Cecina Babich Morrow

2017 Goldwater Scholar

> *When we let go of the idea that we need to have done everything perfectly in order to do something special, we're free to surprise ourselves.*

Undergraduate Institution: Kenyon College
Current Occupation: Scholar, Helen Fellowship, American Museum of Natural History

Cecina Babich Morrow is a 2017 Goldwater Scholar who is passionate about using computational approaches to tackle large-scale ecological questions. Although she entered Kenyon College certain that she would pursue a biology major, her Combinatorics class got her thinking about how math concepts could help her understand biology, and vice versa. Excited about the possibilities at the intersection of these fields, Cecina double majored in biology and mathematics. Under the mentorship of Dr. Drew Kerkhoff, she conducted computational research on new methods to measure biodiversity and to compare life history strategies between different animals. Cecina excelled as an undergraduate researcher, even co-authoring a publication on a computational method for measuring biodiversity by creating n-dimensional shapes.

Post-college, she was certain that she wanted to continue studying similar problems in graduate school, but she wanted to take some time off from school to prevent burn-out and more clearly explore her interests in both research and teaching. After graduating in 2018, Cecina was selected for the prestigious Helen Fellowship at the American Museum of Natural History, a post-baccalaureate program specifically for women in computational sciences. She has been taking full advantage of this opportunity to explore computational ecology research, education, and outreach!

On the research front, she uses machine learning to model the distribution of three-toed sloths. By using the locations where certain species of three-toed sloths have been found and environmental variables like temperature, she is able to use machine learning to predict where other three-toed sloths will be found. Her lab's software can be used by conservationists to make decisions about which areas to protect. Although the underlying habitat

suitability machine learning model is well-established in the field, Cecina is working on new ways to improve the model and to make the software easier for conservationists to use. For example, she is working on a new R package that counteracts overprediction by the habitat suitability model. Cecina uses information like deforestation or the presence of a competitor species to remove regions that are not suitable for the species. The sloths she studies have adjacent ranges that do not overlap, so she uses support vector machines to predict which species are most likely to live where.

On the educational front, Cecina teaches computer programming to high school girls. As part of the Helen Fellowship, she was assigned six high school interns who she mentored in doing species distribution modeling with a focus on climate change. She has learned to create lesson plans to help them develop their computational skills, and she hase found a style of research mentoring that works well for her. Cecina has also developed a passion for outreach by giving presentations about LGBT groups in science and what it is like to pursue research in a museum.

Moving forward, Cecina plans to apply for graduate programs in Ecology and Evolutionary Biology. She enjoys that her current research has more direct conservation applications than her work in college and gives her more opportunities for mentoring, but she misses the broader scope of her earlier work. As a result, she aspires to be a professor who develops computational tools with conservation applications for a broad range of species. By doing this work, she hopes to make an impact on both the species she aims to conserve and the future generations of scientists that she helps to educate.