**Planned title of research project:** Assessing nutrient stoichiometries, limitations, and trophic levels across inland waters in the United States

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**The NARS dataset(s) that will be used in the research:** We plan to use the 2007, 2012, and 2017 National Lakes Assessment datasets. We hope to incorporate the National Rivers and Streams Assessments (2009, 2014, 2019) as well, but that is still to be determined.

**Synopsis:**

*Motivation:* Freshwater resources are critical to human health and food provisioning, industries, ecosystem function, and recreational and cultural experiences. Eutrophication is one of the world’s top threats to biodiversity[i], is commonly caused by anthropogenic activities[ii], and can have serious consequences on both aquatic ecosystem and human health[iii], with economic losses over $2.2 billion[iv]. Enrichment of nitrogen and phosphorus are mainly responsible for eutrophication[v]. The elements are not mutually exclusive, however, as their cycles are coupled in the environment[vi]; and studying the relative abundances may unfold large-scale patterns that would otherwise be unseen. I plan to use the NARS data to assess nutrient stoichiometry of inland waters in the US, as balancing stoichiometry may assist in eutrophication remediation[vii].

*Research Questions:* How does nutrient limitation/enrichment vary across ecoregions and what are the underlying mechanisms? Is trophic status (based on chlorophyll) more influenced by nitrogen or phosphorus and how/why does this relationship vary spatially? Do general trends of stoichiometry and trophic levels hold true across all ecoregions? Is DIN or TN a better predictor of limitation/enrichment?

*Research Plan:* This research will require three phases of assessment. 1) I will use N:P ratios to assess nutrient limitation and stoichiometry spatially at the national scale and at regional scales using ecoregions. 2) I will analyze the limitations and stoichiometries in relation to trophic status to assess if this analysis could impact water quality advancements. 3) I will analyze stoichiometric shifts across time to evaluate the condition of our waters and posit possible future progression. At all phases of this analysis, weights will be used to broaden the results to regional and national extents.

*Impacts:* Lakes and rivers have been extensively altered by climate change, hydrological modifications, land-use, and chemical and nutrient inputs[viii]. Nutrients are of particular interest due to their necessity in ecosystem functioning and their simultaneous capacity to pollute. Understanding coupled nutrient cycling and the regional stoichiometric differences of eutrophication is a fundamental step toward solutions.

**Intended prize category:** Support efforts to assess nutrient water quality and more effectively protect and restore waters from nutrient pollution.

**Submission as a student or team**: I am a PhD student at the University of Wyoming and will be submitting this as a student.

[i] Reid et al., (2019). Bio. Rev. 94(3):849-873. [ii] Smith and Schindler (2009). Trends Ecol. Evol. 24(4):101-207. [iii] Camargo and Alonso (2006). Environ. International 32(6):831-849. [iv] Dodds et al., (2008). Environ. Sci. Tech. 43(1):12-19. [v] Wetzel (2001). Academic Press. [vi] Oveido-Vargas (2013). Limnology Oceanography 58(4):1196-1206. [vii] Stutter et al., (2018). Sci. Tot. Environ. 643:439-447. [viii] Carpenter et al., (2011). Annual Review Environ. Resources 36(1):75-99.