

# David McMorris

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CONTACT INFORMATION	david.mcmorris@huskers.unl.edu <a href="https://davidmcmorris.github.io/">https://davidmcmorris.github.io/</a>
RESEARCH INTERESTS	Mathematical biology and scientific computing, with recent experience in applications of control theory to plant life history and ecology.
EDUCATION	<b>University of Nebraska-Lincoln</b> Ph.D. in Mathematics August 2020 Advisor: Glenn Ledder Dissertation: <i>Optimal Allocation of Two Resources in Annual Plants</i> M.S. in Mathematics May 2016 <b>Hope College</b> B.S. in Mathematics May 2014 <i>Magna Cum Laude</i> Advisor: Brian Yurk
HONORS AND AWARDS	<b>Parents' Recognition Award</b> , UNL 2017 Nominated by parents for making a difference in the lives of their students. <b>Outstanding Qualifying Exam</b> , UNL 2015 <b>Othmer Fellowship</b> , UNL 2014 Merit-based three-year fellowship awarded to incoming graduate students. <b>Albert E. Lampen Mathematics Prize</b> , Hope College 2014 Awarded annually to two graduating seniors in mathematics. <b>Member of Phi Beta Kappa</b> inducted 2014 <b>Member Pi Mu Epsilon</b> , Michigan Delta chapter inducted 2014 <b>John H. Kleinheksel Mathematics Award</b> , Hope College 2012 Awarded annually to select sophomore-level mathematics majors. <b>Presidential Scholarship</b> , Hope College 2010 Merit-based scholarship at Hope College
PUBLICATIONS AND PREPRINTS	1. D. McMorris and G. Ledder, <i>Resource Allocation in Annual Plants</i> . (submitted) bioRxiv 2021.04.19.440512. 2. D. McMorris, P. Pearson, and B. Yurk, <i>A modified wavelet method for identifying transient features in time signals with applications to bean beetle maturation</i> . Involve, a Journal of Mathematics, <b>10(1)</b> (2016), 21-42.
PRESENTATIONS † DENOTES INVITED TALK	<i>Optimal Allocation of Two Resources in Annual Plants</i> (50 min) UNL, Dissertation Defense July 2020 † <i>Plant Life History and Optimal Control</i> (20 min) Nebraska Wesleyan University Math Club November 2019

- † *Investigating Plant Growth Through Mathematical Biology*  
(50 min)  
Nebraska Wesleyan University STEM Seminar March 2019
- † *Using Optimal Control Theory to Model Resource Allocation in Annual Plants*  
(50 min)  
Creighton University Department of Mathematics Colloquium November 2018
- An Optimal Control Approach to Resource Allocation in Annual Plants*  
(50 min)  
UNL MathBio Seminar October 2018
- An Application of Optimal Control to Resource Allocation in Annual Plants*  
(20 min)  
Midwest Mathematical Biology Conference, UW - La Crosse May 2018
- † *Optimal Control Theory and Math Biology*  
(10 min)  
Nebraska Wesleyan University Math Club October 2017
- † *Modified Wavelet Methods for Identifying Transitions in Bean Beetle Maturation*  
(Poster)  
Hope College Celebration of Undergraduate Research April 2014  
† Michigan Mathematics Prize Competition Awards Day March 2014
- † *Identifying Transitions in Bean Beetle Maturation Using Modified Wavelet Methods*  
(15 min)  
† Hope College Mathematics Department Colloquium October 2013  
Midstates Consortium for Math and Science Undergraduate Research  
Symposium, University of Chicago October 2013

## TEACHING EXPERIENCE

### Instructor of Record

- Math 302: Math Modeling Spring 2017, 2019, 2020  
A course for pre-service elementary teachers.
- Math 104: Applied Calculus ( $\sim 110$  students) Fall 2019
- Math 106: Calculus I Fall 2018  
Part of the WHT Scholars Learning Community for first-generation Nebraska college students
- Math 203: Contemporary Mathematics Spring 2018
- Math 301: Geometry Matters Summer 2017  
A course for pre-service elementary teachers.
- Math 103: College Algebra & Trigonometry Fall 2016, 2017  
Part of the WHT Scholars Learning Community for first-generation Nebraska college students
- Math 101: College Algebra Fall 2015, Spring 2016, Summer 2016

### Teaching Assistant

- Math 107: Calculus II Recitation Spring 2015
- Math 106: Calculus I Recitation Fall 2014, Summer 2015

### Qualifying Exam Workshops

Organized workshops for first-year graduate students to prepare for qualifying exams

PDE and Applied Math Workshop May 2018

ODE and Applied Math Workshop May 2017

### Grader

Math 489/889: Stochastic Processes Fall 2018

Math 831: Partial Differential Equations Fall 2017

Math 842: Methods in Applied Mathematics Fall 2016

Math 104: Applied Calculus Spring 2015

## RESEARCH EXPERIENCE

### University of Nebraska-Lincoln 2016 - 2020

Dissertation Research; Advisor: Glenn Ledder

Optimal control theoretical approach to resource allocation in annual plants

- Developed a two-resource model for resource allocation in annual plants.
- Used optimal control theory to determine the growth trajectory that maximizes fruit production over the course of a growing season.
- Implemented numerical methods to simulate the model in MATLAB.

### University of Nebraska-Lincoln Summer 2018

Graduate Research Assistant; Advisor: Adam Larios

Regularity of solutions to fractional Benjamin-Bona-Mahony equation

- Used numerical techniques to investigate the effects of incorporating a fractional differential operator on the smoothness of solutions to the BBM equation.

### Hope College 2013-2014

Undergraduate Research Assistant; Advisor: Brian Yurk

Studied effects of climate change on growth of embryonic *Callosobruchus maculatus*

- Developed and implemented laboratory protocol for exposing embryos to varying environmental conditions and collecting data via digital microscopy.
- Employed a modified wavelet image processing algorithm with R and Java to examine effects of climate variation on the timing of key transition points in embryonic development.

## SERVICE

### Interdisciplinary Contest in Modeling,

Consortium for Mathematics and Its Applications

Spring 2021

Worked as a triage judge to grade 300 papers as part of an international modeling contest which challenges students to engage with open-ended problems.

**Referee**, Letters in Biomathematics

**New Student Enrollment**, UNL

Summer 2019, 2020

Worked with academic advisors and incoming freshmen to determine their math placement based on their backgrounds and major requirements.

**Nebraska Conference for Undergraduate Women in Mathematics,**

Department of Mathematics, UNL

January 2019, 2020

NCUWM is an annual conference open to undergraduate women mathematicians.

I volunteered to assemble informational packets and register conference attendees.

**Dean Search**, College of Arts and Sciences, UNL

January 2019

Served on a panel of 10 students who met with and evaluated each candidate.

**Math Day**, Department of Mathematics, UNL

November 2014 - 2019

Proctored/coordinated throughout a day of high school mathematics competitions for approximately 1400 students across Nebraska.