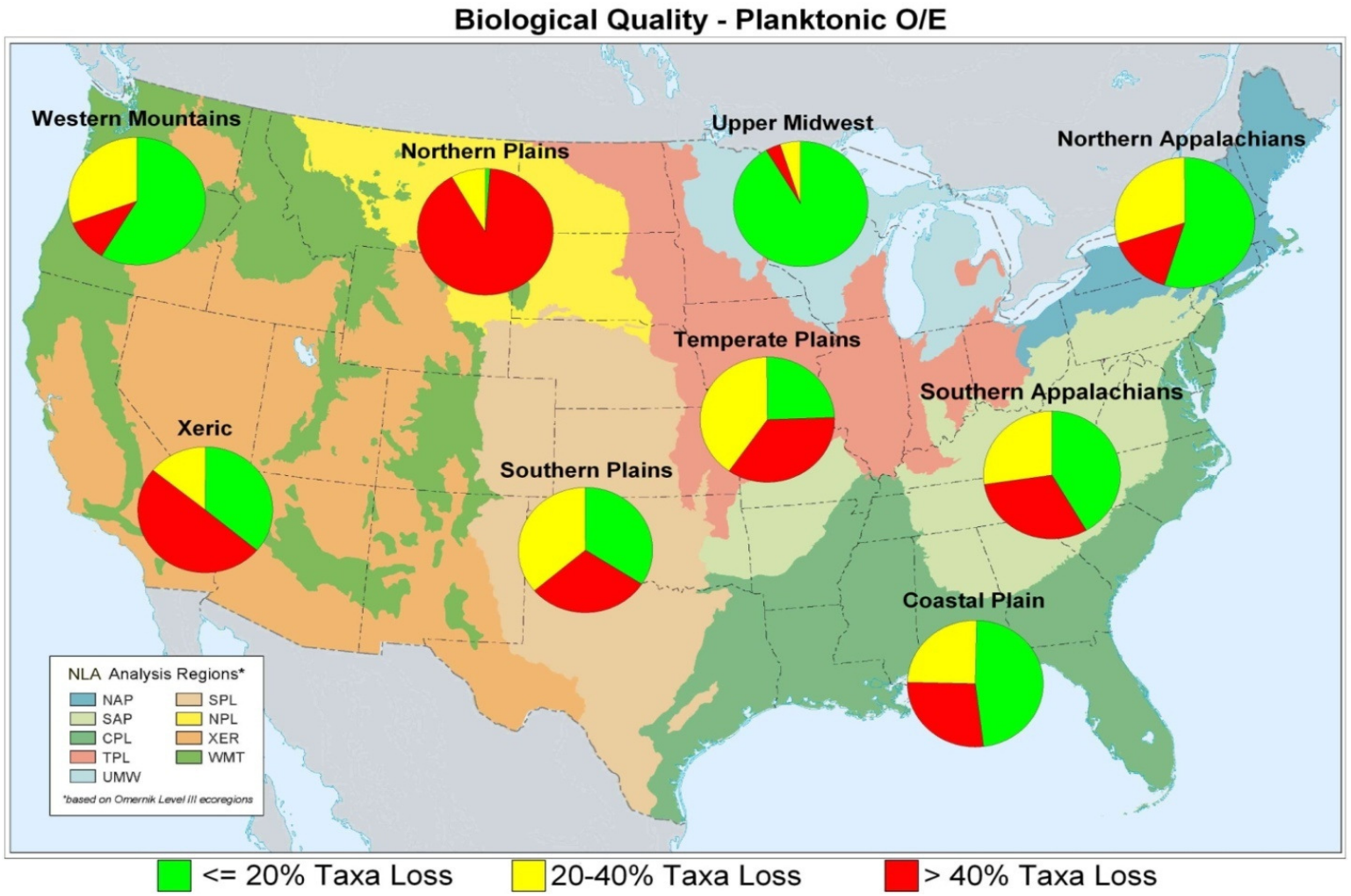








Biological Condition of the Nation's Lakes Varies across the Country



Stressors to Biological Condition: Ranking of stressors

Assessed several stressors

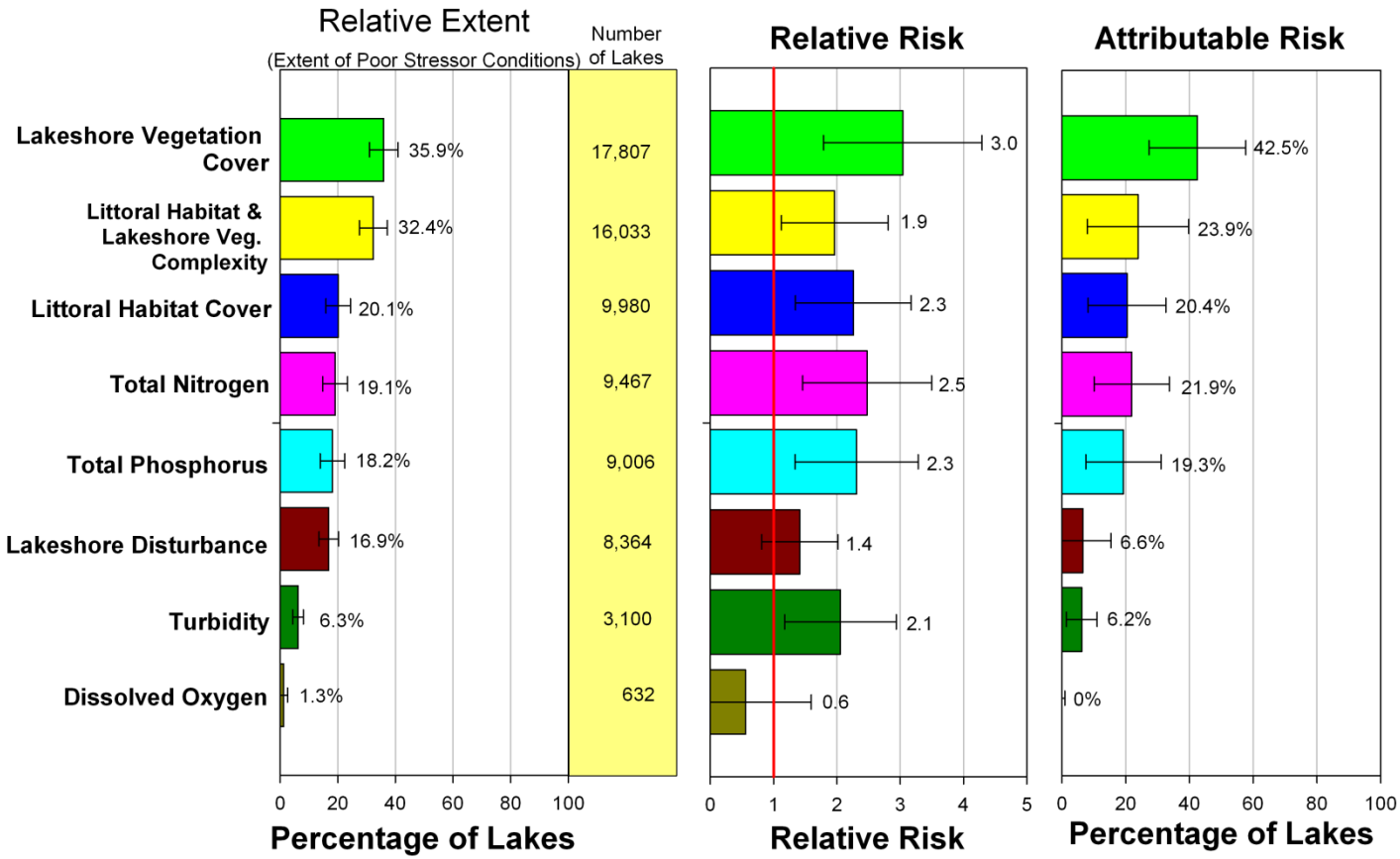
- Chemical – nutrients, turbidity, acidity, oxygen
- Physical – habitat of riparian and littoral zone, and human disturbance
- Stressors ranked as good, fair, or poor based on reference conditions

Relative Extent – *How common or widespread are the stressors?*

Relative Risk – *When stressors occur, what is their relative impact?*

Attributable Risk – *What percent of lakes rated poor for biology should move to good/fair if this stressor is eliminated?*

Ranking of Stressors



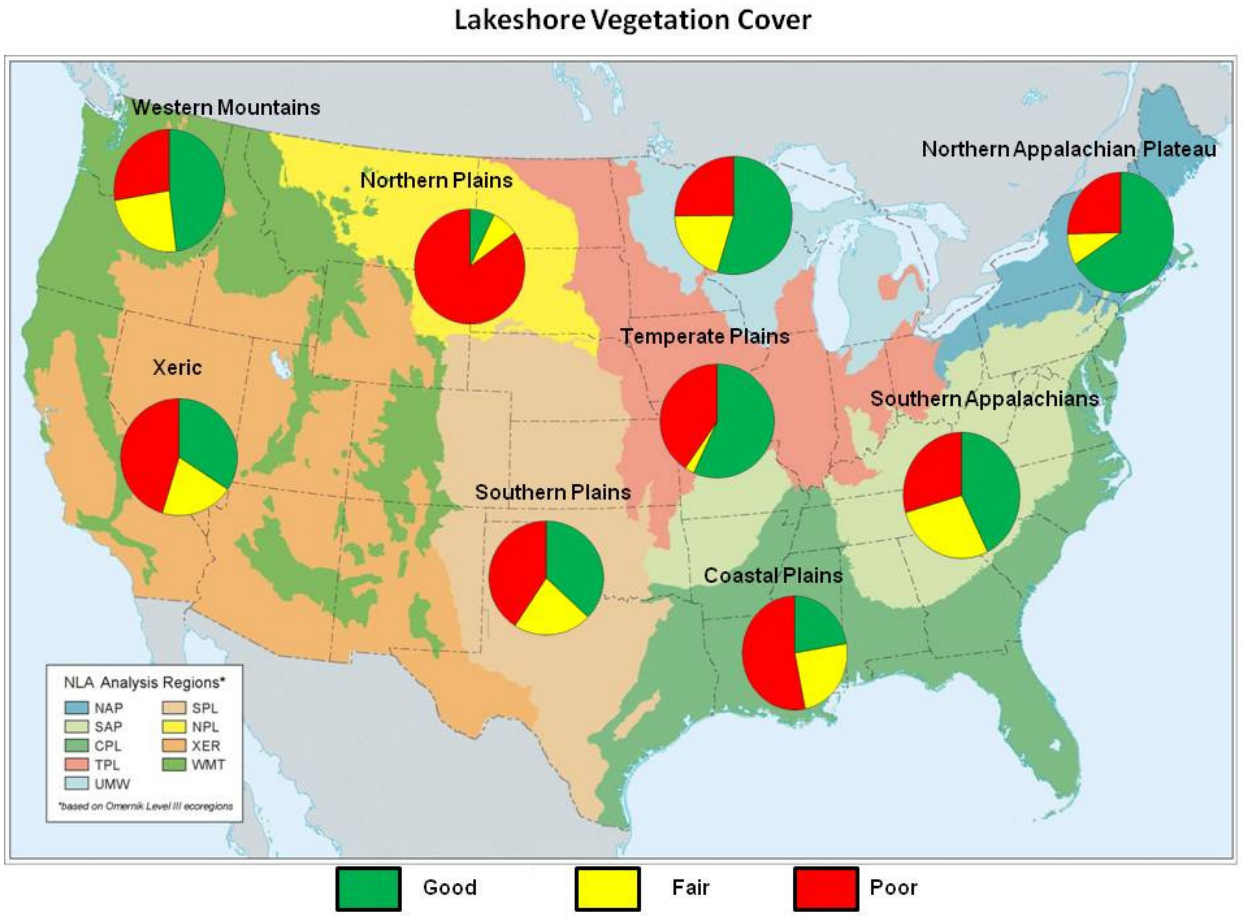
- Loss of lakeshore vegetation is most important stressor on biological condition
- Nutrients are also important
- Caveat: analysis is based on correlation, *not* causality

When Lakeshore Vegetation is Poor:
Lakes have 300% Greater Incidence of Poor Biology

National Summary:

- 46% of lake shorelines in good condition
- 18% are in fair condition
- 36% are in poor condition

Assessment thresholds based on regionally explicit reference expectations.

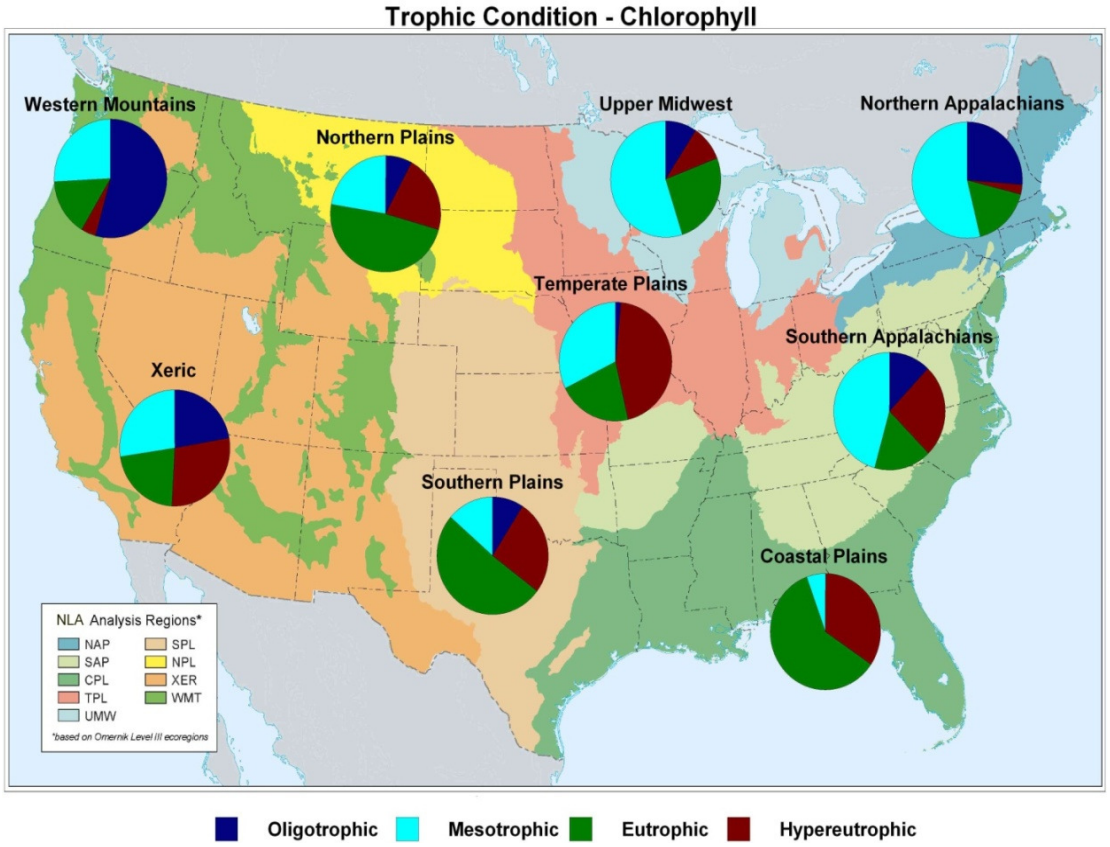


Trophic State of the Nation's Lakes

National Summary:

- 13% of lakes are oligotrophic (very clear)
- 37% are mesotrophic
- 30% are eutrophic
- 20% are hypereutrophic (very nutrient enriched)

Based on widely accepted Carlson Trophic State Index thresholds

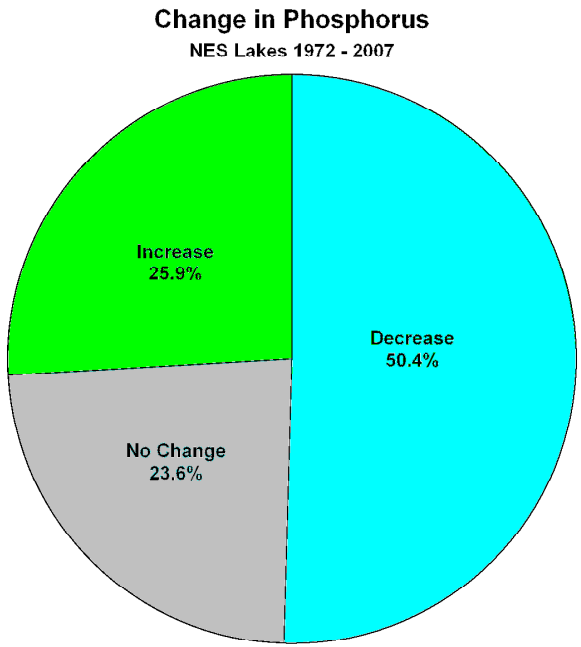


Trends:
National Eutrophication Study and NLA

NES studied 800 wastewater-impacts large recreational lakes

Subset of NES lakes revisited in NLA

Phosphorus Trends:
- 24% of lakes showed no change
- 50% of lakes showed decreased levels



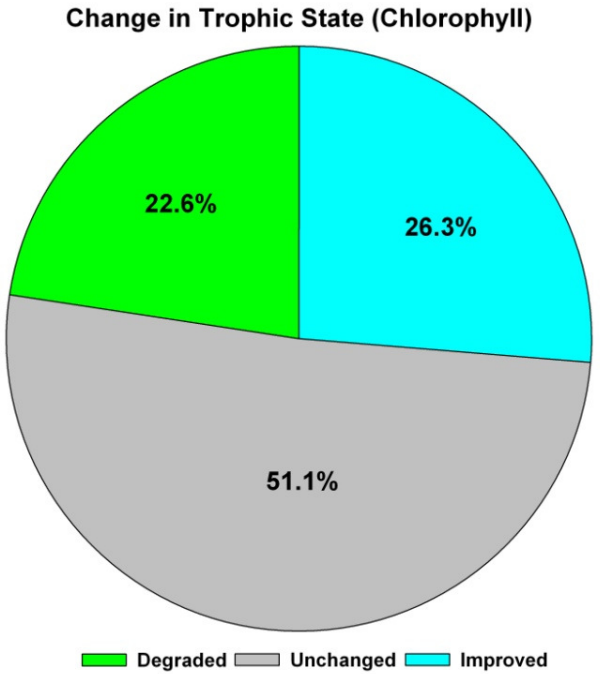
Comparison of change in phosphorus concentration of NES lakes

Trends:
National Eutrophication Study and NLA

Trophic state trend:

- 51% of lakes remained in the same trophic status
- 26% of lakes improved in trophic status

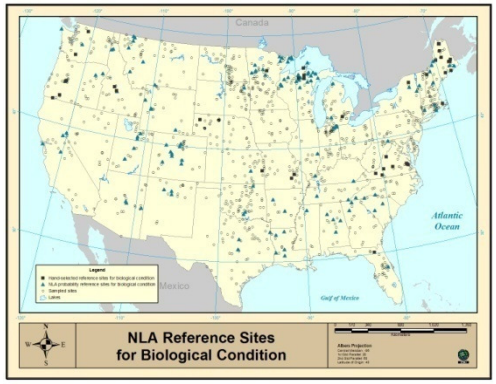
Finding implies success of WWTP improvement and other phosphorus control initiatives



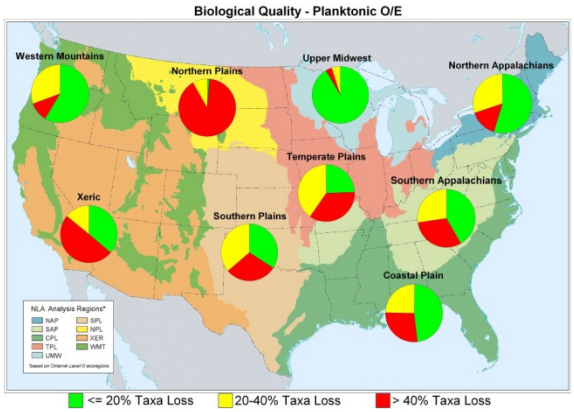
Comparison of change in trophic status of NES lakes

National Lakes Assessment Report

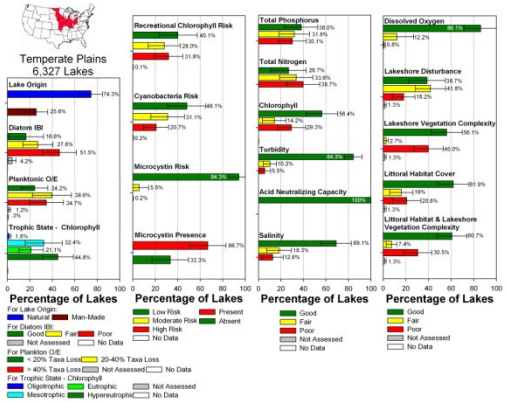
Intro and Design



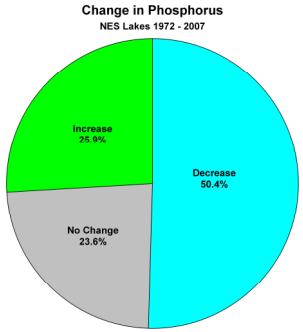
National Findings



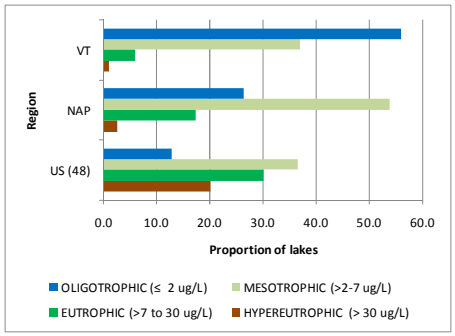
Ecoregional Findings



Change over Time

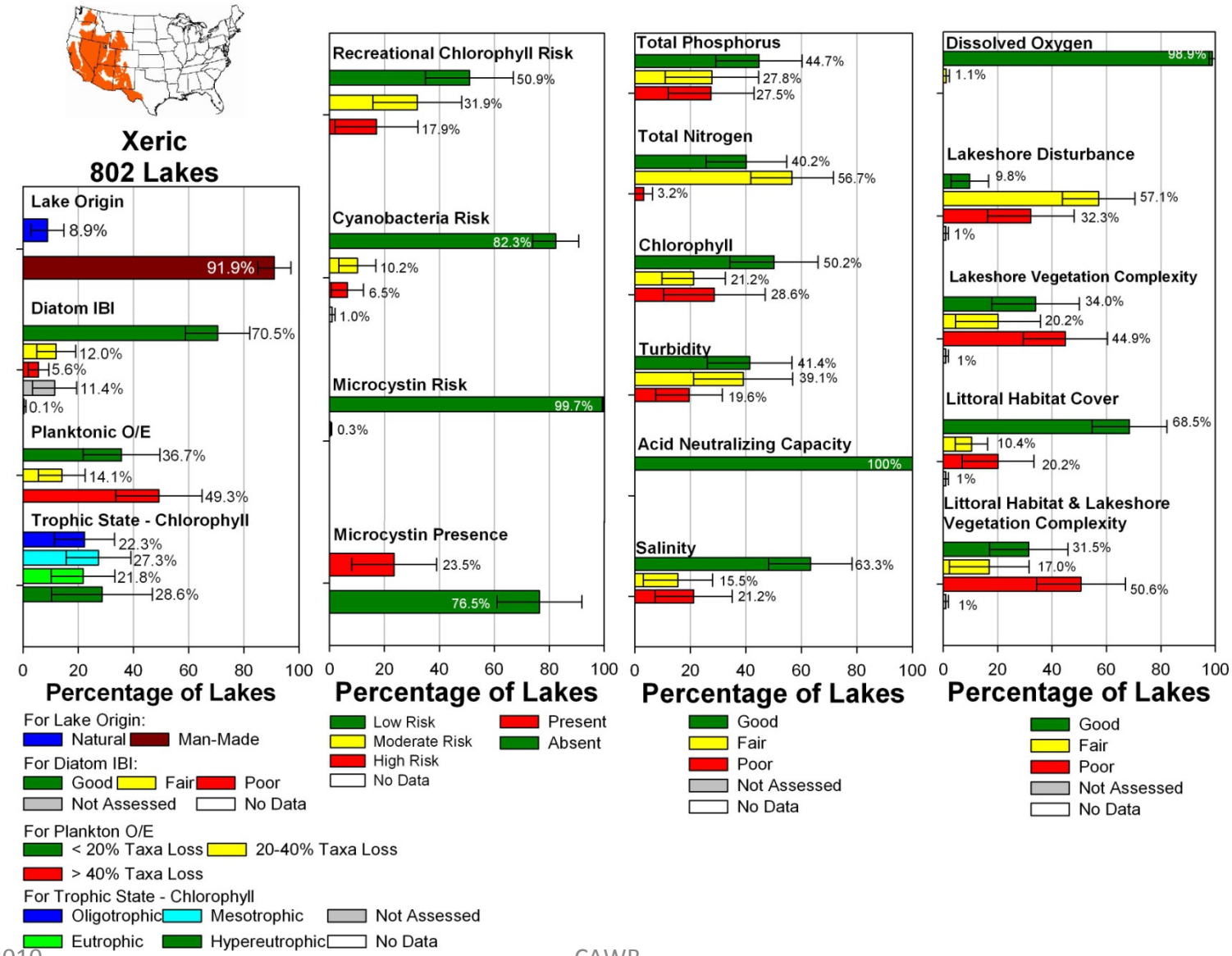


Uses of the NLA Results

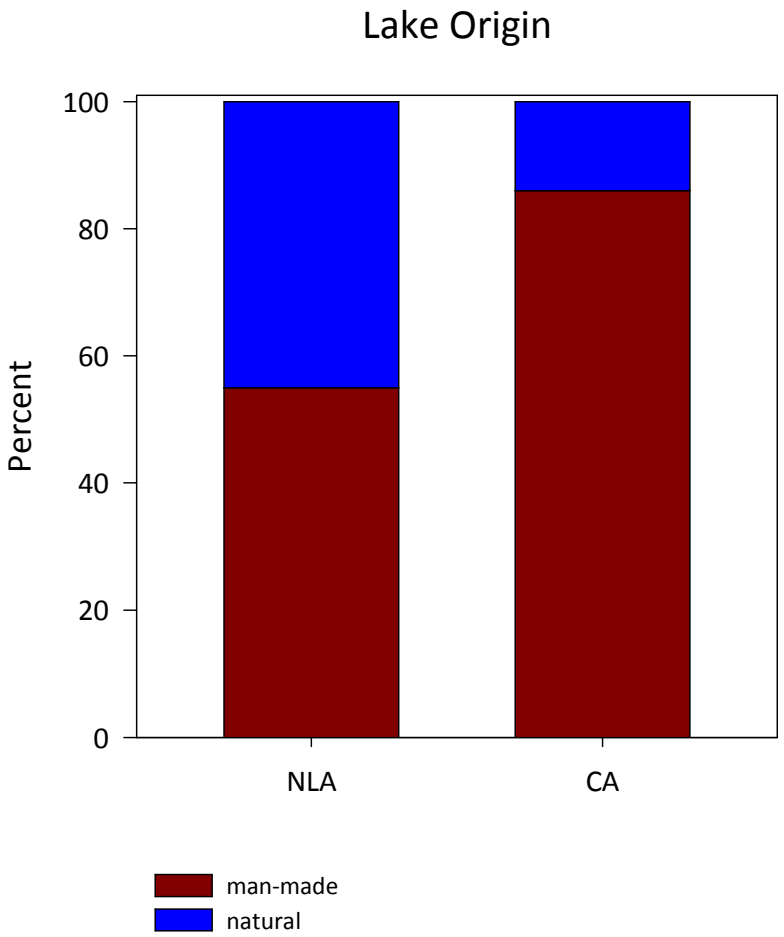


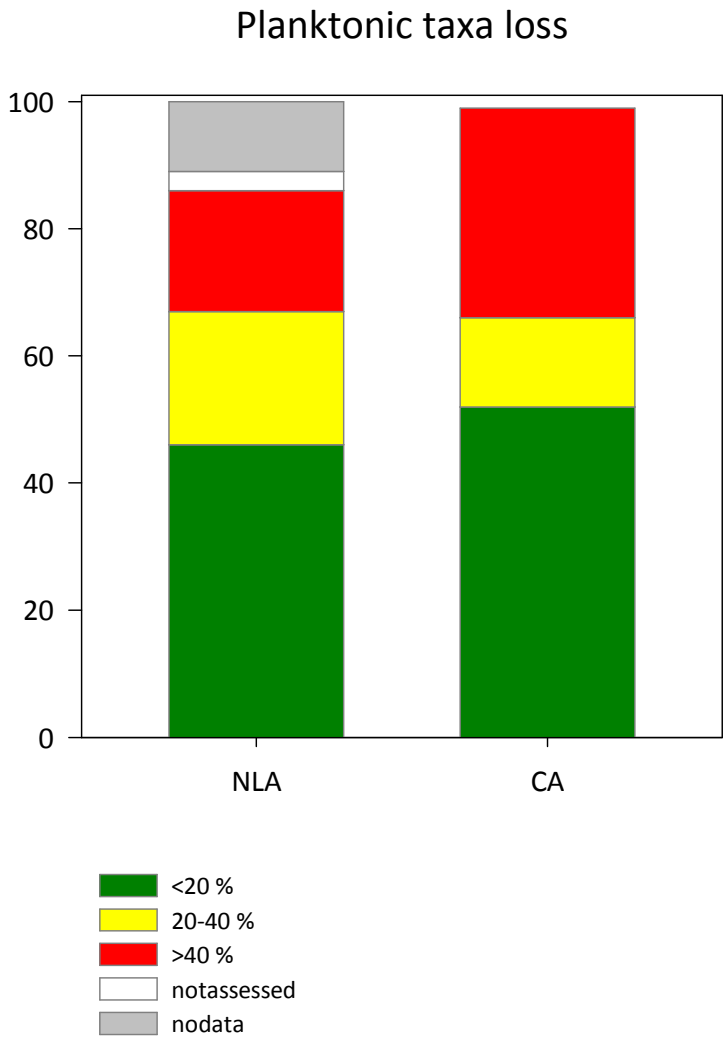
Future Actions –2012

Regional reporting units



California data within the national assessment





NLA 2.0

2012 schedule

Activities

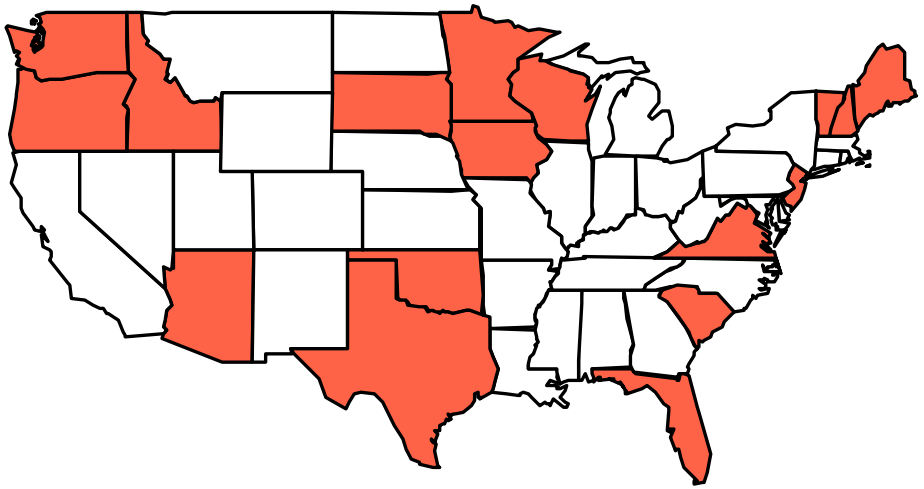
2010	2011	2012	2013	2014
Research	Design	Field	Lab/ Data	Report
Scientific issues	Target population	Training	Lab analysis	Data analysis
Assessment questions	Indicators	Site reconnaissance	Lab quality assurance	Presentations
Supplemental data analysis	Field/ lab practices	Sample collection	Data entry	Peer review
Methods refinement	Quality assurance plan	Field quality assurance	Data quality assurance	Final report

NLA 2.0

steering committee

Partners

- Army Corps of Engineers
- EPA (OWOW, ORD, OST, & Regions)
- Fish and Wildlife Service
- Forest Service
- Osage Nation
- States (17)



Process

- Monthly calls for discussion
  - Issues teed up by Amina Pollard based on upcoming decisions and member suggestions
- Targeted workshops
- National meetings
- State and Regional partners communicate with states without representation

NLA 2.0

assessment questions

Core questions

- What is the current condition of the nation's lakes as reported:
  - Nationally for all targeted population of lakes, and
  - Regionally
- Which stressors are contributing the most to the degradation of lake condition?
- How has the condition of lakes changed since the 2007 National Lakes Assessment?

Possible supplemental questions

- What is the relative condition of :
  - Public use/ public access lakes?
  - Lakes in urban landscapes?

NLA 2.0

indicators

- Zooplankton
- Phytoplankton
- Sediment diatoms
- Pathogens (E. coli)
- Chlorophylla a
- Cyanobacteria
- Algal toxins
- Nutrients (N and P)
- Secchi
- Water chemistry
- Water profile
- Pesticide screen *

- Lakeshore habitat
- Shallow water habitat
- Combined habitat index
- Human lakeshore disturbance
- Macrophyte – transect *

- Benthic macroinvertebrates
- Fluorescence
- Macrophyte – grid

- Fish tissue
- Fish community

NLA 2.0

upcoming milestones

- Indicator selection
  - NLA Indicator Workshop
    - 1-2 NOV 2010, Oklahoma City, Oklahoma
- Initial draw of lake sites
  - ~1000 lakes nationwide and 50 sites per state
  - Possible integration of state sampling sites
  - Initial draw should be completed by the end of JAN 2011
- Manual and QAPP revisions spring 2011
- Field sampling begins spring 2012
- NLA Steering committee contributes to all phases of the survey
  - Contact Amina Pollard (pollard.amina@epa.gov) if you are interested in participating