Emma M. Rhodes Personal, Background, and Future Goals Statement

Introduction: No one introduced me to birds or birding. From a very young age, I was drawn to the natural world. I was inquisitive and wanted to learn the names of my feathered friends visiting the backyard of my childhood home. I was uncertain if I could make a career out of studying birds; however, I was determined to find out. I first came across the term "ornithologist" in a book I discovered at my local library at the age of seven. The book was about a famous North American naturalist, John James Audubon. It explained how Audubon was the first person in North America to band a bird; he tied ribbons on the tarsi of young Eastern Phoebes to see if they would return to their natal grounds in subsequent years. One night in October of 2007, awake in bed, I was too excited to sleep. My father had agreed to take me to a public bird banding research station the following morning. I was 12 at the time and was eager to apply my self-taught bird knowledge that I had accrued through books. Having read about the first person to band a bird in North America, I was excited to see how modern-day scientists applied the method of banding. We left before sunrise to drive to a small, rural town called Fort Morgan, Alabama. The banding station was located at the very end of a 30-mile-long peninsula, a critical stopover site for migratory birds crossing the Gulf of Mexico. Hummer/Bird Study Group (HBSG) was operating this site under the leadership of Bob and Martha Sargent. When I arrived, I could see Bob Sargent holding a bird that had just been banded with a lightweight, aluminum band. I moved in closer to observe the bird and determined it was a Yellow-rumped Warbler. Bob explained how the band had a unique nine-digit code that acted like a "social security number" for that bird. "If anyone ever catches this bird in the future, we will receive a report once it is reported to the Bird Banding Laboratory. This way we can connect the lives of birds", Bob said. He then turned to me and asked, "would you like to release this bird young lady?" I could not believe he was talking to me, but I said yes without hesitation. Bob placed the warbler in my hand with gentleness as he showed me the proper way to hold the bird. He then instructed me on how to release it. As the warbler flew from my hand, I knew that this was something I wanted to pursue. Two years later, I joined the HBSG crew learning how to band under the Sargents' tutelage. I remained a part of this team up until Bob passed away and HBSG dissolved. My time with HBSG gave me the passion and drive I have to study bird migration and to pursue a career in science. **From that point forward, I dedicated myself to the idea that one day I would contribute to the understanding of bird migration.**

Growing up in lower Alabama, there were few kids with similar interests as myself and certainly no female mentors that I could look up to. Nevertheless, I would not allow these hurdles to deter me from pursuing a career in science as a young woman. During my senior year in high school, I was given the opportunity to attend the Hog Island National Audubon Coastal Bird Studies Camp in Maine. A local Audubon society supported me otherwise I would not have been able to attend due to financial constraints. My first summer at Hog Island Camp was a lifechanging networking opportunity where I made long-lasting friendships. I returned the following two summers not just as a volunteer for the camp, but also as a research assistant for the National Audubon's Seabird Institute. These experiences encouraged me to pursue, specifically, a degree in biology.

I have taken the first steps to become an influential researcher in my field. I received my BS degree in Biological Sciences (Minor in Geographic Information Science and Technology) at the University of South Alabama (USA) in May 2017. Shortly after graduating, I accepted a job as a biologist for Alabama Audubon to develop the Alabama Coastal Bird Stewardship Program. I held this position from 2017 through 2020. I developed data protocols and best management practices for monitoring beach-nesting birds. I engaged with the public by having informational stations along Alabama's beaches to share my knowledge about the importance of coastal habitats and birds. **I supervised and instructed volunteers during bird surveys as part of our community science initiatives**. Additionally, I assisted with presenting our results to the Alabama Department of Conservation and Natural Resources to help develop coastal bird management protocols for the state. While working in this position, **I co-wrote a $100,000 USFWS grant** that was successfully funded and served to bolster our program. My time working as a coastal biologist was critical to developing my public relations and

management skills. However, since my early teens, I have aspired to become a professor at a research institution to contribute to the greater knowledge of bird biology and be a positive influence through teaching. I wanted to return to academia and earn my Ph.D. In March of 2020, I accepted a spot in the Biological Sciences Ph.D. program at Auburn University (AU) under the supervision of Drs. Wendy Hood and Geoffrey Hill. My work at AU is focused on understanding the physiological and evolutionary foundation of bird migration. My work will help to set me apart as a top researcher in the field of bird migration, as well as an efficient communicator of science. **As a graduate student in the Hood & Hill labs, I have access to cutting-edge technology to study migration adaptations on a cellular and biochemical level.** I am partnering with the School of Kinesiology to conduct mitochondria respiration research. Auburn Kinesiology is home to world-renowned experts in mitochondrial and cellular energetics. I will make exciting new discoveries about adaptations to bird migration, which will be instrumental to migratory bird conservation. As a professional researcher, I also want to encourage, mentor, and support kids who are interested in STEM careers. Growing up, I did not have any female scientist mentors. There is a paucity of female scientists in Alabama, which I want to help change. Professorship is a way I can recruit, encourage, and support potential young scientists from underrepresented groups and provide them the knowledge and tools they need to become successful. The GRFP fellowship will be instrumental by allowing me to conduct my proposed migratory bird research and have a greater reach through my outreach initiatives.

Intellectual Merit: As an undergraduate, I was awarded the **Summer Undergraduate Research Fellowship (SURF) at the USA (a competitive paid undergraduate program).** This program allowed me to develop research questions and learn how to implement the scientific method as an **independent researcher**. I developed my own hypothesis driven questions related to bird window strike mortality, the second highest anthropogenic cause of bird mortality in North America. I was curious if there were differences between age classes and vulnerability to window strike mortality. In 2017, **I received a $1,000 Alabama Ornithological Society grant for this research**. I discovered the need for standardization of aging bird specimens for window strike studies. High variability in aging criteria across window strike studies may be introducing biases in results. Accurate data on how window strikes affect birds is crucial for conservation management and mitigation. My results shed light on age-class differences within window strike mortality and also presents a comprehensive, standard approach for determining age in bird specimens, providing a better format for future window strike studies to follow. **I have written these results for a first-authored manuscript which will be submitted to the *Journal of Field Ornithology***. I graduated from USA with honors (Magna Cum Laude and Phi Eta Sigma). **I won second place at the Alabama Academy of Science for a paper presentation on my undergraduate research in 2016**. I was also awarded an Institutional Scholarship (two years full tuition) and was awarded a $5,000 Phi Kappa Theta transfer scholarship from Coastal Alabama Community College. Additionally, I have received three student conference travel awards (including one from the American Ornithological Society).

At AU, I was awarded the Presidential Graduate Research Fellowship Scholar, a three-year fellowship, in May 2020. I have presented papers at four different scientific conferences and have presented posters at four different conferences as well. I have been invited to, and given, twelve scientific outreach talks at various institutions. I recently co-authored a paper studying the effects of hurricanes on bird migration and movements in a non-peer reviewed journal (Lawrence Gardella and Emma M. Rhodes 2020. Birds in and near lower Alabama in the wake of tropical storm Cristobal. Alabama Birdlife. Vol 66 Article #1.). I am first author on two publicly accessible scientific reports and co-author on one public report on monitoring birds in Alabama. During my first year at AU, I have been investigating mitochondrial adaptation of White-crowned Sparrow subspecies (non-migratory versus migratory) in California using Auburn's MitoMobile, an outfitted mobile laboratory for cutting-edge mitochondrial research. I conducted a comparative study where I discovered that mean distance traveled of migratory

birds is significantly correlated (p-value <.01) with higher hematocrit levels in blood, an adaptation for migration. I will be presenting these results to the Society for Integrative and Comparative Biology in January 2022. I will measure my success as a GRFP fellow through actively publishing and presenting my work for both the science community and to the lay person.

Broader Impacts: I strive to give back to my community by providing free science-outreach events. I believe that to achieve diversity, equity, and inclusion, barriers must be removed including monetary and location constraints. In 2020, **I co-founded a 501(c)(3) public charity**, Banding Coalition of the Americas (BCA), a volunteer-operated organization. A core part of BCA's work is to bring science to people who have not had the opportunity to see field work in-person. If the banding station I visited as a kid had not been free and local, I might not have had those influential childhood experiences that ultimately molded me into a young scientist. **BCA runs one of the few open to the public bird banding stations in North America.** This station is the same site at Fort Morgan that I worked at in high school and first visited when I was 12. Between October 1st-7th (2021) we had over 400 visitors at this banding site. Apart from my professional work, I have always been an active volunteer and worker in the science-outreach community. I have been interviewed for five different magazines pertaining to birding and bird banding. **I was recently interviewed for Alabama Public Television's *Discovering Alabama,* a 2019 Emmy Award Winner, to discuss and demonstrate bird banding.** Additionally, I am now a paid science instructor for the Hog Island National Audubon Coastal Bird Studies Camp in Maine, the same camp I visited during my senior year of high school. I have volunteered for various bird and nature festivals in Georgia, Mississippi, and Alabama from my high school years to now. From 2018 through 2020, I served as the Vice President for the Mobile Bay Audubon Society in Mobile, AL. **I founded Alabama's first Young Birders Club (2018 to current) and a Hog Island Scholarship Program for Teens.** The young birders club is an outlet for young naturalists in Alabama to go on field trips, meet friends, and network while learning more about the natural world. I was given opportunities as a kid that opened doors and allowed me to expand my knowledge base. Some of these experiences had a profound impact on me. I am dedicated to giving kids the same opportunities that I was given and more. In 2020, I co-wrote a $15,000 Alabama state grant. We were awarded the grant, and I allocated part of the funds to create a scholarship program to support teens to attend the Hog Island teen camp in Maine. In 2021, the scholarship program supported a young birder to attend the camp. With the support of the GRFP, I will develop a program to offer bird banding demonstrations to public schools in Alabama, targeting schools which have the lowest funding and opportunities for field trips and extracurricular, outdoor programs. The goal of the program is to expand BCA's reach to kids that are underrepresented and have disadvantages when it comes to learning about field-based research in STEM. I will coordinate with schools to host banding demonstrations at locations that are most accessible to students and parents. Additionally, I will coordinate with teachers and parents to develop a curriculum on birding and bird banding. **This curriculum will be designed for K-12th graders and will be publicly accessible on BCA's website.** The goal of this curriculum is to **1)** introduce what birds are and why they are important bioindicator species, **2)** the methods in which we study birds and other wildlife, and **3)** how to pursue a career in field-based science. **12th graders in the program will be offered an opportunity to shadow BCA's staff for a week to learn field-based skills that are needed for entry-based wildlife jobs and competitive skills for academia.** Success for this program will be measured by number of students reached through the program and through student/teacher/parent feedback via a survey after the completion of a curriculum module. **Future Plans:** I am currently proposing to conduct my migratory bird research on a much larger scale with the support of the GRFP. My long-term goal is to understand how bird migration has evolved throughout avian lineages over time. My proposed research at AU will build a critical foundation needed to one day answer the unknowns regarding the evolution of migration within organisms. I plan to continue my migration research throughout my entire career. The next step will be to study migration on a genetic level as a postdoctoral researcher.