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Advised by Dr. Jennifer Tank  
Library Research Award Submission  
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“Understanding controls on ammonium-N removal and reach-scale nitrification using experimental streams” and “Monitoring high-risk areas for agricultural impacts on stream water quality: A case study of the Michiana area”

As a senior Environmental Science major in the Glynn Family Honors program, I did my thesis project on nitrogen cycling in stream ecosystems, and was able to produce a final thesis report entitled “Understanding controls on ammonium-N removal and reach-scale nitrification using experimental streams.” Additionally, as a final project for Professor Matthew Sisk’s introductory GIS course, I produced a paper and StoryMap about my pilot study on utilizing GIS methods to monitor and model stream water quality. Throughout the year the Hesburgh Library has provided me tools and resources to help me succeed in these endeavors, and gain an in-depth understanding of Nitrogen cycling and nutrient pollution in stream ecosystems.

I began a literature review for my thesis project during spring of 2022, my junior year at Notre Dame. The Hesburgh Library online databases were integral to the formation of a research question and gathering background information on my area of study. I was able to access textbooks and scientific journal articles, and felt lucky never to have trouble getting permission to read and download papers of relevance. Some of the scientific journals from which I was able to draw information included Freshwater Science, Environmental Science and Technology, Journal of Geophysical Research, Bioscience, Limnology and Oceanography, Science, and countless others. This broad array of resources was afforded to me by the Hesburgh Library.

After settling on research questions for my thesis project, I spent the summer in South Bend to conduct field work at Notre Dame’s Linked Experimental Ecosystem Facility

(ND-LEEF). Throughout the summer, I was able to further conduct literature review on materials and methods from previous studies thanks to the large library database repository. As I began to process samples collected for my project, I utilized computers in the library to conduct data analysis using a dual monitor setup and R studio. I was able to organize very large data sets (e.g., dissolved oxygen data measured every 10 minutes for 150 days over the summer) thanks to this setup and the computing power of desktop computers in the library.

A large portion of my final thesis, which will be submitted as a manuscript for publication this summer, relied on meta-analyses of my data compared to those of previous studies in slightly different ecosystems. I emphasize again that this would not have been possible without Hesburgh Library's online databases. Additionally, I used Hesburgh Library printing and hole punching services to produce hard copies of my final thesis report for submission to the Glynn Family Honors Program. The ability to color print a large quantity of pages and access to an industrial hole puncher were valuable resources for producing my final thesis report.

As I prepared to present a poster about my research at the College of Science and Engineering Joint Annual Meeting (CoSE-JAM) in November, I used the large-paper printing services at the library to print mock-up posters for editing by graduate students in my lab, then Dr. Tank (the Principal Investigator of my lab). I gave an oral presentation in the spring at the College of Science Joint Annual Meeting (CoS-JAM) and was invited to present my thesis at the Glynn Senior Thesis Colloquium the week prior. As I prepared for these presentations, I was able to book a study room to practice my presentation before both events. Additionally, I was able to use figures, photographs, data and experimental results from previous studies in my presentations thanks to the library databases, which formed the foundation for the background portion of my presentation.

This past spring, I expanded my background research for my thesis project by investigating previous studies that have incorporated GIS technologies into stream ecology and nutrient cycling research. Once again, the library databases were critical for my literature review, but I was also newly able to gain access to GIS software on library computers, and was able to create an ESRI account to access data layers and underlying maps for my project. I spent hours

on library desktops working to find the right datasets, utilizing both ArcMap and ArcGIS online services provided by Hesburgh Library. I piloted a model that takes into account stream size, proximity to row crop agriculture and precipitation to indicate areas where there may be high risk of nutrient pulses in stream systems. I investigated the Michiana region, but discussed potential wider applications of GIS technologies as well as the monitoring systems already in place throughout the state of Indiana. Additionally, I compiled information regarding data that are publically available for Indiana citizens interested in learning about the quality of their freshwater supply into a StoryMap using ArcGIS online. This StoryMap, in tandem with my pilot study, represents an effort to integrate the background research I did for my thesis project with a tool for public education on issues of freshwater quality and nutrient pollution.

I could not have accomplished any of this work without the resources provided by Hesburgh Library, and I am extremely grateful for the study spaces, printing resources, databases, computers, and GIS platforms (and ABP coffee) that allowed me to produce an honors thesis and develop skills in R and GIS.