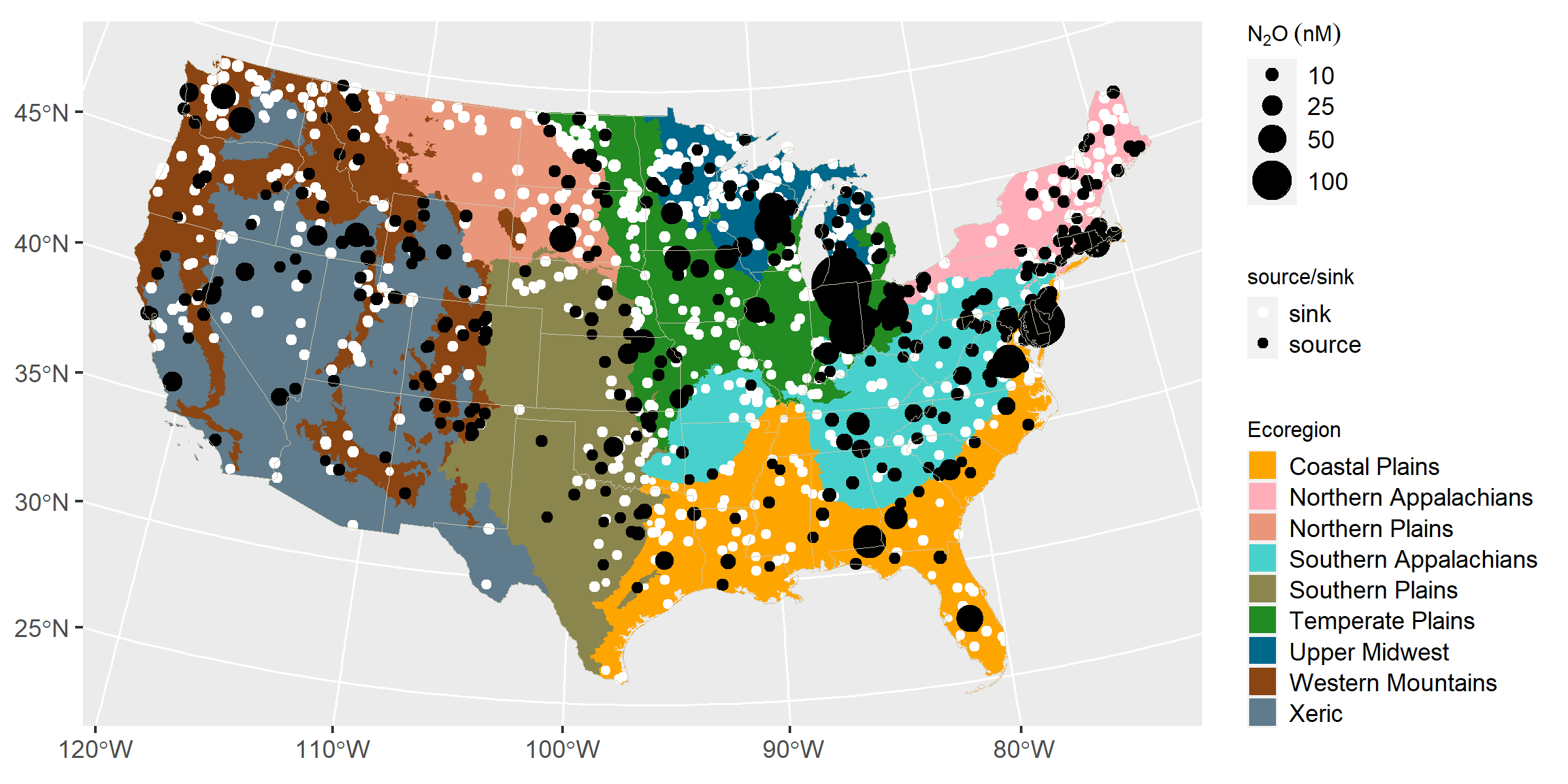
Widespread nitrous oxide undersaturation in U.S. lakes and reservoirs

23 March, 2023

# Introduction

# Results and Discussion

In this study we present the first national-scale survey of N2O concentrations and emissions from lakes, reservoirs, and ponds, hereafter referred to as waterbodies, in the conterminous U.S. (CONUS). A generalized random-tessellation survey design (Stevens and Olsen, 2004) was used to select a spatially-balanced and representative sample of 1090 **[weird, I have 1090, but NLA17 report says 1,005?]** sites from CONUS waterbodies that are least 1 hectare in area, at least 1 meter deep, have at least 0.1 hectare of open water, and have a minimum residence time of one week (Figure 1). Sample sites were distributed across all nine major CONUS ecoregions and varied widely in water chemistry, morphometry, watershed land-use, and climate (See NLA website for all data?). 72.9 percent of the sampled waterbodies were undersaturated in N2O and were therefore functioning as N2O sinks (Figure 1). We modeled the data using a bayesion hierchical approach and predicted the dissolved N2O concentration for all 224,916 CONUS waterbodies in the target population. At the population level, 72.5 percent (95% CI: 72.3 - 72.7) of CONUS waterbodies were functioning as N2O sinks. The Western Mountains ecoregion had the smallest proportion of waterbodies functioning as N2O sinks (mean = 65.5%, 95% CI: 64.8 - 66.2) and the Northern Plains had the greatest (mean = 76.8%, 95% CI: 76.3 - 77.3).



Location of sampling sites. Color of the points indicates whether the waterbody was functioning as a source or sink of nitrous oxide (N2O). Point size indicates the dissolved N2O concentration.

Here is a citation example: Multilevel models are useful for survey inference ([Kennedy and Gelman 2021](#ref-Kennedy_Gelman_2021)). This paper by Kennedy and Gelman ([2021](#ref-Kennedy_Gelman_2021)) provides a nice worked example.

# References

Kennedy, Lauren, and Andrew Gelman. 2021. “Know Your Population and Know Your Model: Using Model-Based Regression and Poststratification to Generalize Findings Beyond the Observed Sample.” Journal Article. *Psychological Methods* 26 (5): 547–58. <https://psycnet.apa.org/doi/10.1037/met0000362>.