Using EPA's National Lake Assessment to Assess the Condition of Vermont Lakes

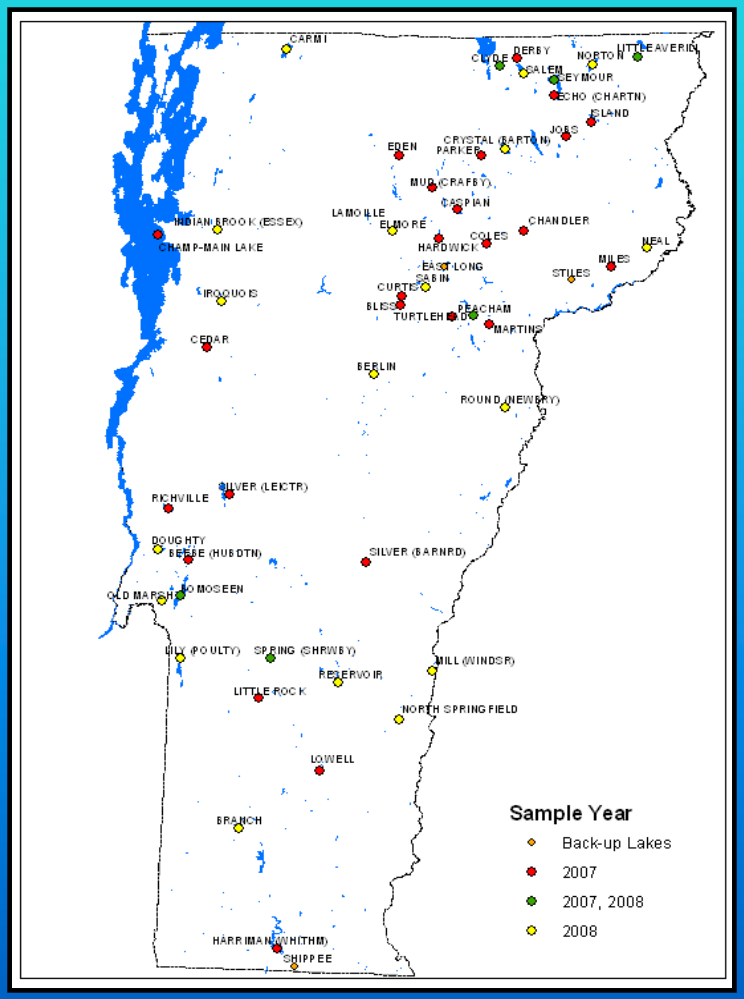
Mark Mitchell[1], Neil Kamman[1], Steve Paulsen[2] and Hilary Snook[3]

[1]VTDEC – Water Quality Division, Waterbury, VT

[2]USEPA – Aquatic Monitoring and Assessment Branch Western Ecology Division, Corvallis, OR

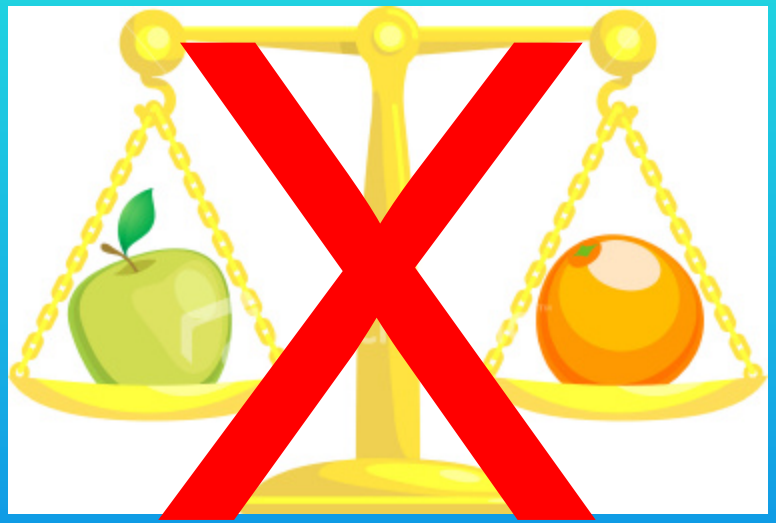
[3]USEPA Region 1 – New England Regional Laboratory, North Chelmsford, MA

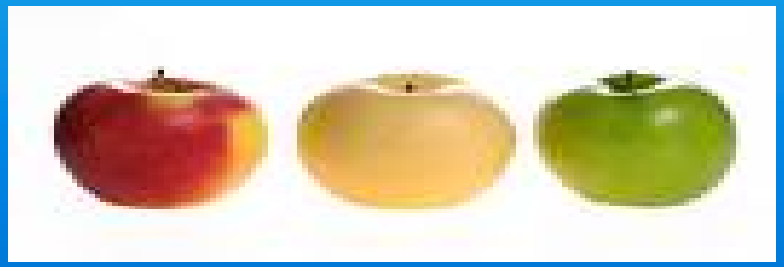
2007 and 2008 Vermont participated in the National Lake Assessment



- 11 lakes: NLA draw
- 40 lakes: EPA's additional draw for VT statewide assessment

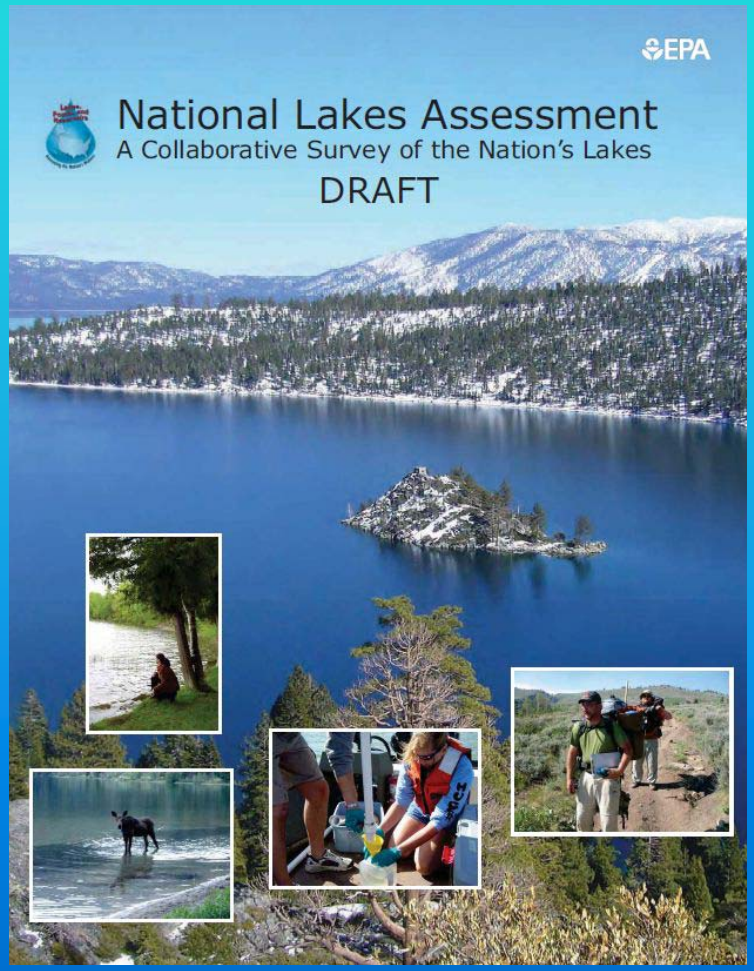
Why Vermont Participated in Overdraw Sampling

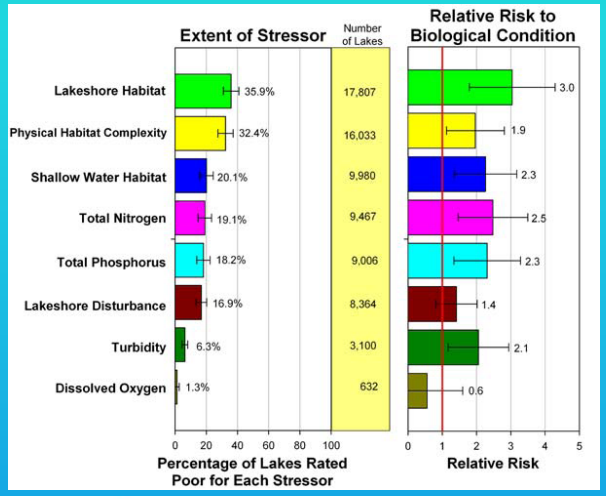


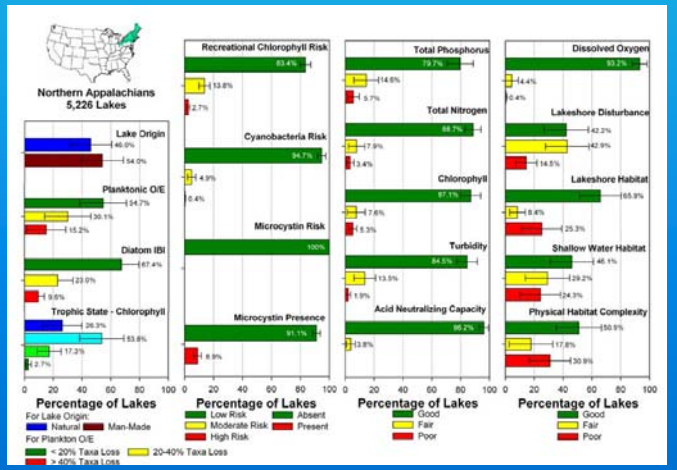


- To assess the condition of Vermont's lakes using a probability survey
- To see how Vermont's lakes compare to the Ecoregion and Nation

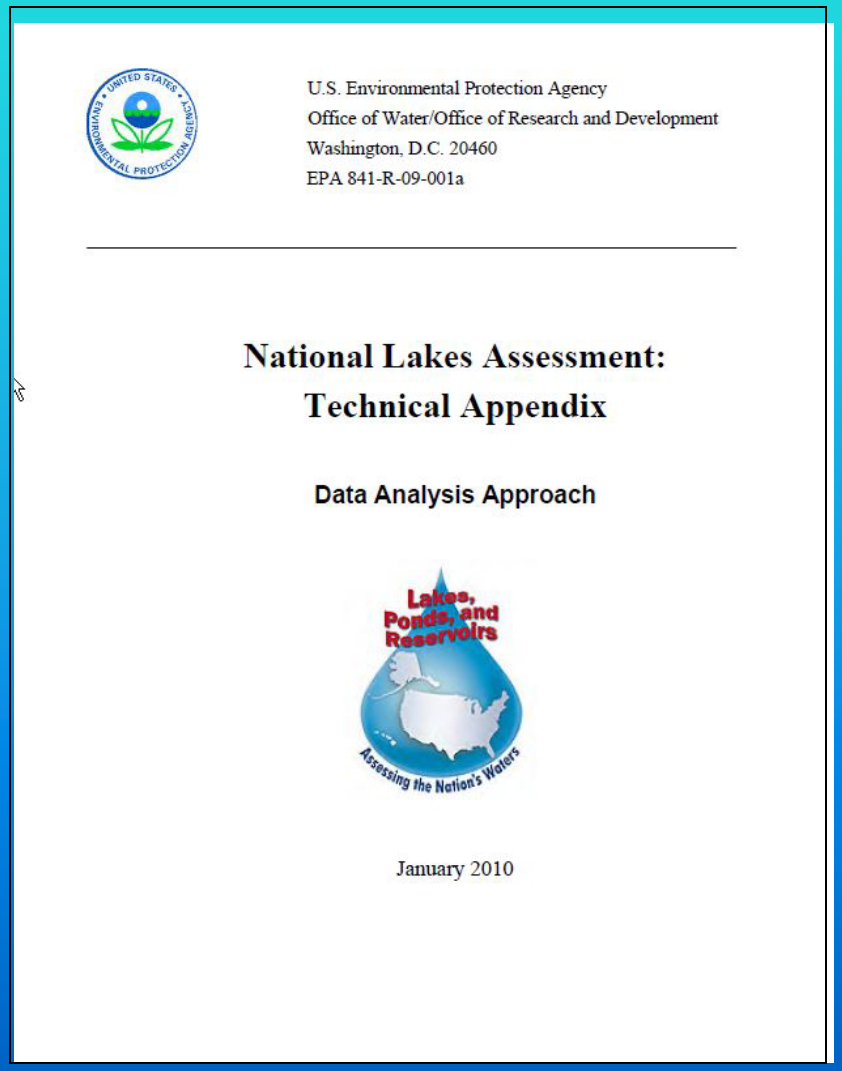
In December 2009 EPA published draft final report on NLA







In January 2010 EPA put out the updated technical document



U.S. Environmental Protection Agency
Office of Water/Office of Research and Development
Washington, D.C. 20460
EPA 841-R-09-001a

National Lakes Assessment:
Technical Appendix

Data Analysis Approach

Lakes, Ponds, and Reservoirs
Assessing the Nation's Waters

January 2010

Physical Habitat Indices:

Shoreline Human Disturbance Index

$$RDis\_IX = \frac{1 - \{ 1 / [1 + hiiNonAg + (5 \times hiiAg)]\} + hifpAnyCirca}{2}$$

Riparian Vegetation Cover-Complexity Index

$$RVegQ\_2 = \frac{\{(rviwoody / 2.5) + rvfcGndInundated \}}{2}$$

Littoral Cover & Complexity Index

$$LitCvr\_D = \frac{(SomeNatCvr/1.5)+(fcfcSnag/0.2875)+\{(amfcFltEmg)/1.515\}}{3}$$

Littoral-Riparian Cover & Complexity Index

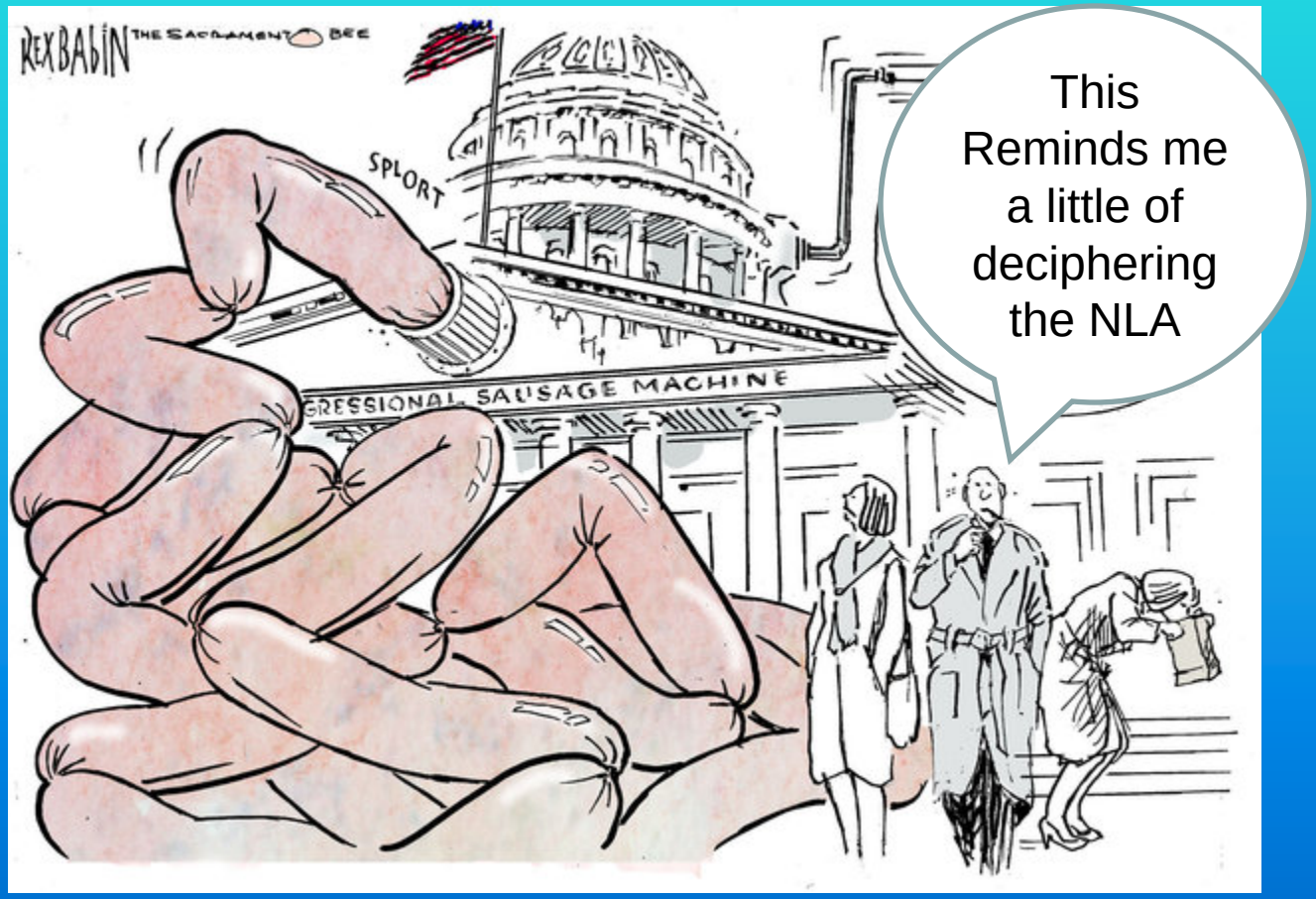
$$LitRipCvQ = \frac{(RVegQ + LitCvrQ)}{2}$$

Thresholds: PHab & WQ

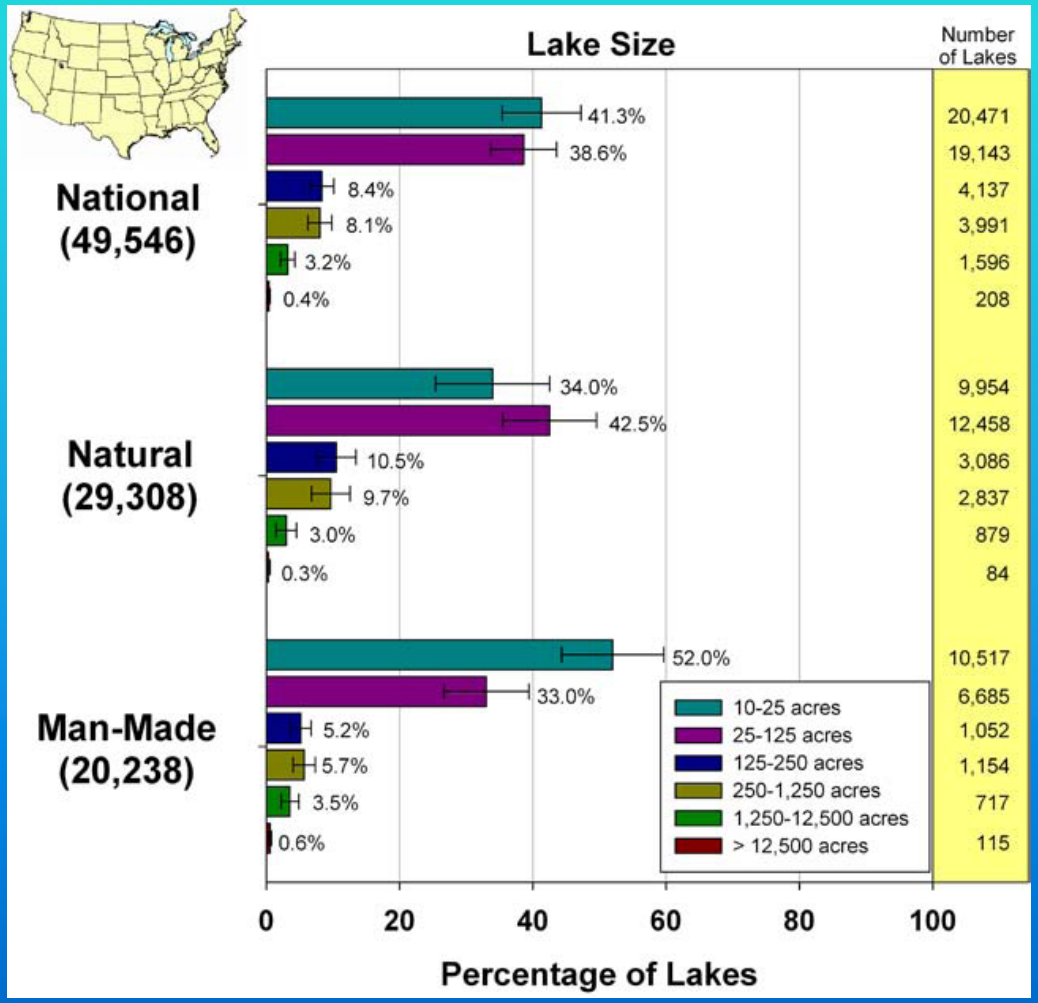
Last Month Enlisted EPA's Help

- Steve Paulsen
- Phil Kaufmann
- Tony Olsen
- David Peck

“People who love sausage and people who believe in justice should never watch either of them being made” Otto Bismark

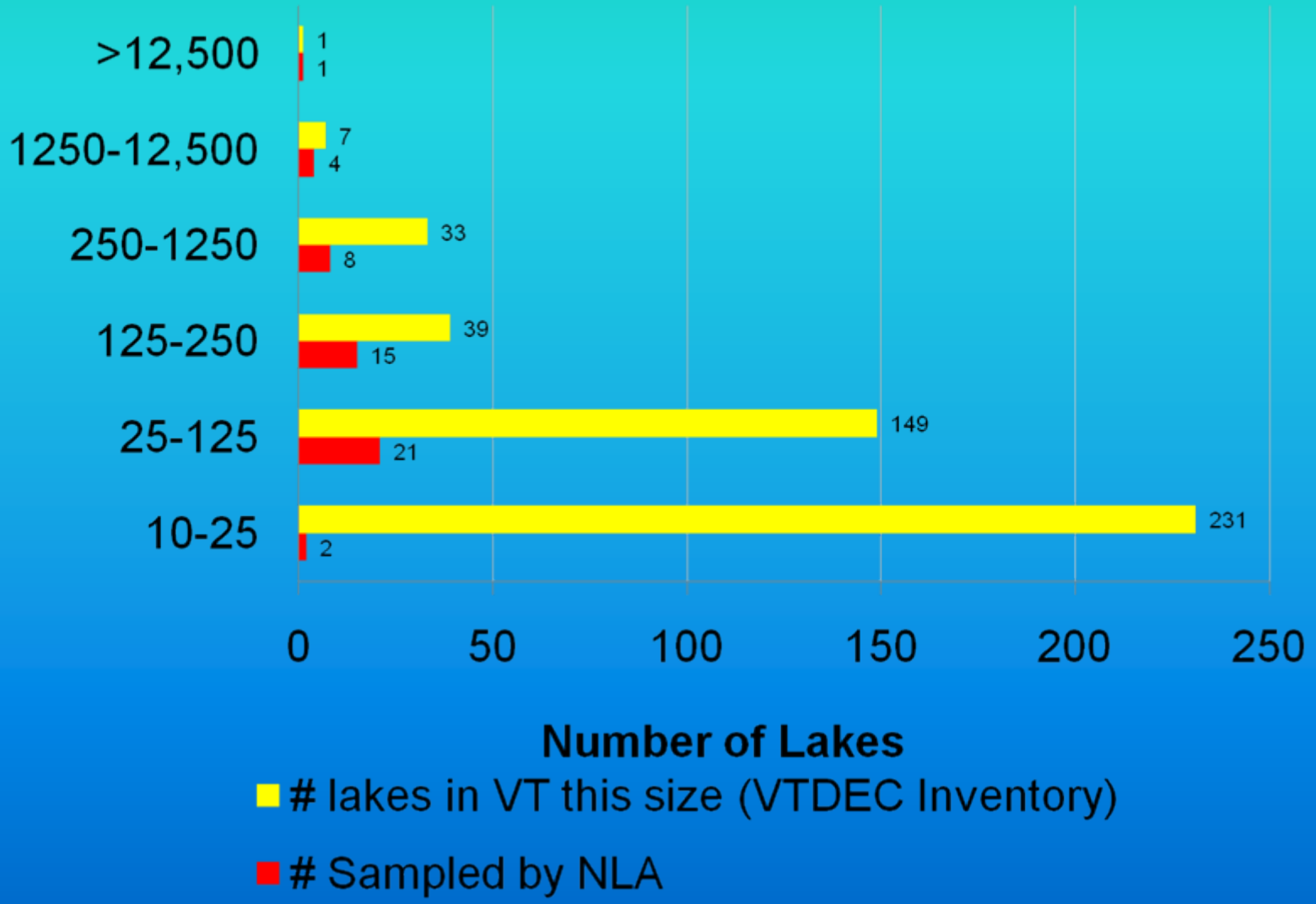


Weighting Based on Lake Size

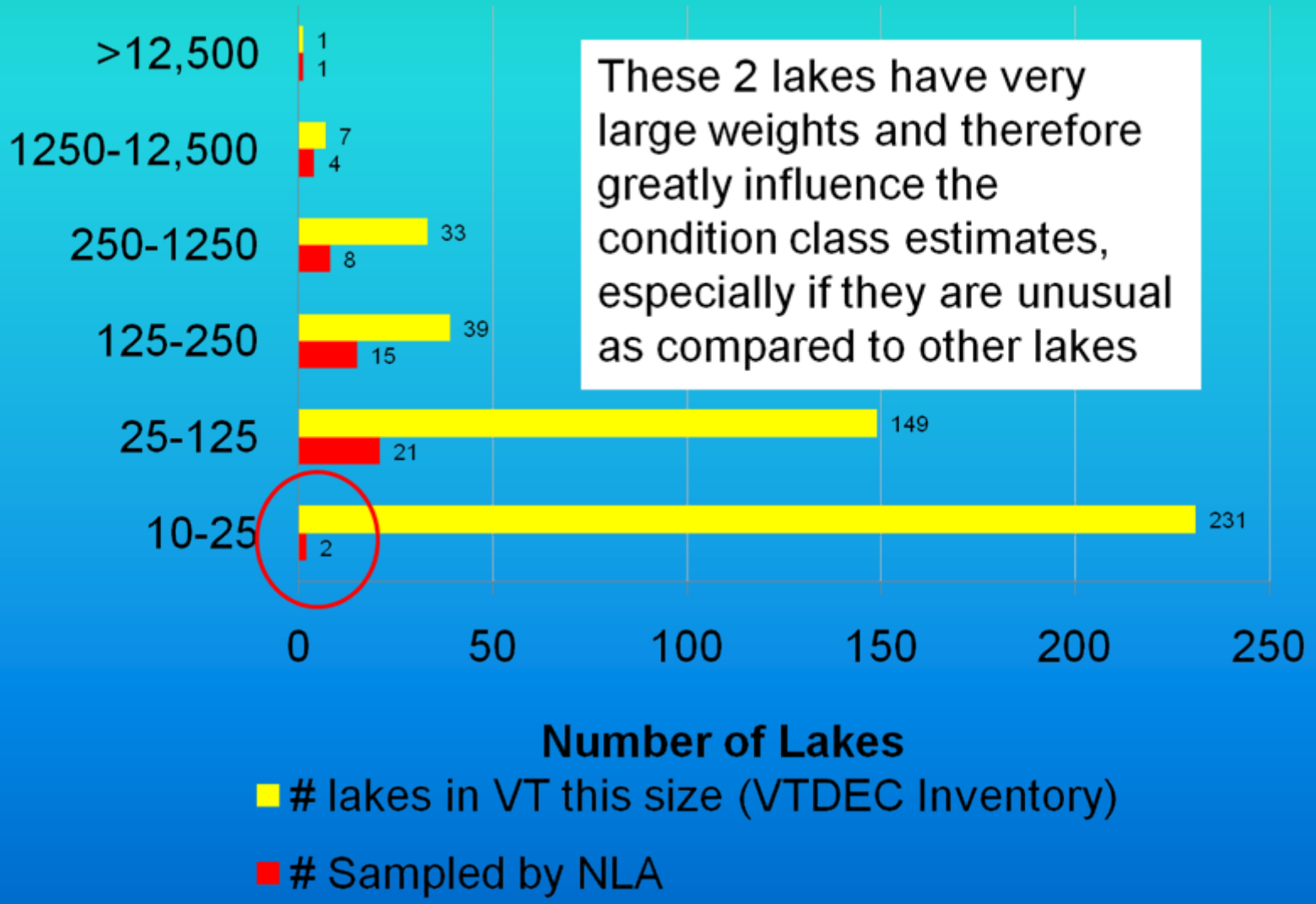


- Lake selection and overdraw designed to be representative of lakes across the nation

Lakes In Each Size Class (NLA Sampled & Total # in VT)

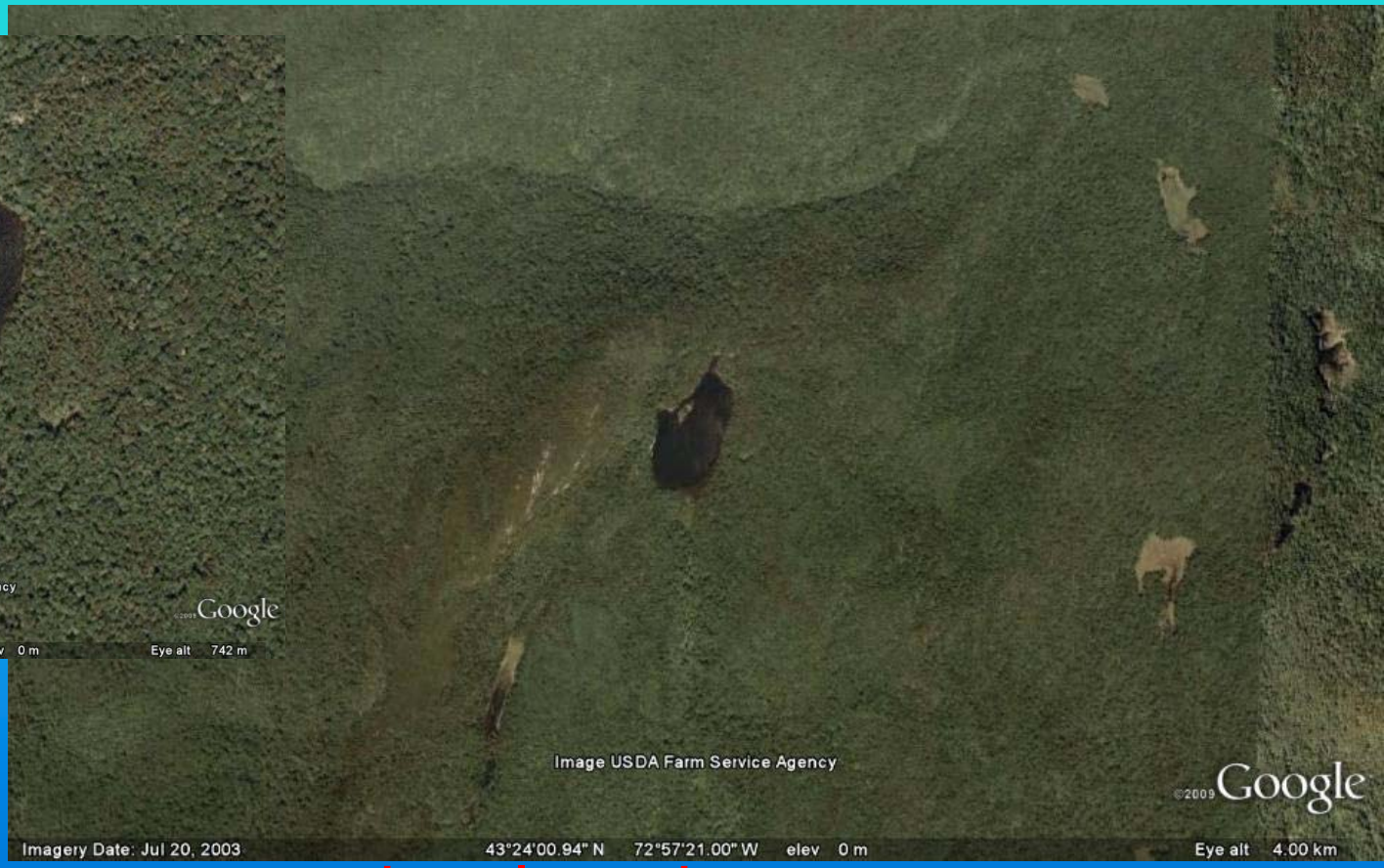


Lakes In Each Size Class (NLA Sampled & Total # in VT)



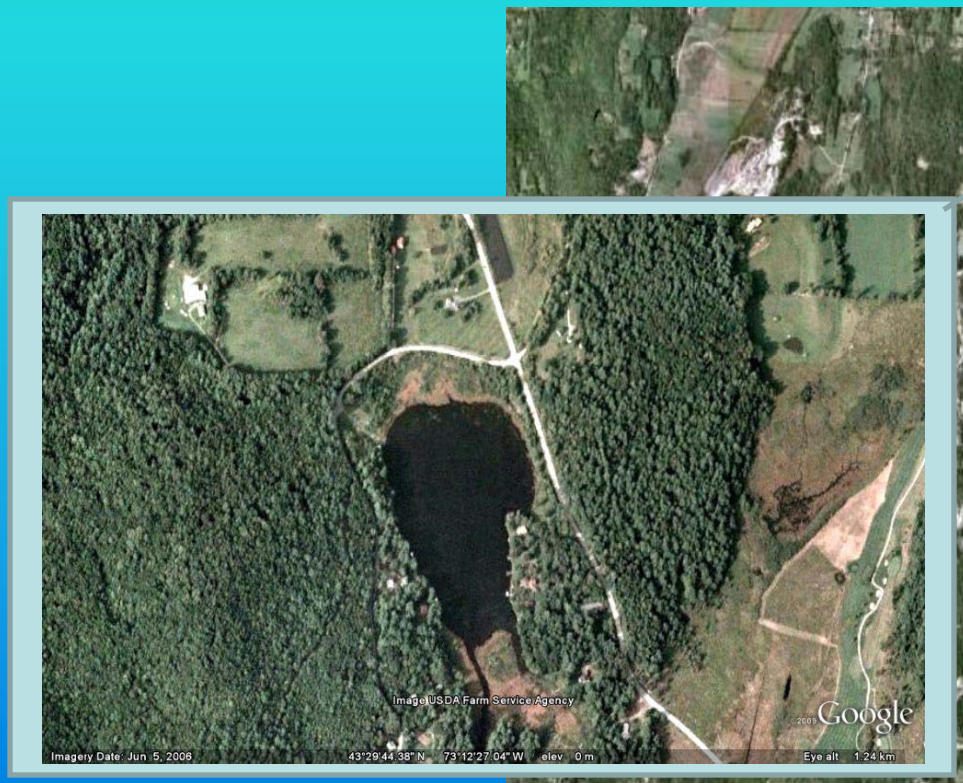
These 2 lakes have very large weights and therefore greatly influence the condition class estimates, especially if they are unusual as compared to other lakes

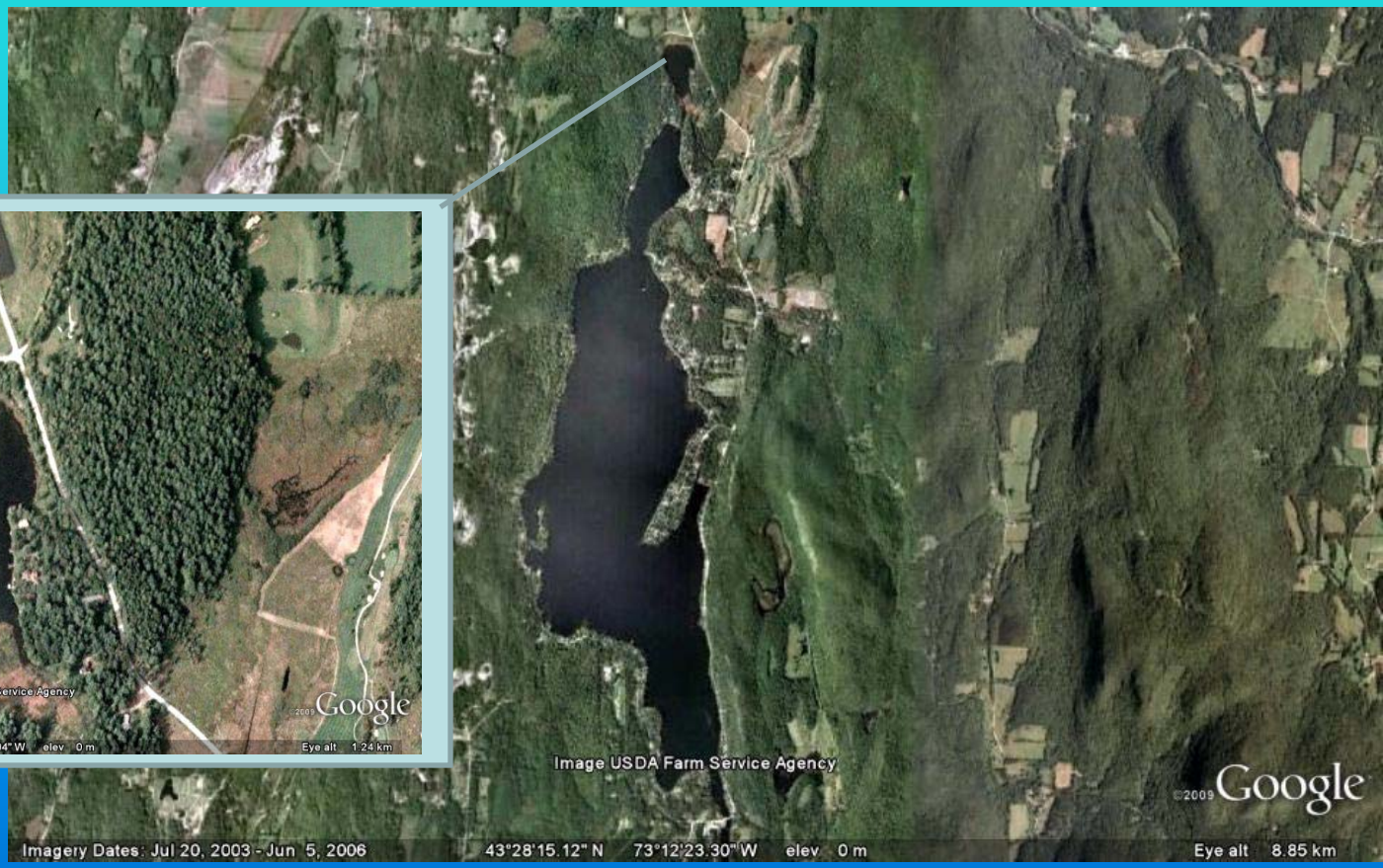
Little Rock Pond
Green Mountain National Forest



Undeveloped
Acid Impaired

Lily Pond, Poultney





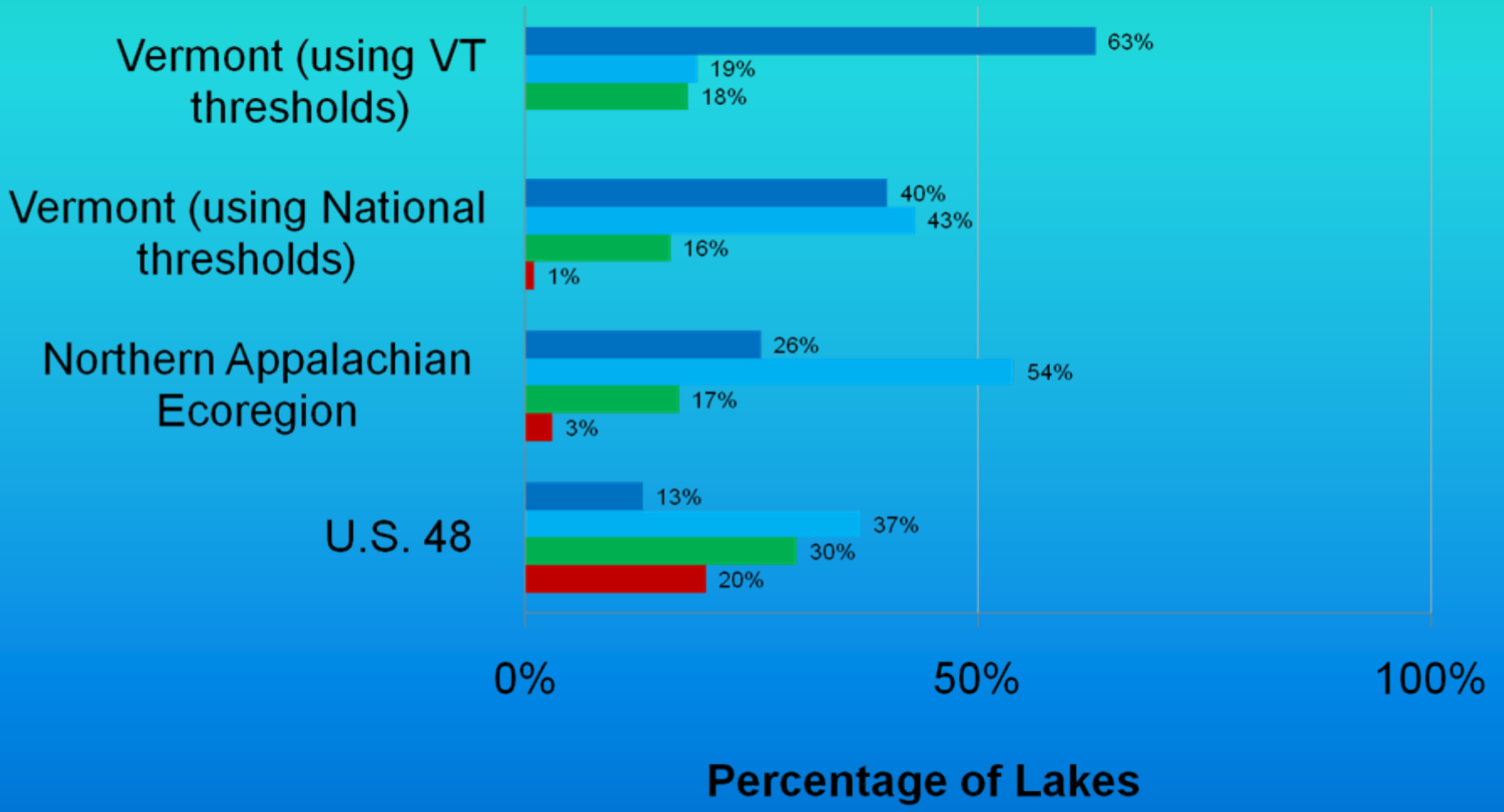
Eutrophic

Part of a larger lake system

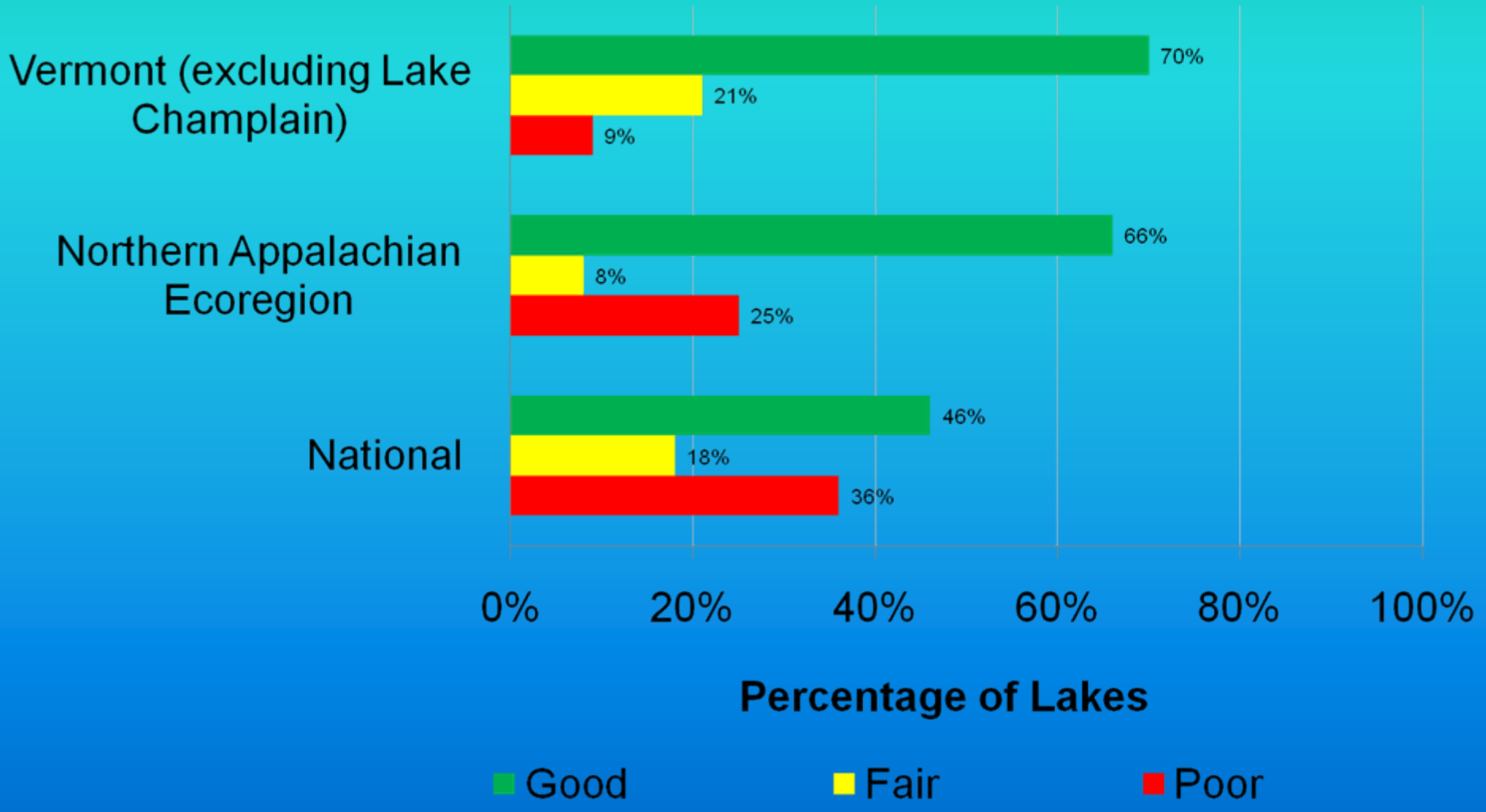
So we threw out the 2 lakes in the 10-25 acre class

- We now compare the condition of Vermont lakes >25 acres to the condition of the ecoregion and national lakes >10 acres

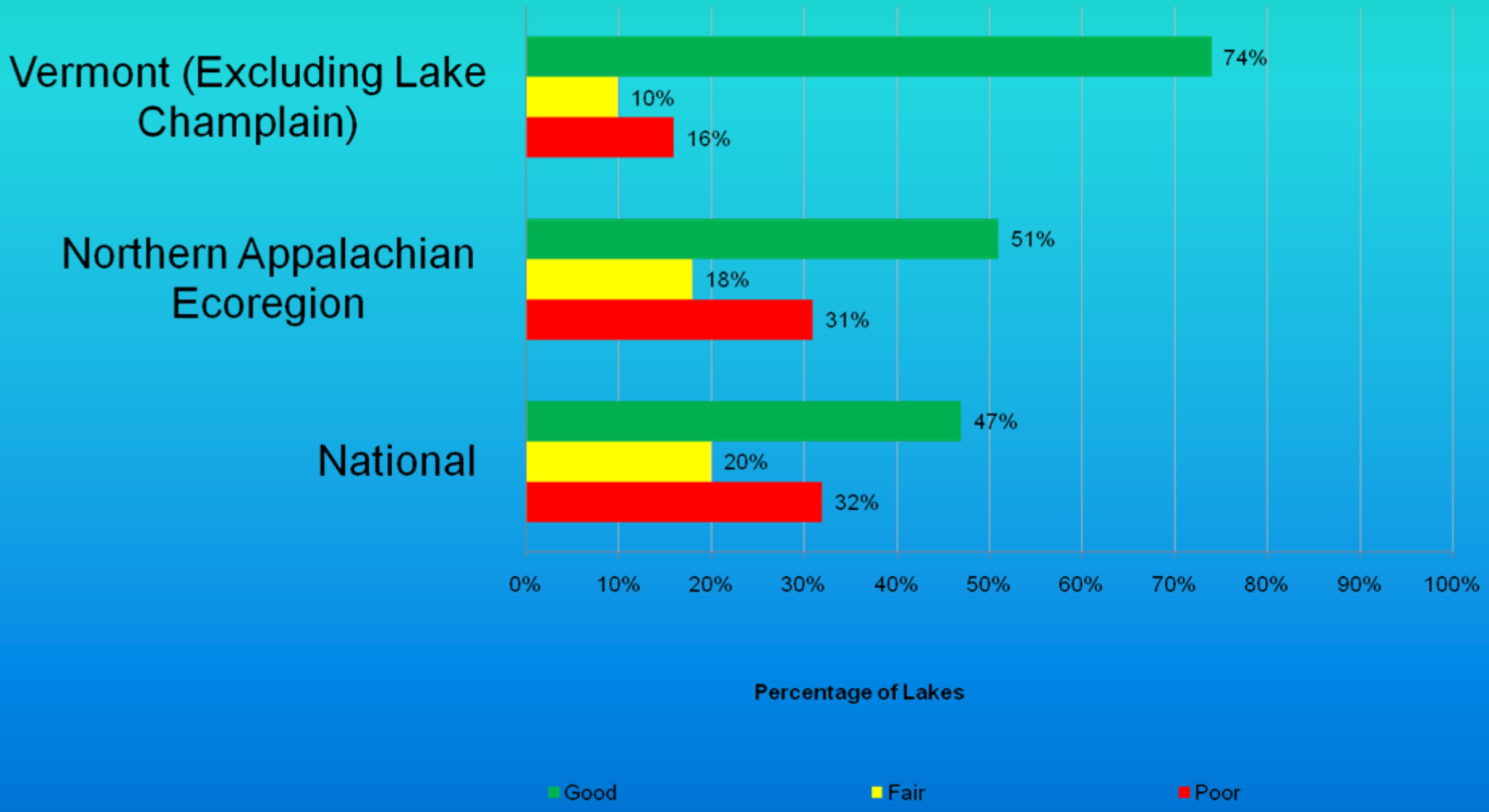
Trophic State (chlorophyll-*a*)



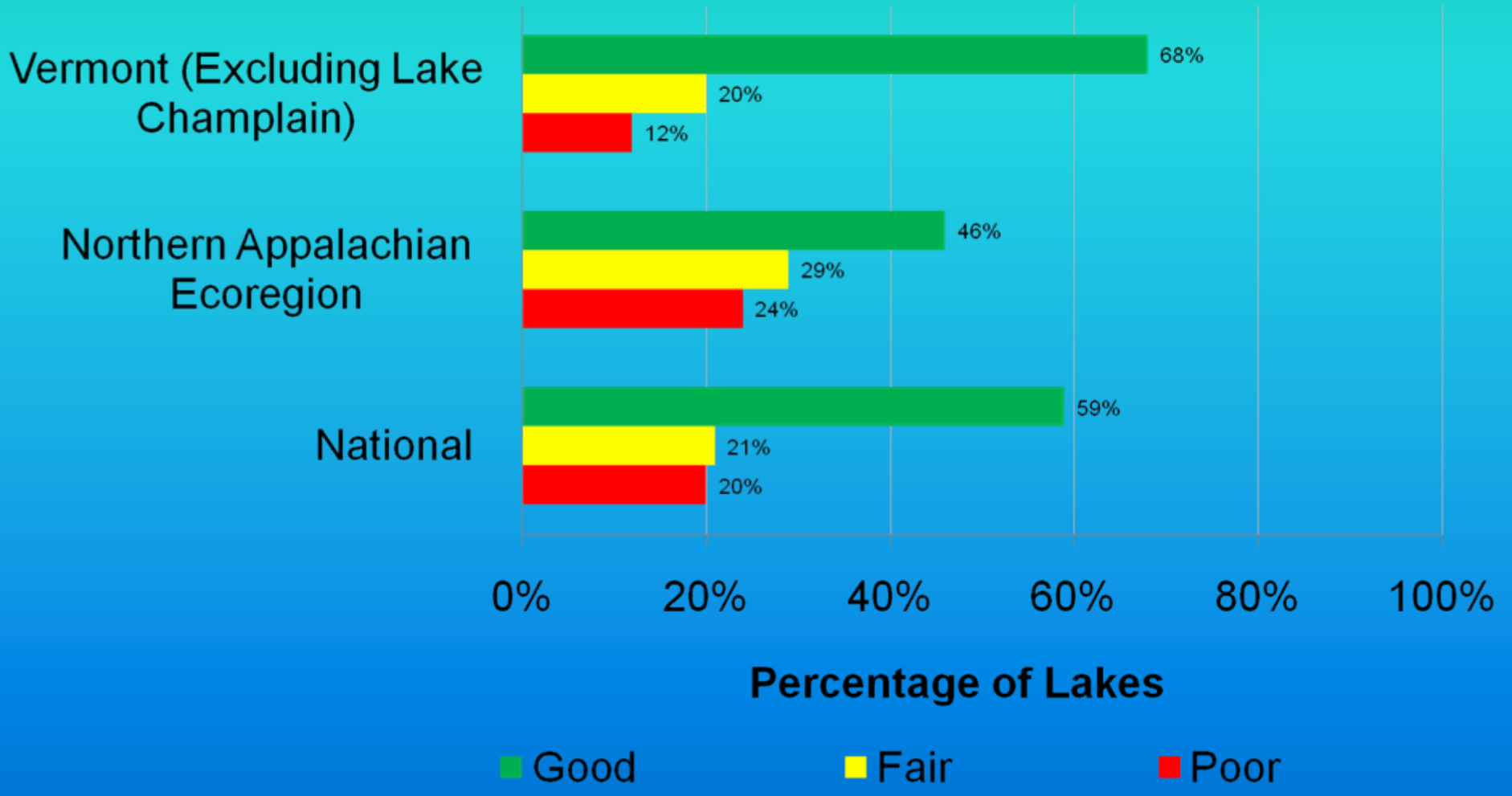
Lakeshore Habitat



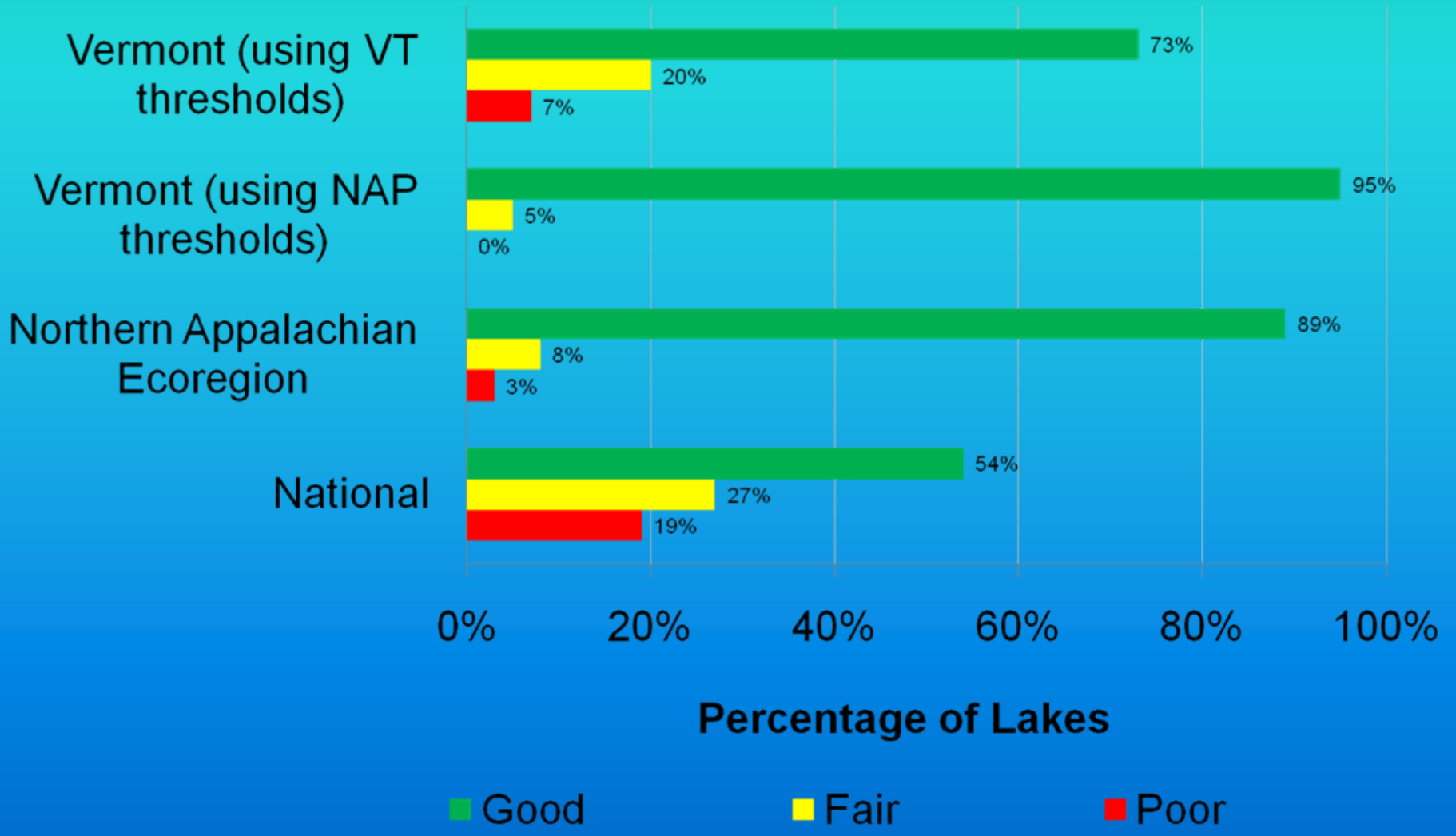
Physical Habitat Complexity



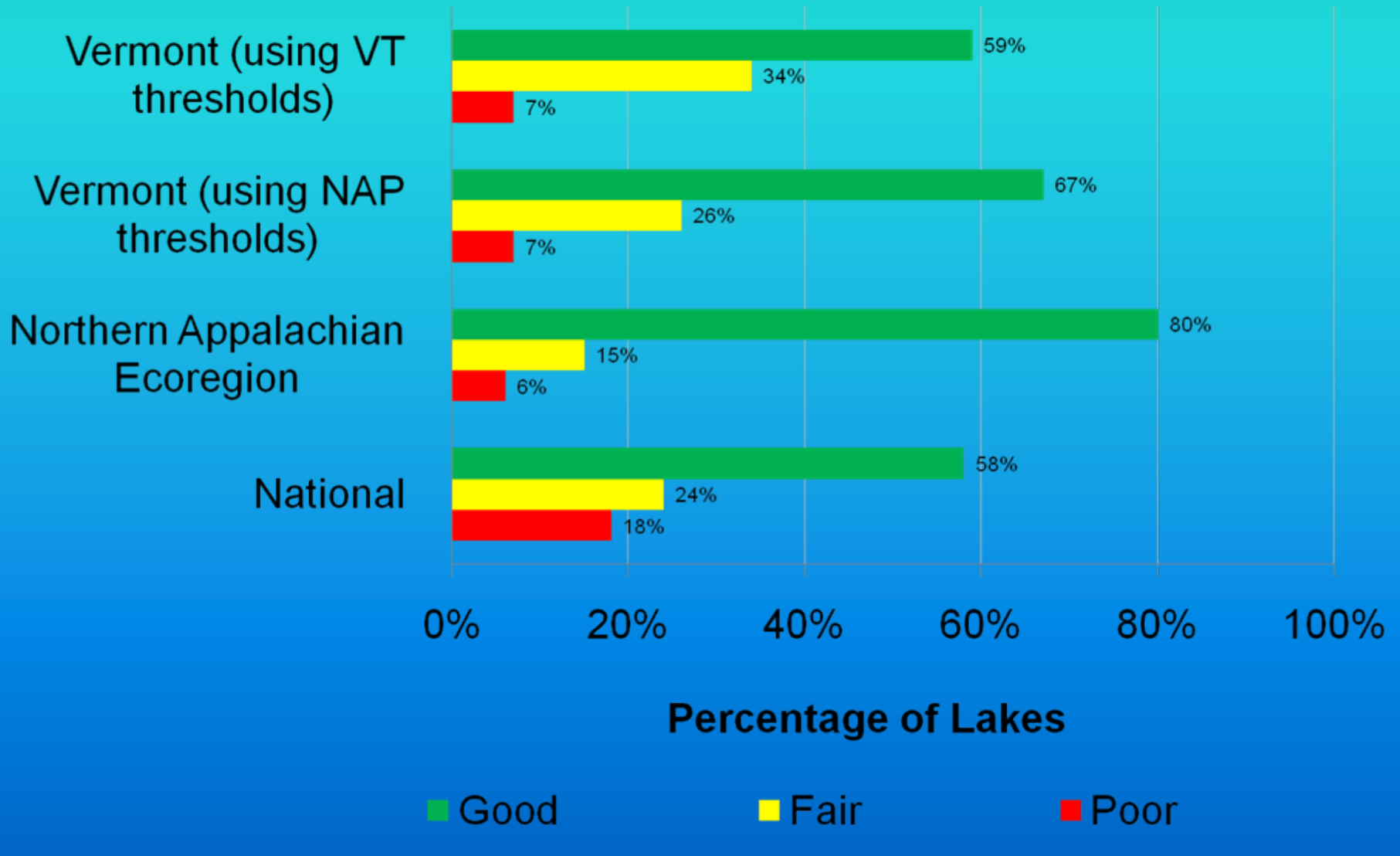
Shallow Water Habitat



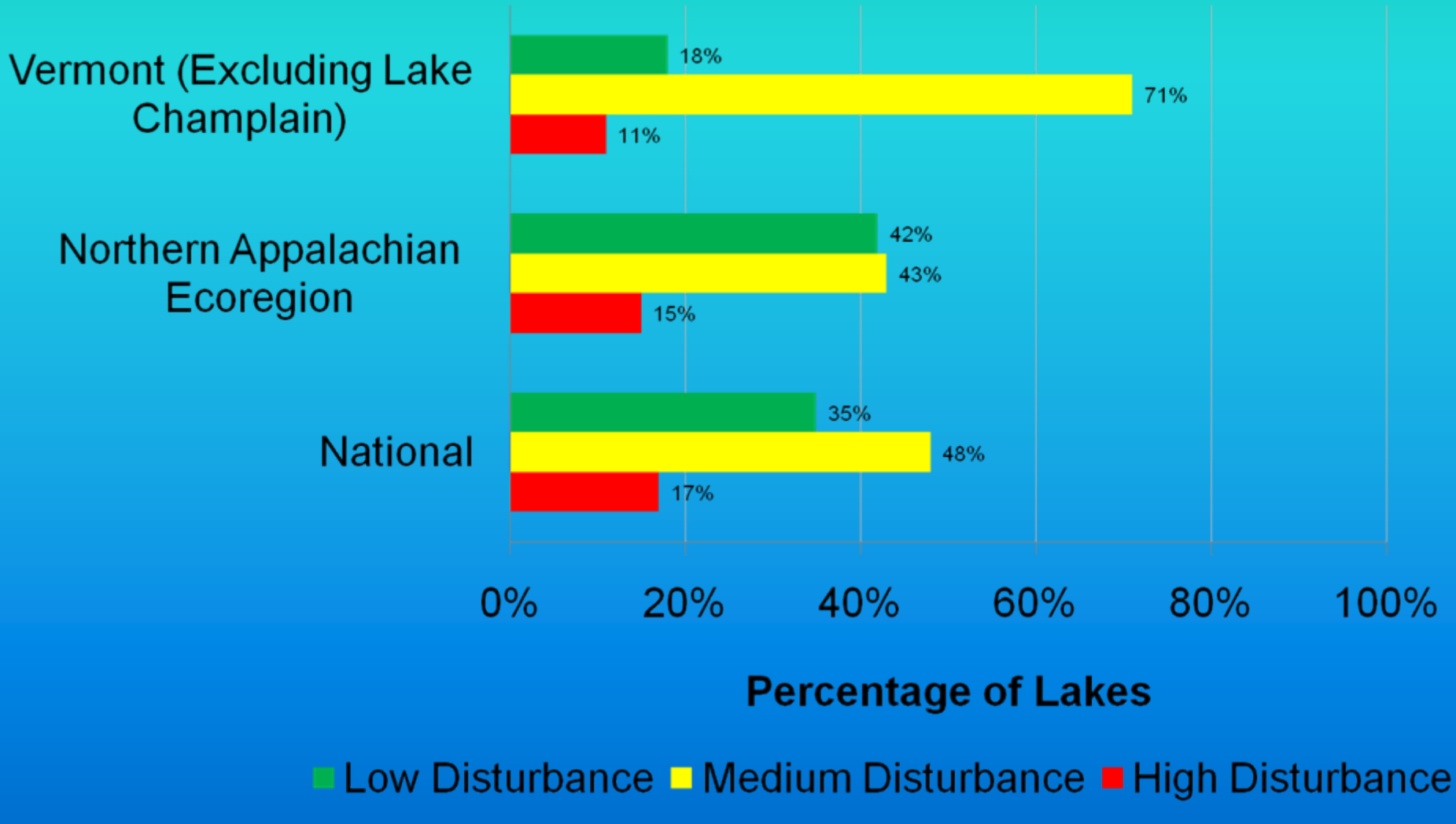
Total Nitrogen



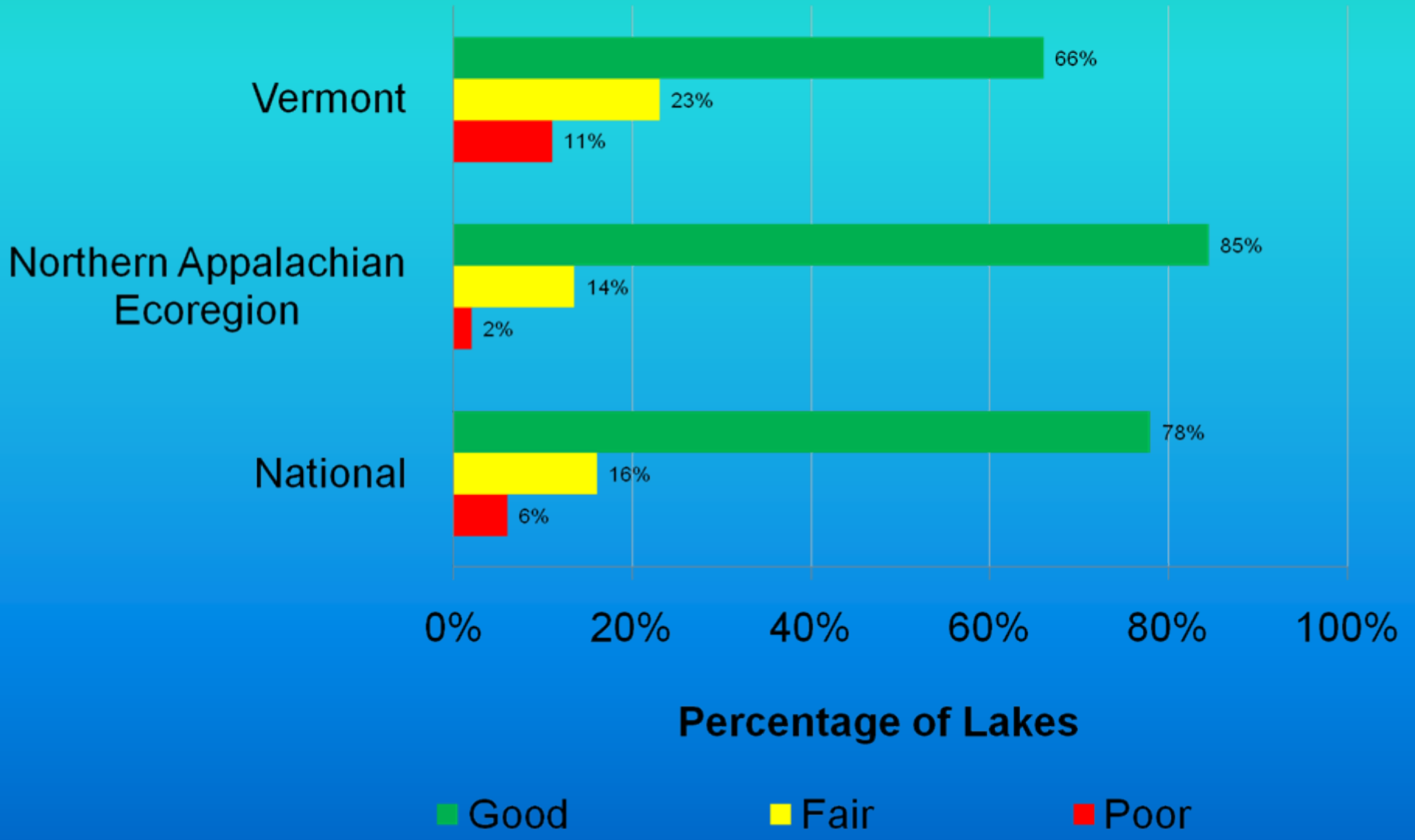
Total Phosphorus



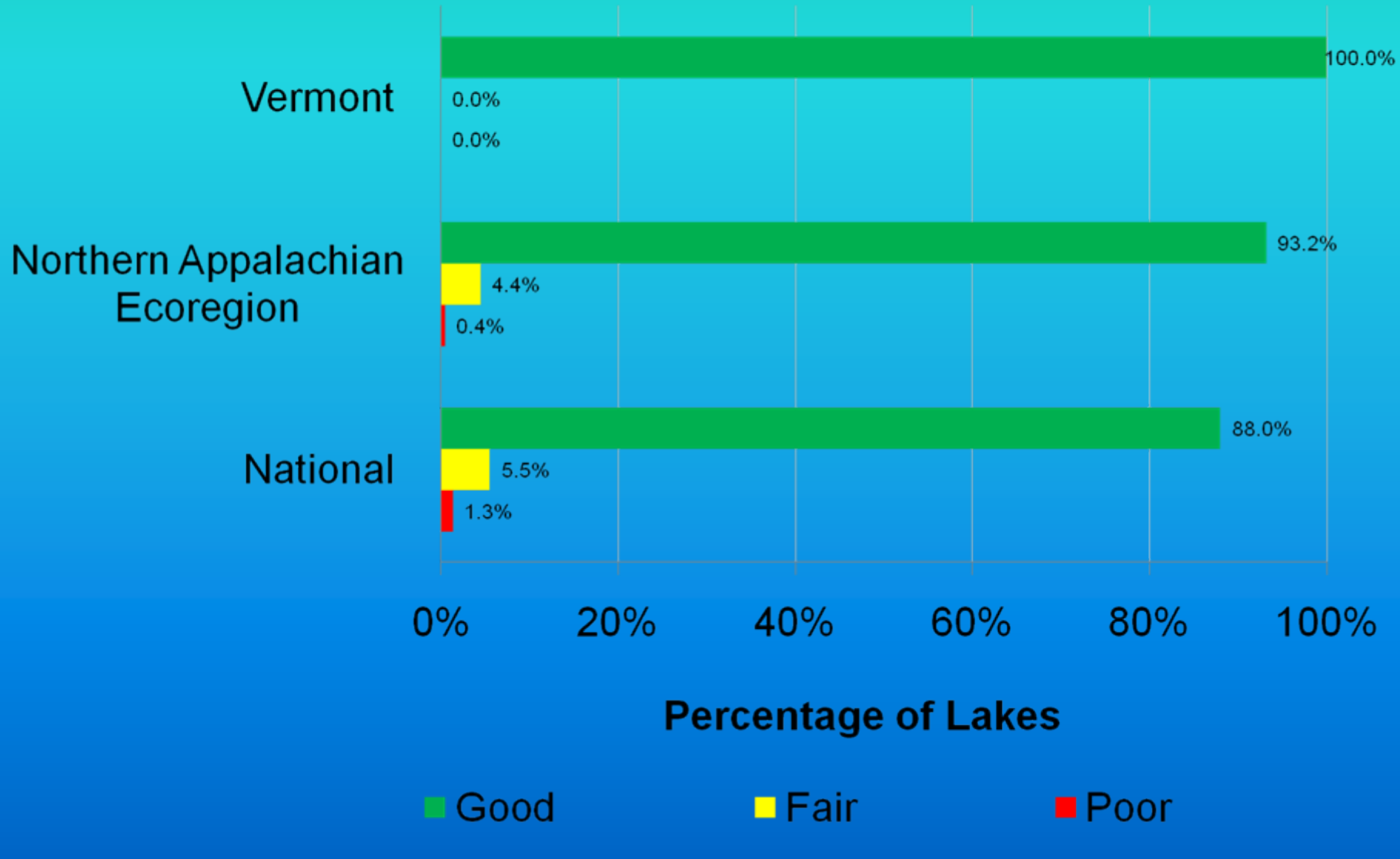
Lakeshore Disturbance



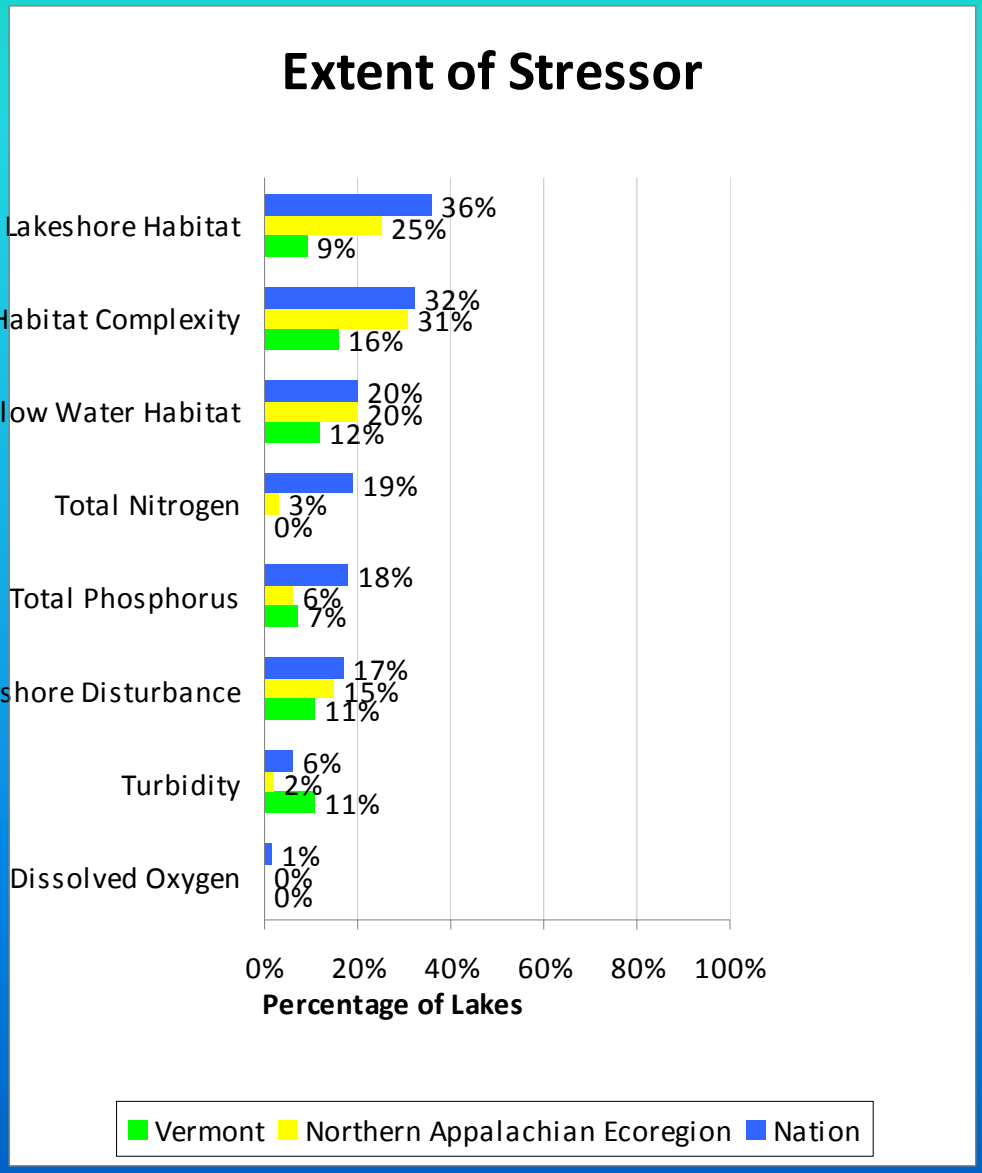
Turbidity


Vermont
66%
23%
11%
Northern Appalachian Ecoregion
85%
14%
2%
National
78%
16%
6%
0%
20%
40%
60%
80%
100%
Percentage of Lakes
Good
Fair
Poor

Dissolved Oxygen

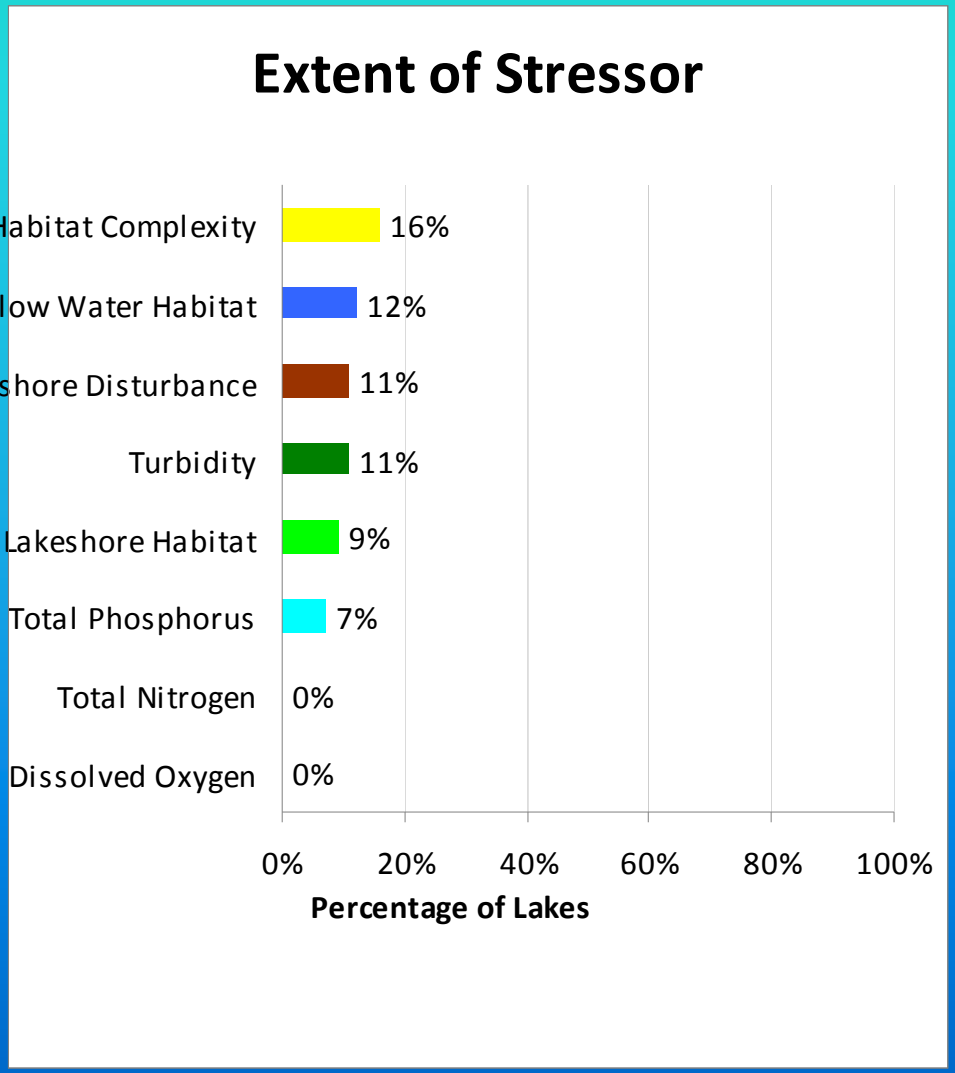


Extent of Lakes in Poor Condition



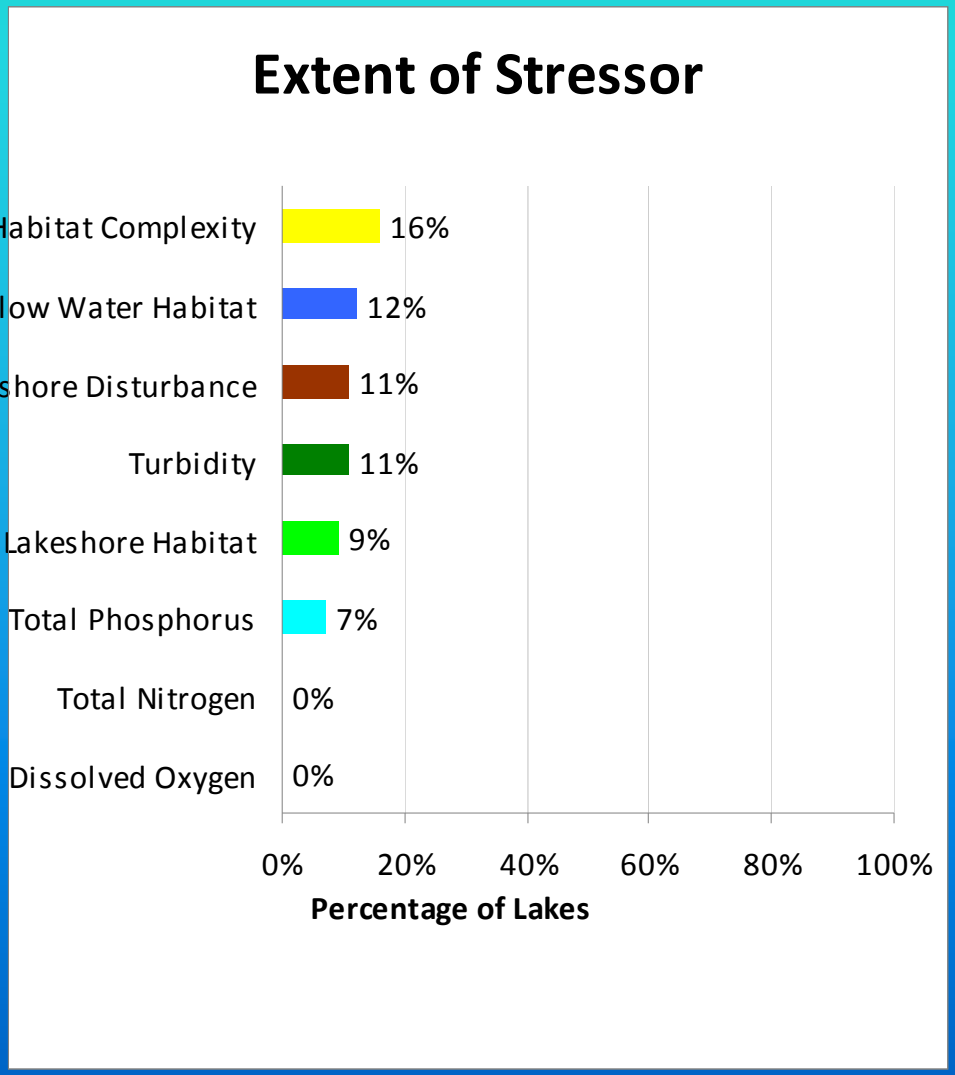
- Poor Turbidity was more widespread across VT lakes than across the region or nation
- All other stressors were less widespread in Vermont than across the nation, especially nitrogen

Extent of Lakes in Poor Condition



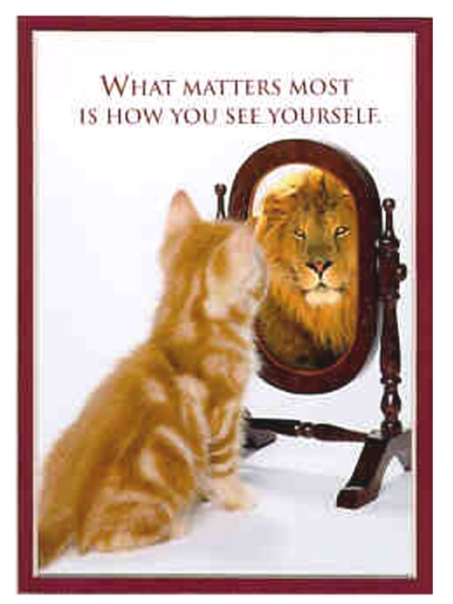
- Vermont's most widespread stressor was Physical Habitat Complexity
- It affected more than twice the percentage of lakes that Phosphorus did

Management & Monitoring Implications for Vermont Lakes



- Address lakeshore and littoral habitat stressors
  - Develop routine monitoring procedures
  - Develop management strategy
- Determine if turbidity really is a more widespread stressor than phosphorus
  - Incorporate into routine monitoring
- Phosphorus monitoring and management major emphasis of lake program
  - Redistribution of program's limited resources may be warranted

Lessons Learned

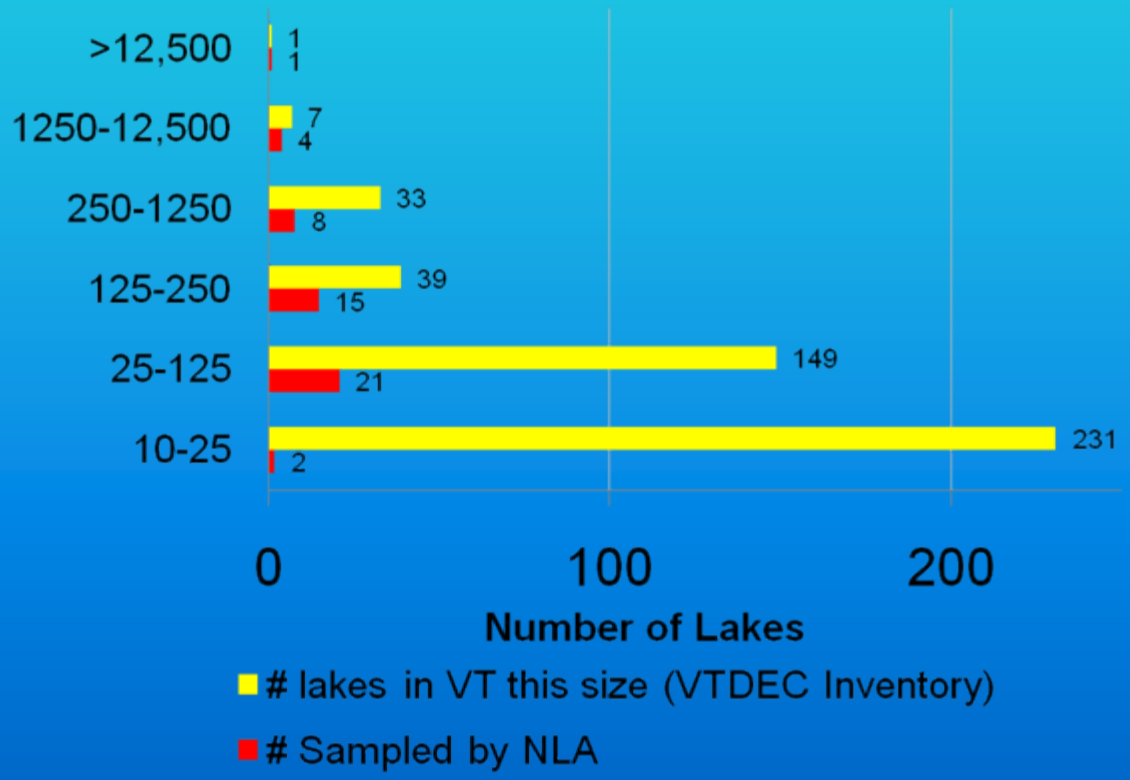


- Participating in the overdraw makes seeing your state's lake condition in comparison with the region and nation possible
- Vermont now knows how the lakes that make up the majority of the lake area in the state compare (lakes >25 acres)

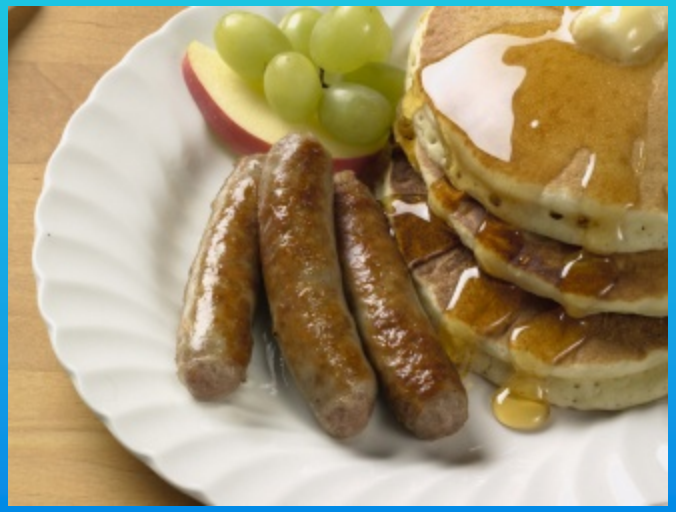
Lessons Learned

- Should be cautious in interpretation of results from lakes sampled and their representation of the whole state
- The most common lake size in the Vermont landscape is the 10-25 acre size
- We were unable to characterize the condition of these lakes due to the draw

- The overdraw is part of the national design, it isn't a state tailored design (but could be in 2012)
- In a state designed approach, more 10-25 acre lakes would have been sampled to characterize the condition of the most common lake size in the Vermont landscape



The nicely packaged sausages in this presentation would never have made it to the plate without the help of EPA:



- Steve Paulsen
- Phil Kaufmann
- Tony Olsen
- David Peck

Vermont provided the maple syrup