

this stage. This co-culture method will be used to phenotype recombinant inbred lines derived from parents contrasting for incompatibility in efforts to identify the gene(s) underlying this *Striga* resistance trait.

Research advisor Patrick Rich writes: “Cameron meticulously phenotyped a recombinant inbred sorghum population for resistance to the parasitic weed Striga hermonthica. He worked for months in our special containment facility with delicate biological materials that required careful handling, observations, and record keeping. His work moves us closer to finding genes controlling post-attachment Striga resistance.”

Gossypium hirsutum as a Study Species to Understand Plant Responses to Drought Stress

Student researcher: Sam Schafer, Senior

Throughout the past year of working with cultivated upland cotton (*Gossypium hirsutum* L.), it has been intriguing to learn how it can serve as a study species for understanding the effects of genotype and water stress on photosynthetic parameters. The goal of the project is to discover whether genotype and environment play a significant role in crop photosynthesis and to quantify any potential interaction between the two variables. Photosynthesis- CO_2 response (A/C_i) curves of 14 biogeographically diverse cotton accessions grown under controlled greenhouse conditions were collected using a Li-COR 6800 Portable Photosynthesis System (Li-COR: Lincoln, Nebraska) and analyzed using R software. Broad-sense heritability (H^2) for maximum rate of rubisco carboxylation (V_{cmax}) and electron transport (J_{max}) were 0.575 and 0.686, respectively. Paired with a one-way ANOVA test, results suggested that photosynthetic parameters were not significantly affected by genotype. A subset of 4 cotton accessions were selected for a follow-up study. During the second experiment, a control group of replicates were maintained under well-watered conditions while another replicate group experienced a 75% reduction in irrigation for two weeks after flowering. Following the first week of treatment, a suite of physiological parameters were collected including plant height, number of developing bolls, number of healthy leaves, and number of buds. Results indicated significant differences between the two populations, which suggests a reduction in photosynthetic activity.



Upland cotton plants growing under controlled greenhouse conditions.

A/C_i curves were collected at the two-week mark of drought treatment and are yet to be analyzed. Conclusions will be drawn based on the differences in photosynthetic performance between accessions from the first and second experiments.

Research advisor Diane Wang writes: “Sam came to me one and a half years ago with an interest in plant physiology research. He has since led this study from concept to analysis and has continuously impressed me with his energy, enthusiasm, and ability to master new skills from technical measurements to data analysis using R.”

Lake Michigan Shoreline Landowner Survey

Student researcher: Colby Smock, Junior

The Lake Michigan Shoreline Landowner Survey was developed to understand the perspectives of homeowners along Indiana's shoreline who have experienced rapidly changing conditions due to water level fluctuations over the past 10 years. From near-record lows in 2013 to record highs in 2020, the significant water level swing is one of many factors that are causing severe erosion of the beach and foredune area. These erosion problems have put the communities along the Indiana shoreline in a dire spot as they risk losing their beaches and homes along the lakeshore. Based on a comprehensive review of community plans and ordinances, many of these communities have little to no plan for addressing the management of their shoreline, significantly altering the ability to fund future management advancements.



Lake Michigan Shoreline Landowner Survey
 800-393-2636

Why is this so important? In 2020, we asked you about your shoreline conditions. It was a great success. We learned that the conditions along the Lake Michigan shoreline are changing. As part of this research project, we need to understand how you feel about your shoreline, what you are doing to manage it, and how you would like to see it change. We are asking about this survey to learn about your shoreline, what you are doing to manage it, and how you would like to see it change. We are asking about this survey to learn about your shoreline, what you are doing to manage it, and how you would like to see it change.

Thank you for your time, and for being part of this survey. We are looking forward to hearing from you.

PLEASE READ BEFORE BEGINNING THIS SURVEY

This survey is to be completed by the landowner of the property. The data collected will be used for research purposes only. Your participation is voluntary, and you may withdraw your participation at any time.

Example: No Yes

SHORELINE MANAGEMENT

Managing erosion along Lake Michigan is complex, and one of the most difficult issues we face is how to keep up with the erosion, repair, and maintain the shore. We are asking you to help us understand the current conditions of your shoreline, what you are doing to manage it, and how you would like to see it change.

How often do you inspect your shoreline for erosion? Never Once a year More than once a year

What do you do to manage your shoreline? Nothing Planting trees Planting shrubs Planting grasses Planting dunes Other (Please list below)

How do you feel about the current conditions of your shoreline? Excellent Good Fair Poor Very Poor

How do you feel about the future of your shoreline? Excellent Good Fair Poor Very Poor

SHORELINE EROSION STRATEGIES

Based on your shoreline condition survey of 2020, we are asking you to help us understand the current conditions of your shoreline, what you are doing to manage it, and how you would like to see it change.

1. Use Rock or Gravelly Material Yes No

2. Planting or Replanting Yes No

3. Use of Cable Anchors Yes No

4. Beach Nourishment Yes No

5. Other (Please list below) Yes No

6. No Action Yes No

How do you feel about the current conditions of your shoreline? Excellent Good Fair Poor Very Poor

How do you feel about the future of your shoreline? Excellent Good Fair Poor Very Poor

RECREATION

The following questions seek information about how you use Lake Michigan and the surrounding shoreline area. We are asking you to help us understand the current conditions of your shoreline, what you are doing to manage it, and how you would like to see it change.

How often do you visit Lake Michigan? Never Once a year More than once a year

What do you do when you visit Lake Michigan? Fishing Swimming Boating Walking Bicycling Other (Please list below)

How do you feel about the current conditions of your shoreline? Excellent Good Fair Poor Very Poor

How do you feel about the future of your shoreline? Excellent Good Fair Poor Very Poor

The Lake Michigan Shoreline Landowner Survey has led to both social and ecological understanding along Indiana's shoreline. This image shows a map of our project areas and includes cross-sections to give an idea of what the current conditions of the shoreline are like. Thank you to Dr. Aaron Thompson and Zac Cody for contributing to the creation of this graphic.

The Lake Michigan Shoreline Landowner Survey is exploratory research that seeks to identify homeowners' attitudes about shoreline erosion management that can inform community actions. We are allowing members of these communities to share what they have witnessed and what they would like to see done in the future with their shoreline. We hope that these conclusions can help guide community-based informed decision-making and kickstart the planning process for these communities along the Indiana shoreline.

Research advisor Aaron Thompson writes: "Engaging the public in solving environmental challenges requires a multidisciplinary approach. Colby has constructed a model of social and ecological conditions along the Indiana shoreline that will become more robust by completing the landowner survey. Colby's willingness to see past

disciplinary boundaries and engage these communities contributes to our success."

BUSINESS
Tourism Insights: ESG in Lodging and Hospitality

Student researcher: Emily Cassanmagnago, Senior

Our world is aiming to be a more sustainable place. In recent years, more and more companies have been adopting reporting formats that address the ESG—environmental, social, and governance—aspects of their activities. A guide was created to explain what ESG covers, why businesses are adopting it, and how it differs from other forms of reporting on corporate