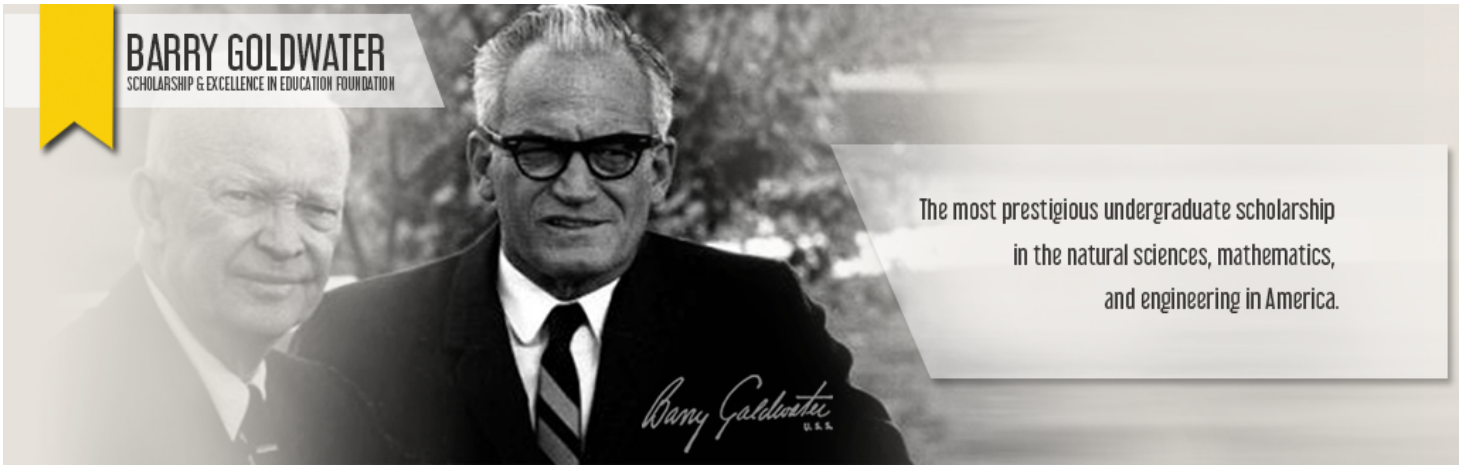
Registration ID 1274417
Log Out



The Barry Goldwater Scholarship and Excellence in Education Foundation

Application Review

Registration ID 1274417

Registration ID 1274417
Your session will automatically time out at **10:01:35am** Central Time if no action is taken. Any action (saving information or choosing a new page) will reset this timer.

Your application has missing or incorrect information in the following pages:

- Supporting Documentation

Your application data has been submitted. No changes to your application can be made, however, you can update profile information at any time from the Student Overview screen.

Recommenders

Recommenders

Actions Name * Email * Action Date Buttons

The recommender's list is currently locked. The submission window is closed.

This application requires 3 recommendations.

Making a change to the list of recommenders: Student applicants cannot make changes to the list of recommenders. Changes to the list must be made by the Campus Representative. For guidance on how to remove and replace a recommender, please see FAQ questions **"How is a letter writer replaced?"**

Application Questions & Answers

Legal Residence Information

Question	Answer
* Citizenship	U.S. Citizen
* Legal Residence Address	3206 Ocean Dr.
Address (line 2)	
* City	Emerald Isle
* State	North Carolina
* Zip Code	28594
* Your U.S. Congressional House District	13th

Career Goals/Professional Aspirations

Question	Answer
* What is the highest degree you plan to obtain?	Ph.D.
* In one or two sentences, describe your career goals and professional aspirations (see example below). This statement will be used in publications if you are selected as a scholar.	I aspire to earn a Ph.D. in Computational Biology. My research will develop the bond between ecological and computational biology, focusing on the link between fauna behavior and human pressures.
* What are your career goals and professional aspirations? Indicate which area(s) of mathematics, science, or engineering you are considering pursuing in your research career and specify how your current academic program and your overall educational plans will assist you in achieving your career goals and professional aspirations.	My career goal is to be an ecologist exploring animal behavior and ecological change with respect to anthropogenic pressures. I have always been infatuated with wildlife and I want to understand, and hopefully slow, the mass biodiversity decline around the world. Being tenaciously independent, learning from past failures, and discovering global links that influence the world's ecosystems, I am motivated to broaden my skill sets into biology and computer science to provide a unique perspective to present and future ecological problems. I came to the University of South Carolina (UofSC) to follow my passion for biology in hopes of gaining experience in ecology and wildlife health analytics. In the SC Honors College, I dove into the deeper niches of my degree with honors classes in ecology, argumentation and debate, algorithmic design, and many more.

	The opportunity to diversify my research portfolio led me to pursue a second degree in computer science. This specialization in multiple subjects coupled with my deep research experiences is a unique multidisciplinary perspective for approaching real-world problems. With Dr. Timothy Mousseau at UofSC, I research ways to utilize machine learning for analyzing data obtained from field camera traps. I have advanced from processing photos to constructing neural nets that identify and classify a variety of species in different ecosystems. Since starting at this lab, I learned to effectively use Python, R, and Java in real-world experiments and prepared submissions to scientific research journals. The majority of this knowledge came from my independent experiences developing AI or basic programming algorithms to automate processes within our lab. My current path is broadening my experiences using machine learning techniques to identify bird behavior from biologger data obtained in a project headed by another professor, Dr. Nathan Senner. Already, I constructed a hidden Markov model that confirms field data findings. As I wrap up my undergraduate degrees, I will pursue opportunities to earn a Ph.D. in computational biology. I have been exploring several interdisciplinary Ph.D. programs, including ones at Duke, UC Davis, and UC Berkeley. My mission is to develop general methods and techniques based on machine learning for understanding the fundamentals and complexities associated with ecological systems. My ability to independently discover and imagine inventive solutions will lead to innovative efficiency between ecology and computing. This interdisciplinarity will be invaluable in big data analytics and a Ph.D. will further foster a dual-disciplined perspective when faced with new projects and ecological data. After earning my Ph.D., I want to continue conducting leading-edge research in population ecology dynamics in a renowned school, such as Duke or Stanford. I look forward to expanding the applicability of machine learning technologies to new problems in ecology and other scientific settings.
* Describe an activity or experience that has been important in helping shape or reinforce your desire to pursue a research career in science, mathematics or engineering.	I joined Sustainable Carolina, a community and college outreach group focused on campus sustainability, to get involved with gardening as I did as a hobby at home. Experimenting with growing clippings and making aquaponic systems fostered my curious nature. Soon I became a peer leader of the Green Event and Offices Team. After quickly learning interpersonal communication during several events, I was managing my own events in green practices. This included certifying the largest and first public green event in South Carolina, the International Food Festival, with an expected +17,000 individuals attending. Unfortunately, the pandemic led to the cancellation of this event; however, the certification process was complete. I have a new perspective on how people think and interact with our environment because of working with people of diverse backgrounds and networking in a community that has varying interests in sustainability. The frequent solutions to 'reuse, reduce, and recycle' have always been the main focus, but it has been challenging to uphold in a pandemic. Reusing anything can be hazardous to one's own well-being. The pandemic has altered our perception of sustainability and how we need to act in solving the big problems of today. The world needs people to create innovative solutions to solve the growing issues of global warming and pollution of waterways. I want to be part of the resilient change for a better relationship with our environment.
* In what way did COVID-19 or other hardships affect your research career plans and did those events alter your ability to pursue those plans? If COVID-19 did not influence your plans, simply state that there was no effect.	When the world shut down, I reached out to bioinformatics professionals and Ph.D. candidates to help gain perspective for my future career aspirations in computational biology. I was surprised to find that developing interpersonal communication skills were mentioned, in one form or another, by almost everyone I contacted. Once my summer research plans became impossible, I was rehired at a local beach restaurant and promoted to co-manager. I focused on developing my soft skills like outstanding customer service, delegating time-sensitive tasks, resolving conflicts, maintaining customer relationships, and multi-tasking six or more tables at a time. Originally, I was selected as an intern again at the Duke marine lab, however, the island was shut down. I was initially devastated that my chance to create a dolphin translator using machine learning for Duke was gone because I was ecstatic to gain experience in my future career aspiration of working on coastal marine life with data mining techniques such as Markov models and random forests. Although my research experience was put off, becoming comfortable with reaching out and creating professional relationships helped me realize the importance of professional development. Experiencing the demands of the restaurant industry became a great opportunity for me to focus on because of my interpersonal skill development. I can already see improvements in my ability to present my research to a wide range of audiences.
(Optional question, answering the question below will depend on your personal experience.) Goldwater Scholars will be representative of the diverse economic, ethnic and occupational backgrounds of families in the United States. Describe any social and/or economic impacts you have encountered that influenced your education - either positively or negatively - and how you have dealt with them or incorporated them in your work to reach your career goals.	Type One Diabetes (T1D) inspired my passion to be a researcher in this field. Every day, I have to analyze not only camera trap imagery or GPS signals, but glucose readings. I have to predict what will happen tomorrow and how to correctly establish a basal or when to have an extra fruit snack pouch in my pocket. I do not eat like everyone else, I do not study like everyone else, and I do not interact like everyone else. My day needs to be scheduled and what I eat needs to be carefully considered. My doctors initially told me and everyone else with T1D, "I need to wait for a cure to be 'normal'". I did not listen and I applied myself instead while challenging the misconceptions surrounded by this autoimmune disease. I take this as a test and a challenge to push past my limits. In high school, I was a year-round athlete, playing on five varsity and travel sports teams. In college, I have been placed in numerous executive positions, tested my academic abilities, and earned accolades as a top student. A person with T1D is not expected to be where I am right now, but I have proved those limitations wrong at least for me. This disease is not an excuse for an inability to do well in your passions, instead, it has advanced mine. I was always infatuated by the STEM fields and excelled in these subjects. The presence of data in my daily life has made me the forethinker and data visualizer that I carry into my work and daily life.

Research Projects and Skills

Question	Answer
Research Project #1	Rapid processing of camera trap images with minimal input
Starting Month	09
Starting Year	2018
Ongoing	Yes
Average Hours/Week (Academic Year)	10
Average Hours/Week (Summer)	2
Name of Project Mentor	Dr. Timothy Mousseau
Position of Project Mentor	Professor of Biology
Affiliation of Project Mentor	University of South Carolina
Name of Project Mentor	Melissa Groleau
Position of Project Mentor	Laboratory Technician
Affiliation of Project Mentor	University of South Carolina
Name of Project Mentor	
Position of Project Mentor	
Affiliation of Project Mentor	
Institution where this research was performed	University of South Carolina
Description of research, including your involvement in AND contribution to the project. A separate narrative box has been provided for you to describe the research skills you acquired while working on this project.	As a project leader, I lead and manage 5 students working on autonomous object detection using Tensorflow libraries. We identify and classify big ecological data by analyzing four million+ images from Fukushima, Japan; Chernobyl, Russia; Fort McCrady, SC; and Clarks Hill, SC by taking account of species, irregularities, subject behavior, equipment errors, and weather. From working on this project, I saw the problem associated with human observers having too many images to process. Instead of continuing a problem for future observers, I developed a solution with machine learning. The end product was a Convolutional Neural Network

	(CNN) with an average F1 score of 86% in McCrady and Clarks Hill, South Carolina for 21 indicator species. Currently, this research has been revised and is in the process of resubmission into the Journal of Ecology and Evolution.
Research Skills (Briefly describe any research skill(s) you developed while working on this project that will be important going forward in your research career.)	I learned proper techniques in writing Python code, running R scripts, managing big data sets, and several soft skills involved in managing a team. These skills included assigning a goal for every member, working with a variety of skillsets, and documenting a project for future reference.
Do you have Papers/Publications associated with this research project?	Yes
If yes, how many publications are associated with this work?	1
Citation	Duggan, M., Groleau, M., Hall, B., Stone, C.G., Anderson, L.L., Waller, M.M., Self, L.S., Utter, T.E., Shealy, E.P., Mousseau, T.A. (tentative 2021). An approach to rapid processing of camera trap images with minimal human input. Manuscript submitted to Journal of Ecology and Evolution.
Status	Submitted
How are you listed in the publication?	First author
Type of Publication	National Professional Society Journal
Do you have Presentations associated with this research project?	Yes
If yes, how many presentations are associated with this work?	3
Citation	Duggan M, Groleau M, and Mousseau T. Machine Learning in Camera Trap Data. Poster presented at: 3rd Annual Sustainability Showcase at USC; 2019, September, 27; Columbia, SC.
Campus, Regional, National or International	Campus
Presentation type	Poster
How are you listed on the presentation?	Presenter
Citation	Duggan M, Groleau M and Mousseau T. Detecting Deer (Odocoileus virginianus) in McCrady and ClarksHill, SC. Poster presented at: Discover USC; 2020, April, 23; Columbia, SC.
Campus, Regional, National or International	Regional
Presentation type	Poster
How are you listed on the presentation?	Presenter
Citation	Groleau M, Hall B, Waller M, Schneider A, Hice B, Hynes R, Shealy E, Duggan M, and Mousseau T. Using Camera Traps for Environmental Management Purposes. Slide show presented at: National Military Fish and Wildlife Association; 2020, March 12; Omaha, NE.
Campus, Regional, National or International	National
Presentation type	Oral
How are you listed on the presentation?	Author(not as presenter)

Research Projects and Skills

Question	Answer
Research Project #2	Concluding Successful Nesting of Limosa limosa with Geolocation Data
Starting Month	09
Starting Year	2020
Ongoing	Yes
Average Hours/Week (Academic Year)	8
Average Hours/Week (Summer)	N/A
Name of Project Mentor	Dr. Nathan Senner
Position of Project Mentor	Professor of Biology
Affiliation of Project Mentor	University of South Carolina
Name of Project Mentor	Luke Wilde
Position of Project Mentor	MSc Student
Affiliation of Project Mentor	University of South Carolina
Name of Project Mentor	
Position of Project Mentor	
Affiliation of Project Mentor	
Institution where this research was performed	
Description of research, including your involvement in AND contribution to the project. A separate narrative box has been provided for you to describe the research skills you acquired while working on this project.	I am using a combination of deep learning, movement-based, and simulation tools to build a model that reliably determines the nesting success of Limosa limosa, the black-tailed godwit. I am determining the appropriate methods to examine nesting success and differentiating behaviors based solely on geolocations by researching previous literature on similar studies. This involves running and creating several R packages to perform machine learning analysis on our geolocator and satellite transmitter data. For example, I have built a preliminary hidden Markov model to discover changes in the behavior states from incubating to brooding chicks using "momentuHMM" and "recurse" packages. The process is being calibrated on GPS data with an error rate of fewer than seven meters and then going to be fitted on Argos satellite data, a cheaper and significantly less accurate tool. Even with high error rates, we are examining the probability of nesting success.
Research Skills (Briefly describe any research skill(s) you developed while working on this project that will be important going forward in your research career.)	I have determined how to characterize animal behaviors and understand migratory patterns through unobserved data collections through biologger data. I am learning proper coding of R scripts, understanding geolocator metrics, and preprocessing Argos data to infer specific animal behavior changes.
Do you have Papers/Publications associated with this research project?	No
Do you have Presentations associated with this research project?	No

Research Projects and Skills

Question	Answer
Research Project #3	Effects of Ionizing Radiation on Plant Germination
Starting Month	10
Starting Year	2020
Ongoing	Yes
Average Hours/Week (Academic Year)	3
Average Hours/Week (Summer)	N/A
Name of Project Mentor	Dr. Timothy Mousseau
Position of Project Mentor	Professor of Biology
Affiliation of Project Mentor	University of South Carolina
Name of Project Mentor	Melissa Groleau
Position of Project Mentor	Laboratory Technician
Affiliation of Project Mentor	University of South Carolina

Name of Project Mentor	
Position of Project Mentor	
Affiliation of Project Mentor	
Institution where this research was performed	
Description of research, including your involvement in AND contribution to the project. A separate narrative box has been provided for you to describe the research skills you acquired while working on this project.	I am observing differences in germination success for the chronically irradiated seeds of Chernobyl, Ukraine in comparison to acute exposure given to lab irradiated seeds to determine the difference in effects on germination. I am working with two other undergraduate students to plate and replate seeds in order to record their germination success. Additionally, we have stored successful germination subjects in order to run DNA tests for analysis into possible adaptations that combat DNA mutation caused by radiation. I will be able to run bioinformatic analyses on this data to compare differences in seed populations and determine these genes responsible for successful germination. The conclusions from this study will help suggest genes in seeds that are capable of handling chronic radiation doses similar to their three-month journey to Mars for the National Aeronautics and Space Administration (NASA).
Research Skills (Briefly describe any research skill(s) you developed while working on this project that will be important going forward in your research career.)	I have learned the proper requirements for successful seed germination and procedure for running seed-related studies. I have written and received a grant to support this study. Additionally, I now have experience in continuous data logging and tracking of seed germination.
Do you have Papers/Publications associated with this research project?	No
Do you have Presentations associated with this research project?	No

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Research Projects and Skills

Question	Answer
Research Project #4	Impact of Ionizing Radiation on Mammalian Abundance in Fukushima and Chernobyl.
Starting Month	10
Starting Year	2018
Ongoing	No
Ending Month	09
Ending Year	2019
Average Hours/Week (Academic Year)	10
Average Hours/Week (Summer)	0
Name of Project Mentor	Dr. Timothy Mousseau
Position of Project Mentor	Professor of Biology
Affiliation of Project Mentor	University of South Carolina
Name of Project Mentor	Melissa Groleau
Position of Project Mentor	Laboratory Technician
Affiliation of Project Mentor	University of South Carolina
Name of Project Mentor	
Position of Project Mentor	
Affiliation of Project Mentor	
Institution where this research was performed	
Description of research, including your involvement in AND contribution to the project. A separate narrative box has been provided for you to describe the research skills you acquired while working on this project.	I identified the correlation between chronic radiation exposure on medium to large mammals in Fukushima and Chernobyl from camera trap data. I analyzed 100,000+ images for a variety of animal life including horses, red deer, moose, and 15 other species. We recorded the classification, behavior, and time. These observations on animal abundance and youth versus adult ratios will be used to determine the overall effect of the Fukushima and Chernobyl nuclear disasters on the surrounding environment. Background research demonstrated that there was a negative correlation in radiation dose versus environmental health, but our results suggested that there was no such correlation. Besides analyzing photos, I prepared cameras to be sent to Chernobyl and made maps that showed radiation dosage and proposed similar habitat types.
Research Skills (Briefly describe any research skill(s) you developed while working on this project that will be important going forward in your research career.)	I learned the basics of ArcMap and geographic information systems (GIS) to create maps of field camera trap locations and determine environment types for future publications. Also, I developed my programming skills in visual basic for applications (VBA) by determining fauna abundance metrics.
Do you have Papers/Publications associated with this research project?	No
Do you have Presentations associated with this research project?	Yes
If yes, how many presentations are associated with this work?	1
Citation	Hynes R, Waller M, Duggan M, Groleau M & Mousseau T. Impact of Ionizing Radiation on Mammalian Abundance in Fukushima. Poster presented at: Discover USC; 2019, April, 23; Columbia, USC.
Campus, Regional, National or International	Regional
Presentation type	Poster
How are you listed on the presentation?	Author(not as presenter)

Mentor Recognition Information

Question	Answer
Mentor Name	Timothy Mousseau
Title	Dr.
Mentor Name	Nathan Senner
Title	Dr.
Mentor Name	Michael Hodgson
Title	Dr.

Other Activities and Accomplishments

Question	Answer
Activity/Accomplishment	Biological Honor Society
Organization (if applicable)	Beta Beta Beta
Scope of Activity/Accomplishment	National
Role/Involvement	I am the elected Historian of the Beta Beta Beta Tau Mu chapter at UofSC. I mentor and inform members about gaining experience in the field of biology for mainly environmental career possibilities either through research or conservation groups.
Leadership Position	Historian

Length of Involvement	More than one academic year

Other Activities and Accomplishments

Question	Answer
Activity/Accomplishment	Sustainable Carolina Leadership Program
Organization (if applicable)	Sustainable Carolina
Scope of Activity/Accomplishment	College/University
Role/Involvement	I head Green Office and Green Event Certification Programs and recognize or give environmental consulting to offices, events, and individuals that incorporate sustainable practices. I certified the largest public green event with +17,000 attendees.
Leadership Position	Peer Leadership Intern
Length of Involvement	More than one academic year

Other Activities and Accomplishments

Question	Answer
Activity/Accomplishment	Student Hall Government
Organization (if applicable)	Residential Housing Association
Scope of Activity/Accomplishment	College/University
Role/Involvement	I was VP of a campus governing and programming body on issues of on-campus living, such as safety, diversity, sustainability, and wellness where representatives are elected by the resident hall body.
Leadership Position	Vice President
Length of Involvement	Academic Year

Other Activities and Accomplishments

Question	Answer
Activity/Accomplishment	Herpetology Club
Organization (if applicable)	
Scope of Activity/Accomplishment	College/University
Role/Involvement	I am the acting VP and one of the founding members in 2020 of the Herpetology Club at UofSC. I help lead excursions and herping events in the Congaree National Park. Also, I 3D print various herp species for lessons in herp anatomy.
Leadership Position	VP
Length of Involvement	Semester

Other Activities and Accomplishments

Question	Answer
Activity/Accomplishment	Engineering Honor Society
Organization (if applicable)	Tau Beta Pi
Scope of Activity/Accomplishment	College/University
Role/Involvement	I was nominated to join because I am in the top 15% of my graduating class in the College of Computing and Engineering. As a member, I participate in professional development events and discuss related projects of interest with fellow members.
Leadership Position	Member
Length of Involvement	Semester

Recognitions

Question	Answer
Recognition	Science Undergraduate Research Fellowship (SURF)
Type	College/University
Award Description	I was awarded a $2,780 grant from the UofSC Honors College to conduct machine learning research on camera trap data.
Award Year	2018

Recognitions

Question	Answer
Recognition	SC Space Grant Consortium Mini-REAP
Type	Other
Award Description	A $10,000 award to my team's grant proposal titled, "Effects of Ionizing Radiation on Plant Germination." The goal of the mini- Research and Education Awards Program (mini-REAP) is to create NASA contacts with students and faculty at SC colleges.
Award Year	2020

Recognitions

Question	Answer
Recognition	T.L. McMeekin Scholarship
Type	College/University
Award Description	I was awarded $500 for being a non-pre-med undergraduate student at the University of South Carolina who has demonstrated academic excellence in Biological Sciences.
Award Year	2020

Recognitions

Question	Answer
Recognition	Academic Scholar-Excellence Award
Type	College/University

Award Description	I was a selected recipient who exhibited an average 33 ACT score and exhibited tremendous merit. I qualified for in-state tuition which has saved me approximately $93,000 from additional out-of-state fees.
Award Year	2018

Recognitions

Question	Answer
Recognition	Magellan Scholar Award
Type	College/University
Award Description	I was awarded a $2,500 grant to my project titled "Concluding Successful Nesting of Limosa limosa with Geolocation Data."
Award Year	2020

Current College/University

Question	Answer
* Institution type:	4-year institution
* Are you a transfer student (i.e., Did you transfer from another academic institution to the institution that is nominating you for a Goldwater scholarship?)	No
* Field of study	Life Sciences
Life Sciences areas of specialization	Ecology
* Period through the end of which you will be reporting your GPA	
* Official cumulative unweighted GPA through the period reported above	4.00
* How many credit hours does your school require for graduation?	120
* How many credit hours will you achieve as of January 1, 2021?	127
* How many credit hours do you plan to achieve for graduation?	177
* Expected baccalaureate graduation month	05
* Expected baccalaureate graduation year	2022
* According to the definition provided above, indicate whether you are a sophomore or junior.	Junior
* Matriculation status at the institution you will be attending during the 2021-2022 academic year	Currently Enrolled
* Have you been involved in or do you plan to Study Abroad?	No

Coursework

Question	Answer
Current Course 1	CSCE 567: Visualization Tools
Course Level	Graduate
Current Course 2	CSCE 416: Intro to Computer Networks
Course Level	Undergraduate
Current Course 3	MATH 241: Honors Vector Calculus
Course Level	Undergraduate
Current Course 4	CSCE 311: Honors Operating Systems
Course Level	Undergraduate
Current Course 5	BIOL 588: Genomic Data Science
Course Level	Graduate
Current Course 6	CSCE 350: Data Structures and Algorithms
Course Level	Undergraduate
Future Course 1	BIOL 461: Honors Advanced Human Anatomy
Course Level	Undergraduate
Future Course 2	CSCE 555: Algorithms in Bioinformatics
Course Level	Graduate
Future Course 3	CSCE 587: Big Data Analytics
Course Level	Graduate
Future Course 4	CSCE 574: Robotics
Course Level	Graduate
Future Course 5	BIOL 571: Conservation Biology
Course Level	Graduate
Future Course 6	BIOL 534: Animal Behavior
Course Level	Graduate
Course outside of Major 1	STAT 530: Applied Multivariate Statistics and Data Mining
Course Level	Graduate
Course outside of Major 2	STAT 528: Environmental Statistics
Course Level	Graduate
Course outside of Major 3	STAT 541: Advanced SAS Programming
Course Level	Graduate
Course outside of Major 4	GEOG 348: Biogeography
Course Level	Undergraduate
Course outside of Major 5	GEOG 575: Digital Techniques and Applications in Remote Sensing
Course Level	Graduate
Course outside of Major 6	GEOG 563: Advanced Geographic Information Systems
Course Level	Graduate

Previous Schools attended

Question	Answer
School Name	

City

State

Institution type:

Dates attended

Unweighted GPA on a 4.00 scale

Will you be providing a transcript from this school to your Goldwater Campus Representative?

Future Academic plans

Question	Answer
* Is the institution you will be attending for the 2021-2022 academic year the same as your current academic institution?	Yes

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Certification and Release

Question	Answer
* Applicant's Signature	Matthew T. Duggan

Supporting Documentation
You must attach at least 1 Essay documents to your application.

File Type / Description	Description
