**Application: Violet Wu**

**The nature and timing of the experiential learning opportunity**

With mentorship and support from Katherine Lauck (a PhD student in Dr. Daniel Karp’s lab), I will conduct an independent research project aiming to link bird food provisioning to reproductive success in agricultural and natural forest habitats. Specifically, from March to July, 2022, I will work with Katherine Lauck to collect data for my project. After the field season, I will analyze my data and write a report detailing our findings.

**Briefly describe the experience that you propose to undertake. This statement of purpose should be 500 words or less. \***

The conversion of natural habitat to agriculture is driving biodiversity declines. Some wildlife can acclimate to these changes. For example, birds may nest in both forest and agriculture, but the quality of the two habitats may be different, leading to lower reproductive success and higher stress in suboptimal habitats. One difference between forest and agriculture is that temperatures on farms are often >10°C hotter than nearby natural sites, especially during hot summers, when dense vegetation in forests can shade and insulate the understory. Songbirds are vulnerable to temperature extremes during breeding seasons when altricial young are ectothermic for the first week after hatching. In a preliminary study across the U.S. and 58 species of birds, high temperatures increased reproductive success of birds in forest but decreased success in agricultural lands. However, the mechanism behind this pattern remains unresolved. One possibility is that, when temperatures are high, food provisioning rates to nestlings may decline, reducing energy input, nestling growth, and survival. Understanding how land covers interact with temperature to affect food provisioning may suggest conservation actions to increase the resilience of birds living in agriculture to climate change.

**Question**: How do nest box temperatures and land cover affect food provisioning to nestling?

**Hypothesis**: Food provisioning is predicted to be lower when temperatures spike because parents may need to decrease foraging time to seek shade or water for thermoregulation. Therefore, nestlings in open land covers (i.e. grassland and row crops) may receive less food than those under closed canopies (i.e. forest or orchard). In addition, insect abundance might be lower in agriculture (i.e. row crops and orchards) than in natural areas (i.e. forest and grassland), making foraging more time-consuming. These factors are hypothesized to lead to less food provisioning, slower growth, and lower survival for nestlings in open, agricultural land.

**Methods**

We will be monitoring Tree Swallow and Western Bluebird nest boxes across four different types of land use habitats: Natural open canopies (grassland), natural closed canopies (riparian forest), agricultural open canopies (crop field), and agricultural closed canopies (orchards). Though many boxes are established, 30 additional boxes will be placed in the Capay Valley to achieve sufficient sample sizes. Specifically, 20 active nests per habitat (N= 20\*4 =80) will be monitored for temperature using loggers placed inside and outside each nest to record temperature every 5 minutes from egg-laying to fledging. The canopy cover of each nest will be quantified with fisheye photography. Half of the nests willbe monitored for food provisioning using motion-activated cameras. We will use an image recognition algorithm to identify adult arrivals and quantify hourly provisioning rates. Provisioning rates will then be modeled as a function of temperature maximums, land-use types, canopy cover, and other factors influencing parental behavior. In addition, all monitored nest boxes will be checked regularly to track nestling growth and survival. We will collect data on nestling weight, wing chord, tarsus length, and bill length for each nestling. These data will be used to estimate the correlation between food provisioning and nestling growth.

**Explain how this experience will benefit your professional goals (150 words or less). \***

My goal is to become an ecology researcher focusing on wildlife conservation. As such, I want to seize this opportunity to gain hands-on experience working with songbirds. From my research experience studying the fitness impact of temperature-induced melanization on monarch caterpillars, I became aware of how climate change can influence the lifestyle of animals and became eager to contribute to their conservation. This project would allow me to extend my knowledge from insects to birds. Though I am passionate about birds and birdwatching, I have never researched birds. This opportunity would give me valuable experience that would be vital for a future career in ecological research, including bird handling, bird banding, and data analysis. Working and communicating with my mentors would also help me develop key skills associated with conducting my first independent research project, including experimental design, scientific writing, and communication.

**The amount of money needed to enable the opportunity, with a budget and justification.**

Total amount of money requested: $6674

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| Item | Dollar amount | Justification |
| Salary | 5175 | 10 hr/wk \* 12 wk\* $15/hr + 25hr/wk \* 9 wk \* $15/hr |
| Benefits | 98 | Benefits @ 1.9% of $5175 salary |
| Boxes for new field site in Capay Valley (30) | 1401 | ($30/bird box + $16.70/pole) \* 30 |

Justification of salary:

The wage for undergraduate students at UC Davis is $15/hour. I will work during spring quarter at 10 hours per week (12 weeks total) and during summer at 25 hours per week (9 weeks total). The benefit rate is 1.9% of the salary. The money I’m requesting will be my only income across the duration of this project. As an international student, I came to study in America alone, and my parents have been paying most of my tuition. Since the Covid-19 pandemic started, I have not been able to go back home and meet my family for more than two years. Thus, I’m seeking job opportunities to compensate my living expense and be more financially independent. Therefore, the Swift fund would be a huge support as it would allow me to conduct paid field research and facilitate my learning experience here at UC Davis. Without monetary compensation to pay for my living expenses, this project would not be possible.