OVERVIEW OF RESEARCH TO DATE

My primary academic interests are developing models for describing changes in populations and communities at broad spatial and temporal scales and to make these models useful and accessible to practitioners and researchers alike by operating within an Open Science framework. Although I would describe myself as a generalist, my research to date can be distilled as: developing and improving methods for identifying changes in ecological populations and communities at broad scales

**I. Research interests overview: synthesis science, quantitative and invasion ecology**

Synthesizing information is integral to the study of ecological systems (Carpenter *et al.*, 2009), and synthesis projects are important in that they emphasize the reuse and integration of disparate data—data which is often expensive and/or difficult to capture. Although I have designed and conduced field studies, my recent research endeavors involve using extant data to understand broad-scale changes in faunal (Burnett & Moulton, 2015; Burnett *et al.*, 2017), floral (Donovan *et al.*, 2018) and algal (Burnett *et al.*, in prep.) populations and communities. Invasions, because they are largely driven by human introductions, are a global phenomena, lending well to studying biogeography at broad spatial scales. In addition to understanding the relationship between invaders and native species, modern invaded systems provide natural experiment for understanding how communities and ecosystems respond to both anthropogenic and ecological perturbations. Studying invasive populations both in the field (Burnett & Moulton, 2015) and out (Allen & Burnett, in prep.; Burnett *et al.*, in review, 2017, 2018; Donovan *et al.*, 2018), coupled with past field experience (Burnett & Moulton, 2015; Burnett & Sieving, 2016) led to my deep appreciation for the amount of time, energy, and monetary resources required to design and conduct field studies and monitoring programs.

**II. Dissertation Research**

Abrupt changes to the feedbacks regulating environmental conditions can trigger non-linear, unexpected, and undesirable responses, or “**regime shifts**”. Alarming examples of regime shifts in response to anthropogenic forcing include widespread insect declines, loss of faunal biodiversity, and an increase in the frequency and intensity of extreme weather events. Forecasting potential regime shifts becomes increasingly important. Scientists propose many statistical and numerical approaches as leading indicators of these regime shifts. However, these do not consistently detect regime shifts in complex, high dimensional ecological systems.

My dissertation research focuses on developing and refining the methods used to detect ecological regime shifts. In addition to rigorously testing these proposed methods, I also introduce a novel approach for detecting quick changes in abrupt systems (see Burnett & Price, 2018). This research addresses an urgent need to develop accessible tools for identifying and predicting such shifts on the landscape.

**III. Collaborative efforts**

In addition to encouraging broad-scale research using extant data, synthesis science is largely driven by collaborative efforts. Adopting this philosophy during my Ph.D. has provided unique experiences to study new fields (Allen *et al.*, 2016; Chuang *et al.*, 2018) and maintain my interests in ornithology (Allen & Burnett, in prep.; Burnett *et al.*, in prep.; La Sorte *et al.*, 2018).

**IV. The POE as a catalyst my development as a quantitative ecologist.**

This fellowship will provide a valuable opportunity to conduct independent research *and* gain valuable teaching experience and skills. Working closely with Dr. Tenhumberg to achieve the aims proposed in this project will improve upon the skills I believe are essential to being a successful quantitative ecologist, including (i) an advanced proficiency in matrix and stochastic population modelling techniques and (ii) effectively communicating quantitative studies to the discipline in high-impact forums.

V. Literature CiedLITERATURE CITED

Allen, C.R., Birge, H.E., Bartelt-Hunt, S., Bevans, R.A., Burnett, J.L., Cosens, B.A., Cai, X., Garmestani, A.S., Linkov, I., Scott, E.A., Solomon, M.D. & Uden, D.R. (2016) Avoiding Decline: Fostering Resilience and Sustainability in Midsize Cities. *Sustainability*, **8**, 844.

Allen, C.R. & Burnett, J.L. (in prep.) *Avian invaders’ biogeography and emerging invasive species in North America*. *Global avian invasions*, CABI.

Burnett, J. & Moulton, M. (2015) Recent trends in House Sparrow (Passer domesticus) distribution and abundance in Gainesville, Alachua County, Florida. *Florida Field Naturalist*, **43**, 167–172.

Burnett, J.L., Pope, K., L., Wong, A., Allen, C.R., Haak, D.M., Stephen, B.J. & Uden, D.R. (2018) Thermal Tolerance Limits of the Chinese Mystery Snail (Bellamya chinensis): Implications for Management. *American Malacological Bulletin*, **36**, 140–144.

Burnett, J.L. & Price, N.B. (2018) R package for calculating distance traveled in community time series.

Burnett, J.L., Price, N.B., Tyre, A.J., Hefley, T.J., Allen, C.R., Angeler, D.G. & Twidwell, D. (in prep.) A guide to Fisher Information for ecologists.

Burnett, J.L., Roberts, C.P., Allen, C.R., Brown, M.B. & Moulton, M.P. (2017) Range expansion by Passer montanus in North America. *Biological invasions*, **19**, 5–9.

Burnett, J.L. & Sieving, K. (2016) Songbird distress calls as an improved method for detecting Red-shouldered Hawks (Buteo lineatus). *Florida Field Naturalist*, **44**, 157–168.

Burnett, J.L., Wilcox, R.C., Stephen, B.J., Uden, D.R., Allen, C.R., Freeman, P.W. & Pope, K.L. (in review) Shell strength does not limit predation of an invasive snail species (Bellamya chinensis) by native fish. *Journal of Freshwater Ecology*.

Burnett, J.L., Wszola, L., Mirochnitchenko, Stuber, E., Bomberger Brown, Mary, Allen, Craig R., Twidwell, Dirac & Carroll, John (in prep.) Large-sacle crop patterns influence Gray Partridge (Perdix perdix) site occupancy in North America.

Carpenter, S.R., Armbrust, E.V., Arzberger, P.W., Chapin, F.S., Elser, J.J., Hackett, E.J., Ives, A.R., Kareiva, P.M., Leibold, M.A., Lundberg, P., Mangel, M., Merchant, N., Murdoch, W.W., Palmer, M.A., Peters, D.P.C., Pickett, S.T.A., Smith, K.K., Wall, D.H. & Zimmerman, A.S. (2009) Accelerate Synthesis in Ecology and Environmental Sciences. *BioScience*, **59**, 699–701.

Chuang, W.C., Garmestani, A., Eason, T.N., Spanbauer, T.L., Fried-Petersen, H.B., Roberts, C.P., Sundstrom, S.M., Burnett, J.L., Angeler, D.G., Chaffin, B.C., Gunderson, L., Twidwell, D. & Allen, C.R. (2018) Enhancing quantitative approaches for assessing community resilience. *Journal of Environmental Management*, **213**, 353–362.

Donovan, V.M., Burnett, J.L., Bielski, C.H., Birgé, H.E., Bevans, R., Twidwell, D. & Allen, C.R. (2018) Social–ecological landscape patterns predict woody encroachment from native tree plantings in a temperate grassland. *Ecology and evolution*.

La Sorte, F.A., Lepczyk, C.A., Burnett, J.L., Hurlbert, A.H., Tingley, M.W. & Zuckerberg, B. (2018) Opportunities and challenges for big data ornithology. *The Condor*, **120**, 414–426.