

HAT ARE HUMAN IMPACTS ON DIATOM BIODIVERSITY?

R. Jan Stevenson¹, Jason Zalack¹ & Julie Wolin²

¹Center for Water Sciences, Department of Zoology, Michigan State University

²Department of Biological, Geological, and Environmental Sciences, Cleveland State University

The United States Environmental Protection Agency conducted a nationwide assessment of the ecological conditions of lakes using a probabilistic sampling design of 1000 lakes. In the National Lakes Assessment, the United States Environmental Protection Agency determined that 47% of US lakes were in good condition, 27% in fair condition, and 23% in poor condition. Substantial changes in species composition and decreases in native species diversity were observed along the human disturbance gradient. Shifts in species composition were largely from taxa adapted to low nutrient concentrations to taxa requiring high nutrient concentrations for growth. The number of taxa in 500 valve counts decreased from approximately 50 to 30 along the human disturbance gradient indicated by total phosphorus (TP) concentration. Native taxa were identified using indicator species analysis as species characteristic of minimally disturbed (“reference”) sites. The percentage of native taxa decreased from approximately 40% to less than 10% in counts along the human disturbance gradient indicated by TP. Thus, in the 27% of US lakes that were deemed in fair condition, only half of the expected native taxa were observed. In the 23% of the lakes deemed in poor condition, only 25% of the expected number of native taxa was observed. Realizing that 500 valve counts identify a relatively small proportion of rare taxa in samples, we estimated the proportion of rare taxa as the proportion of all taxa that occurred at 1% of sites or fewer. Seventy percent of the 2264 diatom taxa observed in the National Lakes Assessment was considered rare.

On one hand, we could argue that there is little chance that we are losing taxa with such a large number of surface waters in the US as well as the large number of refugia and cells in each water body. On the other hand, we could argue that we have to be losing large numbers of diatom taxa as a result of human disturbance because of the large numbers of waters, the large proportion of rare taxa, and large proportion of native taxa lost with disturbance. The absence of many relatively common native taxa in examinations of large numbers of lakes that have been disturbed by human activities also indicates that we are losing diatom taxa. Given the possibility of great loss in diatom biodiversity and great uncertainty in our estimates of loss, there is great risk that human activities cause major loss of diatom biodiversity.