



Graduate Opportunities
in Safe Transportation
and Resilient Systems

GAANN- GOSTARS Fellowship Project



Adviser: Sarah Bauer, Ph.D.

Title: Biofouling of Concrete: Investigation of Microbial and Environmental Factors and Mitigation Techniques

Description

Structural deterioration, or concrete biofouling, has become a critical issue affecting the transportation infrastructure network. Only some mechanisms of the deterioration of reinforced concrete structures are relatively well known. This project will further investigate factors influencing concrete deterioration using a local site as a case study for experimental analysis and will consist of three main research tasks: (1) collection of physicochemical data for a select critical case study site and identification of environmental factors that influence the concrete deterioration process; (2) identification of microbes in the laboratory and determination of how these microbes can influence and/or cause the deterioration of concrete; and (3) evaluation of novel remediation techniques to prevent microbial deterioration.

Impact on GAANN

It is imperative that researchers investigate microbial and environmental factors that contribute to concrete deterioration and identify mitigation techniques that can be used to prevent structural rehabilitation and replacement costs in the future – making our infrastructure more resilient and sustainable over time. This project has the potential to generate solutions to prevent the microbial deterioration of concrete, which can provide significant value for state and local stakeholders and taxpayers. Research findings will be disseminated through journal articles and appropriate commercial organizations to ensure that these findings are fully exploited.

Impact on GOSTAR

This project is very unique and will provide the student with the ability to facilitate research into the interconnection between environmental, biological, and infrastructure systems, resiliency, and sustainability. The student working on this project will have the opportunity to publish a total of three journal papers and present at both local and national conferences.

Tentative Plan

Semester	1	2	3	4	5	6	7	8	9	
Task	Lit. Review/ Selection of Case Study Site	Collection Site Data/ Biofouling Environ. Factors		Identify Microbes in Lab/ Determine How/ Pathways for Microbes Cause Concrete Deterioration using Study Site			Evaluate Novel Mechanisms/ Feasibility of Remediation Techniques in Lab to Prevent Concrete Biofouling			
Outcome	Identify Environmental Factors Influencing Concrete Biofouling			Determine Microbial Influence on Concrete Biofouling			Evaluate Remediation Techniques for Concrete Biofouling			
Deliverable	Publish in Refereed Conference Proceedings and Journal			Publish in Refereed Conference Proceedings and Journal			Publish in Refereed Conference Proceedings and Journal			
Graduation									Summer 2025	