

Session E2: The National Lakes Assessment 2007: Continuing Analyses and Statewide Survey Results

Room A106

10:30 am – 12:00 pm

0063

E2-1

Using $d^2\text{H}$ and $d^{18}\text{O}$ in Assessing Evaporation and Water Residence Time of Lakes in EPA's National Lakes Assessment

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Stable isotopes of water and organic material can be very useful in monitoring programs because stable isotopes integrate information about ecological processes and record this information. Most ecological processes of interest for water quality (*i.e.*, denitrification) require significant time and effort to collect using traditional methods. Thus, measurements of these processes are often excluded from spatially extensive monitoring programs such as EPA's National Aquatic Resource Surveys. The stable isotopes contained in samples collected during brief monitoring visits can be used to elucidate some of these ecological processes of interest. We used the stable isotopes of water ($d^2\text{H}$ and $d^{18}\text{O}$) and of aquatic insects ($d^{13}\text{C}$ and $d^{15}\text{N}$) collected in the 2007 National Lakes Assessment to derive information on evaporation, water residence time, denitrification and methanogenesis. Here, we report on the results from the water stable isotopes. After chemical analysis, water samples were measured for $d^2\text{H}$ and $d^{18}\text{O}$ using a laser isotope system. Water isotopes for precipitation inputs were estimated using the spatially explicit models found at Waterisotopes.org. Lake water isotopes ranged from 5 to -20 for $d^{18}\text{O}$ and 20 to -135 for $d^2\text{H}$ with d-excess values (an indicator of evaporation) ranging from 13 to -43. Most lakes were more enriched than the local precipitation with dual-isotope slopes less than 8, indicating evaporation as the cause for this difference. While climate patterns across the USA drive some of the spatial patterns of evaporation in lakes, variation in lake water residence time is also a driver. Using d-excess and lake-precipitation differences as indices of evaporation, we rated lakes for high evaporation by comparing them to reference lakes within the same ecoregion. Interestingly, we found that highly-evaporated natural lakes were four times more likely to be in poor biological condition compared to less evaporated lakes, but evaporation was not correlated with biological condition in man-made lakes (*i.e.*, reservoirs). We do not currently understand the mechanisms that would explain this correlation and it leads to some intriguing research directions for future research. Water isotopes will also be collected during the 2012 National Lake Assessment so that temporal trends can begin to be assessed.

0149

E2-2

Condition of Indiana Lakes Following the National Lakes Assessment

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A total of 21 lakes were sampled in Indiana from 1,028 lakes sampled nationwide for the National Lakes Assessment in 2007 to report on the condition of the Nation's lakes, help states develop programs for monitoring and assessing lakes, and determine the baseline lake condition for future trend assessment. The US EPA offered to do additional draws of lakes for states that wished to do further statewide assessments similarly to the National assessment, so an additional 29 lakes were sampled giving Indiana a survey set of 50 lakes for a statewide Indiana lake assessment. This presentation will use the Indiana subset of probability lakes to see how Indiana compares to the rest of the nation in terms of healthy biological communities, most significant stressors, and distribution of those stressors.

0314

E2-3

The Health of Vermont Lakes: Results of the 2007 National Lake Assessment

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In 2007, Vermont participated in the National Lake Assessment (NLA). In addition to the 11 core lakes that EPA used as part of the NLA, Vermont sampled 40 more lakes to enable a statistically valid statewide assessment. Using the analytical methods described in

EPA's NLA technical appendix, the graphs used in EPA's 2010 Final Report and the help of EPA staff, Vermont was able to directly compare the condition of its lakes to the Northern Appalachian (NAP) Ecoregion and the Nation. Vermont had a higher proportion of oligotrophic lakes than the nation and eight of the nine ecoregions. It had a similar proportion of eutrophic lakes to the NAP Ecoregion, but half that of the nation. Ninety-five percent of Vermont lakes were rated in good condition for nitrogen and 67% rated good for phosphorus. Only 7% of Vermont's lakes were in poor condition for phosphorus. Overall, the water quality of Vermont lakes was at least as good as the region and typically better than the nation. The largest proportion of lakes in poor condition was for physical habitat complexity. Poor physical habitat complexity affects more than twice the percentage of lakes that are affected by high levels of phosphorus. The most worrisome finding in this assessment was that only 18% of Vermont lakes are in good condition for lakeshore disturbance. In this stressor category, Vermont is lagging behind both the region and the nation. The vast majority of lakes (71%) in the state are in fair condition. No other stressor puts as a great a proportion of lakes in the nation, state or ecoregion in either the poor or fair categories. The majority of Vermont lakes were ranked as either in fair (22%) or poor (38%) condition by the macroinvertebrate IBI. This finding is alarming, especially considering a greater proportion of lakes were ranked poor in Vermont than in five of the nine ecoregions across the nation. The findings from this survey will be used to shape the management of Vermont's lakes and may be useful to other states embarking on a full statewide assessment during this summer's NLA.

0422

E2-4

The National Lakes Assessment: A National Assessment of Bacteria (Enterococci) Levels in Lakes Across the United States

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During the summer of 2007, EPA, States, Tribes and other partners conducted the National Lakes Assessment (NLA), a national-scale survey of the biological and recreational condition of lakes and reservoirs across the United States. The NLA uses a probability-based sampling design to represent the condition of all lakes in similar regions sharing similar ecological characteristics. Consistent sampling and analytical procedures ensure that the results can be compared across the country. As part of this project, enterococci by the quantitative polymerase chain reaction (qPCR)-based assay was included to evaluate recreational condition of lakes across the country. This presentation will first describe the field and lab method used. We will then present findings from this first-ever national assessment of bacteria in lakes including the analyses of the bacteria data at the national and regional scale using different thresholds.