



UNIVERSITY OF CENTRAL OKLAHOMA

# Center for Wildlife Forensics and Conservation Studies

CFACS Research Spotlight | 4 October 2017

Mathematical Biology and Computational Modeling

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*CFACS faculty members and their graduate/undergraduate assistants are involved in a broad spectrum of field and laboratory research programs targeted at wildlife ecology, conservation, and protection. In an effort to enhance membership awareness, communication and collaboration, CFACS periodically highlights select research initiatives via the **CFACS Research Spotlight***

Drs. Sean Laverty and Britt Bannish are applied mathematicians specializing in mathematical biology. They use mathematical computational modeling and related tools to study dynamic processes and data arising in biology. Preliminary reports of many of these projects have been or will soon be presented at major national or international conferences including: the Society for Mathematical Biology Annual Meeting, the Joint Mathematics Meeting, the International Symposium on Biomathematics and Ecology: Education and

Research, the Nebraska Conference for Undergraduate Women in Mathematics, as well as other local and regional meetings.



Sean is currently working on four projects with either immediate or long-term conservation implications. Two projects were sparked by on-campus grants with fellow CFACS members Chad King (Cross Timbers forest composition, structure, and growth) and Paul Stone (Sonoran mud turtles). In work with Chad, Sean is interested in developing mathematical models of radial trunk growth in mature trees and inferring instances of individual growth release by fitting models to local increment core data. Another arm of this project is aimed at inventorying seedling communities and developing models of seedling establishment and recruitment into the understory. In work with Paul, Sean developed and implemented a Cormack-Jolly-Seber

style capture-mark-recapture analysis to help elucidate sex differences in life history parameters of Sonoran mud turtles as part of a larger analysis of turtle movement and life history characteristics based on a long-term dataset.



A third project is aimed at understanding population ecology and habitat selection of endangered black-capped vireos in the Wichita Mountain Wildlife Refuge and Fort Sill area. Efforts for this project were focused on the development and parameterization of a spatially-explicit, discrete-time, matrix model to evaluate population dynamics and dispersal of a recovering population. The fourth project, done by undergraduate Emily Kelting and co-advised by Britt Bannish, is aimed at understanding transmission dynamics of *Toxoplasma gondii* in feral cats. Developing a better understanding of the parasite burden in the environment could help control spillover risks in other important species.

While much of Britt's research does not fall under the CFACS research umbrella, she currently works on two ecology-focused projects with undergraduate students, and is always happy to learn new things and start new collaborations. The first project, mentioned above, is studying the transmission of *Toxoplasma gondii* in feral cats. The second project, in collaboration with undergraduate Kristina Benton, involves modeling the effect of tannin on giraffe digestion and health. Endangered Rothschild's giraffes kept in conservation enclosures have limited food sources, and end up over-browsing tannin-rich acacia trees. Tannin negatively affects the giraffe's health by preventing the digestion of dietary protein. The goal of this project is to understand giraffe digestion in order to recommend strategies to keep endangered giraffes healthy.

**For further information, additional research details and opportunities for future collaboration, contact Dr. Brittany Bannish ([bbannish@uco.edu](mailto:bbannish@uco.edu)) and/or Dr. Sean Laverty ([slaverty@uco.edu](mailto:slaverty@uco.edu)).**

