Abstract:

The fate of biodiversity in the Anthropocene will largely depend on the ability of species to survive alongside us in landscape mosaics of farms and patches of natural habitat. While recent work suggests that large concentrations of wildlife are often found in farming landscapes, at least two major barriers exist to their continued persistence. First, because farms often lack tree canopies that shade the understory, increasingly common temperature spikes associated with climate change may make many agricultural systems inhospitable in the future. Second, fear that wildlife carry foodborne diseases (e.g., pathogenic E. coli) has created great pressure on farmers to discourage wildlife from visiting their farm fields. We propose using wild birds in the California Central Valley as a model system to (1) quantify and compare the impacts of temperature spikes on bird health and reproduction between farms, grasslands, and forests and (2) develop a holistic assessment of the potential food-safety risks of wild birds. To address objective 1, we will monitor nests placed in four habitat types: riparian forests, open grasslands, row-crop agriculture, and orchards. We will quantify the cooling effect of canopy cover on the levels of heat faced by nestlings across these land uses and relate this stressor to growth, parental feeding rate, and nestling physiology to understand the mechanisms underpinning reduced growth and survival in extreme heat observed in previous studies. To address objective 2, we will capture adult birds in mist nets, collect fecal samples, and then assay those fecal samples for Salmonella spp. and pathogenic E. coli bacteria. Then, we will inoculate collected feces with E. coli collected from lettuce leaves and quantify the concentration of E. coli in those feces at several points over 3 weeks with the goal of assessing the survival of E. coli in bird feces across several songbird species and in Canada Goose. Results from these studies will support the co-management of agricultural landscapes for people and nature. The first objective may provide concrete avenues through which agricultural landscapes could be modified to better accommodate cavity-nesting birds. The second will improve our understanding of the risks associated with birds on produce farms, which could help farmers avoid food-safety risks while taking advantage of some of the benefits that birds provide, such as pest control.