Project Feasibility

The goal of this study is to evaluate the forage availabilities surrounding the SAP managed honey bee population and it aims to: (1) identify gaps in forage availability throughout the active season and (2) make specific recommendations for supplemental planting to support the honey bee hives directly. Two honey bee colonies are readily available for the study on the SAP grounds. Due to the nature of the interaction between the honey bee colony and its surrounding forage, the study requires an interdisciplinary approach using aspects of entomology (bee biology), botany, computer information systems and conservation ecology. [redacted], an ecologist by training, has been focusing her efforts and content expertise in interdisciplinary approaches to food systems and honey bee management for the past six years. [redacted] is knowledgeable and experienced in the fields of biology and design. In planning this study, the scholar/mentor team used a system thinking approach to refine the research question and methods, encompassing a variety of environmental perspectives. The resulting project couples a simple design with the interests and knowledge base of the team, resulting in an undergraduate research opportunity that is specifically tailored for [redacted].

The main project aims are discussed below.

1. Gaps in Forage Availability

In this part of the project, the quality and quantity of the two primary forage needs for the SAP honey bees -- plant nectar and plant pollen -- will be quantitatively assessed throughout the blooming season. Bees need nectar for energy to sustain the hive's activities and pollen for larval development to populate the colony.

The blooming season can be divided into three periods: spring, summer and fall. [redacted] will collect and analyze data for the summer blooming period for this S3 project. Two managed honey bee colonies will be monitored at the SAP in the early spring season. The colonies will be provisioned with Sundance pollen traps and electronic hive scales that measure and record hive weight and ambient temperature. This equipment has already been purchased by the GVSU Beekeepers student organization.

The pollen trap will be set for a three-day period and closed for four days per week so that it does not detrimentally affect the colony's health. Pollen collected weekly by the trap will be cleaned, weighed, sampled and sorted by type for qualitative and quantitative assessment. Additionally, a random pollen sample will be sent to Midwest Laboratories for a macro-Kjeldahl method for nitrogen, which is used to calculate the crude protein levels for quantitative value. Scholar and mentor will be working side by side through the first few weeks of data collection, while the scholar develops the skills and confidence to handle data collection independently.

The hive scales will continuously monitor the weight of the hive and will transmit the data automatically to the Bee Informed Partnership (BIP) scale portal at the University of Maryland. This portal was developed and is managed here at GVSU by Prof. [redacted] in CIS, who will serve as our technical support in this data collection. From the daily hive weight data the amount of nectar brought into the hive will be determined.

Additionally, the hives will be inspected regularly throughout the full duration of the data collection period to assess the colony's overall health, growth, and productivity. The mentor and scholar will superpose these qualitative assessments of colony prosperity with the nectar quantity and pollen diversity/protein content data streams to create a quantitative and qualitative timeline for the summer blooming season. [redacted] will cross-reference the average requirements and local

blooming timetable from the literature and identify potential gaps in the surrounding available forage supported by [redacted].

(2) Recommendations for supplemental planting

It is expected that the assessments of the first aim of this project will identify gaps in SAP bee forage quality and quantity. In this second part of the project [redacted] will consider these gaps and recommend specific supplemental plant species that can fill them. These plants would ideally a) produce nectar and pollen during times of need b) be an appropriate and high-value honey bee food source c) be appropriate for the SAP location.

Project Timeline

Wk 1 5/22	Wk 2 5/29	Wk 3 6/5	Wk 4 6/12	Wk 5 6/19	Wk 6 6/26	Wk 7 7/3	Wk 8 7/10	Wk 9 7/17	Wk 10 7/24	Wk 11 7/31	Wk 12 8/7
Hive inspections with recorded observations of colony health, size, food stores, distribution and general equipment functioning. Including visits to local apiaries and studying hive scale data software with Prof. [redacted]											
Research nutritional requirements, pollen libraries, and local flowering plant profile. Research related conservation ecology studies.											
Collect hive scale data (daily). Collect, sort, and send pollen for analysis (weekly). Maintain nectar and pollen database.											
					Construct timeline for summer blooming season. Identify potential nutritional gaps.						
							Analyze timeline in contrast to the avg. nutritional recommendations. Make plant recommendations to SAP.				
									Write research article to report methods, data collected and discuss findings.		
Mentor/ Student Weekly Time Commitment (hrs)											
M: 20 S: 30	M: 20 S: 30	M: 15 S: 30	M: 15 S: 30	M: 15 S: 30	M: 18 S: 35	M: 18 S: 35	M: 20 S: 35	M: 15 S: 40	M: 15 S: 40	M: 12 S: 35	M: 10 S: 35