



Robert (Rob) McManus

Research Assistant - M.S. Candidate - mcman247@d.umn.edu

University of
Minnesota - Duluth
Large Lakes
Observatory
Sternier Lab

EDUCATION

University of Minnesota – Duluth, MN

Water Resource Sciences M.S., Limnology and Oceanography Track

GPA: 4.00

Large Lakes Observatory

Anticipated Graduation: May 2024

- Investigating the role of trace metal nutrient limitation on oligotrophic harmful algal blooms utilizing nutrient addition bioassay, metatranscriptomic, differential gene expression analyses, and community ionomic approaches.
- Conducted a meta-analysis in cooperation with the MNDNR studying temperature and DO trends in the Midwest, U.S.
- Participating in an ongoing RCN aiming to develop stoichiometrically driven, N fixation models.

Saint John's University - Colleagueville, MN

Environmental Studies/Biology Major

GPA: 4.00

College of Arts and Sciences

Graduated Egregia Cum Laude: May 2021

- Recipient of the Trustee's Scholarship, Eldon Seihl Scholarship, 2019 Brandl Scholar, 2020 Jackson Fellow.
- Placed on the Dean's List each semester attended and inducted as a member of the Phi Beta Kappa Society.
- Awarded "Father Gunther Rolfson, OSB, Biologist of the Year", an award given to one student annually.
- Studied abroad in Patagonia, Chile where I conducted conservation biology research and took 18 credits of coursework.
 - Field work included Rapid Biodiversity Inventories, huemul deer, and ñandú population dynamics.
 - Learned how to effectively work and live in a team of 13 members for three consecutive months.

RESEARCH INTERESTS

Freshwater phytoplankton ecology lies at the center of my research interests. Climate change, invasive species, anthropogenic nutrient loading, and toxic pollution drive my desire to understand the base of aquatic food webs and work to protect them. Zooming in, I am fascinated in understanding the stoichiometric controls of harmful algal bloom (HAB) growth, specifically relating to nutrients beyond the C:N:P paradigm. I seek to investigate the importance of environmental and assimilated trace metals – particularly iron – in cyanobacteria cell processes such as photosynthesis, N fixation, and cellular differentiation. The goal of my work seeks to understand the promotion factors of HAB occurrences in lakes not directly impaired by significant anthropogenic nutrient loading. To answer these questions, I am currently developing skills in 'omics analyses (however, mostly meta-transcriptomics), cellular and dissolved elemental analyses via ICP-MS, and spatial analyses via GIS tools. Separately, I have also been building familiarity with times series analyses and am intrigued in understanding ecosystem stable states and learning how they shift over time.

Aquatic Ecology - Cellular Stoichiometry - Harmful Algal Blooms - Ionomics - Bioinformatics

PROFESSIONAL EXPERIENCE

Saint John's Benedictine Volunteer Corps – Newark, NJ

July 2021 – June 2022

- Taught high school science at St. Benedict's, a school committed to educating BIPOC and low-income students.
- Developed a course entitled, "[Natural History of Water](#)" provided as an elective at St. Benedict's.
- Aided with the establishment of a new scout troop within the school, as well as with the symphonic band.

Friends of the Namekagon Barrens Wildlife Area – *Summer Intern* – Burnett County, WI

May 2020- August 2020

- Improved community accessibility by designing kiosk displays and developing visitor maps using GIS software.
- Conducted a small, two-year phenology project on the blooming flower species to be continued after I leave.
- Assisted career botanists in a Wisconsin-wide phenology project characterizing the flora on sand barrens.

Freshwater Society – Summer Intern - St. Paul, MN

May 2019- June 2021

- Developed and enacted research focusing on the contaminant history of endocrine disruptors in the Mississippi River.
- Contacted and presented to Minnesota watershed districts, raising \$27,000 for the research project.
- Communicated and subcontracted through three laboratories and collaborated with 10 doctoral researchers.
- Built a working understanding of environmental policy a state level and how to make research impact communities.
- Furthered my lab and field work proficiency by collecting and processing 40 core samples at the UMN LACCORE lab.
- Worked with, and enhanced my abilities in, Geographic Information Systems (GIS) software.

Saint John's University Residential Life – Resident Assistant - Collegeville, MN

August 2018 – May 2021

- Produced upperclassmen programming such as student tailgates, festivals, parties, and a \$3,000 winter formal.
- Fostered leadership skills through a 2-week training program, bystander training, and hands on experience.
- Developed a floor community of 80 young men while cooperating with two co-RA's, under a Faculty Resident.
- Guided First-Year students in college by providing council in academic, emotional, spiritual, and social life.

SJU Environmental Studies Department - Summer Research Fellow - Collegeville, MN

May 2018 – August 2018

- Assisted in conducting an ongoing phenological study researching how climate change is impacting blooming patterns.
- Aided in a professor's dendrochronological study of drought frequency in the American Southwest to attempt to reconstruct climate models back 2,500 years and make drought predictions on future drought frequencies.
- Gained experience working with the software packages Microsoft Excel and COFECHA to analyze large scale data.

RELEVANT FIELD EXPERIENCES

Lake Superior – Cornucopia, WI

June 2022 – Present

- Chief/Co-Chief Scientist on 15+ day trips onboard the R/V Kingfisher, in addition to many stream sampling trips.
- Established trace metal clean sampling protocols for sampling dissolved and particulate metals in a metal boat.
- Deployed and retrieved moorings aboard the R/V Blue Heron (with Dr. Jay Austin) in addition to performing algal ID on discrete depth, Niskin samples to understand HAB community water column distribution.

Patagonia National Park – Patagonia, Chile

January – March 2020

- Studied huemul deer and ñandú population dynamics to ascertain the role of ranching fences on species movement.
- Performed Rapid Biodiversity Inventories on uncharted land to develop initial estimates on ecosystem biodiversity.
- Located multiple, endemic endangered species on plots of land considered for strip mining. Provided data to CONAF as an argument against land development. (Still undeveloped as of 2023)

Twin Cites Riverine Lakes – St. Paul, MN

June – August 2019

- Planned for, permitted, and lead sediment coring expeditions in five lakes along the Mississippi.
- Developed knowledge in piston and Bolivia coring techniques, as well as with core processing and storage.

Eagle Scout - Anoka, MN

November 2016

- Trained in wilderness survival and first aid, spending over 5 months camping through scouts.
- Developed Leadership abilities through the Senior Patrol Leader position and enabled an efficient, organized troop.
- Became proficient in designing and enacting large scale projects, such as an eagle scout project dedicated toward building horse jumps for a non-profit which utilizes horse riding as therapy for disabled persons.

KEY COURSES TAKEN

University of Minnesota – Duluth, MN

June 2022 – Present

- Limnology Sequence
 - LIM5010
 - LIM5011
 - LIM5013

- Ecological Statistics: BIOL5809
- Stream Ecology: BIOL5833
- Bioinformatics: IBS8993
- Microbial Diversity, Phylogeny: BIOL1585
- Water Policy: WRS5101

St. John's University - Collegeville, MN

September 2017 – 2021

- Aquatic Ecology: BIOL 337
- Environmental Studies Thesis: ENVR 395
- Introduction to Geographic Information Systems: ENVR 311
- Climate and Habitat Change CHEM: 343
- Evolution of Terrestrial Plants: BIOL 304
- Biology Capstone: BIOL 380

Round River Conservation Studies – Patagonia, Chile

January 2020-May 2020

- Introduction to Biological Field Methods: BIOL 3XX
- Applied Conservation Biology: BIOL 3XX
- Applied Ecology: ENVR 3XX

RESEARCH EXPERIENCE

**Iron Man or Iron HABs? Investigating the Role of Trace Metal Nutrient Limitation in Lake Superior
June 2022 – May 2024**

Within the past decade, the south shore of the western arm of Lake Superior has experienced novel harmful algal blooms comprised primarily of the cyanobacterium *Dolichospermum lemmermannii*. HAB occurrences are particularly surprising in Lake Superior due to its oligotrophic nature as well as minimal cultural eutrophication impacts. While recently published research points to warming lakes and strong storms as a potential driver for the blooms, we still lack a clear mechanistic link explaining these blooms. While iron is well known as a limiting nutrient in marine system, much less has been published on its role in freshwater systems. My research seeks to understand the importance of trace metal nutrient limitation via a series of nutrient addition bioassays collected from a spatial gradient from an inland lake, a connecting stream, and a transect within Siskiwit Bay of Lake Superior. In addition to measuring growth responses to Fe, P, and EDTA spikes, particulate and dissolved samples will undergo elemental analysis via ICP-MS to elucidate both trace metal availability as well as algal community ionomics. A select subset of bioassay treatments will also undergo mRNA extraction to conduct a differential gene expression analysis enlightening the biochemical/genetic response to trace metal limitation/abundance. Specific biochemical pathways which have high cellular iron requirements, such as N fixation and photosynthesis, will be of primary focus within the analysis.

**Assessing the Effectiveness of Fortress Conservation in the Global South:
A Patagonia National Park Case Study**

January 2021 – May 2021

Patagonia National Park, located within Aysén, Chile, has undergone a tumultuous history. Originally home to Tehuelche peoples, it was colonized by European Chileans in the early 1900s and converted into ranching land, shepherded by gauchos. The Park was purchased in 2004 by American entrepreneurs who stripped almost all the ranching in the area, removed the gaucho families, and converted into a national park to conserve the unique, endemic biodiversity. While lauded by many in the Global North as an excellent example of modern conservation, many of the local Patagonians feel resentment toward the park as they feel it erases gaucho culture, does not ask for community input, and steals their land. This resentment has led to little community buy-in to conservation programs. However, research suggests that community-based conservation models are integral into framing effective, long term conservation solutions. To create a sustainable, equitable conservation plan, this thesis argues that Patagonia Nation Park must significantly increase its local community and culture focus, restore traditional customs, and enable Patagonian input in the conservation management plans.

Documenting the Contaminant History of Nonylphenol and its Ethoxylates in the Twin Cities' Urban Watershed

May 2019 – October 2020

After multiple discussions with the Minnesota Pollution Control Agency and LACCORE lab, we generated this project to test the contaminant history of nonylphenol and its ethoxylates, endocrine disrupting compounds, in lakes along the Mississippi and Minnesota Rivers using paleolimnological methodologies. There are currently no enforced regulations in Minnesota on this contaminant and we want to quantify current and past concentrations to determine if levels are high enough to prompt a governmental study on the contaminant. I was the initiator of the project, presented on and raised \$27,000 for the project, I learned coring techniques, was present at and helped conduct all fieldwork, processed the samples, performed initial core descriptions, aided in the core pollen analysis, contracted with two labs to perform the chemical and Lead-210 analyses, and I will help write the report we aim to publish and present our information at various conferences.

Freshwater Commercial Fishing in the Great Lakes: The Sustainable Role It Will Play in American's Diets September 2019– December 2019

This project assessed if it would be more environmentally sustainable to transition U.S. citizens', living in Great Lakes Border States, diets from marine sourced fish to fish caught from the Great Lakes. Methods included a comprehensive, interdisciplinary literature review of research focusing on the sustainability of marine and freshwater commercial fishing industries, the key challenges facing both of them, as well as consumer behavior and understanding how to market a transition to Great Lakes sourced fish. My results identified that supplementing Great Lakes fish for consumers in close proximity to the lakes could be a more sustainable option. However, as Great Lakes fisheries are continuing to recover, it is important not to overfish those lakes while attempting to reduce overfishing in marine systems. Finally, a rebranding of Great Lakes Whitefish would need to occur as well as regulations which favor the commercial industry over the recreational one.

A 2700-year Tree-Ring Reconstruction of Uinta Basin Precipitation, Utah, USA

May 2018-August 2018

This project was the first research I worked on and the aim of the study was to reconstruct drought records in the Uinta Basin using three ring samples collected over three summers and dating back 2700 years. Once all of the data is compiled, we will use it to forecast future drought frequencies which will be a useful tool for water management in the area. I worked in Dr. Knight's lab for the summer of 2018. I sanded cross sections, set core samples, counted and measured tree rings, building back the chronology and added more data to bolster its robustness, and finished the summer aiding in the beginning of the data analysis. Almost all of the wood has now been processed and the aim is to write and publish the paper in the spring of 2020.

Tracking Wildflower Phenology on the Saint John's Prairie: A Long-Term Monitoring Project.

May 2018-August 2018

I aided in the continuation of a long-term phenology project within the St. John's arboretum prairie. I constructed transects and monitored them for the blooming period of 250+ species of prairie wildflowers as well as peak bloom. I went on the 3-mile hike four times a week collect data. This study has been an ongoing project for the past 7 years and the PI, Dr. Troy Knight, plans to continue the project throughout his tenure at St. John's University to understand how climate change will impact native prairie flowers blooming patterns over time.

PERSONAL INTERESTS

Rock Climbing - Route Setting - Musical Listening/Performance - Hiking - Board Games - Pizza

REFERENCES

Dr. Robert Sterner - Professor of Biology/Director of the Large Lakes Observatory/Advisor

University of Minnesota

Stern007@d.umn.edu

(218) 726-7926

Dr. Bill Lamberts – Professor of Biology/Advisor

Saint John's University

wlamberts@csbsju.edu

(320) 247-4973

Dr. Corrie Grosse – Professor of Environmental Studies/Advisor

Saint John's University

cgrosse001@csbsju.edu

(208) 709-1634

Dr. Carrie Jennings – Nonylphenol Project PI

Freshwater | Adjunct Grad Faculty, UMN EESCI

cjennings@freshwater.org

(612) 718-1415

Dr. Troy Knight – Professor of Environmental Studies/Dendrochronology PI

Saint John's University

tknight@csbsju.edu

Dr. Jean Lavigne – Professor of Environmental Studies/Advisor

Saint John's University

jlavigne@csbsju.edu