**Why do the effects of temperature on nestling growth and survival vary across land uses?**

The interactive effects of climate change and habitat conversion to agriculture constitute the primary threat to terrestrial wildlife.1 As climate change progresses, human-dominated landscapes may expose birds to new temperature extremes because converting forested land to agriculture removes trees that insulate the understory from ambient temperature.2,3 In hot ecosystems, climate change-driven temperature spikes often induce nest failure and drive population collapse.5 For example, my preliminary results from an analysis of Cornell University’s NestWatch database show that, across North America, temperature spikes lower nesting success in agriculture and urban environments.

For this project, I will investigate the two main mechanisms that could underlie the consequences of temperature spikes: direct thermoregulation challenge for nestlings and food availability. Nestlings can survive heat waves by using more energy to thermoregulate, but this may decrease growth and lead to lower survival.6 Furthermore, heat waves may reduce food provisioning to nestlings, either by forcing adults to spend more energy thermoregulating or by reducing prey availability.7 Here, I propose to investigate the relative contributions of thermoregulation challenge and food provisioning to reduced nestling growth under temperature spikes across four land uses: natural open canopy (grassland), natural closed canopy (riparian forest), agricultural open canopy (row crop), and agricultural closed canopy (orchard).

The results of this project will provide crucial insight into the mechanisms by which climate change may affect the ability of birds to survive in human-dominated habitats. They will also provide concrete avenues through which working landscapes could be modified to support the climate resilience of cavity-nesting birds. If the direct effects of heat are more impactful than food-mediated effects, nest boxes could be modified to reduce their internal temperature. If food-mediated effects predominate, then maintaining patches of non-crop habitats in working landscapes to support food resources may be more effective.

Literature Cited

**1** Travis, J. M. J. *Proc. R. Soc. Lond. B Biol. Sci.* 270, 467–473 (2003)

**2** Suggitt, A. J. *et al.* *Oikos* 120, 1–8 (2011)

**3** De Frenne, P. *et al.* *Nat. Ecol. Evol.* 3, 744–749 (2019)

**4** Dunn, E. H. *Wilson Bull.* 91, 455–457 (1979)

**5** Socolar, J. B. *et al.* *Proc. Natl. Acad. Sci.* 114, 12976–12981 (2017)

**6** Wingfield, J. C. *et al.* *Philos. Trans. R. Soc. B Biol. Sci.* 372, 20160140 (2017)

**7** Forister, M. L. *et al.* *Science* 371, 1042–1045 (2021)

**Qualifications**

I am a PhD candidate with Daniel Karp at the University of California, Davis in the Department of Wildlife, Fish, and Conservation Biology. This ongoing project is the second chapter of my dissertation. I am a sub-permitted bird bander under Daniel Karp’s USFW Master Bander permit, and am permitted through IACUC and CA Fish and Wildlife to handle, band, and collect blood samples from adult and nestling birds. I have been conducting fieldwork for this project for the last two summers, and cumulatively over my career have handled and banded ~800 adult birds and ~500 nestling birds.

I am collaborating with Dr. Paulina Gonzalez, who is also sub-permitted under Daniel Karp’s Master Bander permit. Dr. Gonzalez studies avian stress physiology and has both blood sample collection expertise and corticosterone assay expertise.